Contents

T Plant Complex Part B

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WASHINGTON STATE DEPARTMENT OF ECOLOGY

Addendum A

Part A Form

Date Received			Reviewed by:		Date:	
Month	Day	Year	Approved by:		Date:	

I. This form is submitted to: (place an "X" in the appropriate box)

☒	**Request modification to a final status permit (commonly called a "Part B" permit)**
☐	**Request a change under interim status**
☐	**Apply for a final status permit. This includes the application for the initial final status permit for a site or for a permit renewal (i.e., a new permit to replace an expiring permit).**
☐	**Establish interim status because of the wastes newly regulated on:**
	List waste codes:

II. EPA/State ID Number

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

III. Name of Facility

U.S. Department of Energy – Hanford Facility

IV. Facility Location (Physical address not P.O. Box or Route Number)

A. Street

Refer to Permit Attachment 2 – Hanford Facility Permit Legal Description

City or Town	State	ZIP Code
Near Richland	WA	

County Code (if known)	County Name
0 0 5	Benton

B. Land Type	C. Geographic Location		D. Facility Existence Date		
	Latitude (degrees, mins, secs)	Longitude (degrees, mins, secs)	Month	Day	Year
F	Refer to TOPO Map (Attachment C) for T Plant Complex OUG-9		1 1	1 9	1 9 8 0

V. Facility Mailing Address

Street or P.O. Box

P.O. Box 550

City or Town	State	ZIP Code
Richland	WA	99352

VI. Facility contact (Person to be contacted regarding waste activities at facility)			
Name (last)	**(first)**		
Charboneau	Stacy		
Job Title	**Phone Number**		
Manager	(509) 376-7395		
Contact Address			
Street or P.O. Box			
P.O. Box 550			
City or Town		**State**	**ZIP Code**
Richland		WA	99352

VII. Facility Operator Information	
A. Name	**Phone Number**
U.S. Department of Energy Owner/Operator CH2M HILL Plateau Remediation Company Co-Operator for Dangerous Waste Management Units in T Plant Complex Unit Group*	(509) 376-7395 (509) 376-0556*
Street or P.O. Box	
P.O. Box 550 P.O. Box 1600*	

City or Town	**State**	**ZIP Code**
Richland	WA	99352

B. Owner Type	**C. Does the name in VIII.A reflect a proposed change in owner?**	☐ Yes ☒ No	If yes, provide the scheduled date for the change: Month / Day / Year
F			

C. Does the name in VII.A. reflect a proposed change in operator?	☐ Yes ☒ No
If yes, provide the scheduled date for the change:	Month / Day / Year

D. Is the name listed in VII.A. also the owner? If yes, skip to Section VIII.C.	☐ Yes ☒ No

VIII. Facility Owner Information		
A. Name	**Phone Number (area code and number)**	
U.S. Department of Energy Owner/Operator	(509) 376-7395	
Street or P.O. Box		
P.O. Box 550		
City or Town	**State**	**ZIP Code**
Richland	WA	99352

B. Owner Type	**C. Does the name in VIII.A reflect a proposed change in owner?**	☐ Yes ☒ No	If yes, provide the scheduled date for the change: Month / Day / Year
F			

IX. NAICS Codes (5/6 digit codes)													
A. First							**B. Second**						
5	6	2	2	1	1	Waste Treatment & Disposal	9	2	4	1	1	0	Administration of Air & Water Resource & Solid Waste Management Programs
C. Third							**D. Fourth**						
5	4	1	7	1	2	Research & Development in the Physical, Engineering, & Life Sciences							

X. Other Environmental Permits (see instructions)

A. Permit Type	B. Permit Number	C. Description
E	AOP00-05-006	Title V Air Operating Permit
E	DE01NWP-002	WAC 173-400 & -460 Criteria & Toxics approval
E	FF-01-314	WAC 246-247 Radioactive Air Emissions approval, AIR 12-312, Emission Unit 314
E	FF-01-315	WAC 246-247 Radioactive Air Emissions approval, AIR 12-311, Emission Unit 315
E	FF-01-447	WAC 246-247 Radioactive Air Emissions approval, AIR 12-312, Emission Unit 447
E	ST0004511	State Waste Discharge Permit Misc. Streams Permit

XI. Nature of Business (provide a brief description that includes both dangerous waste and non-dangerous waste areas and activities)

SEE ATTACHMENT A, "NATURE OF BUSINESS," and ADDENDUM C, "PROCESS INFORMATION," for further description.

The Hanford Facility, located in southeastern Washington State, is owned by the U.S. Government and operated by the U.S. Department of Energy and CH2M HILL Plateau Remediation Company. Dangerous waste and mixed waste (containing both dangerous and radioactive components) are generated and managed at the Hanford Facility.

The T Plant Complex (T Plant) Operating Unit Group (OUG) is located in the 200 West Area on the Hanford Site. T Plant was constructed in 1943 for chemical separation of plutonium from uranium fission and activation products using the Bismuth-Phosphate/Lanthanum-Fluoride process. Beginning in 1957, T Plant was used for decontamination operations. Currently, T Plant provides storage and treatment services for dangerous and/or mixed waste.

T Plant consists of the following dangerous waste management units (DWMUs):

- 221-T Canyon Deck
- 221-T Cells (7L, 13R, 16R, and 17R)
- 221-T Railroad Tunnel
- 221-T Head End
- 221-T Operations Gallery Storage
- 221-T BY Storage Area
- 2706-T Building
- 2706-TA Building
- 2706-T Outside Storage Area
- 2706-TA Outside Storage Area

- 2706-T Yard (Including HS-030 and HS-032 Storage Modules)
- 2706-T Asphalt Pad
- 243-T Covered Storage Pad
- 214-T Building
- 211-T Cage
- 2706-T Outdoor Storage Area
- 2706-TA Outdoor Storage Area

S01: The storage (S01) process design capacity for T Plant is 6,578 m^3 (8,604 yd^3). See Attachment A, for storage capacities at each T Plant DWMU. It is assumed that all treated waste is also placed in storage; therefore, the estimated annual quantity of waste stored is equal to the amount treated under T04.

S06: The containment building DWMU is defined as locations within the 221-T Building, including the 221-T Railroad Tunnel, 221-T Canyon Deck, and selected 221-T Cells (7L, 13R, 16R, and 17R). The containment building acts as primary containment for non-containerized stored waste and materials (generally equipment and debris) without free liquids. The maximum storage (S06) design capacity for containment building is 1,698 m^3 (2,221 yd^3). See Attachment A for container storage details at each T Plant DWMU. It is assumed that all treated waste is also placed in storage; therefore, the estimated annual quantity of waste stored is equal to the amount treated under T94.

T04: Container treatment (T04) consists of volume reduction (including sorting and segregation), deactivation (including neutralization and controlled reaction with water), extraction technologies (including debris washing and physical extraction), deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), absorption (i.e., free and containerized liquids), solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing. Addendum C has full descriptions of treatment types. The maximum container treatment process design capacity is 221 metric tons (244 short tons) per day. Assuming 250 working days per year, this would allow an estimated annual quantity of container treatment (T04) of 55,250 metric tons (60,900 short tons).

T94: Containment building treatment (T94) waste treatment activities of non-containerized mixed waste consists of volume reduction, extraction technologies, and sealing of wastes without free liquids. The maximum containment building container treatment process design capacity is 75 metric tons (83 short tons) per day. Assuming 250 working days per year would allow an estimated annual quantity of containment building waste treatment (T94) of 18,750 metric tons (20,670 short tons).

EXAMPLE FOR COMPLETING ITEMS XII and XIII (shown in lines numbered X-1, X-2, and X-3 below):
A facility has two storage tanks that hold 1,200 gallons and 400 gallons respectively. There is also treatment in tanks at

20 gallons/hr. Finally, a one-quarter acre area that is two meters deep will undergo *in situ vitrification.*

Section XII. Process Codes and Design Capacities					Section XIII. Other Process Codes					
Line Number	A. Process Codes	B. Process Design Capacity: 1. Amount	B. Process Design Capacity: 2. Unit of Measure	C. Process Total Number of Units	Line Number	A. Process Codes	B. Process Design Capacity: 1. Amount	B. Process Design Capacity: 2. Unit of Measure	C. Process Total Number of Units	D. Process Description
X1	***S02***	***1,600***	***G***	***002***	***X1***	***T04***	***700***	***C***	***001***	***In situ vitrification***
X2	***T03***	***20***	***E***	***001***						
X3	***T04***	***700***	***C***	***001***						
1	S01	6,578	C	015	1	T04	75	S	005	Volume Reduction (includes sorting and segregation)
2	S06	1,698	C	003	2	T04	5	S	005	Deactivation (includes neutralization and controlled reaction with water)
3	T04	221	S	006	3	T04	25	S	006	Extraction Technologies (includes debris washing and physical extraction)
4	T94	75	S	003	4	T04	2.5	S	005	Deactivation and Recovery of Organics (puncture and decant aerosol cans and/or cylinders)
5					5	T04	5	S	005	Absorption
6					6	T04	31	S	005	Solidification/ Stabilization
7					7	T04	0.042	S	005	Mercury Amalgamation
8					8	T04	77	S	006	Microencap-sulation/ Macroencap-sulation/Sealing
9					9	T94	25	S	002	Volume Reduction
10					10	T94	25	S	003	Extraction Technologies
11					11	T94	25	S	002	Sealing
12					12					
13					13					
14					14					

XIV. Description of Dangerous Wastes

Example for completing this section: A facility will receive three non-listed wastes, then store and treat them on-site. Two wastes are corrosive only, with the facility receiving and storing the wastes in containers. There will be about 200 pounds per year of each of these two wastes, which will be neutralized in a tank. The other waste is corrosive and ignitable and will be neutralized then blended into hazardous waste fuel. There will be about 100 pounds per year of that waste, which will be received in bulk and put into tanks.

Line Number	A. Dangerous Waste No.				B. Estimated Annual Quantity of Waste	C. Unit of Measure	D. Processes (1) Process Codes									D. Processes (2) Process Description [If a code is not entered in D.(1)]
X1	*D*	*0*	*0*	*2*	*400*	*P*	*S*	*0*	*1*	*T*	*0*	*1*				
X2	*D*	*0*	*0*	*1*	*100*	*P*	*S*	*0*	*2*	*T*	*0*	*1*				
X3	*D*	*0*	*0*	*2*												***Included with above***
1																

A description of the Dangerous Wastes managed in T Plant Complex is provided in Attachment B, "Description of Dangerous Waste."

XV. Map

Attach to this application a topographic map of the area extending to at least one (1) 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 dangerous waste treatment, storage, recycling, or disposal units; and each well where fluids are injected underground. Include all springs, rivers, and other surface water bodies in this map area, plus drinking water wells listed in public records or otherwise known to the applicant within ¼ mile of the facility property boundary. The instructions provide additional information on meeting these requirements.

A topographic map of the Hanford Facility has been provided separately. A topographic map for T Plant Complex is located in Attachment C, "Photographs."

XVI. Facility Drawing

All existing facilities must include a scale drawing of the facility (refer to Instructions for more detail).

Facility drawings of the Hanford Facility have been provided separately. Drawings for the T Plant Complex are located in Addendum C.

XVII. Photographs

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

Photographs of the Hanford Facility have been provided separately. Photographs for the T Plant Complex are located in Attachment C.

XVIII. Certifications

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.

Operator Name and Official Title U.S. Department of Energy Richland Operations Office By Stacy L. Charboneau, Manager	**Signature**	**Date Signed**
Operator Name and Official Title CH2M HILL Plateau Remediation Company By John A. Ciucci, President and Chief Executive Officer	**Signature**	**Date Signed**

Co-Operator – Address and Telephone Number*
P.O. Box 1600
Richland, WA 99352
(509) 376-0556

Facility-Property Owner Name and Official Title U.S. Department of Energy Richland Operations Office By Stacy L. Charboneau, Manager	**Signature**	**Date Signed**

XIX. Comments

Section XI. Refer to Attachment A for further description.

Section XIV. Refer to Attachment B for waste codes for storage and treatment at the T Plant Complex. The waste codes have been divided into groups for T Plant Complex based on the two main processes (storage and treatment), and the types of permitted units at T Plant Complex (container and containment buildings).

Section XV. A topographic map of the Hanford Facility has been provided separately. Topographic map for T Plant Complex is located in Attachment C.

Section XVI. Facility drawings of the Hanford Facility have been provided separately. Drawings for the T Plant Complex are located in Addendum C.

Section XVII. Photographs of the Hanford Facility have been provided separately. Photographs for the T Plant Complex are located in Attachment C.

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Attachment A

Section XI – Nature of Business

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Contents

Tables

A1 Introduction

The Hanford Facility, located in southeastern Washington State, is owned by the U.S. Government and operated by the U.S. Department of Energy, Richland Operations Office and CH2M HILL Plateau Remediation Company. Dangerous waste and mixed waste (containing both dangerous and radioactive components) are generated and managed within the Hanford Facility.

The T Plant Complex (T Plant) Operating Unit Group (OUG) is located in the 200 West Area of the Hanford Site. T Plant was constructed in 1943 to provide chemical separation of plutonium from uranium fission and activation products using the Bismuth-Phosphate/Lanthanum-Fluoride process. Beginning in 1957, T Plant was used for decontamination operations. Currently, T Plant provides container storage and treatment services for dangerous and/or mixed waste. The waste received and processed by T Plant has been generated both on and off the Hanford Site.

Please note, the terms “mixed waste” and/or “waste”, when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

A2 General Description of Onsite Activities

The primary missions of T Plant are treatment and storage of noncontainerized and containerized waste. These missions include characterization of Waste Retrieval Project waste, container venting, and verification sampling, treatment, and repackaging of dangerous and mixed waste. T Plant will store and treat nondangerous waste sludge retrieved from the K Basins. Wastes that can be managed at T Plant include low-level waste, mixed low-level waste (MLLW), transuranic mixed (TRUM) waste, hazardous/dangerous waste, and *Toxic Substances Control Act of 1976* (TSCA)-polychlorinated biphenyl (PCB) waste.

The multiple storage dangerous waste management units (DWMUs), each with different configurations, provide the operational flexibility to support various waste management activities at T Plant. In some cases, physical separation between large containers is required to meet *Atomic Energy Act of 1954* controls.

The storage and treatment DWMUs provide space for the storage and processing of mixed and nonmixed radioactive wastes, including TSCA-PCB contaminated mixed and nonmixed radioactively contaminated wastes.

Table A-1 identifies the operating DWMUs in T Plant where dangerous and mixed waste is treated or stored. The type of DWMU and the corresponding treatment authorization are indicated in Table A-2.

T Plant includes DWMUs currently undergoing closure activities, as listed in Table A-1. The closure units are not authorized to accept dangerous and/or mixed waste.

Maps and photographs of the DWMUs are located in Attachment C, “Photographs,” of this Part A application.

Table A-1. T Plant Dangerous Waste Management Units

Operating Dangerous Waste Management Units			
DWMU Name	**Treatment**	**Storage**	**Notes**
221-T Canyon Deck	YES	YES	Part of 221-T Building
221-T Cells (7L, 13R, 16R, and 17R)	YES	YES	Part of 221-T Building; includes the following cells: 7L, 13R, and 17R
221-T Railroad Tunnel	YES	YES	Part of 221-T Building; includes outdoor storage area
221-T Head End	NO	YES	Part of 221-T Building; includes outdoor storage area
221-T Operations Gallery Storage	NO	YES	Part of 221-T Building
221-T BY Storage Area	NO	YES	Outdoor storage area that includes TSCA container 221T-03-000004
2706-T Building	YES	YES	
2706-TA Building	YES	YES	
2706-T Outdoor Storage Area	NO	YES	Outdoor storage area
2706-TA Outdoor Storage Area	NO	YES	Outdoor storage area
2706-T Yard (Including HS-030 and HS-032 Storage Modules)	NO	YES	Outdoor storage area
2706-T Asphalt Pad	NO	YES	Outdoor storage area
243-T Covered Storage Pad	NO	YES	Outdoor storage area
214-T Building	YES	YES	Includes outdoor storage area
211-T Cage	NO	YES	Outdoor storage area

Closing DWMUs	
DWMU Name	**Notes**
271-T Cage	None
211-T Pad	None
221-T Sand Filter Pad	None
221-T R5 Waste Storage Area	None
277-T Outdoor Storage Area	None
277-T Building	None
2706-TB Tank System	Includes 2706-TB Building
221-T Railroad Cut	Gravel area in front of 221-T Railroad Tunnel DWMU
221-T Pipe Gallery Storage	Inside the 221-T Building
221-T Tank System	Includes the 211-T Sump

DWMU = *dangerous waste management unit*

TSCA = *Toxic Substances Control Act of 1976*

Table A-2. Summary of T Plant Operating Dangerous Waste Management Units

Management Unit Type	T Plant Operating Unit Group DWMUs	Part A Treatment Type	Part A Storage Type
Container (Storage)	221-T Head End 221-T Operations Gallery Storage 2706-T Yard (Including HS-030 and HS-032 Storage Modules) 2706-T Asphalt Pad 243-T Covered Storage Pad 221-T BY Storage Area 211-T Cage 2706-T Outdoor Storage Area 2706-TA Outdoor Storage Area	N/A	S01[a]
Container (Storage and Treatment)	221-T Railroad Tunnel 221-T Canyon Deck 2706-T Building 2706-TA Building 214-T Building 221-T Cells (7L, 13R, 16R, and 17R)	T04[a]	S01[a]
Containment Building (Storage and Treatment)	221-T Cells (7L, 13R, 16R, and 17R) 221-T Canyon Deck 221-T Railroad Tunnel	T94[b]	S06[b]

a. Containers.

b. Containment building (storage and treatment of dry, noncontainerized waste; waste with free liquids must be stored and treated in containers).

DWMU = dangerous waste management unit

N/A = not applicable

A3 Operating Units

The following sections describe the function of each operating DWMU.

A3.1 221-T Building

The 221-T Building includes the following operating DWMUs: 221-T Head End, 221-T Operations Gallery Storage, 221-T Cells (7L, 13R, 16R, and 17R), 221-T Canyon Deck, and 221-T Railroad Tunnel. Photographs in Attachment C provide locations for these DWMUs inside the 221-T Building.

The 221-T Building is a canyon type containment building (*Washington Administrative Code* [WAC] 173-303-695, "Dangerous Waste Regulations," "Containment Buildings") constructed of reinforced concrete approximately 260 m (850 ft) long, 21 m (70 ft) wide, and 23 m (75 ft) high, and covers approximately 5,400 m^2 (58,000 ft^2). The building consists of the canyon (221-T Canyon Deck, 221-T Cells, and 221-T Tank System), three galleries (operating, pipe, and electrical), one crane-way, a head-end area (221-T Head End) and access to the railroad tunnel (221-T Railroad Tunnel). The canyon deck consists of 38 covered and uncovered process cells (2L through 20L) and the railroad tunnel access. The process cells begin at Section 2R and continue through Section 20L.

Table A-2 summarizes the operating DWMUs in the 221-T Building and the remainder of the DWMUs that make up T Plant.

The function of each operating DWMU in T Plant is provided in the following sections.

A3.2 221-T Head End DWMU (Storage)

The 221-T Head End is located at the north end of the 221-T Building and consists of a large high-bay work area, located inside the 221-T Building, approximately 12 m (39 ft) wide by 13 m (44 ft) long for a total footprint and available waste storage area of approximately 160 m^2 (1,700 ft^2). At the canyon deck level, the head end provides a working space for contamination control activities and container storage. The northernmost portion of the head end is a mezzanine level accessed by open metal stairs. There is direct access to a portion of the craneway from the mezzanine. An overhead rolling door provides direct access to the associated outdoor storage area constructed of concrete used for container staging.

The floor, roof, and other walls are continuations of the canyon construction. A metal wall of corrugated sheet metal on steel beams isolates the head end from the canyon at the beginning of Section 2. A double-wide door has been added to the sheet metal wall separating the head end from the balance of the canyon.

The 221-T Head End does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7), “Dangerous Waste Regulations,” “Use and Management of Containers.”

No treatment is authorized in the 221-T Head End.

A3.3 221-T Operations Gallery DWMU (Storage)

The 221-T Operations Gallery Storage is located within the 221-T Building (Section 14). This unit consists of two metal cabinets approximately 2.0 m (6.5 ft) tall by 0.9 m (3 ft) wide by 0.46 m (1.5 ft) deep. The cabinets have multiple shelves and may store solid and/or liquid dangerous waste items, but are not suitable for flammable waste storage. Liquid waste is stored and segregated by using portable secondary containment systems such as plastic spill tubs.

No treatment is authorized in the 221-T Operations Gallery Storage Area.

A3.4 221-T Cells (7L, 13R, 16R, and 17R) DWMU (Storage and Treatment)

The 221-T Cells (7L, 13R, 16R, and 17R) are permitted as a containment building for waste storage and treatment. Access to the waste in the containment cells is with an overhead crane. Access by surveillance personnel to the cell floor is not feasible.

The 221-T Containment Building cell design and operation meet the requirements of 40 *Code of Federal Regulations* 264, “Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities,” Subpart DD, “Containment Buildings,” for containment structures for dry waste only. Four process cells (7L, 13R, 16R, and 17R) are identified as containment building cells certified for storage and treatment of dangerous, noncontainerized dry waste only. Wastes containing free liquid must be managed with portable secondary containment, such as spill pallets and/or berms.

The cells measure approximately 5.4 m (18 ft) long, by 4.0 m (13 ft) wide, by 6.7 m (22 ft) deep for a total volume of approximately 150 m^3 (5,100 ft^3) per cell. The standard canyon cells normally are covered by four approximately 1.8 m (6.0 ft) thick concrete cover blocks. Each cover block has a carbon steel lifting bail to allow access into the cells.

Containment building waste treatment activities of noncontainerized waste include deactivation, extraction technologies, neutralization, solidification/stabilization, macroencapsulation, microencapsulation, and sealing. Treatment in the 221-T Cells will be accomplished remotely using the canyon crane.

A diverse range of waste can be stored in the containment cells, including contaminated process equipment and noncontainerized dry waste.

Liquids can be present in the waste to be managed in the containment building, but additional secondary containment is required.

A3.5 221-T Canyon Deck DWMU (Storage and Treatment)

The 221-T Canyon Deck is approximately 11 m (37 ft) wide by over 244 m (800 ft) long for a total footprint area of approximately 2,700 m^2 (30,000 ft^2). The canyon ceiling is approximately 12 m (40 ft) above the 221-T Canyon Deck. The tops of the cell cover blocks serve as the floor surface in much of the 221-T Canyon Deck. Each section is numbered according to the building section number and consists of two cells: one designated right (R) and the other left (L).

The 221-T Canyon Deck can be used for packaging, special decontamination services, repair, treatment, and storage. The amount and type of equipment on the canyon deck can vary with treatment and storage support requirements.

The 221-T Canyon Deck does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

Treatment capabilities on the 221-T Canyon Deck pertain to container treatment and containment building treatment of dry waste. Containment building waste treatment activities of noncontainerized waste include volume reduction, deactivation, extraction technologies, deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), neutralization, absorption, controlled reaction with water, solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing. See Addendum C, “Process Information,” for further treatment details.

A3.6 221-T Railroad Tunnel DWMU (Storage and Treatment)

The 221-T Railroad Tunnel storage area is located within the railroad tunnel that enters the 221-T Building at Cell 2L. Waste and equipment to be stored in other DWMUs located inside the 221-T Building can be transported by vehicle through the high overhead roll-up door of the 221-T Railroad Tunnel DWMU. Materials are lifted by crane and placed in the desired storage location within the 221-T Canyon Deck or cells. Although normally used only as a transfer and staging area for waste, the 221-T Railroad Tunnel may also be used for waste storage and treatment.

The 221-T Railroad Tunnel measures approximately 63.7 m (209 ft) long by 4.9 m (16 ft) wide, for a total footprint and available waste storage area of approximately 310 m^2 (3,300 ft^2). The floor, walls, and ceiling are constructed of reinforced concrete. At the west end of the 221-T Railroad Tunnel, an overhead roll-up door provides vehicular and railway access.

The ramp and asphalt pad outdoor storage area leading up to the 221-T Railroad Tunnel is included in the 221-T Railroad Tunnel DWMU.

Treatment capabilities of containerized waste include volume reduction, deactivation, extraction technologies, deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), neutralization, absorption, controlled reaction with water, solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing. Containment building waste treatment activities of noncontainerized dry waste include volume reduction, extraction technologies, and sealing. Wastes containing free liquid must be managed with portable secondary containment, such as spill pallets and/or berms. See Addendum C for further treatment details.

The 221-T Railroad Tunnel does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

A3.7 221-T BY Storage Area DWMU (Storage)

The 221-T BY Storage Area is an approximately 37 m (120 ft) wide by 61 m (199 ft) long uncovered, irregular shaped area encompassing asphalt and gravel pads. It is located northwest of the 221-T Building and 221-T Railroad Tunnel. The 221-BY Storage Area DWMU does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

No treatment is authorized in the 221-T BY Storage Area.

A3.8 2706-T Building DWMU (Storage and Treatment)

The 2706-T Building is approximately 15 m (48 ft) wide by 20 m (64 ft) long, with a heating, ventilating, and air conditioning (HVAC) room measuring approximately 8.3 m (25 ft) wide by 10 m (31 ft) long and a fire riser room approximately 3.7 m (11 ft) wide by 2 m (7 ft) long, for a total footprint area of approximately 440 m^2 (4,700 ft^2). Areas not available for container storage and treatment were subtracted from this value resulting in an available waste storage area of approximately 290 m^2 (3,100 ft^2). Openings on the east and west ends (the west end leading to 2706-TA Building) are fitted with roll-up metal doors.

The 2706-T Building does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

Containerized waste treatment activities include volume reduction, deactivation, extraction technologies, deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), neutralization, absorption, controlled reaction with water, solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing. See Addendum C for further treatment details.

A3.9 2706-TA Building DWMU (Storage and Treatment)

The 2706-TA Building, constructed of prefabricated steel, is approximately 15 m (50 ft) wide by 18 m (60 ft) long, with an HVAC and electrical room measureing approximately 8.3 m (25 ft) wide by 14 m (41 ft) long, for a total footprint area of approximately 470 m^2 (5,000 ft^2). Areas not available for container storage and treatment were subtracted from this value resulting in an available waste storage area of approximately 280 m^2 (3,000 ft^2). The 2706-TA Building has an equipment roll-up door located at the west end of the building along with the roll-up doors to the 2706-T Building.

The 2706-TA Building does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

Containerized waste treatment activities include volume reduction, deactivation, extraction technologies, deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), neutralization, absorption, controlled reaction with water, solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing. See Addendum C for further treatment details.

A3.10 2706-T Outdoor Storage Area DWMU (Storage)

The 2706-T Outdoor Storage Area DWMU is an uncovered outdoor fenced area approximately 21 m (70 ft) wide by 23 m (76 ft) long, for a total footprint area of approximately 490 m^2 (5,300 ft^2), constructed of asphalt located at the southwest end of the 2706-T Building. The waste storage location consists of a concrete pad approximately 5.2 m (17 ft) wide by 18m (60 ft) long for an available waste storage area of approximately 94 m^2 (1,020 ft^2).

The 2706-T Outdoor Storage Area does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

A3.11 2706-TA Outdoor Storage Area DWMU (Storage)

The 2706-TA Outdoor Storage Area DWMU is an uncovered, irregular shaped, asphalt outdoor fenced area consisting of measurements varying from approximately 7.3 m (24 ft) up to approximately 53.3 m (175 ft) for a total footprint area of approximately 870 m^2 (9,300 ft^2). The DWMU is located to the north end of the 2706-TA Building and wraps around to the west side of the building.

The 2706-TA Outdoor Storage Area does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

A3.12 2706-T Yard (Including HS-030 and HS-032 Storage Modules) DWMU (Storage)

The 2706-T Yard is a fenced, uncovered asphalt paved area for storage of containerized waste.
The 2706-T Yard is located northwest of the 2706-TA Building. The 2706-T Yard is irregular in shape measuring approximately 27 m (87 ft) long by 28 m (93 ft) wide for a total footprint and available waste storage area of approximately 750 m^2 (8,100 ft^2), and contains two flammable waste storage modules (HS-030 and HS-032).

The 2706-T Yard does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

The two flammable waste storage modules (HS-030 and HS-032) are pre-engineered metal storage modules, located inside the 2706-T Yard fence line. Each module measures approximately 7.2 m (24 ft) long by 3.50 m (11.5 ft) wide by 2.7 m (8.5 ft) high and is divided into two separate compartments.

No treatment is authorized in the 2706-T Yard DWMU.

A3.13 2706-T Asphalt Pad DWMU (Storage)

The 2706-T Asphalt Pad is a fenced, uncovered asphalt area approximately 45.7 m (150 ft) long by 24 m (80 ft) wide for a total footprint and available waste storage area of approximately 1,100 m^2 (12,000 ft^2). It is located northwest of the 2706-T Yard.

The 2706-T Asphalt Pad does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

No treatment is authorized in the 2706-T Asphalt Pad DWMU.

A3.14 243-T Covered Storage Pad DWMU (Storage)

The 243-T Covered Storage Pad is an irregular shaped area with a concrete and asphalt base, containing a covered storage structure, located at the southwest corner of T Plant. The pad consists of multiple measurements ranging from approximately 7.3 m (22 ft) up to 94.3 m (283 ft) for a total footprint and available waste storage are of approximately 3,100 m^2 (34,000 ft^2). The structure is constructed with a steel frame, sheet metal roof, and open sides, and it covers only a portion of the pad area.

The 243-T Covered Storage Pad also includes the uncovered, paved area beyond the structure that is used for loading, unloading, and staging of containers.

The 243-T Covered Storage Pad does not have engineered secondary containment; therefore, any waste containers requiring secondary containment within this area will be stored over devices meeting the requirements of WAC 173-303-630(7).

No treatment is authorized in the 243-T Covered Storage Pad DWMU.

A3.15 214-T Building DWMU (Storage and Treatment)

The 214-T Building is approximately 15 m (48 ft) long by 9.8 m (32 ft) wide, for a total footprint and available waste storage area of 140 m^2 (1,500 ft^2), located on the west side of the 221-T Building near the 221-T Railroad Tunnel. The building is constructed of corrugated steel overlaying I-beams and has a concrete floor. The concrete floor is covered with a chemical resistant coating and divided by a raised concrete berm to allow for the separation of incompatible waste types. The two floor areas are sloped to prevent mixing of incompatible materials and direct any spills to separate floor sumps.

The uncovered/unenclosed outdoor storage area consists of the approach apron and access path to the vehicle entrance roll-up door for the building and measures approximately 3 m (10 ft) wide by 4.3 m (14 ft) long.

Containerized waste treatment activities include volume reduction, deactivation, extraction technologies, deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), neutralization, absorption, controlled reaction with water, solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing. See Addendum C for further treatment details.

The 214-T Building has compliant secondary containment; therefore, containers requiring secondary containment can be stored in this container storage area without portable secondary containment.

A3.16 211-T Cage DWMU (Storage)

The 211-T Cage is an approximately 7.6 m (25 ft) long by 4.9 m (16 ft) wide, for a total footprint and available waste storage area of approximately 40 m^2 (400 ft^2), covered outdoor fenced storage area with a locking gate for storing containerized waste. The floor is concrete and has engineered berms, a collection sump, and epoxy coating. The 211-T Cage is split into two sections separated by a concrete berm and surrounded by an above grade curb.

No treatment is authorized in the 211-T Cage.

A4 Closing DWMUs

T Plant includes DWMUs currently undergoing closure activities per an approved closure plan. These units are not authorized to accept dangerous and/or mixed waste into the units.

A4.1 271-T Cage (Closing)

The 271-T Cage is adjacent to the north side of 271-T Building. The 271-T Cage was used to store dangerous, mixed, and TSCA-PCB waste in a <90 day or satellite accumulation storage area and materials for recycle.

The 271-T Cage area is an uncoated concrete floor approximately 5.5 m (18 ft) long by 2.7 m (9.0 ft) wide, with a total area of approximately 15.1 m^2 (162 ft^2). The 271-T Cage is defined on the south side by the 271-T Building and on the remaining three sides by metal chain-link cage material. The 271-T Cage outdoor storage area is covered with corrugated metal roofing material. The 271-T Cage does not currently store dangerous, mixed, or TSCA-PCB waste.

This DWMU is undergoing *Resource Conservation and Recovery Act of 1976* (RCRA) closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.2 211-T Pad (Closing)

The 211-T Pad is located west of the 221-T Building and adjacent to the 211-T-52 Building and ancillary equipment. The 211-T Pad was generally used as secondary containment for tanker trucks. However, containerized dangerous, mixed, or TSCA-PCB waste was also stored on the 211-T Pad. The 211-T Pad area is a curbed, uncoated concrete pad approximately 18 m (59 ft) long by 6.1 m (20 ft) wide, with a total area of approximately 110 m^2 (1,180 ft^2) that slopes into a blind sump. The 211-T Pad blind sump provided secondary containment during periods of waste storage. The 211-T Pad does not currently store dangerous, mixed, or TSCA-PCB waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.3 211-T Sand Filter Pad (Closing)

The 221-T Sand Filter Pad is located east of the north end of the 221-T Building. The 221-T Sand Filter Pad is an uncovered gravel area approximately 55 m (180 ft) long by 18 m (60 ft) wide. The perimeter of the 221-T Sand Filter Pad is designated by jersey barriers. The 221-T Sand Filter Pad was used to store dangerous, mixed, and TSCA-PCB waste in a <90 day or satellite accumulation storage area. The 221-T Sand Filter Pad does not currently store dangerous, mixed, or TSCA-PCB waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.4 221-T R5 Waste Storage Area (Closing)

The 221-T R5 Waste Storage Area is located at the northeast end of 221-T Building. The 221-T R5 Waste Storage Area was used to store dangerous, mixed, and TSCA-PCB waste in a <90 day or satellite accumulation storage area.

The 221-T R5 Waste Storage Area was constructed with the primary purpose of storing containers of various sizes and volumes and a variety of waste streams to ensure adequate capacity and operational flexibility to support T Plant activities. The 221-T R5 Waste Storage Area is an asphalt paved area approximately 47.2 m (155 ft) long by 18 m (60 ft) wide. A portable weather shelter, designated as 229-W, currently occupies the northeast end of the pad. The 221-T R5 Waste Storage Area does not currently store dangerous, mixed, or TSCA-PCB waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.5 277-T Outdoor Storage Area (Closing)

The 277-T Outdoor Storage Area is located at the northwest of the 221-T Building, north of the 221-T Railroad Tunnel. The 277-T Outdoor Storage Area was previously used for storing containers of various sizes and volumes and a variety of waste streams to ensure adequate capacity and operational flexibility to support T Plant activities. The 277-T Outdoor Storage Area consists of two uncoated concrete pads and a gravel area surrounding the 277-T Building. The 277-T Outdoor Storage Area is approximately 29 m (32 yd) on the south side, by 29 m (32 yd) on the west side, by 44 m (49 yd) on the north side, by 29 m (32 yd) on the east side, for a total approximate area of 1,081 m^2 (1,293 yd^2). The 277-T Outdoor Storage Area does not currently store dangerous, mixed, or TSCA-PCB waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.6 277-T Building (Closing)

The 277-T Building is located on the west side of the 221-T Building, on the north side of the 221-T Railroad Tunnel. It is a single story pre-engineered metal building constructed of I-beams covered with corrugated steel on a concrete slab on grade. The building is approximately 12 m (40 ft) long, 9.8 m (32 ft) wide, and 7.3 m (24 ft) high, with roll-up doors located on each end of the building. The 277-T Building does not currently store any dangerous, mixed waste, or TSCA-PCB waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.7 2706-TB Tank System (Closing)

The 2706-TB Tank System includes two storage tanks (T-XX-2706-220 and T-XX-2706-221), piping, ancillary equipment, and the 2706-TB Building. The 2706-TB Building was constructed to enclose the 2706-TB tanks that managed liquid mixed waste generated in the 2706-T and 2706-TA Buildings.

The 2706-TB Building is approximately 9.4 m (31 ft) wide, 14 m (46 ft) long, and 9.4 m (31 ft) high. The building is constructed of prefabricated steel and has a concrete foundation and floor. The 2706-TB Building contains the two storage and treatment tanks, provides secondary containment, and includes a chemical addition room located at the north end of the enclosure. The chemical addition room is not included in the closing portion of the 2706-TB Tank System.

Secondary containment for the 2706-TB Tank System consists of a concrete berm with an external liner made of a high-density epoxy coating that is free of cracks and gaps.

The 2706-TB Tank System does not currently manage dangerous or mixed waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.8 221-T Railroad Cut (Closing)

The 221-T Railroad Cut is an uncovered gravel area located northwest of the 221-T Building outside adjacent to the 221-T Railroad Tunnel. The 221-T Railroad Cut is approximately 27 m (90 ft) long by 15 m (50 ft) wide at the fence and 7.6 m (25 ft) wide at the 221-T Railroad Tunnel end. The 221-T Railroad Cut was occasionally used to store mixed waste being transferred into or out of the 221-T Railroad Tunnel. This area is not currently being proposed for further mixed waste storage as part of the 221-T Railroad Tunnel DWMU. The 221-T Railroad Cut does not currently store dangerous, mixed, or TSCA-PCB waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.9 221-T Pipe Gallery Storage (Closing)

The 221-T Pipe Gallery Storage is located within the 221-T Pipe Gallery, Sections 10 and 11 of the 221-T Building. The unit was installed between 1995 and 1996, and it stored waste until December 2012. This DWMU is an approximate 9.1 m (30 ft) long by 2 m (7 ft) wide area of the 221-T Pipe Gallery surrounded by a steel cage with a sliding gate. The walls, floor, and ceiling are concrete. This unit was used to accumulate and store dangerous wastes, as well as universal and recycle wastes. All liquid wastes were stored on spill pallets. The 221-T Pipe Gallery Storage DWMU does not currently store dangerous, mixed, or TSCA-PCB waste.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A4.10 221-T Tank System (Closing)

The 221-T Tank System is located inside the 221-T Building. The 221-T Tank System consists of six tanks (Tank 5-6, Tank 5-7, Tank 5-9, Tank 6-1, Tank 11-R, and Tank 15-1), the 211-T Sump, the 5-8 Sump, associated piping, and ancillary equipment. The six tanks are stainless steel, closed bottom tanks of varying sizes that have been isolated from further waste addition and, therefore, are considered nonoperating. The 5-8 sump is located in the 221-T Cell 5-R below Tank 5-7. The 211-T Sump is located between the 2706-T Building and the 221-T Building. The 211-T Sump has been isolated and is awaiting closure.

No liquid waste remains within the 221-T Tank System. The last addition of waste to the 221-T Tank System occurred on June 3, 1999. The 221-T Tank System has been isolated from any further waste addition.

This DWMU is undergoing RCRA closure. No future receipts of RCRA waste for storage or treatment of dangerous or mixed waste are authorized.

A5 Treatment and Storage Capacities

The following sections describe the T Plant treatment and storage capacities.

A5.1 S01 (Container Storage)

The storage (S01) process design capacity is approximately 6,578 m^3 (8,604 yd^3). The maximum total volume is shown in Table A-3 within each DWMU at T Plant. A diverse range of waste containers is managed within the T Plant DWMUs. It is assumed that all the waste treated is also placed in storage; therefore, the estimated annual quantity of waste stored is equal to the amount treated under T04.

A5.2 S06 (Containment Building Storage)

The storage (S06) process design capacity is approximately 1,698 m^3 (2,221 yd^3). The maximum total volume is shown in Table A-4 within each DWMU at T Plant. A diverse range of noncontainerized mixed waste can be stored in the S06 containment buildings. It is assumed that all the waste treated is also placed in storage; therefore, the estimated annual quantity of waste stored is equal to the amount treated under T94.

A5.3 T04 (Treatment-Other)

Treatment within the T Plant DWMUs consists of volume reduction, deactivation, extraction technologies, deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), neutralization, absorption, controlled reaction with water, solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing.

The total process design capacity for treatment-other is 221 metric tons (244 short tons) per day and is shown in Table A-3 for each DWMU at T Plant. To determine this maximum treatment capacity, calculations were performed that conservatively estimated the maximum volume of waste expected to be treated using the volume of containers expected to be managed at T Plant in a day. The estimated annual quantity of waste processed is based on an average of 250 working days per year, which equals 55,250 metric tons/year (60,900 short tons/year).

A5.4 T94 (Containment Building Treatment)

Containment building treatment activities of noncontainerized dangerous and/or mixed waste include volume reduction, extraction technologies, and sealing of wastes without free liquids. The maximum process design capacity for containment building treatment is 75 metric tons (83 short tons) per day as shown in Table A-4. The estimated annual quantity of waste processed is based on an average of 250 working days per year, which equals 18,750 metric tons/year (20,670 short tons/year).

Table A-3. Maximum Total Storage Capacity by DWMU

Dangerous Waste Management Unit	**Maximum Total Storage Capacity Volume and Associated Waste Codes (m^3)***	**Process Codes (Part A Form Section XII and Section XIII)**	**Line Numbers (Part A Form Section XII)**
221-T Canyon Deck	858.6	S01	Line Number 1
	Included in S01 capacity	S06	Line Number 2
221-T Cells (7L, 13R, 16R, 17R)	494	S01	Line Number 1
	Included in S01 capacity	S06	Line Number 2
221-T Railroad Tunnel	345.3	S01	Line Number 1
	Included in S01 capacity	S06	Line Number 2
221-T Head End	167.2	S01	Line Number 1

Table A-3. Maximum Total Storage Capacity by DWMU

Dangerous Waste Management Unit	Maximum Total Storage Capacity Volume and Associated Waste Codes (m^3)*	Process Codes (Part A Form Section XII and Section XIII)	Line Numbers (Part A Form Section XII)
221-T Operations Gallery Storage	0.82	S01	Line Number 1
221-T BY Storage Area	1,150	S01	Line Number 1
2706-T Building	56.6	S01	Line Number 1
2706-TA Building	48.3	S01	Line Number 1
2706-T Outdoor Storage Area	64.9	S01	Line Number 1
2706-TA Outdoor Storage Area	279.5	S01	Line Number 1
2706-T Yard (Including HS-030 and HS-032 Storage Modules)	246.3	S01	Line Number 1
2706-T Asphalt Pad	688.9	S01	Line Number 1
243-T Covered Storage Pad	2,063	S01	Line Number 1
214-T Building	94.8	S01	Line Number 1
211-T Cage	20	S01	Line Number 1
Total Storage Capacity			
Process Code		**Maximum Storage Capacity**	
S01		6,578 m^3	
S06		1,698 m^3	

* In accordance with WAC 173-303-630(7)(a)(iii), "Dangerous Waste Regulations," "Use and Management of Containers," secondary containment must have a sufficient capacity to contain 10% of the volume of waste containing free liquids, or waste designated as F020, F021, F022, F023, F026, or F027. In buildings where secondary containment is provided, the maximum volume for the waste types listed will not exceed 10 times the corresponding secondary containment capacity.

Table A-4. Maximum Treatment Capacity by DWMU

Dangerous Waste Management Unit	Maximum Treatment Capacity* (Metric Tons/Day)	Process Codes (Part A Form Section XII and Section XIII)	Line Numbers (Part A Form Sections XII and XII)	
			Part A Form Section XII	Part A Form Section XIII
221-T Canyon Deck	221	T04	Line Number 3	Line Numbers 1-8
	75	T94	Line Number 4	Line Number 9-11
221-T Cells (7L, 13R, 16R, and 17R)	75	T94	Line Number 4	Line Number 9-11
221-T Railroad Tunnel	221	T04	Line Number 3	Line Numbers 1-8

Table A-4. Maximum Treatment Capacity by DWMU

Dangerous Waste Management Unit	Maximum Treatment Capacity* (Metric Tons/Day)	Process Codes (Part A Form Section XII and Section XIII)	Line Numbers (Part A Form Sections XII and XII)	
			Part A Form Section XII	Part A Form Section XIII
	75	T94	Line Number 4	Line Number 9-11
221-T Head End	No treatment proposed			
221-T Operations Gallery Storage	No treatment proposed			
221-T BY Storage Area	No treatment proposed			
2706-T Building	221	T04	Line Number 3	Line Numbers 1-8
2706-TA Building	221	T04	Line Number 3	Line Numbers 1-8
2706-T Outside Storage Area	No treatment proposed			
2706-TA Outside Storage Area	No treatment proposed			
2706-T Yard (Including HS-030 and HS-032 Storage Modules)	No treatment proposed			
2706-T Asphalt Pad	No treatment proposed			
243-T Covered Storage Pad	No treatment proposed			
214-T Building	221	T04	Line Number 1	Line Numbers 1-8
211-T Cage	No treatment proposed			
Total Treatment Capacity				
Process Code			**Maximum Storage Capacity**	
T04			221 Metric Tons/Day	
T94			75 Metric Tons/Day	

* The maximum treatment rate for the T Plant operating unit group is 221 metric tons per day for T04, and75 metric tons for T94. This treatment rate can be realized in any of the DWMUs having the specific treatment capability; however, the combined daily treatment rate cannot exceed the daily maximum.

A6 Waste Generated

Waste is received into T Plant from various onsite and offsite waste generators (e.g., Plutonium Finishing Plant, Pacific Northwest National Laboratory, and Perma-Fix Northwest). The waste received at T Plant includes TRUM waste, MLLW, and TSCA PCB-contaminated waste.

T Plant also generates dangerous and mixed wastes from routine management and processing operations. Waste includes batteries, oils, solvents, paint, miscellaneous debris, and discarded chemicals.

A7 Universal Waste

Universal waste managed at T Plant includes batteries, mercury thermostats, and lamps under WAC 173-303-573, “Dangerous Waste Regulations,” “Standards for Universal Waste Management.”

A8 Corrective Actions Statement

There are no historical or ongoing corrective actions taken at T Plant under WAC 173-303; WAC 173-340, “Model Toxics Control Act—Cleanup;” or federal regulations.

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Attachment B

Section XIV – Description of Dangerous Waste

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U.S. Environmental Protection Agency State Identification Number WA7890008967

Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1	D001	55,250	M	S01	Container Storage
2	D002				Included with above
3	D003				Included with above
4	D004				Included with above
5	D005				Included with above
6	D006				Included with above
7	D007				Included with above
8	D008				Included with above
9	D009				Included with above
10	D010				Included with above
11	D011				Included with above
12	D012				Included with above
13	D013				Included with above
14	D014				Included with above
15	D015				Included with above
16	D016				Included with above
17	D017				Included with above
18	D018				Included with above
19	D019				Included with above
20	D020				Included with above
21	D021				Included with above
22	D022				Included with above
23	D023				Included with above
24	D024				Included with above
25	D025				Included with above
26	D026				Included with above
27	D027				Included with above
28	D028				Included with above
29	D029				Included with above
30	D030				Included with above
31	D031				Included with above
32	D032				Included with above
33	D033				Included with above
34	D034				Included with above
35	D035				Included with above
36	D036				Included with above
37	D037				Included with above
38	D038				Included with above
39	D039				Included with above
40	D040				Included with above
41	D041				Included with above
42	D042				Included with above
43	D043				Included with above
44	WSC2				Included with above
45	WT01				Included with above
46	WT02				Included with above
47	WP01				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
48	WP02				Included with above
49	WP03				Included with above
50	WPCB				Included with above
51	F001				Included with above
52	F002				Included with above
53	F003				Included with above
54	F004				Included with above
55	F005				Included with above
56	F006				Included with above
57	F007				Included with above
58	F008				Included with above
59	F009				Included with above
60	F010				Included with above
61	F011				Included with above
62	F012				Included with above
63	F019				Included with above
64	F027				Included with above
65	F039				Included with above
66	U001				Included with above
67	U002				Included with above
68	U003				Included with above
69	U004				Included with above
70	U005				Included with above
71	U006				Included with above
72	U007				Included with above
73	U008				Included with above
74	U009				Included with above
75	U010				Included with above
76	U011				Included with above
77	U012				Included with above
78	U014				Included with above
79	U015				Included with above
80	U016				Included with above
81	U017				Included with above
82	U018				Included with above
83	U019				Included with above
84	U020				Included with above
85	U021				Included with above
86	U022				Included with above
87	U023				Included with above
88	U024				Included with above
89	U025				Included with above
90	U026				Included with above
91	U027				Included with above
92	U028				Included with above
93	U029				Included with above
94	U030				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
95	U031				Included with above
96	U032				Included with above
97	U033				Included with above
98	U034				Included with above
99	U035				Included with above
100	U036				Included with above
101	U037				Included with above
102	U038				Included with above
103	U039				Included with above
104	U041				Included with above
105	U042				Included with above
106	U043				Included with above
107	U044				Included with above
108	U045				Included with above
109	U046				Included with above
110	U047				Included with above
111	U048				Included with above
112	U049				Included with above
113	U050				Included with above
114	U051				Included with above
115	U052				Included with above
116	U053				Included with above
117	U055				Included with above
118	U056				Included with above
119	U057				Included with above
120	U058				Included with above
121	U059				Included with above
122	U060				Included with above
123	U061				Included with above
124	U062				Included with above
125	U063				Included with above
126	U064				Included with above
127	U066				Included with above
128	U067				Included with above
129	U068				Included with above
130	U069				Included with above
131	U070				Included with above
132	U071				Included with above
133	U072				Included with above
134	U073				Included with above
135	U074				Included with above
136	U075				Included with above
137	U076				Included with above
138	U077				Included with above
139	U078				Included with above
140	U079				Included with above
141	U080				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
142	U081				Included with above
143	U082				Included with above
144	U083				Included with above
145	U084				Included with above
146	U085				Included with above
147	U086				Included with above
148	U087				Included with above
149	U088				Included with above
150	U089				Included with above
151	U090				Included with above
152	U091				Included with above
153	U092				Included with above
154	U093				Included with above
155	U094				Included with above
156	U095				Included with above
157	U096				Included with above
158	U097				Included with above
159	U098				Included with above
160	U099				Included with above
161	U101				Included with above
162	U102				Included with above
163	U103				Included with above
164	U105				Included with above
165	U106				Included with above
166	U107				Included with above
167	U108				Included with above
168	U109				Included with above
169	U110				Included with above
170	U111				Included with above
171	U112				Included with above
172	U113				Included with above
173	U114				Included with above
174	U115				Included with above
175	U116				Included with above
176	U117				Included with above
177	U118				Included with above
178	U119				Included with above
179	U120				Included with above
180	U121				Included with above
181	U122				Included with above
182	U123				Included with above
183	U124				Included with above
184	U125				Included with above
185	U126				Included with above
186	U127				Included with above
187	U128				Included with above
188	U129				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
189	U130				Included with above
190	U131				Included with above
191	U132				Included with above
192	U133				Included with above
193	U134				Included with above
194	U135				Included with above
195	U136				Included with above
196	U137				Included with above
197	U138				Included with above
198	U140				Included with above
199	U141				Included with above
200	U142				Included with above
201	U143				Included with above
202	U144				Included with above
203	U145				Included with above
204	U146				Included with above
205	U147				Included with above
206	U148				Included with above
207	U149				Included with above
208	U150				Included with above
209	U151				Included with above
210	U152				Included with above
211	U153				Included with above
212	U154				Included with above
213	U155				Included with above
214	U156				Included with above
215	U157				Included with above
216	U158				Included with above
217	U159				Included with above
218	U160				Included with above
219	U161				Included with above
220	U162				Included with above
221	U163				Included with above
222	U164				Included with above
223	U165				Included with above
224	U166				Included with above
225	U167				Included with above
226	U168				Included with above
227	U169				Included with above
228	U170				Included with above
229	U171				Included with above
230	U172				Included with above
231	U173				Included with above
232	U174				Included with above
233	U176				Included with above
234	U177				Included with above
235	U178				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
236	U179				Included with above
237	U180				Included with above
238	U181				Included with above
239	U182				Included with above
240	U183				Included with above
241	U184				Included with above
242	U185				Included with above
243	U186				Included with above
244	U187				Included with above
245	U188				Included with above
246	U189				Included with above
247	U190				Included with above
248	U191				Included with above
249	U192				Included with above
250	U193				Included with above
251	U194				Included with above
252	U196				Included with above
253	U197				Included with above
254	U200				Included with above
255	U201				Included with above
256	U203				Included with above
257	U204				Included with above
258	U205				Included with above
259	U206				Included with above
260	U207				Included with above
261	U208				Included with above
262	U209				Included with above
263	U210				Included with above
264	U211				Included with above
265	U213				Included with above
266	U214				Included with above
267	U215				Included with above
268	U216				Included with above
269	U217				Included with above
270	U218				Included with above
271	U219				Included with above
272	U220				Included with above
273	U221				Included with above
274	U222				Included with above
275	U223				Included with above
276	U225				Included with above
277	U226				Included with above
278	U227				Included with above
279	U228				Included with above
280	U234				Included with above
281	U235				Included with above
282	U236				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
283	U237				Included with above
284	U238				Included with above
285	U239				Included with above
286	U240				Included with above
287	U243				Included with above
288	U244				Included with above
289	U246				Included with above
290	U247				Included with above
291	U248				Included with above
292	U249				Included with above
293	U271				Included with above
294	U278				Included with above
295	U279				Included with above
296	U280				Included with above
297	U328				Included with above
298	U353				Included with above
299	U359				Included with above
300	U364				Included with above
301	U367				Included with above
302	U372				Included with above
303	U373				Included with above
304	U387				Included with above
305	U389				Included with above
306	U394				Included with above
307	U395				Included with above
308	U404				Included with above
309	U409				Included with above
310	U410				Included with above
311	U411				Included with above
312	P001				Included with above
313	P002				Included with above
314	P003				Included with above
315	P004				Included with above
316	P005				Included with above
317	P006				Included with above
318	P007				Included with above
319	P008				Included with above
320	P009				Included with above
321	P010				Included with above
322	P011				Included with above
323	P012				Included with above
324	P013				Included with above
325	P014				Included with above
326	P015				Included with above
327	P016				Included with above
328	P017				Included with above
329	P018				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
330	P020				Included with above
331	P021				Included with above
332	P022				Included with above
333	P023				Included with above
334	P024				Included with above
335	P026				Included with above
336	P027				Included with above
337	P028				Included with above
338	P029				Included with above
339	P030				Included with above
340	P031				Included with above
341	P033				Included with above
342	P034				Included with above
343	P036				Included with above
344	P037				Included with above
345	P038				Included with above
346	P039				Included with above
347	P040				Included with above
348	P041				Included with above
349	P042				Included with above
350	P043				Included with above
351	P044				Included with above
352	P045				Included with above
353	P046				Included with above
354	P047				Included with above
355	P048				Included with above
356	P049				Included with above
357	P050				Included with above
358	P051				Included with above
359	P054				Included with above
360	P056				Included with above
361	P057				Included with above
362	P058				Included with above
363	P059				Included with above
364	P060				Included with above
365	P062				Included with above
366	P063				Included with above
367	P064				Included with above
368	P065				Included with above
369	P066				Included with above
370	P067				Included with above
371	P068				Included with above
372	P069				Included with above
373	P070				Included with above
374	P071				Included with above
375	P072				Included with above
376	P073				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
377	P074				Included with above
378	P075				Included with above
379	P076				Included with above
380	P077				Included with above
381	P078				Included with above
382	P081				Included with above
383	P082				Included with above
384	P084				Included with above
385	P085				Included with above
386	P087				Included with above
387	P088				Included with above
388	P089				Included with above
389	P092				Included with above
390	P093				Included with above
391	P094				Included with above
392	P095				Included with above
393	P096				Included with above
394	P097				Included with above
395	P098				Included with above
396	P099				Included with above
397	P101				Included with above
398	P102				Included with above
399	P103				Included with above
400	P104				Included with above
401	P105				Included with above
402	P106				Included with above
403	P108				Included with above
404	P109				Included with above
405	P110				Included with above
406	P111				Included with above
407	P112				Included with above
408	P113				Included with above
409	P114				Included with above
410	P115				Included with above
411	P116				Included with above
412	P118				Included with above
413	P119				Included with above
414	P120				Included with above
415	P121				Included with above
416	P122				Included with above
417	P123				Included with above
418	P127				Included with above
419	P128				Included with above
420	P185				Included with above
421	P188				Included with above
422	P189				Included with above
423	P190				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
424	P191				Included with above
425	P192				Included with above
426	P194				Included with above
427	P196				Included with above
428	P197				Included with above
429	P198				Included with above
430	P199				Included with above
431	P201				Included with above
432	P202				Included with above
433	P203				Included with above
434	P204				Included with above
435	P205				Included with above
1	D001	18,750	M	S06	Container Storage
2	D002				Included with above
3	D003				Included with above
4	D004				Included with above
5	D005				Included with above
6	D006				Included with above
7	D007				Included with above
8	D008				Included with above
9	D009				Included with above
10	D010				Included with above
11	D011				Included with above
12	D012				Included with above
13	D013				Included with above
14	D014				Included with above
15	D015				Included with above
16	D016				Included with above
17	D017				Included with above
18	D018				Included with above
19	D019				Included with above
20	D020				Included with above
21	D021				Included with above
22	D022				Included with above
23	D023				Included with above
24	D024				Included with above
25	D025				Included with above
26	D026				Included with above
27	D027				Included with above
28	D028				Included with above
29	D029				Included with above
30	D030				Included with above
31	D031				Included with above
32	D032				Included with above
33	D033				Included with above
34	D034				Included with above
35	D035				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
36	D036				Included with above
37	D037				Included with above
38	D038				Included with above
39	D039				Included with above
40	D040				Included with above
41	D041				Included with above
42	D042				Included with above
43	D043				Included with above
44	WSC2				Included with above
45	WT01				Included with above
46	WT02				Included with above
47	WP01				Included with above
48	WP02				Included with above
49	WP03				Included with above
50	WPCB				Included with above
51	F001				Included with above
52	F002				Included with above
53	F003				Included with above
54	F004				Included with above
55	F005				Included with above
56	F006				Included with above
57	F007				Included with above
58	F008				Included with above
59	F009				Included with above
60	F010				Included with above
61	F011				Included with above
62	F012				Included with above
63	F019				Included with above
64	F027				Included with above
65	F039				Included with above
66	U001				Included with above
67	U002				Included with above
68	U003				Included with above
69	U004				Included with above
70	U005				Included with above
71	U006				Included with above
72	U007				Included with above
73	U008				Included with above
74	U009				Included with above
75	U010				Included with above
76	U011				Included with above
77	U012				Included with above
78	U014				Included with above
79	U015				Included with above
80	U016				Included with above
81	U017				Included with above
82	U018				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
83	U019				Included with above
84	U020				Included with above
85	U021				Included with above
86	U022				Included with above
87	U023				Included with above
88	U024				Included with above
89	U025				Included with above
90	U026				Included with above
91	U027				Included with above
92	U028				Included with above
93	U029				Included with above
94	U030				Included with above
95	U031				Included with above
96	U032				Included with above
97	U033				Included with above
98	U034				Included with above
99	U035				Included with above
100	U036				Included with above
101	U037				Included with above
102	U038				Included with above
103	U039				Included with above
104	U041				Included with above
105	U042				Included with above
106	U043				Included with above
107	U044				Included with above
108	U045				Included with above
109	U046				Included with above
110	U047				Included with above
111	U048				Included with above
112	U049				Included with above
113	U050				Included with above
114	U051				Included with above
115	U052				Included with above
116	U053				Included with above
117	U055				Included with above
118	U056				Included with above
119	U057				Included with above
120	U058				Included with above
121	U059				Included with above
122	U060				Included with above
123	U061				Included with above
124	U062				Included with above
125	U063				Included with above
126	U064				Included with above
127	U066				Included with above
128	U067				Included with above
129	U068				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
130	U069				Included with above
131	U070				Included with above
132	U071				Included with above
133	U072				Included with above
134	U073				Included with above
135	U074				Included with above
136	U075				Included with above
137	U076				Included with above
138	U077				Included with above
139	U078				Included with above
140	U079				Included with above
141	U080				Included with above
142	U081				Included with above
143	U082				Included with above
144	U083				Included with above
145	U084				Included with above
146	U085				Included with above
147	U086				Included with above
148	U087				Included with above
149	U088				Included with above
150	U089				Included with above
151	U090				Included with above
152	U091				Included with above
153	U092				Included with above
154	U093				Included with above
155	U094				Included with above
156	U095				Included with above
157	U096				Included with above
158	U097				Included with above
159	U098				Included with above
160	U099				Included with above
161	U101				Included with above
162	U102				Included with above
163	U103				Included with above
164	U105				Included with above
165	U106				Included with above
166	U107				Included with above
167	U108				Included with above
168	U109				Included with above
169	U110				Included with above
170	U111				Included with above
171	U112				Included with above
172	U113				Included with above
173	U114				Included with above
174	U115				Included with above
175	U116				Included with above
176	U117				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
177	U118				Included with above
178	U119				Included with above
179	U120				Included with above
180	U121				Included with above
181	U122				Included with above
182	U123				Included with above
183	U124				Included with above
184	U125				Included with above
185	U126				Included with above
186	U127				Included with above
187	U128				Included with above
188	U129				Included with above
189	U130				Included with above
190	U131				Included with above
191	U132				Included with above
192	U133				Included with above
193	U134				Included with above
194	U135				Included with above
195	U136				Included with above
196	U137				Included with above
197	U138				Included with above
198	U140				Included with above
199	U141				Included with above
200	U142				Included with above
201	U143				Included with above
202	U144				Included with above
203	U145				Included with above
204	U146				Included with above
205	U147				Included with above
206	U148				Included with above
207	U149				Included with above
208	U150				Included with above
209	U151				Included with above
210	U152				Included with above
211	U153				Included with above
212	U154				Included with above
213	U155				Included with above
214	U156				Included with above
215	U157				Included with above
216	U158				Included with above
217	U159				Included with above
218	U160				Included with above
219	U161				Included with above
220	U162				Included with above
221	U163				Included with above
222	U164				Included with above
223	U165				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
224	U166				Included with above
225	U167				Included with above
226	U168				Included with above
227	U169				Included with above
228	U170				Included with above
229	U171				Included with above
230	U172				Included with above
231	U173				Included with above
232	U174				Included with above
233	U176				Included with above
234	U177				Included with above
235	U178				Included with above
236	U179				Included with above
237	U180				Included with above
238	U181				Included with above
239	U182				Included with above
240	U183				Included with above
241	U184				Included with above
242	U185				Included with above
243	U186				Included with above
244	U187				Included with above
245	U188				Included with above
246	U189				Included with above
247	U190				Included with above
248	U191				Included with above
249	U192				Included with above
250	U193				Included with above
251	U194				Included with above
252	U196				Included with above
253	U197				Included with above
254	U200				Included with above
255	U201				Included with above
256	U203				Included with above
257	U204				Included with above
258	U205				Included with above
259	U206				Included with above
260	U207				Included with above
261	U208				Included with above
262	U209				Included with above
263	U210				Included with above
264	U211				Included with above
265	U213				Included with above
266	U214				Included with above
267	U215				Included with above
268	U216				Included with above
269	U217				Included with above
270	U218				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
271	U219				Included with above
272	U220				Included with above
273	U221				Included with above
274	U222				Included with above
275	U223				Included with above
276	U225				Included with above
277	U226				Included with above
278	U227				Included with above
279	U228				Included with above
280	U234				Included with above
281	U235				Included with above
282	U236				Included with above
283	U237				Included with above
284	U238				Included with above
285	U239				Included with above
286	U240				Included with above
287	U243				Included with above
288	U244				Included with above
289	U246				Included with above
290	U247				Included with above
291	U248				Included with above
292	U249				Included with above
293	U271				Included with above
294	U278				Included with above
295	U279				Included with above
296	U280				Included with above
297	U328				Included with above
298	U353				Included with above
299	U359				Included with above
300	U364				Included with above
301	U367				Included with above
302	U372				Included with above
303	U373				Included with above
304	U387				Included with above
305	U389				Included with above
306	U394				Included with above
307	U395				Included with above
308	U404				Included with above
309	U409				Included with above
310	U410				Included with above
311	U411				Included with above
312	P001				Included with above
313	P002				Included with above
314	P003				Included with above
315	P004				Included with above
316	P005				Included with above
317	P006				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
318	P007				Included with above
319	P008				Included with above
320	P009				Included with above
321	P010				Included with above
322	P011				Included with above
323	P012				Included with above
324	P013				Included with above
325	P014				Included with above
326	P015				Included with above
327	P016				Included with above
328	P017				Included with above
329	P018				Included with above
330	P020				Included with above
331	P021				Included with above
332	P022				Included with above
333	P023				Included with above
334	P024				Included with above
335	P026				Included with above
336	P027				Included with above
337	P028				Included with above
338	P029				Included with above
339	P030				Included with above
340	P031				Included with above
341	P033				Included with above
342	P034				Included with above
343	P036				Included with above
344	P037				Included with above
345	P038				Included with above
346	P039				Included with above
347	P040				Included with above
348	P041				Included with above
349	P042				Included with above
350	P043				Included with above
351	P044				Included with above
352	P045				Included with above
353	P046				Included with above
354	P047				Included with above
355	P048				Included with above
356	P049				Included with above
357	P050				Included with above
358	P051				Included with above
359	P054				Included with above
360	P056				Included with above
361	P057				Included with above
362	P058				Included with above
363	P059				Included with above
364	P060				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
365	P062				Included with above
366	P063				Included with above
367	P064				Included with above
368	P065				Included with above
369	P066				Included with above
370	P067				Included with above
371	P068				Included with above
372	P069				Included with above
373	P070				Included with above
374	P071				Included with above
375	P072				Included with above
376	P073				Included with above
377	P074				Included with above
378	P075				Included with above
379	P076				Included with above
380	P077				Included with above
381	P078				Included with above
382	P081				Included with above
383	P082				Included with above
384	P084				Included with above
385	P085				Included with above
386	P087				Included with above
387	P088				Included with above
388	P089				Included with above
389	P092				Included with above
390	P093				Included with above
391	P094				Included with above
392	P095				Included with above
393	P096				Included with above
394	P097				Included with above
395	P098				Included with above
396	P099				Included with above
397	P101				Included with above
398	P102				Included with above
399	P103				Included with above
400	P104				Included with above
401	P105				Included with above
402	P106				Included with above
403	P108				Included with above
404	P109				Included with above
405	P110				Included with above
406	P111				Included with above
407	P112				Included with above
408	P113				Included with above
409	P114				Included with above
410	P115				Included with above
411	P116				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
412	P118				Included with above
413	P119				Included with above
414	P120				Included with above
415	P121				Included with above
416	P122				Included with above
417	P123				Included with above
418	P127				Included with above
419	P128				Included with above
420	P185				Included with above
421	P188				Included with above
422	P189				Included with above
423	P190				Included with above
424	P191				Included with above
425	P192				Included with above
426	P194				Included with above
427	P196				Included with above
428	P197				Included with above
429	P198				Included with above
430	P199				Included with above
431	P201				Included with above
432	P202				Included with above
433	P203				Included with above
434	P204				Included with above
435	P205				Included with above
436	D001	55,250	M	T04	Other Treatment
437	D002				Included with above
438	D003				Included with above
439	D004				Included with above
440	D005				Included with above
441	D006				Included with above
442	D007				Included with above
443	D008				Included with above
444	D009				Included with above
445	D010				Included with above
446	D011				Included with above
447	D012				Included with above
448	D013				Included with above
449	D014				Included with above
450	D015				Included with above
451	D016				Included with above
452	D017				Included with above
453	D018				Included with above
454	D019				Included with above
455	D020				Included with above
456	D021				Included with above
457	D022				Included with above
458	D023				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
459	D024				Included with above
460	D025				Included with above
461	D026				Included with above
462	D027				Included with above
463	D028				Included with above
464	D029				Included with above
465	D030				Included with above
466	D031				Included with above
467	D032				Included with above
468	D033				Included with above
469	D034				Included with above
470	D035				Included with above
471	D036				Included with above
472	D037				Included with above
473	D038				Included with above
474	D039				Included with above
475	D040				Included with above
476	D041				Included with above
477	D042				Included with above
478	D043				Included with above
479	WSC2				Included with above
480	WT01				Included with above
481	WT02				Included with above
482	WP01				Included with above
483	WP02				Included with above
484	WP03				Included with above
485	WPCB				Included with above
486	F001				Included with above
487	F002				Included with above
488	F003				Included with above
489	F004				Included with above
490	F005				Included with above
491	F006				Included with above
492	F007				Included with above
493	F008				Included with above
494	F009				Included with above
495	F010				Included with above
496	F011				Included with above
497	F012				Included with above
498	F019				Included with above
499	F027				Included with above
500	F039				Included with above
501	U001				Included with above
502	U002				Included with above
503	U003				Included with above
504	U004				Included with above
505	U005				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
506	U006				Included with above
507	U007				Included with above
508	U008				Included with above
509	U009				Included with above
510	U010				Included with above
511	U011				Included with above
512	U012				Included with above
513	U014				Included with above
514	U015				Included with above
515	U016				Included with above
516	U017				Included with above
517	U018				Included with above
518	U019				Included with above
519	U020				Included with above
520	U021				Included with above
521	U022				Included with above
522	U023				Included with above
523	U024				Included with above
524	U025				Included with above
525	U026				Included with above
526	U027				Included with above
527	U028				Included with above
528	U029				Included with above
529	U030				Included with above
530	U031				Included with above
531	U032				Included with above
532	U033				Included with above
533	U034				Included with above
534	U035				Included with above
535	U036				Included with above
536	U037				Included with above
537	U038				Included with above
538	U039				Included with above
539	U041				Included with above
540	U042				Included with above
541	U043				Included with above
542	U044				Included with above
543	U045				Included with above
544	U046				Included with above
545	U047				Included with above
546	U048				Included with above
547	U049				Included with above
548	U050				Included with above
549	U051				Included with above
550	U052				Included with above
551	U053				Included with above
552	U055				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
553	U056				Included with above
554	U057				Included with above
555	U058				Included with above
556	U059				Included with above
557	U060				Included with above
558	U061				Included with above
559	U062				Included with above
560	U063				Included with above
561	U064				Included with above
562	U066				Included with above
563	U067				Included with above
564	U068				Included with above
565	U069				Included with above
566	U070				Included with above
567	U071				Included with above
568	U072				Included with above
569	U073				Included with above
570	U074				Included with above
571	U075				Included with above
572	U076				Included with above
573	U077				Included with above
574	U078				Included with above
575	U079				Included with above
576	U080				Included with above
577	U081				Included with above
578	U082				Included with above
579	U083				Included with above
580	U084				Included with above
581	U085				Included with above
582	U086				Included with above
583	U087				Included with above
584	U088				Included with above
585	U089				Included with above
586	U090				Included with above
587	U091				Included with above
588	U092				Included with above
589	U093				Included with above
590	U094				Included with above
591	U095				Included with above
592	U096				Included with above
593	U097				Included with above
594	U098				Included with above
595	U099				Included with above
596	U101				Included with above
597	U102				Included with above
598	U103				Included with above
599	U105				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
600	U106				Included with above
601	U107				Included with above
602	U108				Included with above
603	U109				Included with above
604	U110				Included with above
605	U111				Included with above
606	U112				Included with above
607	U113				Included with above
608	U114				Included with above
609	U115				Included with above
610	U116				Included with above
611	U117				Included with above
612	U118				Included with above
613	U119				Included with above
614	U120				Included with above
615	U121				Included with above
616	U122				Included with above
617	U123				Included with above
618	U124				Included with above
619	U125				Included with above
620	U126				Included with above
621	U127				Included with above
622	U128				Included with above
623	U129				Included with above
624	U130				Included with above
625	U131				Included with above
626	U132				Included with above
627	U133				Included with above
628	U134				Included with above
629	U135				Included with above
630	U136				Included with above
631	U137				Included with above
632	U138				Included with above
633	U140				Included with above
634	U141				Included with above
635	U142				Included with above
636	U143				Included with above
637	U144				Included with above
638	U145				Included with above
639	U146				Included with above
640	U147				Included with above
641	U148				Included with above
642	U149				Included with above
643	U150				Included with above
644	U151				Included with above
645	U152				Included with above
646	U153				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
647	U154				Included with above
648	U155				Included with above
649	U156				Included with above
650	U157				Included with above
651	U158				Included with above
652	U159				Included with above
653	U160				Included with above
654	U161				Included with above
655	U162				Included with above
656	U163				Included with above
657	U164				Included with above
658	U165				Included with above
659	U166				Included with above
660	U167				Included with above
661	U168				Included with above
662	U169				Included with above
663	U170				Included with above
664	U171				Included with above
665	U172				Included with above
666	U173				Included with above
667	U174				Included with above
668	U176				Included with above
669	U177				Included with above
670	U178				Included with above
671	U179				Included with above
672	U180				Included with above
673	U181				Included with above
674	U182				Included with above
675	U183				Included with above
676	U184				Included with above
677	U185				Included with above
678	U186				Included with above
679	U187				Included with above
680	U188				Included with above
681	U189				Included with above
682	U190				Included with above
683	U191				Included with above
684	U192				Included with above
685	U193				Included with above
686	U194				Included with above
687	U196				Included with above
688	U197				Included with above
689	U200				Included with above
690	U201				Included with above
691	U203				Included with above
692	U204				Included with above
693	U205				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
694	U206				Included with above
695	U207				Included with above
696	U208				Included with above
697	U209				Included with above
698	U210				Included with above
699	U211				Included with above
700	U213				Included with above
701	U214				Included with above
702	U215				Included with above
703	U216				Included with above
704	U217				Included with above
705	U218				Included with above
706	U219				Included with above
707	U220				Included with above
708	U221				Included with above
709	U222				Included with above
710	U223				Included with above
711	U225				Included with above
712	U226				Included with above
713	U227				Included with above
714	U228				Included with above
715	U234				Included with above
716	U235				Included with above
717	U236				Included with above
718	U237				Included with above
719	U238				Included with above
720	U239				Included with above
721	U240				Included with above
722	U243				Included with above
723	U244				Included with above
724	U246				Included with above
725	U247				Included with above
726	U248				Included with above
727	U249				Included with above
728	U271				Included with above
729	U278				Included with above
730	U279				Included with above
731	U280				Included with above
732	U328				Included with above
733	U353				Included with above
734	U359				Included with above
735	U364				Included with above
736	U367				Included with above
737	U372				Included with above
738	U373				Included with above
739	U387				Included with above
740	U389				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
741	U394				Included with above
742	U395				Included with above
743	U404				Included with above
744	U409				Included with above
745	U410				Included with above
746	U411				Included with above
747	P001				Included with above
748	P002				Included with above
749	P003				Included with above
750	P004				Included with above
751	P005				Included with above
752	P006				Included with above
753	P007				Included with above
754	P008				Included with above
755	P009				Included with above
756	P010				Included with above
757	P011				Included with above
758	P012				Included with above
759	P013				Included with above
760	P014				Included with above
761	P015				Included with above
762	P016				Included with above
763	P017				Included with above
764	P018				Included with above
765	P020				Included with above
766	P021				Included with above
767	P022				Included with above
768	P023				Included with above
769	P024				Included with above
770	P026				Included with above
771	P027				Included with above
772	P028				Included with above
773	P029				Included with above
774	P030				Included with above
775	P031				Included with above
776	P033				Included with above
777	P034				Included with above
778	P036				Included with above
779	P037				Included with above
780	P038				Included with above
781	P039				Included with above
782	P040				Included with above
783	P041				Included with above
784	P042				Included with above
785	P043				Included with above
786	P044				Included with above
787	P045				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
788	P046				Included with above
789	P047				Included with above
790	P048				Included with above
791	P049				Included with above
792	P050				Included with above
793	P051				Included with above
794	P054				Included with above
795	P056				Included with above
796	P057				Included with above
797	P058				Included with above
798	P059				Included with above
799	P060				Included with above
800	P062				Included with above
801	P063				Included with above
802	P064				Included with above
803	P065				Included with above
804	P066				Included with above
805	P067				Included with above
806	P068				Included with above
807	P069				Included with above
808	P070				Included with above
809	P071				Included with above
810	P072				Included with above
811	P073				Included with above
812	P074				Included with above
813	P075				Included with above
814	P076				Included with above
815	P077				Included with above
816	P078				Included with above
817	P081				Included with above
818	P082				Included with above
819	P084				Included with above
820	P085				Included with above
821	P087				Included with above
822	P088				Included with above
823	P089				Included with above
824	P092				Included with above
825	P093				Included with above
826	P094				Included with above
827	P095				Included with above
828	P096				Included with above
829	P097				Included with above
830	P098				Included with above
831	P099				Included with above
832	P101				Included with above
833	P102				Included with above
834	P103				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
835	P104				Included with above
836	P105				Included with above
837	P106				Included with above
838	P108				Included with above
839	P109				Included with above
840	P110				Included with above
841	P111				Included with above
842	P112				Included with above
843	P113				Included with above
844	P114				Included with above
845	P115				Included with above
846	P116				Included with above
847	P118				Included with above
848	P119				Included with above
849	P120				Included with above
850	P121				Included with above
851	P122				Included with above
852	P123				Included with above
853	P127				Included with above
854	P128				Included with above
855	P185				Included with above
856	P188				Included with above
857	P189				Included with above
858	P190				Included with above
859	P191				Included with above
860	P192				Included with above
861	P194				Included with above
862	P196				Included with above
863	P197				Included with above
864	P198				Included with above
865	P199				Included with above
866	P201				Included with above
867	P202				Included with above
868	P203				Included with above
869	P204				Included with above
870	P205				Included with above
871	D001	18,750	M	T94	Containment Building (Storage and Treatment)
872	D002				Included with above
873	D003				Included with above
874	D004				Included with above
875	D005				Included with above
876	D006				Included with above
877	D007				Included with above
878	D008				Included with above
879	D009				Included with above
880	D010				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
881	D011				Included with above
882	D012				Included with above
883	D013				Included with above
884	D014				Included with above
885	D015				Included with above
886	D016				Included with above
887	D017				Included with above
888	D018				Included with above
889	D019				Included with above
890	D020				Included with above
891	D021				Included with above
892	D022				Included with above
893	D023				Included with above
894	D024				Included with above
895	D025				Included with above
896	D026				Included with above
897	D027				Included with above
898	D028				Included with above
899	D029				Included with above
900	D030				Included with above
901	D031				Included with above
902	D032				Included with above
903	D033				Included with above
904	D034				Included with above
905	D035				Included with above
906	D036				Included with above
907	D037				Included with above
908	D038				Included with above
909	D039				Included with above
910	D040				Included with above
911	D041				Included with above
912	D042				Included with above
913	D043				Included with above
914	WSC2				Included with above
915	WT01				Included with above
916	WT02				Included with above
917	WP01				Included with above
918	WP02				Included with above
919	WP03				Included with above
920	WPCB				Included with above
921	F001				Included with above
922	F002				Included with above
923	F003				Included with above
924	F004				Included with above
925	F005				Included with above
926	F006				Included with above
927	F007				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
928	F008				Included with above
929	F009				Included with above
930	F010				Included with above
931	F011				Included with above
932	F012				Included with above
933	F019				Included with above
934	F027				Included with above
935	F039				Included with above
936	U001				Included with above
937	U002				Included with above
938	U003				Included with above
939	U004				Included with above
940	U005				Included with above
941	U006				Included with above
942	U007				Included with above
943	U008				Included with above
944	U009				Included with above
945	U010				Included with above
946	U011				Included with above
947	U012				Included with above
948	U014				Included with above
949	U015				Included with above
950	U016				Included with above
951	U017				Included with above
952	U018				Included with above
953	U019				Included with above
954	U020				Included with above
955	U021				Included with above
956	U022				Included with above
957	U023				Included with above
958	U024				Included with above
959	U025				Included with above
960	U026				Included with above
961	U027				Included with above
962	U028				Included with above
963	U029				Included with above
964	U030				Included with above
965	U031				Included with above
966	U032				Included with above
967	U033				Included with above
968	U034				Included with above
969	U035				Included with above
970	U036				Included with above
971	U037				Included with above
972	U038				Included with above
973	U039				Included with above
974	U041				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
975	U042				Included with above
976	U043				Included with above
977	U044				Included with above
978	U045				Included with above
979	U046				Included with above
980	U047				Included with above
981	U048				Included with above
982	U049				Included with above
983	U050				Included with above
984	U051				Included with above
985	U052				Included with above
986	U053				Included with above
987	U055				Included with above
988	U056				Included with above
989	U057				Included with above
990	U058				Included with above
991	U059				Included with above
992	U060				Included with above
993	U061				Included with above
994	U062				Included with above
995	U063				Included with above
996	U064				Included with above
997	U066				Included with above
998	U067				Included with above
999	U068				Included with above
1000	U069				Included with above
1001	U070				Included with above
1002	U071				Included with above
1003	U072				Included with above
1004	U073				Included with above
1005	U074				Included with above
1006	U075				Included with above
1007	U076				Included with above
1008	U077				Included with above
1009	U078				Included with above
1010	U079				Included with above
1011	U080				Included with above
1012	U081				Included with above
1013	U082				Included with above
1014	U083				Included with above
1015	U084				Included with above
1016	U085				Included with above
1017	U086				Included with above
1018	U087				Included with above
1019	U088				Included with above
1020	U089				Included with above
1021	U090				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1022	U091				Included with above
1023	U092				Included with above
1024	U093				Included with above
1025	U094				Included with above
1026	U095				Included with above
1027	U096				Included with above
1028	U097				Included with above
1029	U098				Included with above
1030	U099				Included with above
1031	U101				Included with above
1032	U102				Included with above
1033	U103				Included with above
1034	U105				Included with above
1035	U106				Included with above
1036	U107				Included with above
1037	U108				Included with above
1038	U109				Included with above
1039	U110				Included with above
1040	U111				Included with above
1041	U112				Included with above
1042	U113				Included with above
1043	U114				Included with above
1044	U115				Included with above
1045	U116				Included with above
1046	U117				Included with above
1047	U118				Included with above
1048	U119				Included with above
1049	U120				Included with above
1050	U121				Included with above
1051	U122				Included with above
1052	U123				Included with above
1053	U124				Included with above
1054	U125				Included with above
1055	U126				Included with above
1056	U127				Included with above
1057	U128				Included with above
1058	U129				Included with above
1059	U130				Included with above
1060	U131				Included with above
1061	U132				Included with above
1062	U133				Included with above
1063	U134				Included with above
1064	U135				Included with above
1065	U136				Included with above
1066	U137				Included with above
1067	U138				Included with above
1068	U140				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1069	U141				Included with above
1070	U142				Included with above
1071	U143				Included with above
1072	U144				Included with above
1073	U145				Included with above
1074	U146				Included with above
1075	U147				Included with above
1076	U148				Included with above
1077	U149				Included with above
1078	U150				Included with above
1079	U151				Included with above
1080	U152				Included with above
1081	U153				Included with above
1082	U154				Included with above
1083	U155				Included with above
1084	U156				Included with above
1085	U157				Included with above
1086	U158				Included with above
1087	U159				Included with above
1088	U160				Included with above
1089	U161				Included with above
1090	U162				Included with above
1091	U163				Included with above
1092	U164				Included with above
1093	U165				Included with above
1094	U166				Included with above
1095	U167				Included with above
1096	U168				Included with above
1097	U169				Included with above
1098	U170				Included with above
1099	U171				Included with above
1100	U172				Included with above
1101	U173				Included with above
1102	U174				Included with above
1103	U176				Included with above
1104	U177				Included with above
1105	U178				Included with above
1106	U179				Included with above
1107	U180				Included with above
1108	U181				Included with above
1109	U182				Included with above
1110	U183				Included with above
1111	U184				Included with above
1112	U185				Included with above
1113	U186				Included with above
1114	U187				Included with above
1115	U188				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1116	U189				Included with above
1117	U190				Included with above
1118	U191				Included with above
1119	U192				Included with above
1120	U193				Included with above
1121	U194				Included with above
1122	U196				Included with above
1123	U197				Included with above
1124	U200				Included with above
1125	U201				Included with above
1126	U203				Included with above
1127	U204				Included with above
1128	U205				Included with above
1129	U206				Included with above
1130	U207				Included with above
1131	U208				Included with above
1132	U209				Included with above
1133	U210				Included with above
1134	U211				Included with above
1135	U213				Included with above
1136	U214				Included with above
1137	U215				Included with above
1138	U216				Included with above
1139	U217				Included with above
1140	U218				Included with above
1141	U219				Included with above
1142	U220				Included with above
1143	U221				Included with above
1144	U222				Included with above
1145	U223				Included with above
1146	U225				Included with above
1147	U226				Included with above
1148	U227				Included with above
1149	U228				Included with above
1150	U234				Included with above
1151	U235				Included with above
1152	U236				Included with above
1153	U237				Included with above
1154	U238				Included with above
1155	U239				Included with above
1156	U240				Included with above
1157	U243				Included with above
1158	U244				Included with above
1159	U246				Included with above
1160	U247				Included with above
1161	U248				Included with above
1162	U249				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1163	U271				Included with above
1164	U278				Included with above
1165	U279				Included with above
1166	U280				Included with above
1167	U328				Included with above
1168	U353				Included with above
1169	U359				Included with above
1170	U364				Included with above
1171	U367				Included with above
1172	U372				Included with above
1173	U373				Included with above
1174	U387				Included with above
1175	U389				Included with above
1176	U394				Included with above
1177	U395				Included with above
1178	U404				Included with above
1179	U409				Included with above
1180	U410				Included with above
1181	U411				Included with above
1182	P001				Included with above
1183	P002				Included with above
1184	P003				Included with above
1185	P004				Included with above
1186	P005				Included with above
1187	P006				Included with above
1188	P007				Included with above
1189	P008				Included with above
1190	P009				Included with above
1191	P010				Included with above
1192	P011				Included with above
1193	P012				Included with above
1194	P013				Included with above
1195	P014				Included with above
1196	P015				Included with above
1197	P016				Included with above
1198	P017				Included with above
1199	P018				Included with above
1200	P020				Included with above
1201	P021				Included with above
1202	P022				Included with above
1203	P023				Included with above
1204	P024				Included with above
1205	P026				Included with above
1206	P027				Included with above
1207	P028				Included with above
1208	P029				Included with above
1209	P030				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1210	P031				Included with above
1211	P033				Included with above
1212	P034				Included with above
1213	P036				Included with above
1214	P037				Included with above
1215	P038				Included with above
1216	P039				Included with above
1217	P040				Included with above
1218	P041				Included with above
1219	P042				Included with above
1220	P043				Included with above
1221	P044				Included with above
1222	P045				Included with above
1223	P046				Included with above
1224	P047				Included with above
1225	P048				Included with above
1226	P049				Included with above
1227	P050				Included with above
1228	P051				Included with above
1229	P054				Included with above
1230	P056				Included with above
1231	P057				Included with above
1232	P058				Included with above
1233	P059				Included with above
1234	P060				Included with above
1235	P062				Included with above
1236	P063				Included with above
1237	P064				Included with above
1238	P065				Included with above
1239	P066				Included with above
1240	P067				Included with above
1241	P068				Included with above
1242	P069				Included with above
1243	P070				Included with above
1244	P071				Included with above
1245	P072				Included with above
1246	P073				Included with above
1247	P074				Included with above
1248	P075				Included with above
1249	P076				Included with above
1250	P077				Included with above
1251	P078				Included with above
1252	P081				Included with above
1253	P082				Included with above
1254	P084				Included with above
1255	P085				Included with above
1256	P087				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1257	P088				Included with above
1258	P089				Included with above
1259	P092				Included with above
1260	P093				Included with above
1261	P094				Included with above
1262	P095				Included with above
1263	P096				Included with above
1264	P097				Included with above
1265	P098				Included with above
1266	P099				Included with above
1267	P101				Included with above
1268	P102				Included with above
1269	P103				Included with above
1270	P104				Included with above
1271	P105				Included with above
1272	P106				Included with above
1273	P108				Included with above
1274	P109				Included with above
1275	P110				Included with above
1276	P111				Included with above
1277	P112				Included with above
1278	P113				Included with above
1279	P114				Included with above
1280	P115				Included with above
1281	P116				Included with above
1282	P118				Included with above
1283	P119				Included with above
1284	P120				Included with above
1285	P121				Included with above
1286	P122				Included with above
1287	P123				Included with above
1288	P127				Included with above
1289	P128				Included with above
1290	P185				Included with above
1291	P188				Included with above
1292	P189				Included with above
1293	P190				Included with above
1294	P191				Included with above
1295	P192				Included with above
1296	P194				Included with above
1297	P196				Included with above
1298	P197				Included with above
1299	P198				Included with above
1300	P199				Included with above
1301	P201				Included with above
1302	P202				Included with above
1303	P203				Included with above

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Line Number	A. Dangerous Waste Number	B. Estimated Annual Quantity of Waste	C. Unit of Measure	Processes	
				(1) Process Codes	(2) Process Description
1304	P204				Included with above
1305	P205				Included with above

Attachment C

Section XVII – Photographs

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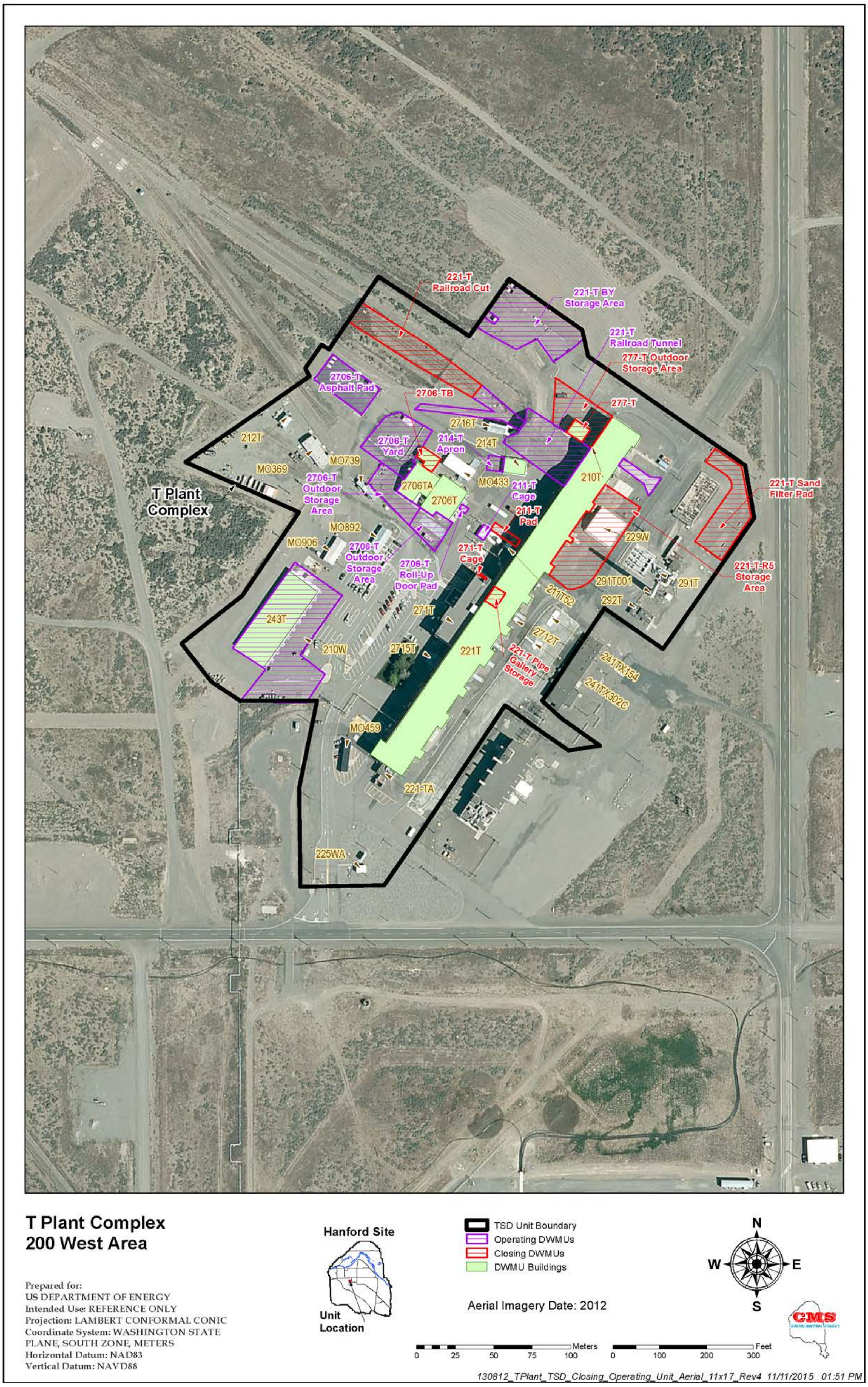
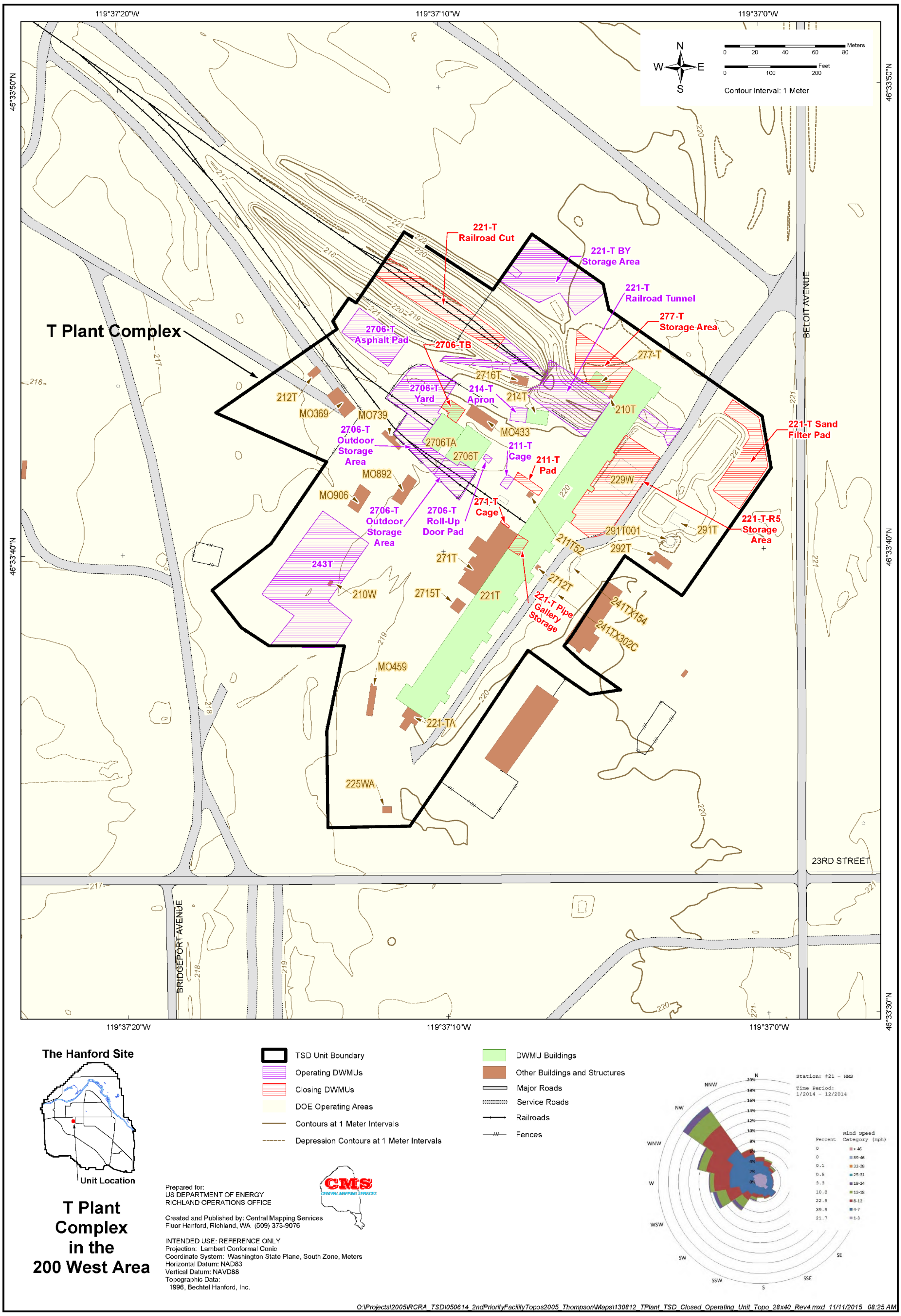
Figures



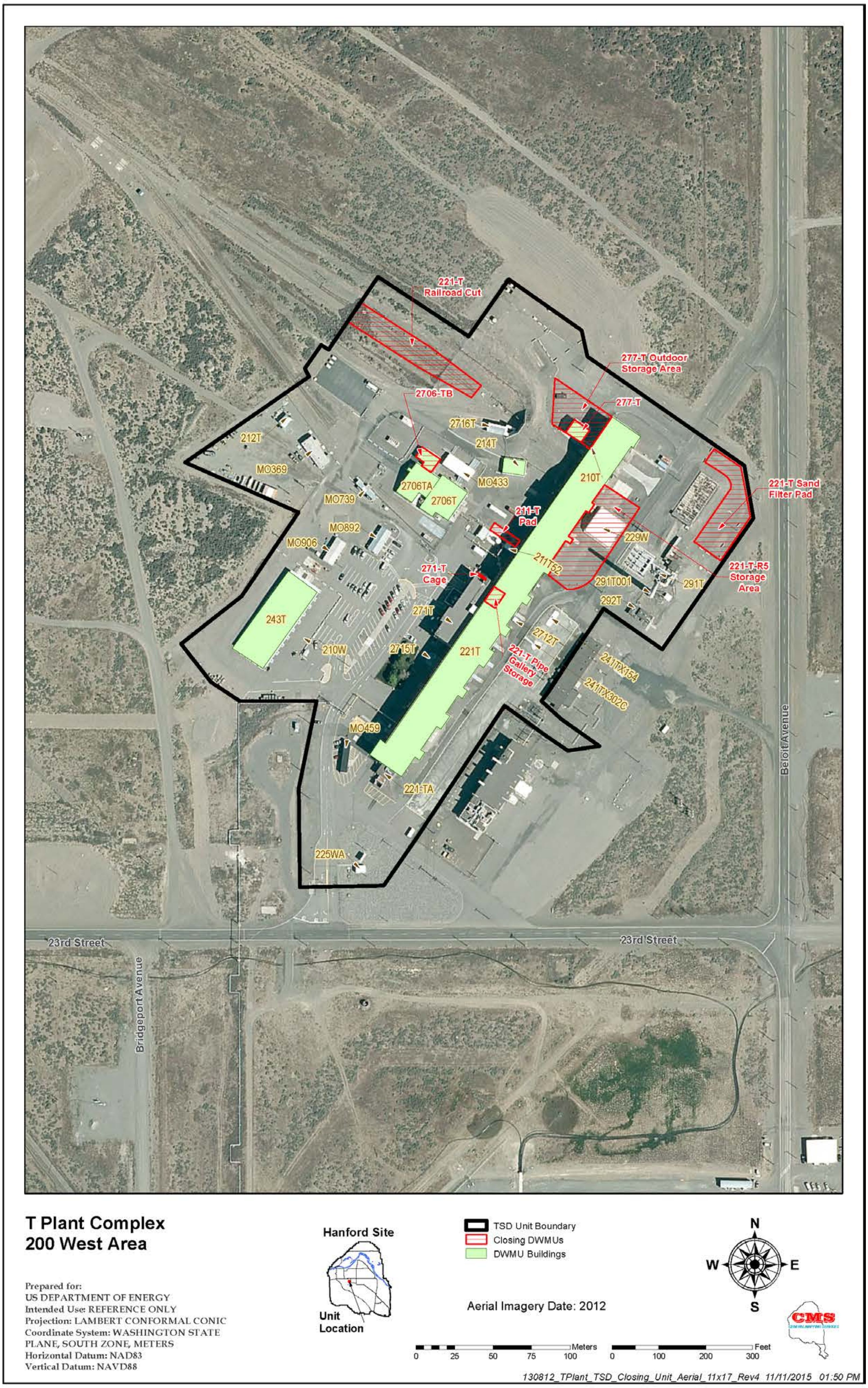
References: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure C-1. T Plant Complex Aerial Photo Operating and Closing Unit



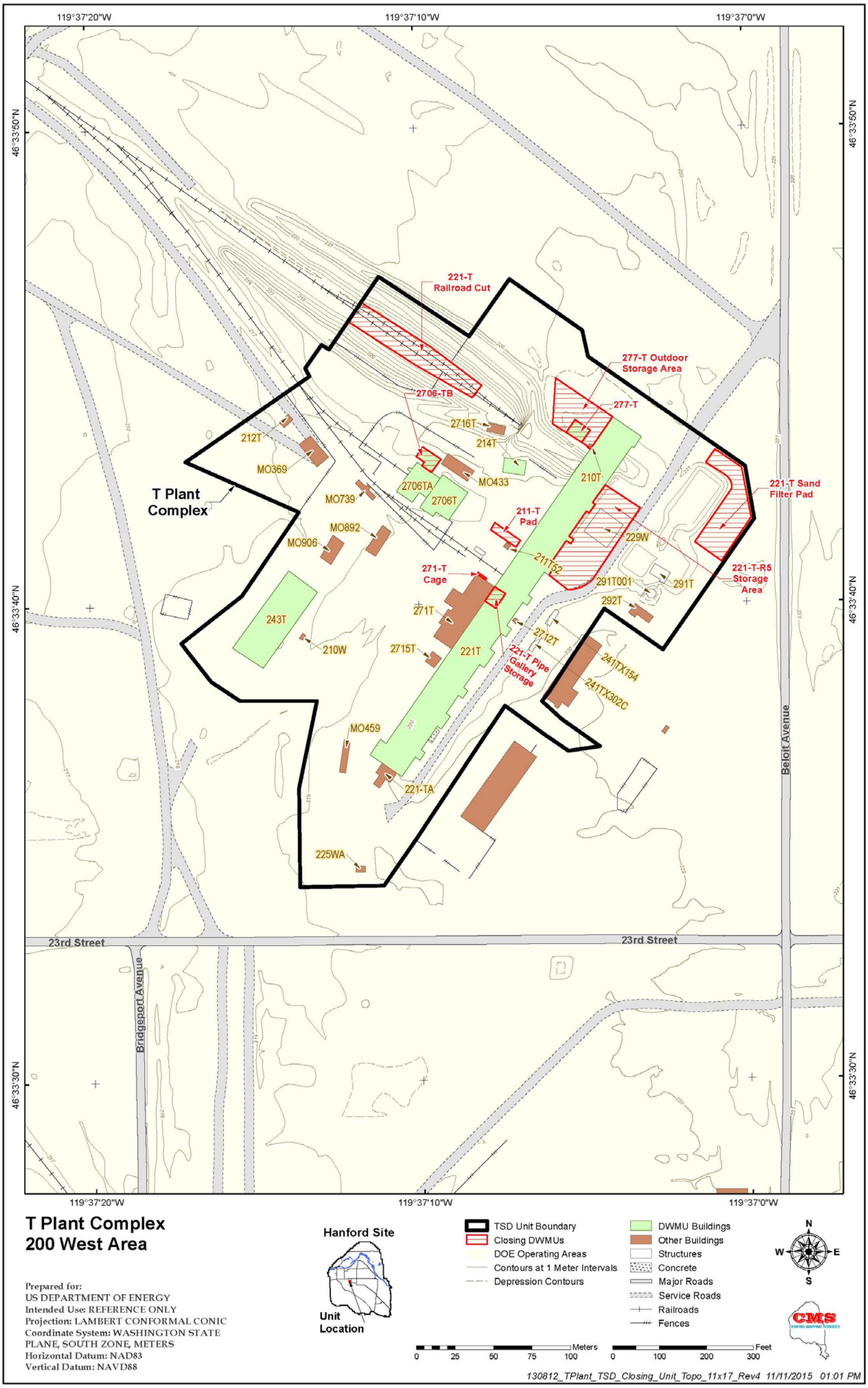
References: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure C-2. Topographic Map of T Plant Complex Operating and Closing Units Only



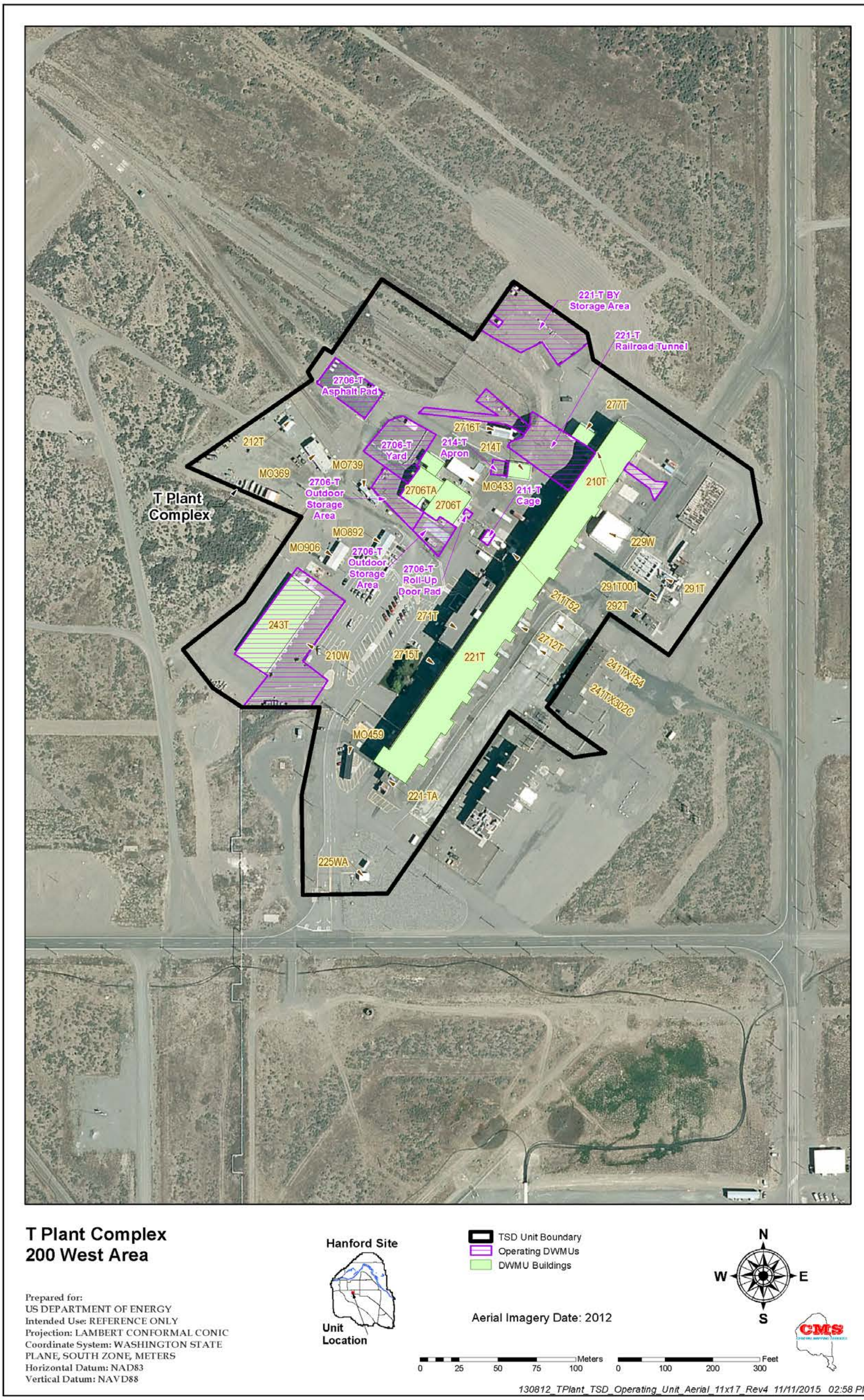
References: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure C-3. T Plant Complex Aerial Photo Closing Units Only



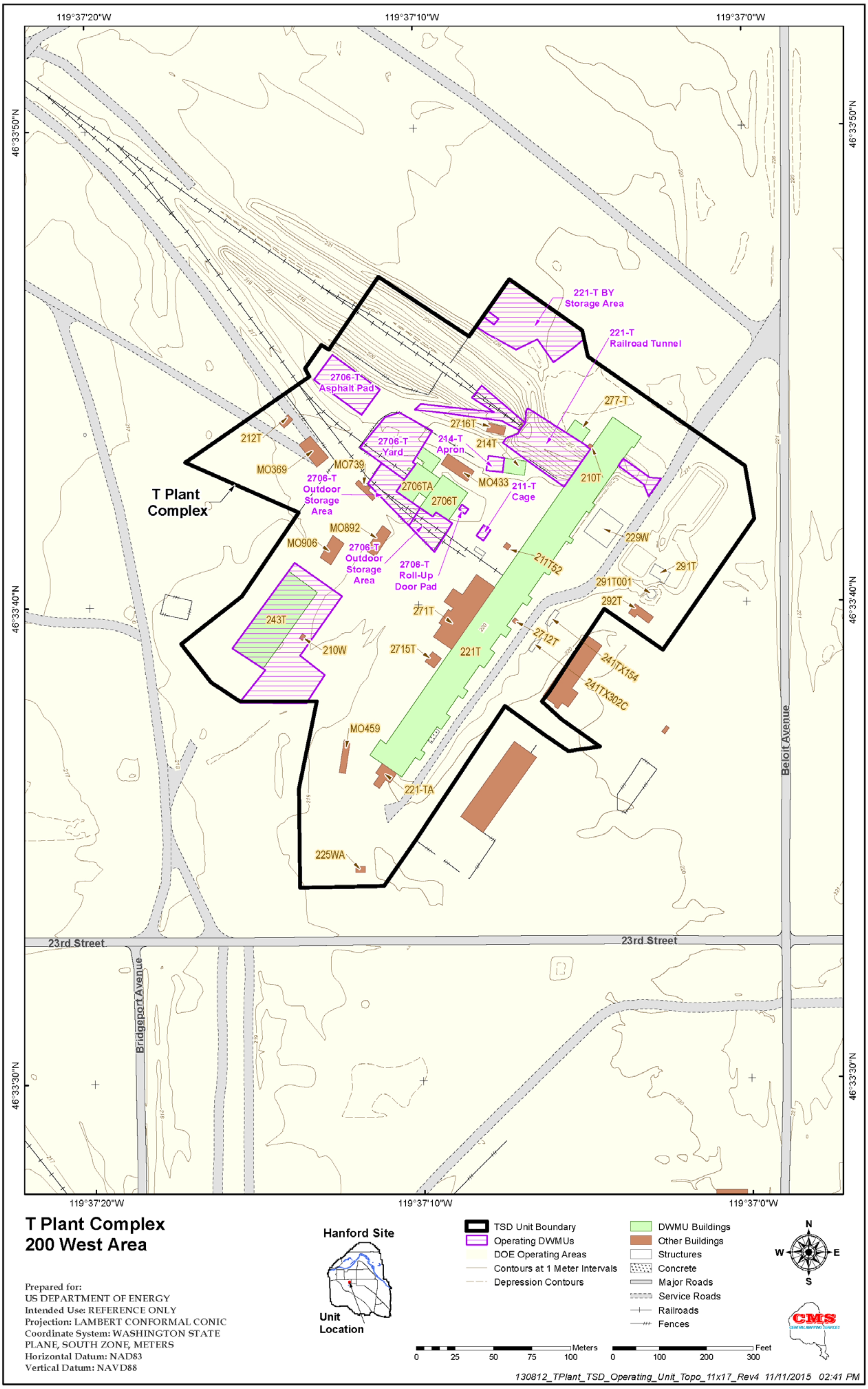
References: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure C-4. Topographic Map of the T Plant Complex Closing Units Only



References: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure C-5. T Plant Complex Aerial Photo Operating Units Only



References: NAD83, *North American Datum of 1983*; NAVD88, *North American Vertical Datum of 1988*.

Figure C-6. Topographic Map of the T Plant Complex Operating Units Only

Photo C-1. 214-T Building (September 2013)

Photo C-2. 221-T Canyon Deck (Undated Photograph)

Photo C-3. 221-T Cells (Example; Undated Photograph)

Photo C-4. 221-T Railroad Tunnel (Exterior View; September 2013)

Photo C-5. 221-T Railroad Tunnel (Interior View; April 2015)

Photo C-6. 221-T Head End (Exterior View; September 2013)

Photo C-7. 221-T Operations Gallery Storage (September 2013)

Photo C-8. 2706-T Building (Exterior View; September 2013)

Photo C-9. 2706-T Asphalt Pad (February 2013)

Photo C-10. 2706-TA Building (Exterior View; September 2013)

Photo C-5. 2706-T Outdoor Storage Area (March 2013)

Photo C-12. 2706-T Yard (Looking North; October 2015)

Photo C-6. 2706-T Yard (HS-030 View; March 2013)

Photo C-7. 2706-T Yard (HS-032 View; March 2013)

Photo C-8. 243-T Covered Storage Pad (February 2013)

Photo C-9. 211-T Cage (March 2013)

Photo C-10. 221-T BY Storage Area (September 2013)

Photo C-11. 271-T Cage (Closing Dangerous Waste Management Unit; February 2013)

Photo C-12. 211-T Pad (Closing Dangerous Waste Management Unit; February 2013)

Photo C-20. 221-T Sand Filter Pad (Closing Dangerous Waste Management Unit; February 2013)

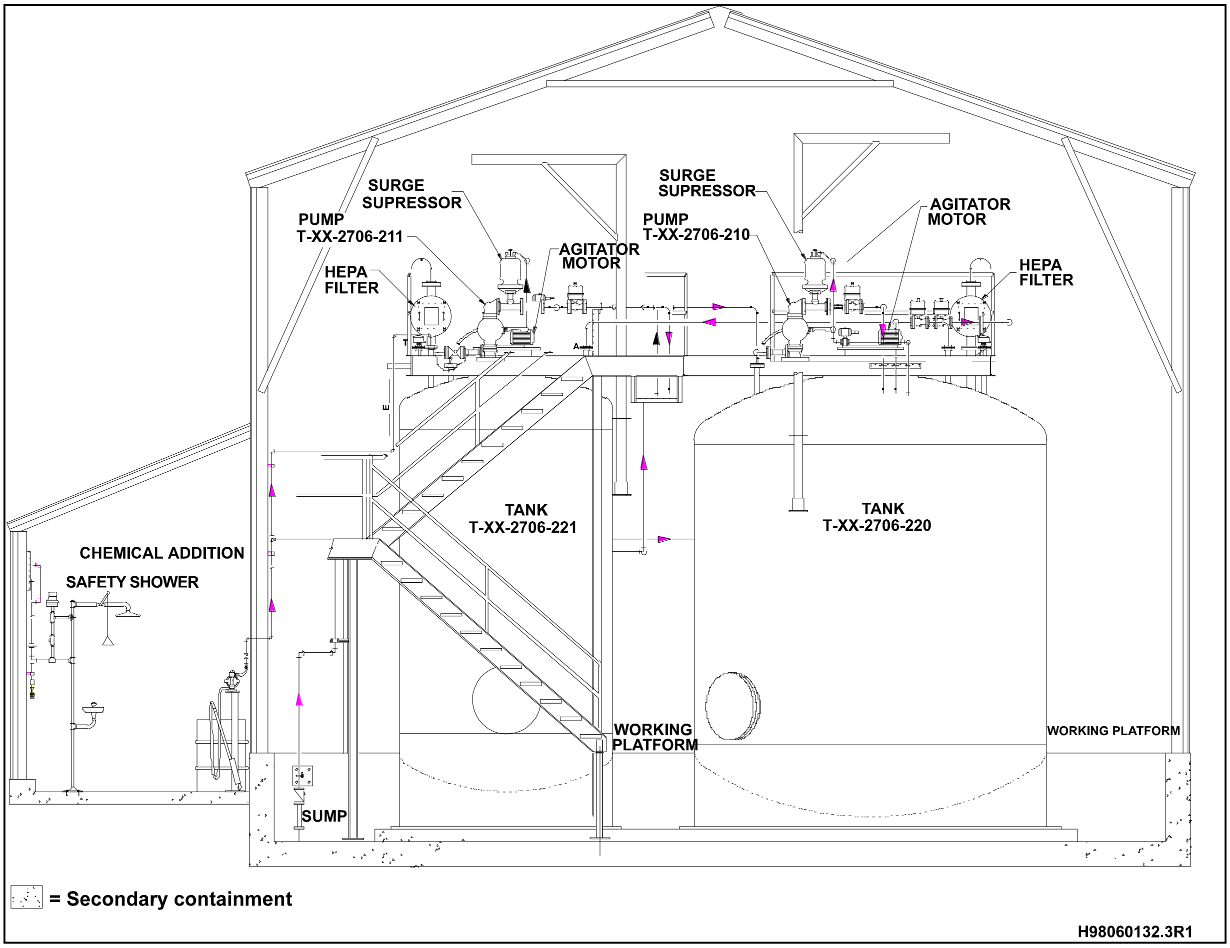
Photo C-21. 221-T-R5 Waste Storage Area (Closing Dangerous Waste Management Unit; February 2013)

Photo C-22. 277-T Outdoor Storage Area (Closing Dangerous Waste Management Unit; February 2013)

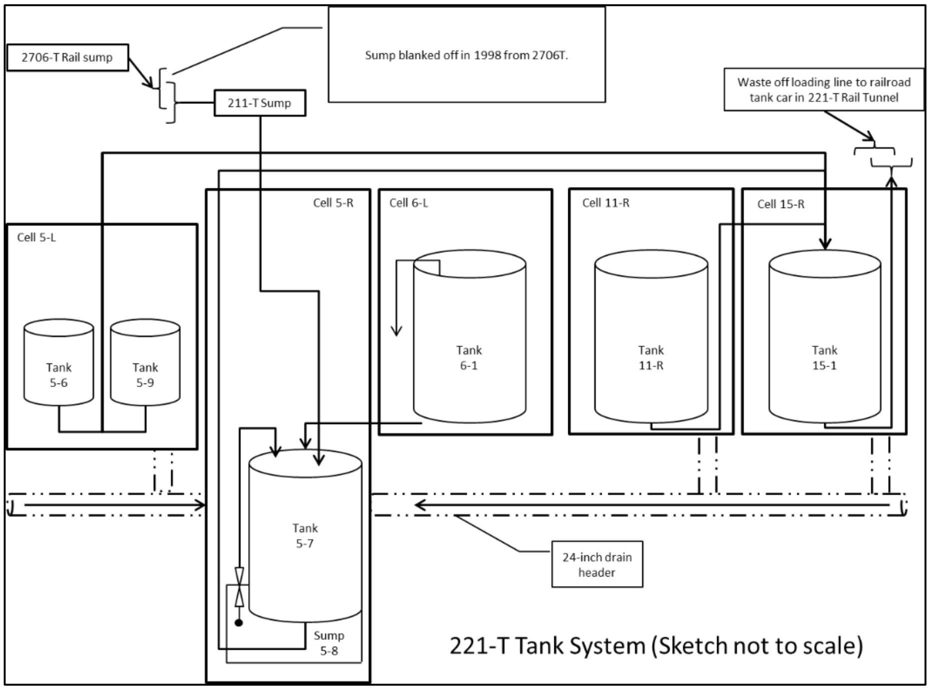
Photo C-23. 277-T Building (Closing Dangerous Waste Management Unit; February 2013)

Photo C-24. 221-T Railroad Cut (Closing Dangerous Waste Management Unit; September 2013)

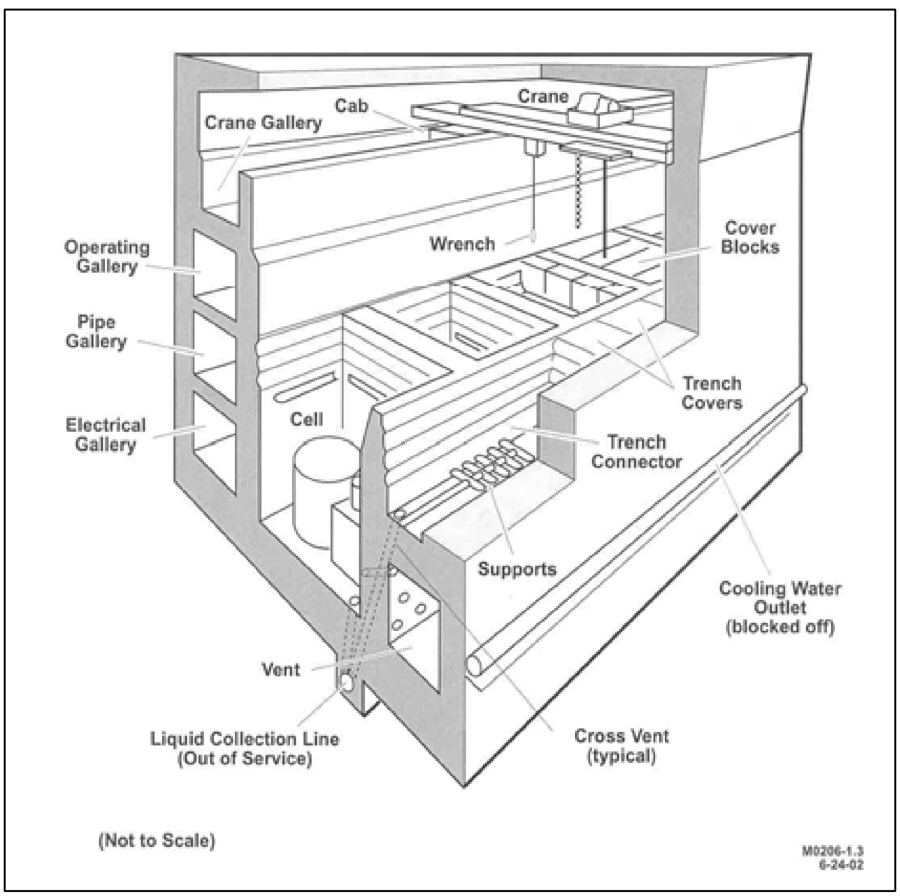
Photo C-25. 221-T Pipe Gallery Storage
(Closing Dangerous Waste Management Unit; September 2013)



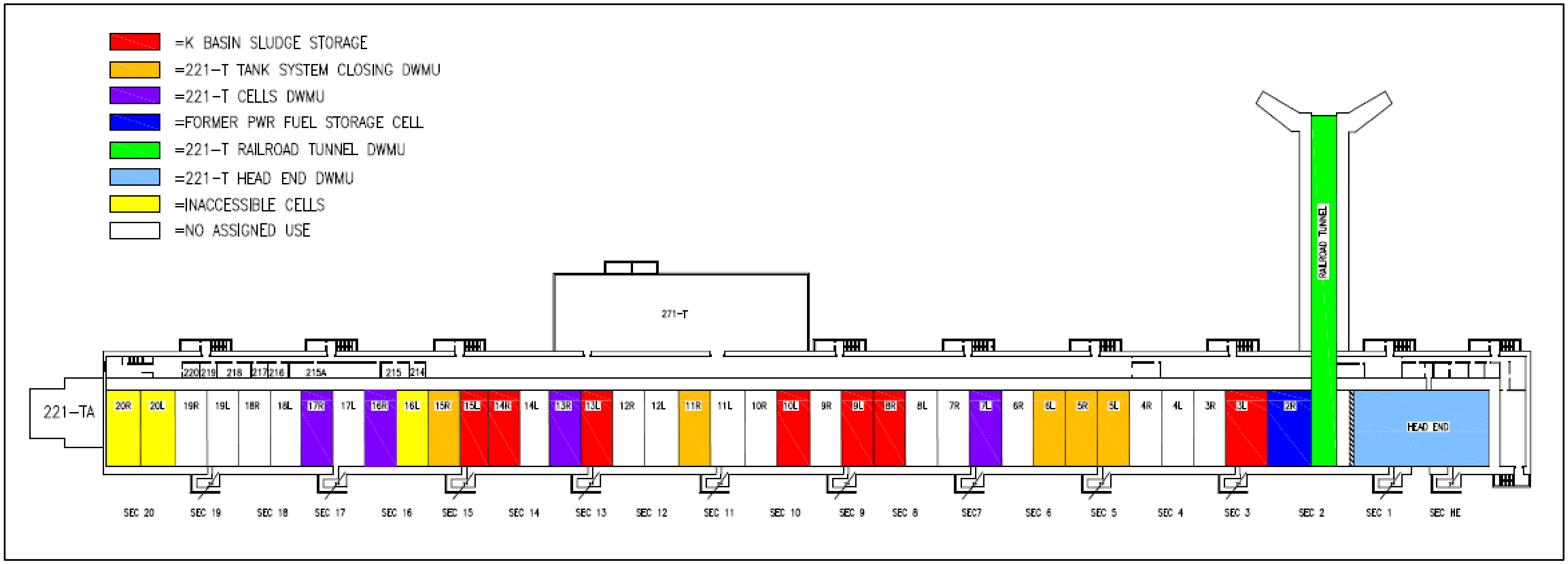
Drawing C-1. 2706-TB Tank System



Drawing C-2. 221-T Tank System Schematic



Drawing C-3. 221-T Cell (Example Cutaway)



Drawing C-4. 221-T Cell Diagram

Addendum B

Waste Analysis Plan

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Contents

Appendix

Tables

Glossary

Characterization	Information provided for a waste stream that includes the use of "Knowledge" and/or the methods of laboratory analysis approved in *Washington Administrative Code* (WAC) 173-303-110, "Dangerous Waste Regulations," "Sampling, Testing Methods, and Analytes."
Knowledge	Sufficient information about a waste to reliably substitute for direct testing of the waste. To be sufficient and reliable, the "knowledge" used must provide information necessary to manage the waste in accordance with the requirements of WAC 173-303-300, "General Waste Analysis."
	Note: "Knowledge" may be used by itself or in combination with testing to designate a waste pursuant to WAC 173-303-070(3)(c), "Designation of Dangerous Waste," or to obtain a detailed chemical, physical, and/or biological analysis of a waste as required in WAC 173-303-300(2).
Lab Pack	A packaging method where a number of inner containers of waste are packaged into an outer drum as specified in 49 *Code of Federal Regulations* (CFR) 173.12(b), "Transportation," "Exceptions for Shipment of Waste Materials." For this document, the term also could be used for U.S. Department of Transportation Class 7 material packaged in the same manner.
Nonconformance	A significant discrepancy difference in quantity or type of waste. A waste shipment may be classified as *nonconforming* if it is different in chemical or physical properties from the information on the waste profile. A variation in shipment piece count from the manifest as defined by WAC 173-303-370(5), "Manifest System," is *nonconforming.*
Retrievably Stored Waste	Waste that was previously generated and accepted for storage at the 200 Area burial grounds.
Retrieved Waste	Waste that was formerly retrievably stored waste and has now been accepted for management at the Central Waste Complex-Waste Receiving and Processing Facility, T Plant, or other treatment, storage, and/or disposal facility.
Testing	Performance of a procedure that yields a quantitative or qualitative evaluation of the type and/or quantity of materials present; sometimes referred to as *analysis* or *laboratory analysis*.
Testing for Total Metals	Includes sample preparation followed by testing (analysis) for arsenic (D004), barium (D005), cadmium (DO06), chromium (D007), lead (D008), mercury (D009), selenium (D010), and silver (D011).

Testing for Total Organics	Includes sample preparation followed by testing (analysis) for benzene (D018), carbon tetrachloride (D019), chlordane (D020), chlorobenzene (D021), chloroform (D022), 1,4-dichlorobenzene (D027), 1,2-dichloroethane (D028), 1,1-dichloroethylene (D029), 2,4-dinitrotoluene (D030), endrin (D012), heptachlor and heptachlor epoxide (D031), hexachlorobenzene (D032), hexachlorobutadiene (D033), hexachloroethane (D034), methoxychlor (D014), methyl ethyl ketone (D035), nitrobenzene (D036), pentachlorophenol (D037), tetrachloroethylene (D039), toxaphene (D015), trichloroethylene (D040), 2,4,5-trichlorophenol (D041), 2,4,6-trichlorophenol (D042), and vinyl chloride (D043).
Treatment	The physical, chemical, or biological processing of dangerous waste to make such waste nondangerous or less dangerous, safer for transport, amenable for energy or material resource recovery, amenable for storage, amenable for disposal, or reduced in volume, with the exception of compacting, repackaging, and sorting as allowed under WAC 173-303-400(2), “Interim Status Facility Standards,” and WAC 173-303-600(3), “Final Facility Standards.”
Waste Shipment	Waste transferred from point A to point B under a single waste manifest or shipping paper.
Waste Stream	A waste or group of wastes from a process or a facility with similar physical, chemical, or radiological properties.

B1 Introduction and Unit Description

This addendum details the waste analysis plan (WAP) required by WAC 173-303, “Dangerous Waste Regulations,” in effect at the T Plant Complex Operating Unit Group (OUG). (Note: This WAP expressly supersedes Exhibit A, Sections 1.8.1 and 1.8.2 of Ecology, 2014, *Agreed Order and Stipulated Penalty No. DE10156.*)

The purpose of this T Plant WAP is to provide a clear outline of the pre-waste acceptance, waste acceptance, and waste analysis processes that occur for treatment and storage of waste at T Plant. This WAP demonstrates compliance with the requirements of *Washington Administrative Code* (WAC) 173-303-300(1) through (5), “General Waste Analysis,” as well as applicable federal and state land disposal restrictions (LDRs). Additional information on T Plant waste storage and treatment processes is detailed in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter Hanford Facility RCRA Permit) Addendum C, “Process Information.”

Please note, the terms “mixed waste” and/or “waste” when seen in this document refers to dangerous waste or hazardous waste, as applicable.

B1.1 T Plant Unit Description

The T Plant OUG is comprised of the following dangerous waste management units:

- 221-T Canyon Deck
- 221-T Cells (includes Cells 7L, 13R, 16R, and 17R)
- 221-T Railroad Tunnel
- 221-T Head End
- 221-T Operations Gallery Storage
- 221-T BY Storage Area
- 2706-T Building
- 2706-TA Building
- 2706-T Yard (including HS-030 and HS-032 Storage Modules)
- 2706-T Asphalt Pad
- 243-T Covered Storage Pad
- 214-T Building
- 211-T Cage
- 2706-T Outdoor Storage Area
- 2706-TA Outdoor Storage Area.

B1.2 T Plant Waste Management Activities

Waste management within T Plant includes the following activities:

- Waste receipt
- Storage
- Nondestructive examination (NDE)
- Physical/chemical screening
- Sampling

- Treatment
- Sorting and repackaging
- Waste notification and certification (e.g., LDR)
- Shipment of waste offsite
- Transfer of waste to and/or from other Solid Waste Operations Complex (SWOC) treatment, storage, and/or disposal (TSD) locations, or other approved facility.

B1.3 Waste Managed at T Plant

The following wastes are managed at T Plant:

- Newly generated waste comprised of contaminated debris, size-reduced items, and other waste types (e.g., polychlorinated biphenyl [PCB] waste) from both onsite and offsite generators.
- Waste previously accepted at other SWOC TSD units and then transferred to T Plant.
- Retrieved waste (RW) including but not limited to contaminated debris, contaminated soils, absorbed oils, PCB-contaminated waste, and lab packs.
- T Plant-generated waste from operations and maintenance (O&M) activities, including debris, discarded personal protective equipment, and maintenance waste.
- Waste that was treated at T Plant.

B2 Waste Pre-acceptance Processes

The following sections address the waste pre-acceptance process, including waste stream identification and classification, and profile review and approval at T Plant.

B2.1 Identification and Classification of Waste

Generators must characterize and designate their waste and submit all required waste profile information to a Waste Management Representative (WMR). Waste is designated by the generator using known information provided by manufacturers, safety data sheets, laboratory analysis, knowledge of the waste-generating process (Section B2.1.1), and reference materials such as NIOSH, 2014, *Registry of Toxic Effects of Chemical Substances*; EPA, 2015, ECOTOX Database; or the U.S. National Library of Medicine, TOXNET: Toxicology Data Network Hazardous Substance Databank website.

For additional information on waste codes accepted at T Plant, refer to Hanford Facility RCRA Permit, Part A.

For identification of waste prohibited at T Plant, refer to T Plant Addendum C.

B2.1.1 Use of Knowledge

Waste designated using knowledge requires sufficient information about the waste-generation process to provide a reliable substitution for direct testing of waste (WAC 173-303-040, “Definitions”). Waste profiles, using knowledge defined in WAC 173-303-040, must include all supporting data and records, including a description of the methodology employed to obtain the data. The waste profile review and approval process (Section B2.2) includes an evaluation of generator knowledge. Knowledge of the waste-generating process may be used with a combination of chemical, physical, and/or biological analysis (WAC 173-303-300(2)) to designate waste.

B2.2 Waste Profile Review and Approval Process

The waste profile review and approval process consists of review and approval of new draft waste profiles and annual reviews of standing waste profiles. The WMR coordinates the documentation for all waste profile reviews and approvals and ensures that the waste profile information complies with T Plant solid waste acceptance requirements.

B2.2.1 New Waste Profile Review and Approval

Generators submit draft waste profiles for each new waste stream destined for T Plant.

Each waste profile is assigned a unique number for tracking purposes. Once the draft waste profile is received, the WMR performs a consistency check of profile information. This consistency check is the primary means by which T Plant obtains data about each waste stream. These data are required to ensure that a waste stream can be managed in compliance with T Plant waste acceptance requirements. The profile must provide a clear picture of the waste stream's physical and chemical characteristics, regulatory classification, and packaging methods. Any relevant background information, documents, and analytical data must be referenced or attached. The consistency check also determines if knowledge, provided in lieu of other analysis methods (Section B2.1.1), is adequate to quantify waste constituents and determine waste characteristics.

The waste profile includes the following information at a minimum:

- Waste-generating process description
- Waste category (e.g., dangerous, mixed, and PCB)
- Estimated volume of the waste
- Estimated number of waste containers to be shipped
- Knowledge used for characterization of the waste stream
- Sampling and analysis performed to characterize the waste stream
- Regulatory requirements of the waste stream (e.g., testing for underlying hazardous constituents) and federal LDRs
- Waste characteristics (e.g., flash point and pH), physical state (e.g., sludge and debris), liquid content information, and waste composition
- Description of the packaging to be used, including container compatibility with the waste
- Provisions for handling (e.g., maximum container size and weight and special handling requirements)
- Conditions of approval (when applicable).

Errors discovered by the WMR during the waste profile review process must be reconciled by the generator, and the profile information must be updated. Upon successful review and approval of the waste profile, the generator will receive an approval notice with the initial container verification rate as determined by the Performance Evaluation System (PES) Committee (Appendix B-A, Section B-A2).

B2.2.2 Standing Waste Profile Review

A standing waste profile is used to receive multiple shipments from the same generator for the same waste stream. Standing waste profiles are subject to review and must be recertified at least annually, or revised if applicable, when the waste stream or generating process changes. Standing waste profiles are subject to review and revision if T Plant personnel have reason to suspect a change in the waste, based on inconsistencies in packaging, labeling, or visual verification of the waste. A generator may also request that a standing waste profile be revised and approved for additional waste generated that consists of the same types of waste. The WMR coordinates the revisions and recertification by PES, as required.

B2.2.3 Waste Exempt from the Profile Process

T Plant-generated waste from O&M activities is exempt from the profile process. Additional information on T Plant-generated waste is provided in Section B4.2.

RW is exempt from the waste profile process as a previously accepted waste stream.

B3 Waste Acceptance Process

The T Plant waste acceptance process includes confirmation (Section B3.1) of waste against the previously reviewed and approved waste profile information and receipt of the waste into T Plant for treatment and/or storage.

Once waste profiles are reviewed and approved, a generator may request to ship or transfer the approved waste containers to T Plant for treatment and/or storage. Each waste container received at T Plant must match the identity of the waste container specified on the accompanying shipping or transfer paperwork.

Waste shipments or transfers to T Plant for treatment and/or storage can be received and verified prior to acceptance. Documentation of an approved waste profile (if applicable), sufficient characterization to manage the waste safely, designation of waste codes identifying any dangerous constituents of the waste, and all other information required by the T Plant waste acceptance process must accompany the shipment or transfer at the time of container receipt.

Retrievably stored waste (RSW) transfers, newly generated waste from onsite and offsite generators, and SWOC waste transfers are accepted into T Plant by the processes detailed in the following sections.

B3.1 Confirmation

WAC 173-303-300(1) requires confirmation of waste before treatment, storage, or disposal. Confirmation for waste is a two-part process consisting of verification and pre-shipment review. Verification occurs either before or after pre-shipment review.

B3.1.1 Verification

Verification ensures that waste received into T Plant matches waste in the approved profile. Verification can occur either at the generator location, before shipment or transfer of the waste containers to T Plant, or at T Plant. The verification rate will be established by PES during approval of the waste profile (Section B2.2). Verification can include the use of physical screening (NDE and visual verification) or chemical screening.

NDE is performed using real-time radiography.

Visual verification includes comparing the container contents to the container inventory, waste acceptance criteria, and waste profile. Containers can be subject to NDE or visual verification, but the use of both techniques for the same container is not required.

Chemical screening is most often performed for containers with liquids. Of the visually verified mixed waste, 10 percent will be chemically screened as allowed by the waste stream characteristics.

The following are cases in which chemical screening is not required:

- Small containers of waste in overpacked containers (lab packs) packaged in accordance with WAC 173-303-161, "Overpacked Containers (Labpacks)," and not prohibited under LDRs specified in WAC 173-303-140, "Land Disposal Restrictions", which includes by reference 40 *Code of Federal Regulations* (CFR) 268
- Commercial chemical products in the original product container(s) (e.g., off-specification, outdated, or unused products)
- Chemical-containing equipment removed from service, (e.g., ballasts and batteries)
- Waste containing asbestos
- Waste, environmental media, and/or debris from the cleanup of spills or release of a single substance or commercial product or otherwise known material
- Confirmed noninfectious waste (e.g., xylene, acetone, ethyl alcohol, and isopropyl alcohol) generated from laboratory tissue preparation, slide staining, or fixing processes
- Hazardous debris as defined in WAC 173-303-040.

B3.1.1.1 Verification of Waste from Non-SWOC Onsite or Offsite Generators

Verification may be conducted either at the generator location or at T Plant. Verification is conducted by the Waste Verifier and, in the case of visual verification and chemical screening, most often occurs during container packaging at the generator location.

Certain types of waste (e.g., debris to be macroencapsulated) may be difficult or impossible to verify after treatment. Generators planning to treat waste before shipment to T Plant must obtain an approved waste profile before treating the waste. Verification will then occur prior to treatment or packaging of the waste. The waste will be verified at the frequency determined by PES during waste profile review and approval (Appendix B-A, Section B-A3).

B3.1.1.2 Verification of Waste from Other Hanford SWOC TSD Units

Verification at other SWOC TSD units is conducted by the Waste Verifier and, in the case of visual verification and chemical screening, most often occurs during container packaging. Once the container has been verified, a tamperproof seal is placed on the container. Containers can undergo multiple transfers between SWOC TSD units; however, additional verification is not required upon receipt at T Plant if the tamperproof seal is intact. Containers that arrive at T Plant with a compromised tamperproof seal will require notification of the waste services department for evaluation of potential reverification or application of a new tamperproof seal.

B3.1.1.3 Waste Exempt from the Verification Process

RSW is waste that was accepted for storage at the 200 Area burial grounds. During the retrieval process, this waste is unearthed, retrieved, and identified by unique container number or burial location. During retrieval activities, RSW historical records and knowledge of waste-generating processes are reviewed to characterize the waste and designate dangerous waste codes. As previously accepted waste, RSW is exempt from the waste profile approval and verification processes. However, NDE will be used on drums and boxes, for which NDE capability exists, and will be performed either at the trench prior to shipment or following receipt at T Plant.

T Plant waste generated from O&M activities is exempt from the verification process. See Section B4 for additional details.

B3.1.2 Preshipment Review

Prior to shipping or transferring waste containers to T Plant, the WMR conducts a preshipment review of documentation. This review ensures that all previously submitted and approved generator information is current and complete.

The generator must provide the following documentation:

- Characterization information and waste code designations
- List of containers, each with a unique identification number
- Container inventory information, including the following:
  - Name and location of the waste-generating facility
  - Specific contents of each container
  - Approximate weight of waste in each container
- LDR notification/certification (required for LDR-compliant waste subject to the requirements of WAC 173-303-140 which includes by reference 40 CFR 268).

If the WMR discovers an error during the preshipment review, the generator must reconcile the error and provide updated information, as applicable. For additional information on conformance issue resolution, refer to Appendix B-A, Section B-A4.

T Plant-generated waste from O&M activities is generated and located at the T Plant facility and is, therefore, exempt from the preshipment review. See Section B4 for additional details.

B3.2 Waste Receipt

The waste receipt process includes inspection of container receipts and waste receipt discrepancies. T Plant-generated waste from O&M activities is generated and located at the T Plant facility and is, therefore, exempt from the waste receipt process. Additional information on T Plant-generated waste is provided in Section B4.

B3.2.1 Container Receipt Inspection

Arriving container shipments are assigned a specific delivery location within T Plant. Transport vehicles may access the following locations:

- 221-T Railroad Tunnel
- 221-T Head End
- 221-T BY Storage Area
- 2706-T Building
- 2706-TA Building
- 2706-T Yard (including HS-030 and HS-032 Storage Modules)
- 2706-T Asphalt Pad
- 243-T Covered Storage Pad
- 214-T Building
- 211-T Cage
- 2706-T Outdoor Storage Area
- 2706-TA Outdoor Storage Area.

Upon arrival, 100 percent of containers will undergo physical inspection for the following items:

- Damage to the container
- Evidence of leaking
- Presence of accurate labeling
- Tamper-resistant seal integrity (if present).

Waste received at T Plant will be accompanied by the following container receipt documentation:

- Receipt report and container list for each approved shipment
- Uniform Hazardous Waste Manifest, if applicable
- LDR certification/notification for LDR-compliant waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, certifying that the waste meets the appropriate treatment, variance, or exemption standard.

In addition to the physical container inspection, an inspection of paperwork and documentation will also be conducted for each shipment or transfer to confirm that waste containers received are listed on the manifest/receipt report.

Following completion of the receipt process, the waste is considered accepted at T Plant. Following acceptance at T Plant, RSW is referred to as RW.

B3.2.2 Waste Receipt Discrepancies

If discrepancies, such as improper container labeling, improper packaging, nonconformance issues, or manifest inconsistencies, are discovered during the container receipt inspection, the discrepant containers or shipment will be evaluated for entrance into a discrepant container management program and will not be accepted into T Plant until the discrepancies have been resolved using one or more of the following alternatives:

- Incorrect or incomplete entries on the Uniform Hazardous Waste Manifest or onsite shipping or transfer paperwork can be immediately corrected with concurrence from the generator. Corrections are made by drawing a single line through the incorrect manifest entry. Corrected entries are initialed and dated by the individual making the correction.
- The waste package(s) can be held at T Plant and segregated from other stored waste, and the generator must provide written instructions for use in correcting the discrepancies.
- The waste package may be returned to the generator.

If a discrepant (nonconforming) waste container or shipment is received from an offsite generator and is returned to the generator, then a new manifest will be prepared in accordance with WAC 173-303-370(5)(f). If the waste container or shipment is nonreturnable to the offsite generator because of container condition deficiencies, and if an agreement cannot be reached among the parties to resolve the noncompliant condition, then the Washington State Department of Ecology (Ecology) will be notified in writing within 15 days after receiving the noncompliant shipment. A copy of the manifest at issue will accompany the notification (WAC 173-303-370, "Manifest System"). Pending resolution, the nonreturnable package will be segregated from other waste and will not be accepted at T Plant. If the discrepancy is discovered after the manifest has been signed and returned to the delivering transporter or offsite generator, the manifest will be updated to include the discrepancy, re-signed and dated. A copy of the updated manifest must be sent to the transporter and offsite generator within thirty days and maintained in the operating record for a minimum of three years.

If the waste container or shipment is damaged to such an extent, or the waste is in such a condition as to present a hazard to the public health or the environment in the process of further transportation, then actions must be taken in accordance with T Plant Addendum J, “Contingency Plan”.

B4 T Plant-Generated Waste

Waste generated at T Plant from processing and treatment operations, performing repair and maintenance activities, spill cleanup materials, or other sources within T Plant will be managed to ensure proper handling and disposition. This includes two different categories of waste: waste resulting from treatment at T Plant and T Plant waste generated from O&M activities.

B4.1 Waste Resulting from Treatment at T Plant

Waste from onsite and offsite generators may be processed and/or treated at T Plant, resulting in a newly generated waste stream. Treatment may be performed at T Plant to change the characteristics and/or to render the waste LDR compliant. Methods for confirming the effectiveness of treatment are shown in Table B-1.

B4.2 Other T Plant-Generated Waste

Waste will be characterized by T Plant personnel for proper handling. Information for the T Plant waste generated during O&M activities is captured during the work planning process and provided to a WMR for review. Laboratory analysis for the waste is performed as necessary by the WMR. Planning for the T Plant-generated waste stream begins prior to waste generation. For the work activity to be performed, T Plant-generated waste is identified, reviewed, and designated. Packaging and storage requirements are determined based on compatibility, receiving TSD acceptance criteria, and U.S. Department of Transportation regulations. Requirements for T Plant-generated waste are placed in work plans to be executed in the field during generation of the waste. The waste to be generated is identified for the work activity to be performed.

The following T Plant-generated waste does not require chemical analysis:

- Commercial chemical products in the original product container(s) (e.g., off-specification, outdated, or unused products)
- Articles removed from service, (e.g., ballasts, batteries, and fluids)
- Waste containing asbestos
- Waste, environmental media, and/or debris from cleanup of a spill or release of a single substance, commercial product, or otherwise known material
- Waste, environmental media, and/or debris from cleanup of a spill or release from a container previously accepted at T Plant
- Hazardous debris, as defined in WAC 173-303-040
- Liquids discovered in T Plant that are known to be precipitation.

Waste that does not meet the preceding exceptions will be sampled using the applicable parameters in Table B-2 and will be designated according to the regulatory requirements of WAC 173-303-070, “Designation of Dangerous Waste.” Known precipitation liquids will be managed as nondangerous waste.

Table B-1. Post-Treatment Waste Analysis Confirmation

Treatment Type	Description	Frequency	Confirmation		
			Debris*	Liquids	Homogeneous Solids
Physical Extraction Technologies	Removes characteristics of waste items through the physical extraction methods of abrasive blasting, scarification, grinding, and planning.	Every item treated	Visual inspection	N/A	N/A
Immobilization Technologies	Stabilization of the debris such that the leachability of the hazardous contaminants is reduced. Includes macroencapsulation, microencapsulation, and sealing.	Every container treated	Visual inspection	N/A	Visual inspection
Debris Washing	Removes characteristics of waste items through high-pressure steam and water sprays.	Every item treated	Visual inspection	N/A	N/A
Sorting/Segregation	Removes items to facilitate future disposal at the Waste Isolation Pilot Plant; separates potentially ignitable, reactive, and/or corrosive materials.	Every container treated	Visual inspection	Liquids removed from containers will be managed as newly generated waste, in accordance with Section B4.	Visual inspection
Solidification and/or Absorption of Liquids	Includes stabilization and cementing. Immobilizes hazardous constituents; can change or remove characteristics of waste.	Every container treated	N/A	Analysis: Method 9095, paint filter	N/A
Puncture and Decant of Aerosol Cans or Cylinders	Renders cans as empty containers; contents of punctured/decanted container will be collected and designated.	Daily when puncturing containers	Verify that puncturing device is operational.	N/A	N/A

Table B-1. Post-Treatment Waste Analysis Confirmation

Treatment Type		Description	Frequency	Confirmation		
				Debris*	**Liquids**	**Homogeneous Solids**
Deactivation	Neutralization	Removes the characteristic of corrosivity of a waste.	Every container treated	N/A	pH screening	N/A
	Controlled Reaction with Water	Removes the characteristic of reactivity of a waste: Reactive Sulfides Subcategory.	Every container treated	N/A	Technology-Based Standard: waste treatment personnel must determine that the treated waste no longer exhibits a reactive characteristic.	N/A
		Removes the characteristic of reactivity of a waste: Water Reactive Subcategory.			Technology-Based Standard: waste treatment personnel must determine that the treated waste no longer exhibits a reactive characteristic.	
		Removes the characteristic of reactivity of a waste: Reactive Cyanides Subcategory.			Analysis: SW-846 9010 or 9012 (Total Cyanides)	
		Removes the characteristic of reactivity of a waste: Other Reactive Subcategory.			Technology-Based Standard: waste treatment personnel must determine that the treated waste no longer exhibits a reactive characteristic.	
	Absorption	Reduces or eliminates liquid to the point of changing or eliminating characteristics of the waste; may be used for spill cleanup.	Every container treated	N/A	Analysis: Method 9095	N/A

Table B-1. Post-Treatment Waste Analysis Confirmation

Treatment Type	Description	Frequency	Confirmation		
			Debris*	Liquids	Homogeneous Solids
Encapsulation	Immobilizes and changes waste characteristic through macroencapsulation and/or microencapsulation.	Every container treated	Visual inspection	N/A	Visual inspection
Chemical Stabilization	Stabilization with a reagent to reduce the leachability of the contaminant; can change or remove characteristics of a waste.	Every container treated	N/A	Preparation: Method 1311 Analysis: Method 6010	N/A
Mercury Amalgamation	Amalgamation of liquid, elemental mercury utilizing inorganic reagents such as copper, zinc, nickel, gold, and sulfur that result in a nonliquid semisolid amalgam. Reduces potential emissions of elemental mercury vapors to the air.	Every container treated	N/A	Analysis: Method 7471	N/A
Volume Reduction	Can include compaction or crushing to remove void spaces.	Every container treated	Visual inspection	N/A	N/A

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

* Confirmation for waste debris is performance based when meeting the requirements of the treatments listed in 40 CFR 268.45, “Land Disposal Restrictions,” “Treatment Standards for Hazardous Debris.”

N/A = not applicable

Table B-2. Waste Requiring Verification or Characterization Analysis

Verification					
Waste Stream	**Parameter**	**Method**	**Frequency of Analysis**	**Sampling Method**	**Rationale for Selection**
Debris	Physical Inspection	Visual inspection	Other SWOC- and Non-SWOC-generated waste: The verification rate will be established by PES during approval of the waste profile (see Section B2.2). RSW is exempt from verification; however, NDE will be used on drums and boxes for which NDE capability exists, either at the trench prior to shipment or following receipt at T Plant. T Plant waste generated during O&M activities – Exempt.	Visual of open container content	Consistency between container documentation and container content is confirmed.
		NDE		NDE scan	Used to confirm consistency between container documentation and container content. Used to minimize handling of waste.
Liquids	Physical Inspection	Visual inspection	Other SWOC- and Non-SWOC-generated waste: The verification rate will be established by PES during approval of the waste profile (Section B2.2). RSW is exempt from verification; however, NDE will be used on drums and boxes for which NDE capability exists, either at the trench prior to shipment or following receipt at T Plant. T Plant waste generated during O&M activities – Exempt.	Visual of open container content	Consistency between container documentation and container content is confirmed.
		NDE		NDE scan	Used to confirm consistency between container documentation and container content. Used to minimize handling of waste.
	pH Liquids	Field pH test paper	10% of physically verified mixed waste will be chemically screened as allowed by the waste stream characteristics, as described in Section B3.1.1. 100% of chemically	Grab	Confirms D002, corrosivity.
	Peroxides	Field peroxide test paper		Grab	Confirms container contents are consistent with documentation.

Table B-2. Waste Requiring Verification or Characterization Analysis

Verification					
Waste Stream	**Parameter**	**Method**	**Frequency of Analysis**	**Sampling Method**	**Rationale for Selection**
	Oxidizers	Field potassium iodide test paper	screened containers will be analyzed for these parameters.	Grab	Confirms D003, reactivity.
	Cyanides	Field cyanide screen	For waste subject to chemical screening, performed at the discretion of the Verification Team Lead.	Grab	Confirms D003, reactivity.
	Sulfides	Field sulfide screen	For waste subject to chemical screening, performed at the discretion of the Verification Team Lead.	Grab	Confirms D003, reactivity.
Homogenous Solids	Physical Inspection	Visual inspection	Other SWOC- and Non-SWOC-generated waste: The verification rate will be established by PES during approval of the waste profile (see Section B2.2). RSW is exempt from verification; however, NDE will be used on drums and boxes for which NDE capability exists, either at the trench prior to shipment or following receipt at T Plant. T Plant waste generated during O&M activities – Exempt.	Visual of open container content	Consistency between container documentation and container content is confirmed.
		NDE		NDE scan	Used primarily for RW to confirm consistency between container documentation and container content. Used to minimize handling of waste. May also be used for newly generated containers restricted from visual verification due to content type (e.g., sludge, soil, and cement chips).

Table B-2. Waste Requiring Verification or Characterization Analysis

Verification					
Waste Stream	**Parameter**	**Method**	**Frequency of Analysis**	**Sampling Method**	**Rationale for Selection**
Characterization Analysis for Other T Plant-Generated Waste*					
Liquids	pH Liquids	Analysis: 9040, 9041, or 9045	Each container of liquids generated as described in Section B4.2	Pipet, Dip Grab COLIWASA	Confirms regulatory status as WSC2.
	Flashpoint	Analysis: 1010 or 1020			Confirms D001, ignitability.
	Cyanide	Analysis: 9012, 9014, and 9213			Confirms D003, reactivity.
	Sulfide	Analysis: 9030			
	Total Organics	Preparation: 5030 and 3510 or 3520 Analysis: 8260 and 8270			Determines the presence of TCLP organics.
	Total Metals	Preparation: 3005, 3010, 3015, or 3052 Analysis: 6010, 6020, or 200.8 (ASTM) Preparation and Analysis: 7470			Confirms the presence of TCLP metals.
Homogenous Solids	Presence of Free Liquids	Analysis: 9095	Each container of homogeneous solids generated as described in Section B4.2	Grab	Confirms presence of liquids, if any.
	pH Solids	Analysis: 9045			Confirms regulatory status as WSC2.
	Total Organics	Preparation: 1311 Analysis: 8260 and 8270			Confirms the presence of volatile/ semivolatile organic compounds.
	Cyanide	Analysis: 9013			Confirms D003, reactivity.
	Sulfide	Analysis: 9030			

Table B-2. Waste Requiring Verification or Characterization Analysis

Verification					
Waste Stream	**Parameter**	**Method**	**Frequency of Analysis**	**Sampling Method**	**Rationale for Selection**

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

* Parameters and methods are analytical, and SW-846 methods will be used unless otherwise noted. Analytical results for solids and soils will be reported on a dry weight basis.

ASTM = ASTM International, formerly the American Society for Testing and Materials
COLIWASA = composite liquid waste sampler
NDE = nondestructive examination
O&M = operations and maintenance
PES = Performance Evaluation System
RSW = retrievably stored waste
RW = retrieved waste
SWOC = Solid Waste Operations Complex
TCLP = toxic characteristic leaching procedure
WSC = *Washington State Code*

B5 Waste Analysis Parameters

Table B-2 details the physical and chemical analyses to be performed as well as the rationale for the selection of analyses.

In addition to the analysis frequencies listed, laboratory analyses may be used, as needed, upon the discretion of the WMR.

The most recent revision of SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*, will be used.

B5.1 Sampling Methods and Equipment

Sampling methods performed at T Plant are in accordance with WAC 173-303-110(2), "Sampling, Testing Methods, and Analytes." Sampling equipment appropriate to the waste type to be sampled and in accordance with WAC 173-303-110 will be used. Sampling equipment used at T Plant is shown in Table B-3.

Table B-3. T Plant Sampling Equipment

Waste Stream	Waste Forms	Equipment
Liquids	Free-flowing liquids and slurries	COLIWASA, glass thief, pipet, dip, tank bomb, and bailer/tube samplers
Homogeneous Solids	Sludges	Trier, scoops and shovels, tube-type samplers and augers, and spoons (for small containers)
	Sand or packed powders and granules	
	Large-grained solids	
	Moist powders or granules	
	Dry powders or granules	

COLIWASA = composite liquid waste sampler

B6 Quality Assurance/Quality Control

Quality assurance and quality control programs in effect at T Plant ensure that sampling and analysis of waste, generator performance, and waste receipt provide data that ensure waste is sufficiently characterized to be managed at T Plant.

B6.1 Waste Receipt Quality Assurance

To ensure that waste shipped or transferred to T Plant is properly characterized and meets acceptance requirements, an initial container verification rate is determined. This decision uses the following generator-provided information to determine the relative potential for problems in a waste stream:

- Documentation of the customer's waste management program
- Waste profile characterization information
- The potential for inappropriate segregation of the waste.

For more information on initial verification rate determinations, refer to Appendix B-A, Section B-A2.

Generators are monitored on a monthly basis to identify trends in performance and correct problems or potential problems before they arise. For more information on generator performance evaluations, refer to Appendix B-A, Section B-A5.

B6.2 Laboratory Selection

Onsite and offsite laboratories providing analytical support to T Plant must be approved by a U.S. Department of Energy (DOE) evaluation organization. The laboratory quality assurance plan will be submitted to Ecology in accordance with the Tri-Party Agreement Action Plan (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order Action Plan*), Section 6.5, for review as a secondary document before commencement of analytical work. The quality assurance plan will address the following items at a minimum:

- Sample custody and management practices
- Sample preservation protocols
- Sample preparation and analytical method requirements
- Instrument maintenance and calibration requirements
- Internal quality control measures (e.g., method blanks, spikes, and duplicates)
- Corrective action process.

Periodic audits performed by a DOE evaluation organization ensure compliant operations by approved laboratories.

B7 Recordkeeping

Permittees will place documentation into the Hanford Facility Operating Record (T Plant portion) as required by Hanford Facility RCRA Permit Condition II.I (WAC 173-303-380, "Facility Recordkeeping") to include approved waste profile documentation (Hanford Facility RCRA Permit Condition II.I.1.j) and confirmation records (Hanford Facility RCRA Permit Condition II.I.1.b). LDR records referred to in Section B3.2.1 will be maintained in the Hanford Facility Operating Record (T Plant portion) in accordance with WAC 173-303-380(1)(m).

B8 Training

For training requirements related to duties described in the T Plant WAP, refer to T Plant Addendum G, "Personnel Training."

B9 References

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol26/xml/CFR-2010-title40-vol26-part268.xml.

40 CFR 268.45, "Land Disposal Restrictions," "Treatment Standards for Hazardous Debris," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol26/xml/CFR-2010-title40-vol26-sec268-45.xml.

49 CFR 173.12, "Transportation," "Exceptions for Shipment of Waste Materials," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2009-title49-vol2/pdf/CFR-2009-title49-vol2-sec173-12.pdf.

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WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit*, as amended, Washington State Department of Ecology, Richland, Washington.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

303-040, "Definitions."

303-070, "Designation of Dangerous Waste."

303-110, "Sampling, Testing Methods, and Analytes."

303-140, "Land Disposal Restrictions."

303-161, "Overpacked Containers (Labpacks)."

303-300, "General Waste Analysis."

303-370, "Manifest System."

303-380, "Facility Recordkeeping."

303-400, "Interim Status Facility Standards."

303-600, "Final Facility Standards."

Appendix B-A

Performance Evaluation System

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Contents

Tables

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B-A1 Introduction

The Performance Evaluation System (PES) Committee acts as an agent to ensure that waste accepted for treatment and storage at T Plant meets applicable permit and regulatory requirements. The PES Committee conducts performance-based generator oversight in support of compliant waste acceptance.

B-A2 Initial Waste Profile Review

As a component of the waste profile review process, PES evaluates the waste profile, information related to other waste streams from the same generator, and any other generator-provided information. PES determines if there are concerns in any of the following areas:

- Documented waste management program: Concerns could exist in this area if the processes, procedures, or certification methods used by the generator might not be sufficient to ensure that the waste meets the acceptance criteria. Recent verification failure in similar waste streams due to deficiencies in the generator’s waste management program would indicate concerns in this area.
- Waste stream characterization information: Concerns could exist in this area if the generator’s knowledge and/or sampling and analysis data might lead to mischaracterization or misdesignation of the waste. Recent verification failure in similar waste streams due to incorrect characterization data would indicate concerns in this area.
- Potential for inappropriate segregation: Waste streams that require segregation from other waste streams (e.g., those with different waste codes or treatment/disposal pathways) could lead to concerns in this area, depending on the specific waste-generating process and details of segregation procedures used by the generator. Recent verification failure in similar waste streams due to inappropriate segregation would also indicate concerns in this area.

PES then establishes initial verification rates as identified in Table B-A-1.

Table B-A-1. Initial Verification Rates

Areas of Concern	Verification Rate
None	20 to 50%
Concern in 1 Area	50 to 100%
Concern in 2 Areas	100%

B-A2.1 Nonverifiable Waste

The following waste streams may not be verifiable:

- Shielded waste that cannot be viewed through nondestructive examination
- Classified waste
- Remote-handled waste
- Other waste that cannot be physically screened because no facility is available to perform such screening (either at the generating location or at a Solid Waste Operations Complex facility unit).

In the case of nonverifiable waste, the following information will be assembled and provided to PES for review:

- Procedures used to segregate and package the waste
- Process knowledge documentation and sampling
- Analysis data used to characterize the waste.

PES will evaluate whether the combination of characterization data and segregation/packaging procedures provide reasonable assurance that the waste will be properly designated and meet the treatment, storage, and/or disposal unit acceptance criteria, or if additional actions are needed, such as verification of the waste at the point of generation or surveillance of the generating process. If PES determines there is insufficient information to accept the waste at T Plant, the waste profile will be rejected.

B-A3 Reducing the Verification Rate

The minimum verification rate is 5 percent for onsite generators and 10 percent for offsite generators. At a minimum of each month, PES reviews waste streams above these percentages and can make changes, as identified in Table B-A-2.

Table B-A-2. PES Verification Rate Reduction

Reduction Step	Criteria	Reduction
Step 1	Five containers from the waste stream (or group of related streams) pass verification with no failures.	Reduce the verification rate by a maximum of 66% (e.g., from 100% to a minimum of 34%).
Step 2	Step 1 reduction is complete, plus five additional containers (or group of related streams) pass verification with no failures.	Reduce the verification rate by a maximum of 50%.
Step 3	Step 2 reduction is complete, plus five additional containers (or group of related streams) pass verification with no failures.	Reduce the verification rate to 5% for onsite generators or 10% for offsite generators.

Additionally, if the verification rate was elevated due to past conformance issues, the PES Committee must have evaluated the generator's corrective action plan and found it adequate.

B-A4 Addressing Conformance Issues

Nonconformance issues identified during pre-waste acceptance or during the waste acceptance process will be addressed and evaluated by PES for resolution. The following types of conformance issues require PES Committee actions:

- Shipment of unmanifested waste (from an offsite generator)
- Shipment of a container that has not been approved for shipment
- Shipment of leaking or severely damaged containers
- Containers that fail verification
- Other conformance issues identified subsequent to receipt of a container that cannot be resolved within 1 week of discovery.

A generator may be contacted to provide additional information or requested to provide corrective actions. If conformance issues are unable to be resolved, waste will not be accepted into the T Plant Complex (T Plant) Operating Unit Group (OUG). The verification rate for that waste stream will be increased to 100 percent, and the generator's other waste streams will be evaluated to determine whether all waste streams or a subset of waste streams might be subject to the same type of conformance issue. The physical screening frequency for each waste stream that might be subject to the same type of verification failure is also adjusted to 100 percent.

B-A5 Monthly Evaluations

Monthly evaluations of generators by PES will monitor performance on a programmatic basis. The number of conformance issues for areas described in Section B-A4 and the severity of the issues are reviewed by PES. Increases to verification frequencies are established, based on the severity of the nonconformance. Corrective actions for nonconformance issues are requested from generators. PES may also address the status of existing corrective actions during the monthly evaluations.

When waste acceptance issues are identified (nonconforming items), the PES Committee performs the following actions:

- May increase the verification rate for the waste streams that have incurred verification failures or for waste that is received and deemed nonconforming.
- May reject waste from acceptance into the T Plant OUG if conformance issues are unable to be resolved.
- May request corrective actions for nonconformance issues from generators. PES may also address the status of existing corrective actions during the monthly evaluations.

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Addendum C

Process Information

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Contents

Appendices

Figures

Tables

C1 Introduction and Operating Unit Group Description

This addendum provides a description of storage operations, waste management, treatment processes, and associated equipment required by *Washington Administrative Code* (WAC) 173-303, "Dangerous Waste Regulations," in effect at the T Plant Complex Operating Unit Group (OUG), hereinafter referred to as T Plant.

T Plant also conducts processing and storage of nondangerous low-level radioactive waste in accordance with the *Atomic Energy Act of 1954* (AEA). Management of radioactive waste is not within the scope of the *Resource Conservation and Recovery Act of 1976* (RCRA) or WAC 173-303. Any information provided in this document for radioactive waste is for informational purposes only.

C1.1 Dangerous Waste Management Unit Description

Located in the 200 West Area, T Plant provides container storage and treatment for mixed waste (MW)[1] from onsite and offsite Hanford generators and T Plant operations, as well as storage of waste[2] generated by T Plant operations. Waste management activities are conducted within the dangerous waste management units (DWMUs) shown in Table C-1 and on the T Plant aerial photographs (Figure C-1 and Figure C-2).

Table C-1. Dangerous Waste Management Unit Operation

DWMU	Operation
221-T Head End	Storage
221-T Operations Gallery Storage	
221-T BY Storage Area	
2706-T Yard (Including HS-030 and HS-032 Storage Modules)	
2706-T Outdoor Storage Area	
2706-TA Outdoor Storage Area	
2706-T Asphalt Pad	
243-T Covered Storage Pad	
211-T Cage	
221-T Canyon Deck	Storage and Treatment
221-T Cells (7L, 13R, 16R, and 17R)	
221-T Railroad Tunnel	
2706-T Building	
2706-TA Building	
214-T Building	

[1] Mixed waste refers to dangerous waste or hazardous waste, as applicable.
[2] Waste refers to dangerous waste or hazardous waste, as applicable.

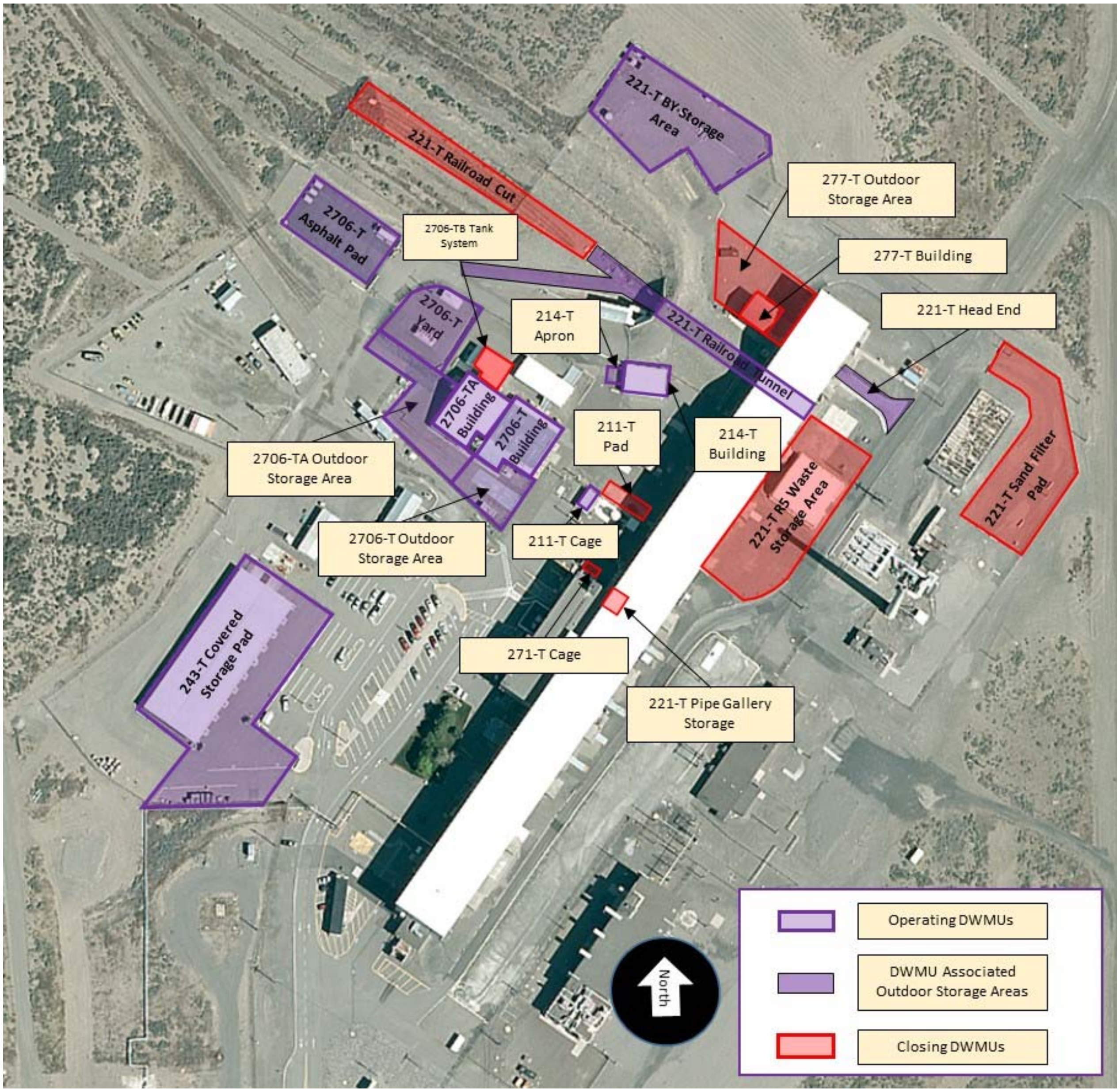

Figure C-1. Aerial Photo of T Plant DWMUs (2011)

Capacity for each storage area was calculated based on the storage requirements in accordance with WAC 173-303-630, "Use and Management of Containers," and then used to determine the total DWMU maximum permitted storage capacity. Permitted storage and secondary containment capacities are listed in Table C-2.

Treatment of waste is primarily conducted using a variety of technologies to meet the disposal requirements of WAC 173-303-140, "Land Disposal Restrictions." Treatment activities are discussed in Section C3. The process design capacity for waste treatment is shown in Table C-2. To determine the maximum permitted treatment capacity, calculations were performed that conservatively estimated the maximum volume of waste expected to be treated using the volume of containers expected to be managed at the DWMU in a day.

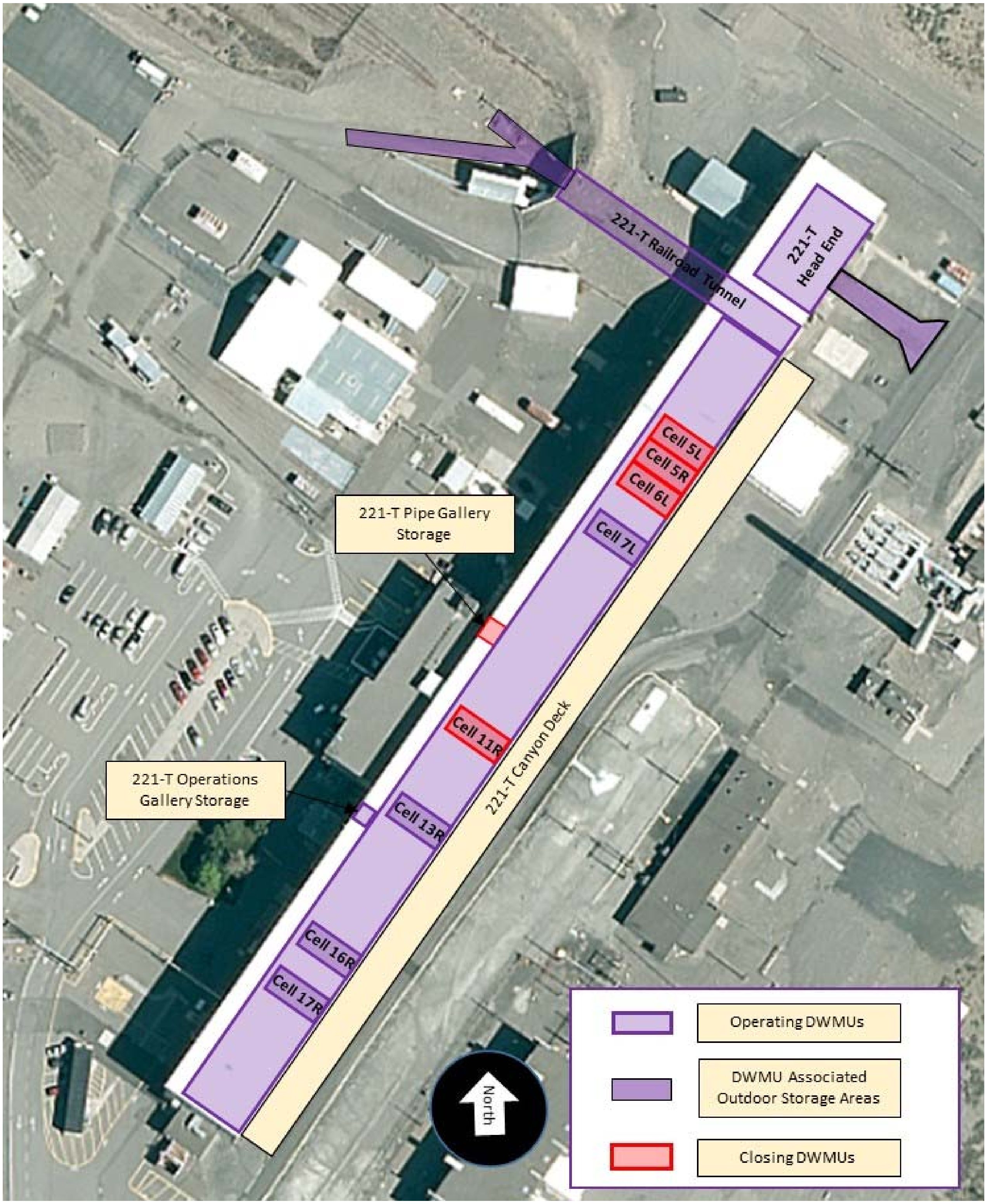

Figure C-2. Second Aerial Photo of T Plant DWMUs (2011)

Engineering drawings illustrating secondary containment design, general structure layout, and fire suppression systems are located in Appendix C-B. The following subsections briefly describe each DWMU.

C1.1.1 221-T Head End

The 221-T Head End DWMU is located at the north end of the 221-T Building and is permitted for waste container storage. Primary access for transferring waste containers into the 221-T Canyon is through this DWMU. The DWMU consists of a large high-bay work area located inside the 221-T Building, as well as the associated outdoor storage area, and concrete ramp that provides vehicular access into the building.

The 221-T Head End DWMU does not have an engineered secondary containment system. Storage containers that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

The 221-T Head End DWMU section located inside of the 221-T Building measures approximately 12 m (39 ft) wide by 13 m (44 ft) long for a total footprint and available waste storage area of approximately 160 m^2 (1,700 ft^2). It is constructed of reinforced concrete and partitioned off by a corrugated sheet metal wall that separates the area from the majority of the 221-T Building. Design and construction of the 221-T Building is outlined in Section C1.3.

The uncovered/unenclosed associated outdoor storage area is constructed of concrete. This storage area provides a place to stage containers, prior to placement inside the building for storage and/or treatment, or in preparation for transport:

- To/from another T Plant DWMU
- To/from another Hanford OUG
- To/from an offsite shipment to another treatment, storage, and disposal facility (TSDF)
- To the Environmental Restoration Disposal Facility (ERDF).

Treatment of waste will not be conducted within this DWMU.

C1.1.2 221-T Operations Gallery Storage

The 221-T Operations Gallery Storage DWMU is located within the 221-T Building and is permitted for nonflammable waste container storage. The DWMU consists of two metal cabinet units that do not have engineered secondary containment systems. Each cabinet measures approximately 2.0 m (6.5 ft) tall by 0.9 m (3 ft) wide by 0.46 m (1.5 ft) deep and has multiple shelves used for storage. The total volume for each cabinet is approximately 0.82 m^3 (29 ft^3). The available storage volume is assumed to be half of the total volume resulting in approximately 0.413 m^3 (14.6 ft^3). Therefore, the total available storage area for both cabinets combined equals approximately 0.82 m^3 (29 ft^3).

Design and construction of the 221-T Building are outlined in Section C1.3. Containers stored inside the cabinets that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) are placed on portable secondary containment systems, such as spill tubs. Treatment of waste will not be conducted within this DWMU.

Table C-2. T Plant DWMU Capacities

DWMU	Available Waste Storage Area		Maximum Permitted Storage Capacity		Secondary Containment Capacity[a]		Maximum Treatment Rate (Metric Tons/Day)[b]
	m^2	ft^2	m^3	Liters	m^3	Liters	
221-T Head End DWMU							
221-T Head End	160	1,700	167.2	167,200	n/a	n/a	n/a
Total DWMU Capacity			**167.2**	**167,200**	**n/a**	**n/a**	**n/a**
221-T Operations Gallery Storage DWMU[c]							
221-T Operations Gallery Storage	0.413 m^3	14.6 ft^3	0.41	410	n/a	n/a	n/a
Total DWMU Capacity			**0.82**	**820**	**n/a**	**n/a**	**n/a**
221-T BY Storage Area DWMU							
221-T BY Storage Area	2,300	24,000	1,150	1,150,000	n/a	n/a	n/a
Total DWMU Capacity			**1,150**	**1,150,000**	**n/a**	**n/a**	**n/a**
2706-T Yard (Including HS-030 and HS-032 Storage Modules) DWMU							
2706-T Yard (Including HS-030 and HS-032 Storage Modules)	750	8,100	246.3	246,300	n/a	n/a	n/a
Total DWMU Capacity			**246.3**	**246,300**	**n/a**	**n/a**	**n/a**
2706-T Outdoor Storage Area DWMU							
2706-T Outdoor Storage Area	94	1,020	64.9	64,900	n/a	n/a	n/a
Total DWMU Capacity			**64.9**	**64,900**	**n/a**	**n/a**	**n/a**
2706-TA Outdoor Storage Area DWMU							
2706-TA Outdoor Storage Area	870	9,300	279.5	279,500	n/a	n/a	n/a
Total DWMU Capacity			**279.5**	**279,500**	**n/a**	**n/a**	**n/a**

Table C-2. T Plant DWMU Capacities

DWMU	Available Waste Storage Area		Maximum Permitted Storage Capacity		Secondary Containment Capacity[a]		Maximum Treatment Rate (Metric Tons/Day)[b]
	m^2	ft^2	m^3	Liters	m^3	Liters	
2706-T Asphalt Pad DWMU							
2706-T Asphalt Pad	1,100	12,000	688.9	688,900	n/a	n/a	n/a
Total DWMU Capacity			**688.9**	**688,900**	**n/a**	**n/a**	**n/a**
243-T Covered Storage Pad DWMU							
243-T Covered Storage Pad	3,100	34,000	2,063	2,063,000	n/a	n/a	n/a
Total DWMU Capacity			**2,063**	**2,063,000**	**n/a**	**n/a**	**n/a**
211-T Cage DWMU							
211-T Cage	40	400	20	20,000	1.14	1,140	n/a
Total DWMU Capacity			**20**	**20,000**	**1.14**	**1,140**	**n/a**
221-T Canyon Deck DWMU							
221-T Canyon Deck	2,000	22,000	858.6	858,600	n/a	n/a	296
Total DWMU Capacity			**858.6**	**858,600**	**n/a**	**n/a**	**296**
221-T Cells (7L, 13R, 16R, and 17R) DWMU[d]							
221-T Cells (7L, 13R, 16R, and 17R)	123.5 m^3	123,500 ft^3	123.5	123,500	n/a	n/a	296
Total DWMU Capacity			**494**	**494,000**	**n/a**	**n/a**	**296**
221-T Railroad Tunnel DWMU							
221-T Railroad Tunnel	310	3,300	345.3	345,300	n/a	n/a	296
Total DWMU Capacity			**345.3**	**345,300**	**n/a**	**n/a**	**296**

Table C-2. T Plant DWMU Capacities

DWMU	Available Waste Storage Area		Maximum Permitted Storage Capacity		Secondary Containment Capacity[a]		Maximum Treatment Rate (Metric Tons/Day)[b]
	m^2	ft^2	m^3	Liters	m^3	Liters	
2706-T Building DWMU[e]							
2706-T Building	290	3,100	56.6	56,600	n/a	n/a	296
Total DWMU Capacity			**56.6**	**56,600**	**n/a**	**n/a**	**296**
2706-TA Building DWMU[f]							
2706-TA Building	280	3,000	48.3	48,300	n/a	n/a	296
Total DWMU Capacity			**48.3**	**48,300**	**n/a**	**n/a**	**296**
214-T Building DWMU							
214-T Building	140	1,500	94.8	94,800	1.42	1,420	296
Total DWMU Capacity			**94.8**	**94,800**	**1.42**	**1,420**	**296**

a. Containers stored in any DWMU or outside storage area that meet the criteria specified in WAC 173-303-630(7)(c), “Dangerous Waste Regulations,” “Use and Management of Containers” (i.e., waste packages containing free liquids) are placed on portable secondary containment systems, such as spill pallets and/or berms. Containers stored in any DWMU or outside storage area that meet the criteria specified in WAC 173-303-630(7)(c) (i.e., ignitable and/or reactive waste) are placed on portable secondary containment systems (i.e., containment pallets) in accordance with IFC requirements. Containers stored in any DWMU that meet the criteria specified in WAC 173-303-630(7)(c) (i.e., ignitable and/or reactive waste) are placed on portable secondary containment systems, such as spill pallets and/or berms, in accordance with IFC requirements.

b. Individual treatment unit is permitted to process at the daily maximum treatment rate; however, the maximum treatment rate for all associated treatment units combined within T Plant cannot exceed 296 metric tons/day.

c. Volumes listed for the 221-T Operations Gallery Storage DWMU are for one cabinet only. Total DWMU capacity includes both cabinets.

d. Volumes listed for the 221-T Cells (7L, 13R, 16R, and 17R) DWMU are for one cell only. Total DWMU capacity includes all four cells.

e. The 2706-T Building DWMU is not permitted to store containers holding ignitable and/or reactive waste listed under WAC 173-303-630(7)(c) in accordance with WAC 173-303-630 and IFC requirements.

f. The 2706-TA Building DWMU is not permitted to store containers holding ignitable and/or reactive waste listed under WAC 173-303-630(7)(c) in accordance with WAC 173-303-630 and IFC requirements.

IFC = International Fire Code

n/a = not applicable

Table C-3. Treatment Technologies

Treatment Technology	221-T Canyon Deck*	221-T Cells (7L, 13R, 16R and 17R)*	221-T Railroad Tunnel*	2706-T Building	2706-TA Building	214-T Building
Volume Reduction	Yes	No	Yes	Yes	Yes	Yes
Deactivation	Yes	Yes	Yes	Yes	Yes	Yes
Extraction Technologies	Yes	Yes	Yes	Yes	Yes	Yes
Deactivation and Recovery of Organics (i.e., Puncture and Decant Aerosol Cans/Cylinders)	Yes	No	Yes	Yes	Yes	Yes
Neutralization	Yes	Yes	Yes	Yes	Yes	Yes
Absorption	Yes	No	Yes	Yes	Yes	Yes
Controlled Reaction with Water	Yes	No	Yes	Yes	Yes	Yes
Solidification/Stabilization	Yes	Yes	Yes	Yes	Yes	Yes
Mercury Amalgamation	Yes	No	Yes	Yes	Yes	Yes
Macroencapsulation	Yes	Yes	Yes	Yes	Yes	Yes
Microencapsulation	Yes	Yes	Yes	Yes	Yes	Yes
Sealing	Yes	Yes	Yes	Yes	Yes	Yes

* Treatment may also be performed on dry (i.e., nonliquid), noncontainerized waste.

C1.1.3 221-T BY Storage Area

The 221-T BY Storage Area DWMU is an outdoor storage area that is located northwest of the 221-T Building and permitted for waste container storage. The DWMU is an uncovered/unenclosed, irregular shaped storage pad and does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

The storage pad is constructed of asphalt and gravel and measures approximately 37 m (120 ft) wide, by 61 m (199 ft) long for a total footprint, and available waste storage area, of approximately 2,300 m^2 (24,000 ft^2).

This DWMU is primarily used to store remote-handled *Toxic Substances Control Act of 1976* waste. However, the size and location facilitates storage of large containers that require appropriate separation distances (e.g., high-level radioactive containers that are managed under *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* requirements).

Treatment of waste will not be conducted within this DWMU.

C1.1.4 2706-T Yard (Including HS-030 and HS-032 Storage Modules)

The 2706-T Yard DWMU is an outdoor storage area that is located northwest of the 2706-TA Building and permitted for waste container storage. The DWMU is an uncovered fenced area consisting of a storage pad and two associated flammable waste storage modules (HS-030 and HS-032). The DWMU does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

The storage pad is constructed of asphalt and measures approximately 28 m (93 ft) wide by 27 m (87 ft) long for a total footprint and available waste storage area of approximately 750 m^2 (8,100 ft^2).

The modules are pre-engineered covered/enclosed metal structures that each measure approximately 3.50 m (11.5 ft) wide by 7.2 m (24 ft) long by 2.7 m (8.5 ft) high. Each module complies with the requirements of National Fire Protection Association (NFPA) 30, *Flammable and Combustible Liquids Code*, for ignitable and reactive waste and is divided into two separate compartments accessible by separate doors that open onto a loading platform/ramp. Containers are stored on a chemical resistant nonskid fiberglass grate above a steel secondary containment basin that has been sealed with a chemically resistant coating (e.g., epoxy resin). The containment basins provide spill containment and preclude accumulation of liquids. The roofs collect and direct precipitation to the rear of the modules away from the doorways and loading platforms. The modules are anchored to concrete pads and are capable of withstanding winds up to 90 mi/hour and floor loading of 1,220 kg/m^2 (250 lb/ft^2).

This storage area provides a place to stage containers, prior to placement inside the 2706-T Building and/or 2706-TA Building for storage and/or treatment, or in preparation for transport:

- To/from another T Plant DWMU
- To/from another Hanford OUG
- To/from an offsite shipment to another TSDF
- To ERDF.

Shipping conveyances (e.g., flatbed trailers, van trailers, and casks) can be staged at this location and loaded with waste containers in transit. Treatment of waste will not be conducted within this DWMU.

C1.1.5 2706-T Outdoor Storage Area

The 2706-T Outdoor Storage Area DWMU is an outdoor storage area that is located on the southwest side of the 2706-T Building and permitted for waste container storage. The DWMU is an uncovered fenced area constructed of concrete and asphalt and does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

The DWMU measures approximately 21 m (70 ft) wide by 23 m (76 ft) long for a total footprint area of approximately 490 m^2 (5,300 ft^2). The storage pad is constructed of concrete and measures approximately 5.2 m (17 ft) wide by 18 m (60 ft) long for an available waste storage area of approximately 94 m^2 (1,020 ft^2). This storage area provides a place to stage containers, prior to placement inside the 2706-T Building and/or 2706-TA Building for storage and/or treatment, or in preparation for transport:

- To/from another T Plant DWMU
- To/from another Hanford OUG
- To/from an offsite shipment to another TSDF
- To ERDF.

Shipping conveyances (e.g., flatbed trailers, van trailers, and casks) can be staged at this location and loaded with waste containers in transit. Treatment of waste will not be conducted within this DWMU.

C1.1.6 2706-TA Outdoor Storage Area

The 2706-TA Outdoor Storage Area DWMU is an outdoor storage area that is located along the northwest side of the 2706-TA Building and permitted for waste container storage. The DWMU is an uncovered, irregular shaped storage pad and does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

The DWMU consists of measurements varying from approximately 7.3 m (24 ft), up to approximately 53.3 m (175 ft) for a total footprint area of approximately 870 m^2 (9,300 ft^2). This storage area provides a place to stage containers, prior to placement inside the 2706-T Building and/or 2706-TA Building for storage and/or treatment, or in preparation for transport:

- To/from another T Plant DWMU
- To/from another Hanford OUG
- To/from an offsite shipment to another TSDF
- To ERDF.

Shipping conveyances (e.g., flatbed trailers, van trailers, and casks) can be staged at this location and loaded with waste containers in transit. Treatment of waste will not be conducted within this DWMU.

C1.1.7 2706-T Asphalt Pad

The 2706-T Asphalt Pad DWMU is an outdoor storage area that is located northwest of the 2706-TA Building and permitted for waste container storage. The DWMU is an uncovered fenced storage pad and does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

The storage pad is constructed of asphalt and measures approximately 24 m (80 ft) wide by 45.7 m (150 ft) long for a total footprint and available waste storage area of approximately 1,100 m^2 (12,000 ft^2). This storage area provides a place to stage containers, prior to placement inside a DWMU for storage and/or treatment, or in preparation for transport:

- To/from another T Plant DWMU
- To/from another Hanford OUG
- To/from an offsite shipment to another TSDF
- To ERDF.

Shipping conveyances (e.g., flatbed trailers, van trailers, and casks) can be staged at this location and loaded with waste containers in transit. Treatment of waste will not be conducted within this DWMU.

C1.1.8 243-T Covered Storage Pad

The 243-T Covered Storage Pad DWMU is an outdoor storage area that is located west of the 221-T Building and permitted for waste container storage. The DWMU is a covered/unenclosed, irregular shaped storage pad and does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

The pre-engineered cover is constructed with a steel frame and sheet metal roof. The storage pad is constructed of concrete and asphalt and consists of multiple measurements ranging from approximately 7.3 (22 ft), up to approximately 94.3 m (283 ft), for a total footprint and available waste storage area of approximately 3,100 m^2 (34,000 ft^2). Treatment of waste will not be conducted within this DWMU.

C1.1.9 211-T Cage

The 211-T Cage is located between the 2706-T Building and 221-T Building and is permitted for waste container storage. The DWMU is a covered outdoor fenced area with a locking gate. This DWMU has an engineered secondary containment system and is structurally designed with the following features:

- Design facilitates segregation of incompatible wastes.
- Foundation measures approximately 4.9 m (16 ft) wide by 7.6 m (25 ft) long, for a total footprint and available waste storage area of approximately 40 m^2 (400 ft^2).
- Foundation is constructed of concrete and split into two sections separated by a concrete berm and surrounded by an approximate 15 cm (5.9 in.) above grade curb.
- Foundation is sealed with a chemically resistant coating (e.g., epoxy resin) that slopes to a sump not connected to any piping system.

Treatment of waste will not be conducted within this DWMU.

C1.1.10 221-T Canyon Deck

The 221-T Canyon Deck DWMU is an area located within the 221-T Building and is permitted for waste management activities that are separated into two categories.

C.1.1.10.1 Noncontainerized Storage and Treatment of Mixed Waste

The DWMU is permitted in accordance with WAC 173-303-695, "Containment Buildings" (incorporated by 40 *Code of Federal Regulations* (CFR) 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart DD, "Containment Buildings"), as described in HNF-19668, *T Plant Complex, 221-T Building Dangerous Waste Containment Building Certification*, to store and/or treat dry (i.e., nonliquid), noncontainerized waste. As described in Section C1.3, the containment building's certification is permitted exclusively under 40 CFR 264, Subpart DD for noncontainerized dry waste only, and does not facilitate or support liquid waste management. No storage or treatment of waste(s) exhibiting the characteristics of ignitability or reactivity will be managed in this DWMU.

C.1.1.10.2 Containerized Storage and Treatment of Waste

The DWMU does not have an engineered secondary containment system operating in accordance with WAC 173-303-630. Waste containers stored and/or MW containers treated in this area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) and/or the criteria specified in the containment building certification (HNF-19668) are managed with the following:

- Portable secondary containment systems, as described in Section C2.3
- Modular confinement structures (e.g., Perma-Cons® and work tents).

No storage or treatment of waste(s) exhibiting the characteristics of ignitability or reactivity will be managed in this DWMU. Secondary containment for containerized waste managed separate from the containment building certification is discussed further in Section C2.3.

C.1.1.10.3 DWMU Description

Design and construction of the 221-T Building is outlined in Section C1.3. The 221-T Canyon Deck consists of the area above cells 3L through 20R and measures approximately 11 m (37 ft) wide by over 244 m (800 ft) long, for a total footprint area of approximately 2,700 m^2 (30,000 ft^2). Areas not available for storage or treatment were subtracted from this value, resulting in an available waste storage and treatment area of approximately 2,000 m^2 (22,000 ft^2).

Treatment of waste is conducted within the DWMU using a variety of technologies to meet the requirements of WAC 173-303-140 and/or acceptance criteria for the Waste Isolation Pilot Plant (WIPP), another TSDF, and/or other approved facilities. Treatment processes are discussed in Section C3.

C1.1.11 221-T Cells (7L, 13R, 16R, and 17R)

The 221-T Cells (7L, 13R, 16R, and 17R) DWMU is located underneath the canyon deck (221-T Canyon Deck DWMU) of the 221-T Building and consists of four cells (7L, 13R, 16R, and 17R). The DWMU is permitted for waste management activities that are separated into two categories.

C.1.1.11.1 Noncontainerized Storage and Treatment of Mixed Waste

The DWMU is permitted in accordance with WAC 173-303-695 (40 CFR 264, Subpart DD), as described in HNF-19668, to store and/or treat dry (i.e., nonliquid), noncontainerized waste. As described in Section C1.3, the containment building's certification is permitted exclusively under 40 CFR 264, Subpart DD for noncontainerized dry waste only, and does not facilitate or support liquid waste management. No storage or treatment of waste(s) exhibiting the characteristics of ignitability or reactivity will be managed in this DWMU.

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C.1.1.11.2 Containerized Storage and Treatment of Waste

The DWMU does not have an engineered secondary containment system operating in accordance with WAC 173-303-630. Waste containers stored and/or MW containers treated in this area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) and/or the criteria specified in the containment building certification (HNF-19668) can be managed with portable secondary containment systems. No storage or treatment of waste(s) exhibiting the characteristics of ignitability or reactivity will be managed in this DWMU. Secondary containment for containerized waste managed separate from the containment building certification is discussed further in Section C2.3.

C.1.1.11.3 DWMU Description

Design and construction of the 221-T Building is outlined in Section C1.3. Each of the four cells measures approximately 4.0 m (13 ft) wide, by 5.4 m (18 ft) long, by 6.7 m (22 ft) deep for a total volume of approximately 150 m^3 (5,100 ft^3) per cell. Based on design criteria, storage volume was reduced, resulting in an available waste storage volume of approximately 123.5 m^3 (123,500 L) per cell.

Any material, equipment, and debris located in the 221-T Cells (7L, 13R, 16R, and 17R) DWMU, dated prior to August 19, 1987, are defined as past-practice waste in accordance with the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order Action Plan*) and not subject to RCRA permitting requirements.

Treatment of waste is conducted within the DWMU, using a variety of technologies to meet the requirements of WAC 173-303-140 and/or acceptance criteria for WIPP, another TSDF, and/or other approved facilities. Treatment processes are discussed in Section C3.

C1.1.12 221-T Railroad Tunnel

The 221-T Railroad Tunnel DWMU enters the 221-T Building on the west side and consists of an area located within the 221-T Building, as well as the associated ramp and outdoor storage area. The DWMU is permitted for waste management activities that are separated into two categories.

C.1.1.12.1 Noncontainerized Storage and Treatment of Mixed Waste

The area located within the 221-T Building is permitted in accordance with WAC 173-303-695 (40 CFR 264, Subpart DD), as described in HNF-19668, to store and/or treat dry (i.e., nonliquid), noncontainerized waste. As described in Section C1.3, the containment building's certification is permitted exclusively under 40 CFR 264, Subpart DD for noncontainerized dry waste only and does not facilitate or support liquid waste management. No storage or treatment of waste(s) exhibiting the characteristics of ignitability or reactivity will be managed in this DWMU.

C.1.1.12.2 Containerized Storage and Treatment of Waste

The DWMU does not have an engineered secondary containment system operating in accordance with WAC 173-303-630. Waste containers stored and/or MW containers treated in this area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) and/or the criteria specified in the containment building certification (HNF-19668) are managed with the following:

- Portable secondary containment systems, as described in Section C2.3
- Modular confinement structures (e.g., Perma-Cons and work tents).

No storage or treatment of waste(s) exhibiting the characteristics of ignitability or reactivity will be managed in this DWMU. Secondary containment for containerized waste managed separate from the containment building certification is discussed further in Section C2.3.

C.1.1.12.3 DWMU Description

Design and construction of the 221-T Building is outlined in Section C1.3. The 221-T Railroad Tunnel DWMU consists of the railroad tunnel located within the 221-T Building, as well as the associated ramp and outdoor storage area. Waste to be stored in other DWMUs located inside the 221-T Building can be transported by vehicle through the high overhead roll-up door of the 221-T Railroad Tunnel DWMU. Materials can be lifted from the tunnel by the canyon crane and then placed in the desired DWMU storage area location. The ramp and outdoor storage area located outside. Both areas are uncovered/unenclosed and constructed of asphalt.

The railroad tunnel measures approximately 4.9 m (16 ft) wide by 63.7 m (209 ft) long, for a total footprint and available waste storage area of approximately 310 m^2 (3,300 ft^2). It is constructed of reinforced concrete, and the floor has been sealed with a chemically resistant coating (e.g., epoxy resin). A stair provides access between the 221-T Railroad Tunnel DWMU and the 221-T Canyon Deck DWMU.

Treatment of waste is conducted within the DWMU using a variety of technologies to meet the requirements of WAC 173-303-140 and/or acceptance criteria for WIPP, another TSDF, and/or other approved facilities. Treatment processes are discussed in Section C3.

C1.1.13 2706-T Building

The 2706-T Building DWMU is located to the west the 221-T Building and is permitted for waste container storage and treatment. The DWMU consists of one building measuring approximately 15 m (48 ft) wide by 20 m (64 ft) long (waste storage and treatment area), 8.3 m (25 ft) wide by 10 m (31 ft) long (heating, ventilating, and air conditioning (HVAC) room), and 3.7 m (11 ft) wide by 2 m (7 ft) long (fire riser room) for a total footprint area of approximately 440 m^2 (4,700 ft^2). Areas not available for container storage and treatment were subtracted from this value resulting in an available waste storage area of approximately 290 m^2 (3,100 ft^2). Access on the east and west ends is facilitated by roll-up metal doors. The west side has two roll-up doors, the larger of which is approximately 3.7 m (12 ft) wide by 4.9 m (16 ft) high, and provides entrance from the 2706-TA Building. The east side door and the other door on the west end, leading to the 2706-TA Building, are approximately 2.7 m (9.0 ft) wide by 4.3 m (14 ft) high.

The building is constructed of prefabricated steel with approximately 5.94 m (19.5 ft) high insulated sidewalls and concrete floors. The walls of the building are approximately 15 cm (6.0 in.) thick and consist of insulation sheathed in prefabricated steel. The DWMU does not have an operational engineered secondary containment system. Storage containers that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

Treatment of waste is conducted within the building using a variety of technologies to meet the requirements of WAC 173-303-140 and/or acceptance criteria for WIPP, another TSDF, and/or other approved facilities. Treatment processes are discussed in Section C3.

C1.1.14 2706-TA Building

The 2706-TA Building DWMU was installed over the concrete pad located west of the 2706-T Building and is permitted for waste container storage and treatment. The building was designed and constructed after the adjoining 2706-T Building DWMU described in Section C1.1.13. The DWMU consists of one building measuring approximately 15 m (50 ft) wide by 18 m (60 ft) long (waste storage and treatment area), 8.3 m (25 ft) wide by 14 m (41 ft) long (HVAC and electrical areas) for a total footprint area of approximately 470 m^2 (5,000 ft^2). Areas not available for container storage and treatment were subtracted from this value resulting in an available waste storage area of approximately 280 m^2 (3,000 ft^2). Access on the east and west ends is facilitated by roll-up metal doors. The east side has two roll-up doors, the larger of which provides entrance to the 2706-T Building.

The building is constructed of prefabricated steel with insulated sidewalls and concrete floors. The DWMU does not have an operational engineered secondary containment system. Storage containers that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3.

Treatment of waste is conducted within the building using a variety of technologies to meet the requirements of WAC 173-303-140 and/or acceptance criteria for WIPP, another TSDF, and/or other approved facilities. Treatment processes are discussed in Section C3.

C1.1.15 214-T Building

The 214-T Building DWMU is located on the west side of the 221-T Building near the 221-T Railroad Tunnel and is permitted for waste container storage and treatment. The DWMU consists of one building and associated outdoor storage area.

The uncovered/unenclosed outdoor storage area measures approximately 3 m (10 ft) wide by 4.3 m (14 ft) long, is constructed of asphalt, and does not contain an engineered secondary containment system. Containers stored in the outside storage area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in Section C2.3. This storage area provides a place to stage containers, prior to placement inside the building for storage, or in preparation for transport:

- To/from another T Plant DWMU
- To/from another Hanford OUG
- To/from an offsite shipment to another TSDF
- To ERDF.

The 214-T Building has an engineered secondary containment system. It contains two floor areas, sloped to prevent mixing of incompatible materials and direct any spills to separate floor sumps, and a third flammable storage area. The sumps are not connected to any piping system. The building is structurally designed with the following features:

- Building is constructed of corrugated steel overlaying I-beams.
- Foundation measures approximately 9.8 m (32 ft) wide by 15 m (48 ft) long, for a total footprint and available waste storage area of approximately 140 m^2 (1,500 ft^2).
- Foundation is constructed of concrete and split into two sections that are separated by a concrete berm.
- Interior floor is sealed with a chemically resistant coating (e.g., epoxy resin).
- Steel gratings cover the containment basins and provide an even flooring surface for movement of containers.
- Containment basins are coated with material that is resistant to caustic, oxidizing, combustible, and flammable chemicals.

Treatment of waste is conducted within the building using a variety of technologies to meet the requirements of WAC 173-303-140 and/or acceptance criteria for WIPP, another TSDF, and/or other approved facilities. Treatment processes are discussed in Section C3.

C1.2 List of Wastes

T Plant manages listed hazardous waste, characteristic hazardous waste, state only dangerous waste, and AEA regulated nonhazardous low-level radioactive waste.

Waste generated at T Plant from processing and treatment operations, performing repair and maintenance activities, spill cleanup materials, or other sources within T Plant will be managed to ensure proper handling and disposition. Waste from onsite and offsite Hanford generators may be processed and/or treated at T Plant, resulting in newly generated waste streams.

For a comprehensive list of waste managed in accordance with RCRA regulations, including classification and estimated annual quantities, refer to WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter Hanford Facility RCRA Permit), Part A.

C1.3 Containment Building

This section provides a general overview of the 221-T Building and details the design and operation for areas of the building that are certified in accordance with 40 CFR 264, Subpart DD (HNF-19668).

The 221-T Building includes the following operating DWMUs as described in this document: 221-T Head End, 221-T Operations Gallery Storage, 221-T Cells (7L, 13R, 16R, and 17R), 221-T Canyon Deck, and 221-T Railroad Tunnel. The containment building's certification is permitted exclusively under 40 CFR 264, Subpart DD to store and/or treat dry (i.e., nonliquid), noncontainerized waste. The following DWMUs are the only ones permitted under this certification:

- 221-T Canyon Deck DWMU (including cell cover blocks)
- 221-T Cells (7L, 13R, 16R, and 17R) DWMU
- 221-T Railroad Tunnel DWMU.

C1.3.1 Construction

The 221-T Building exterior foundation measures approximately 21 m (70 ft) wide, by 260 m (850 ft) long, by 23 m (75 ft) high and covers an area of approximately 5,400 m^2 (58,000 ft^2). Constructed of reinforced concrete, the floor of the building is approximately 2.4 m (8.0 ft) thick while the walls and ceiling range from 0.91 to 1.5 m (3.0 to 5.0 ft) thick. The interior foundation measures approximately 18 m (58 ft) wide by 244 m (800 ft) long and consists of the following areas:

- Canyon (221-T Canyon Deck DWMU and 221-T Cells [7L, 13R, 16R, and 17R] DWMU)
- Railroad tunnel (221-T Railroad Tunnel DWMU)
- Operating, pipe, and electrical galleries (221-T Operations Gallery Storage DWMU)
- Head end area (221-T Head End DWMU).

The canyon is divided into 20 sections that run the length of the building. Each section, measuring approximately 11 m (37 ft) wide, is numbered according to building section and consists of two cells: one designated (R) and one designated (L). There is an expansion joint between each section. Sections 2 through 20 are divided into cells. Cells within each section are separated from the electrical and pipe galleries by a reinforced concrete shielding wall that measures approximately 2.7 m (9.0 ft) thick.

Under normal operations, the standard canyon cells are covered by four approximately 1.8 m (6.0 ft) thick concrete cover blocks (one for each cell). Each cover block has a carbon steel lifting bail to allow access into the cells. The area on top of the cover blocks is referred to as the canyon deck and serves as the location for the 221-T Canyon Deck DWMU. The canyon deck is separated from the operating gallery by an approximate 2.1 m (7.0 ft) thick reinforced concrete wall and sits approximately 12 m (40 ft) below the roof of the building. The roof is constructed of reinforced concrete and is approximately 0.91 m (3.0 ft).

Located above the operating gallery, the crane cab is separated from the canyon by an approximate 1.5 m (5.0 ft) thick reinforced concrete wall that extends approximately 2.7 m (9.0 ft) above the canyon deck level. A 41 metric ton capacity master crane runs parallel to the canyon, providing remote access into the cells by removing the cover blocks that make up the canyon deck. The crane maintenance platform is located in Section 20 of the building and allows hands-on crane inspection and maintenance.

A cutaway diagram of the 221-T Building (Figure C-3) shows the general design of the facility.

C.1.3.1.1 Structural Integrity

The 221-T Building was designed and built to standards applicable in 1944 including static, vertical, live and dead loads, and lateral wind forces based on the projected building area. These standards were evaluated through inspection of the construction drawings in 2000. Additional standards requiring further evaluation included seismic provisions and tornado resistance. Various structural analyses revealed that the building is adequate for earthquake and tornado events.

C.1.3.1.2 Primary Barrier Description

The primary barrier consists of the canyon deck, the floor of the railroad tunnel, and the floor of the cells. The floors and walls are constructed of reinforced concrete with sufficient strength and thickness to support themselves, waste contents, and any personnel or heavy equipment that operate within the area. The railroad tunnel is overburdened with a minimum of approximately 0.9 m (3 ft) of native rock and soil. Engineering analyses were conducted to ensure that the structural integrity was capable of preventing collapse or failure due conditions such as pressure gradients, settlement, compression, and uplift.

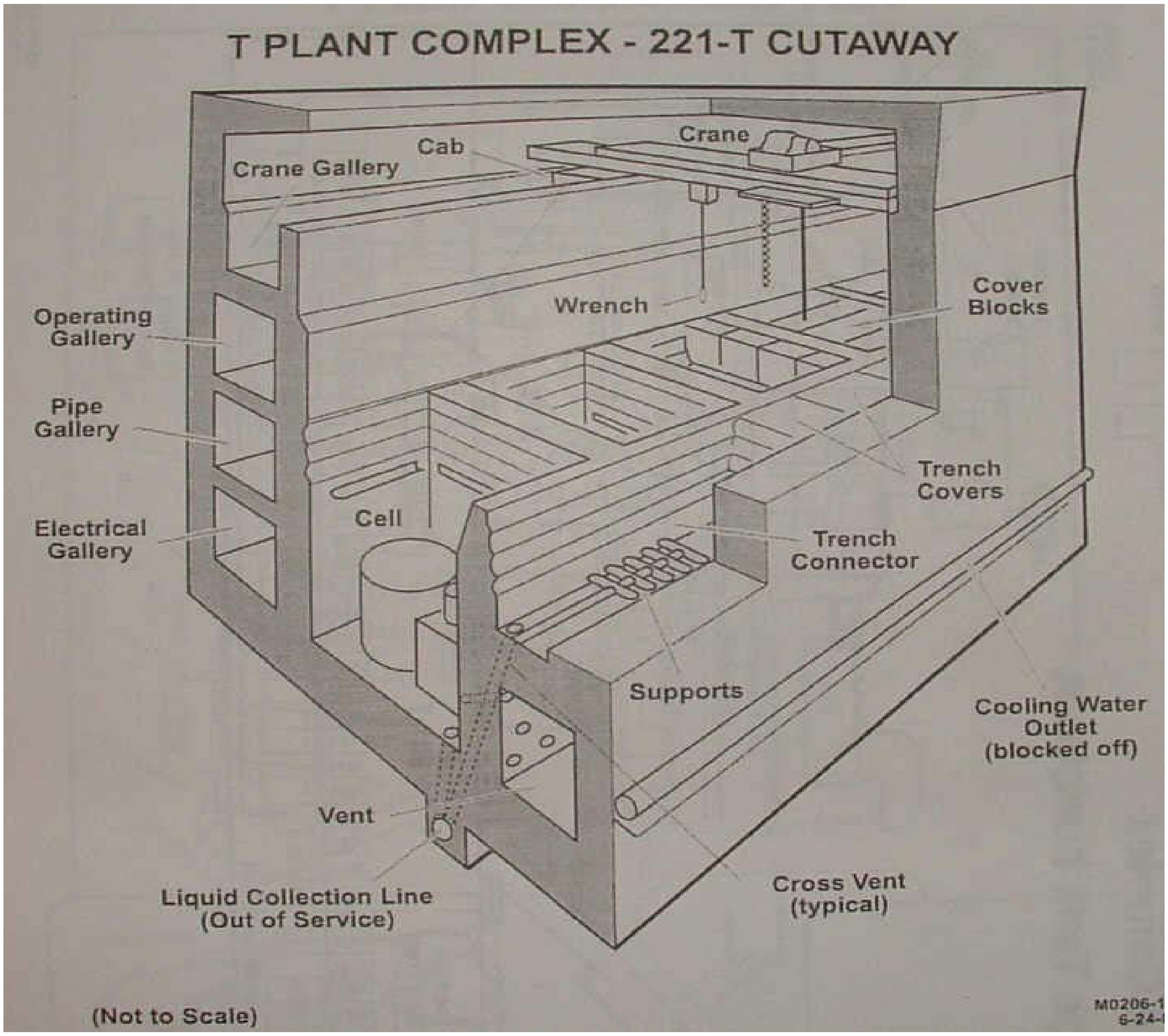

Figure C-3. 221-T Building Cutaway Diagram

C.1.3.1.3 Compatibility of Structure with Wastes

All structural surfaces that may come in contact with dry (i.e., no liquid) waste exhibiting hazardous properties should not be affected. No incompatible hazardous waste or treatment reagents that could corrode or damage the containment areas are brought into or used unless special precautions are taken to prevent commingling of incompatibles.

C.1.3.1.4 Fugitive Dust Emissions

The 221-T Building is enclosed with no windows, and all doors are structurally adequate. The building is maintained at a negative differential pressure with respect to the ambient atmosphere. The main exhaust system prevents the release of fugitive emissions by pulling air from lower contaminated areas to higher contaminated areas. Supply fans draw air from the canyon, past the cell cover blocks down into the cells, through high-efficiency particulate air (HEPA) filters, and out the 291-T Stack. An approximate 1.0 m^2 (11 ft^2) concrete exhaust air tunnel runs parallel to the canyon and provides exhaust for the canyon cells. The exhaust air tunnel narrows to an approximate 1.2 by 2.1 m (4.0 by 7.0 ft) duct as it exits the building approximately 6.7 m (12 ft) below the canyon deck level.

C.1.3.1.5 Certification of Design

Certification from an independent qualified registered professional engineer, showing that the design of the 221-T Building meets the requirements set forth under 40 CFR 264, Subpart DD, is located in the Hanford Facility Operating Record (T Plant portion).

C.1.3.1.6 Operating Standards

Primary Barrier Integrity

Controls and practices used to maintain the primary barrier are conducted in accordance with T Plant Addendum I, "Inspection Requirements," to ensure that no cracks, gaps, corrosion, or other deterioration exist that could cause hazardous waste to be released.

Volume of Waste

The 221-T Building containment walls are approximately 7.6 m (25 ft) high above the canyon deck level to the crane cab, and the walls are a minimum of approximately 1.5 m (5.0 ft) thick. Waste stored within the 221-T Canyon Deck DWMU and 221-T Railroad Tunnel DWMU will not reach this height.

The 221-T Cells (7L, 13R, 16R, and 17R) DWMU each have a ventilation inlet duct located approximately 2.4 m (8.0 ft) above the bottom of the cells. Waste will not be placed in such a manner to obstruct the ventilation inlet duct.

Tracking Waste out of the Unit

Control practices that prevent tracking contamination out of each applicable DWMU include engineering (e.g., monitoring) and administrative (e.g., personal protective equipment and step off pads).

Management of Incompatible Wastes

Refer to Section C1.3.1.

Fugitive Dust Emissions

Refer to Section C1.3.1.

Treatment of Wastes

Treatment of waste is described in Section C3.

C2 Process Information – Container Management

This section details management of containers at T Plant. Newly generated waste and containers accepted for storage and treatment are subject to WAC 173-303-630 requirements. Treatment technologies are addressed in Section C3. A summary of the waste managed, including classification and estimated annual quantities, is located in the Hanford Facility RCRA Permit Part A.

C2.1 Description of Containers

Containers vary in shape and size, depending on the waste form and how the waste was packaged. The most common containers include, but are not limited to, waste boxes (e.g., 115,000 L [30,380 gal]) and 19 L (5 gal), 114 L (30 gal), 208 L (55 gal), 322 L (85 gal), 379 L (100 gal), and 416 L (110 gal) drums.

Containers of waste stored in T Plant may contain free liquids. Requirements for secondary containment, including what defines free liquids in a container, are located in Section C2.3.

All waste will be packaged in U.S. Department of Transportation (DOT) and/or U.S. Department of Energy approved containers, including alternate packages required due to the size, shape, or form of waste (e.g., metal boxes and flexible containers).

C2.1.1 Condition

Containers accepted shall be in good condition or in overpacks. If a container is not in good condition (e.g., severe rusting, apparent structural defects, or leaks), and returning it to the generator for repackaging is not possible, the container may be segregated from other waste and managed in accordance with waste receipt discrepancies. Resolutions are located in T Plant Addendum B, “Waste Analysis Plan” (WAP).

C2.1.2 Identification and Labeling

Each waste container placed in storage will be affixed with a label identifying the major risk(s), as applicable, associated with the waste contents. Labels will be managed to facilitate compliance with the requirements outlined in T Plant Addendum I. If waste management activities (e.g., treatment processes or overpacking) obscure the label, a new label will be affixed. During management of empty containers, old labels will be destroyed by removing them from the containers, or the labels will be made non-legible.

C2.1.3 Waste Compatibility

Newly generated waste and waste accepted for storage and/or treatment are packaged in containers that are compatible and nonreactive with the waste to be stored.

Waste containers are made of or lined with materials (e.g., chemical resistant epoxy). Labpacks will have at least two layers of containment (outer container and inner container).

C2.2 Managing Containers

Containers accepted for storage and treatment are packaged by offsite and onsite Hanford generators. Prior to shipment and receipt of containers, generators must complete the acceptance criteria detailed in the WAP (T Plant Addendum B).

Containers used to store waste will be handled, managed, stored, and/or treated in a manner that maintains containment and limits personnel contact with the waste. Waste containers are managed, based on the following criteria:

- Waste contents must be compatible with all layers used for containment (e.g., container and lining).
- Waste contents must be authorized in accordance with the Hanford Facility RCRA Permit.
- Each container must display a dangerous waste label and a major risk(s) marking or label, if applicable.
- All waste containers generated off the Hanford Facility site that are shipped to T Plant must have an accompanying manifest.

If waste discrepancies, such as improper container labeling, improper packaging, or manifest differences, are discovered during the container receipt inspection, the nonconforming containers or shipment will not be accepted until the discrepancies have been resolved. Discrepancy resolutions are detailed in the WAP (T Plant Addendum B).

C2.2.1 Procedure for Handling

Waste container handling practices are conducted by trained and qualified personnel. Containers shall always be closed, except at the following times:

- While adding or removing waste
- While conducting waste treatment activities
- When sampling activities are required
- When the container is managed in accordance with Level 1 controls based on 40 CFR 264.1086(c)(3), "Standards: Containers," and Level 2 controls based on 40 CFR 264.1086(d)(3)
- When the container meets the definition of empty as defined in WAC 173-303-160(2)(a), "Containers" (i.e., a nonregulated container)
- When managed in accordance with 40 CFR 264, Subpart DD containment building certification for applicable DWMUs located in the 221-T Building.

If upon examination it is determined that a container should not be opened, the container will be shipped to another appropriate onsite or offsite facility capable of managing it.

C2.2.2 Container Handling Equipment

Containers may be handled individually or grouped on pallets (e.g., four 208 L [55 gal] drums). The primary types of container handling equipment are described briefly in the following subsections. This list is not all inclusive, but provides examples of equipment utilized while moving containers.

C.2.2.2.1 Forklifts

Forklifts unload waste containers from trailers. They also move waste containers within and between facilities, stack waste containers, and load containers onto vehicles. Drum lifting attachments commonly called drum grabs or grabbers (i.e., parrot beaks) are used to remove single drums. The drum grabs pick up the drum effectively so that no additional banding, strapping, or anchoring is necessary. Grabs are sized for the waste drums to be moved. Waste received on pallets or in waste boxes is unloaded using the forklift tines. Pallets of drums are secured, as necessary, with banding or load straps to prevent toppling. Loads are kept close to the ground to prevent drops from height.

C.2.2.2.2 Cranes

Various cranes are used to lift heavy containers or when remote handling is needed. The types of cranes used include mobile cranes, temporary A-frame type cranes, and other lifting devices.

C2.2.3 Aisle Spacing

A minimum of approximately 91 cm (36 in.) shall be maintained for means of ingress or egress in container storage areas. Containers are stored on rows of pallets and/or when required, portable secondary containment or selectively chosen structures contingent upon container size. Containers are placed in such a way to ensure space to allow unobstructed movements of personnel (e.g., daily operations and inspections) and emergency equipment (e.g., fire protection, spill control, and decontamination). Secondary containment requirements and activities are discussed in Section C2.3.

C2.2.4 Inspections

Inspections of active storage areas and containers are conducted by qualified personnel trained in accordance with T Plant Addendum G, "Personnel Training," to detect any signs of malfunction, deterioration, discharges, or other anomalies. Content and frequency of inspections are described in T Plant Addendum I.

C2.3 Secondary Containment

This section details the secondary containment design and operation at T Plant required for storage areas in which containers hold free liquids and/or wastes exhibiting the characteristic of ignitability or reactivity, as described in WAC 173-303-090(5) and (7), "Dangerous Waste Characteristics."

Other containerized waste (i.e., no free liquid, not ignitable, or reactive) may be stored without a containment system under either of the following conditions:

- Storage area is sloped to drain and remove liquids resulting from a known source (e.g., precipitation).
- Containers are elevated or otherwise protected from accumulating liquids (e.g., pallets).

Free liquids are defined as liquids that readily separate from the solid portion of waste under ambient temperature and pressure. The following containers hold liquids that are not considered free liquids:

- Containers meeting WAC 173-303-161, "Overpacked Containers (Labpacks)," requirements
- Very small containers, such as ampules
- Containers designed to hold free liquids, for use other than storage, such as a battery or capacitor
- Containers packaged with a sufficient quantity of sorbent to sorb all of the liquid contents completely.

Secondary containment for containers with free liquids can consist of portable secondary containment equipment (e.g., spill pallets and totes). Secondary containment can also include engineered containment systems where the floors have been sealed with a chemically resistant coating (e.g., epoxy resin), and there is a controlled method to collect liquids (e.g., sump, sloped floor, concrete curbing, and water stops embedded into concrete joints). Identification of DWMUs that are equipped with engineered secondary containment is described in Section C1.1. Additional requirements for free liquids are located in the WAP (T Plant Addendum B).

C2.3.1 Base

All DWMU secondary containment systems (portable and engineered) are inspected in accordance with T Plant Addendum I to ensure that they are free of cracks or gaps that could allow the release of liquids.

Portable secondary containment equipment will be used for containers that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) when they are stored in areas that do not contain an engineered containment system. Portable secondary containment equipment is constructed of materials that are compatible with waste that will be stored in/on it and are able to contain any liquids from leaks, spills, and precipitation. Examples of portable secondary containment equipment are listed in the following subsections. This list is not all inclusive but merely serves to illustrate common types of equipment used during operations.

C.2.3.1.1 Portable Spill Pallets

Typically, portable spill pallets are constructed of high-density polyethylene (HDPE), which is compatible with a wide variety of waste. The pallets have a support structure and support grate that elevates containers off the base/floor, preventing contact between containers and accumulating liquids. The grate also provides visual detection of liquids. Portable spill pallets may also be constructed of steel or stainless steel to minimize combustibles inside the storage buildings.

C.2.3.1.2 Fabricated Spill Pans

Fabricated spill pans are typically constructed of steel. All containers stored in the spill pans will be elevated off the base of the pan to prevent contact between the container and spilled or leaking waste. Spill pans may be designed with a grated platform to allow for visual detection of accumulated liquids.

C.2.3.1.3 Spill Berms

Typically, portable spill berms are constructed with chemically resistant urethane and polyvinyl chloride, which are compatible with a wide variety of waste. The berms provide for rapid deployment preventing contact between containers and accumulating liquids.

C2.3.2 Drainage Control

All DWMUs are constructed and/or operated with positive drainage control (e.g., graded slopes, drainage valves, and/or sumps) to prevent release of contaminated liquids and facilitate prompt removal of uncontaminated precipitation. Removal of liquids is discussed in Section C2.4.

C2.3.3 Containment Capacity

This section describes DWMU capacity information for both engineered and portable containment systems operating in accordance with WAC 173-303-630 and/or International Fire Code (IFC) requirements.

C.2.3.3.1 DWMUs Managing Free Liquids

DWMUs managing free liquids (nonreactive and nonignitable) are designed and/or operated in accordance with WAC 173-303-630(7) through the use of engineered secondary containment and/or portable secondary containment (e.g., spill pallets and/or berms).

Engineered and portable secondary containment systems for all DWMUs managing nonreactive and/or nonignitable free liquids are designed and/or operated to contain a minimum of 10 percent of the total volume of containers, or 100 percent of the volume of the largest container (WAC 173-303-630(7)(a) and (a)(iii), and IFC Chapter 50, "Hazardous Materials-General Provisions," Section 5004.2.2.4).

C.2.3.3.2 DWMU Managing Ignitable and/or Reactive Waste

DWMUs managing ignitable and/or reactive (liquid or solid) waste are designed and/or operated in accordance with WAC 173-303-630(7) to meet IFC requirements through the use of engineered secondary containment and/or portable secondary containment (i.e., containment pallets). Containment pallets are used as an alternative to engineered containment for uncovered and/or unenclosed outdoor storage areas and comply with all of the following requirements:

- A liquid-tight sump accessible for visual inspection shall be provided.
- The sump shall be designed to contain not less than 250 L (66 gal).
- Exposed surfaces shall be compatible with material stored.
- Containment pallets shall be protected to prevent collection of rainwater within the sump (IFC Chapter 50, Section 5004.2.3).

Engineered secondary containment systems for covered/enclosed DWMUs managing ignitable and/or reactive waste are designed and/or operated to contain either of the following volumes:

- At least 10 percent of the total volume of containers (WAC 173-303-630(7)(a)(iii))

- 100 percent of the volume of the largest container (WAC 173-303-630(7)(a)(iii)), plus the volume of water resulting from a 20 minute automatic sprinkler system discharge (IFC Chapter 50, Section 5004.2.2.3).

Portable secondary containment systems for uncovered/unenclosed DWMUs managing ignitable and/or reactive waste free liquids are designed and/or operated to contain either of the following volumes:

- At least 10 percent of the total volume of containers (WAC 173-303-630(7)(a)(iii))
- 100 percent of the volume of the largest container, plus the precipitation from a 25-year, 24-hour storm event (WAC 173-303-630(7)(a)(iii) and IFC Chapter 50, Section 5004.2.2.4)

Engineered and portable secondary containment systems for unenclosed DWMUs managing free liquids are designed and/or operated to contain a minimum of 10 percent of the total volume of containers, or 100 percent of the volume of the largest container (WAC 173-303-630(7)(a) and (a)(iii) and IFC Chapter 50, Section 5004.2.2.4).

C.2.3.3.3 Capacity Calculations

Secondary containment capacities for each DWMU equipped with engineered secondary containment are shown in Table C-2. Supporting calculations were completed utilizing the following examples of site-specific inputs and conditions:

- Containment structure design and drum pallet dimensions
- Container storage arrangement
- Volume of the largest container for liquids and nonliquids
- Total volume of all containers storing free liquids
- Additional volume from automatic fire sprinkler systems (where applicable)

Designs for each secondary containment system are provided in Appendix C-B.

C2.3.4 Controlling Run-on and Runoff

Run-on into and runoff away from the containment systems are prevented by one or more of the following characteristics:

- Engineering controls physically separate containers and run-on such as perimeter berms/curbs, walls, and/or ramps.
- Foundation is elevated or otherwise graded to slope away from the system, preventing and/or diverting run-on from adjacent areas.
- Engineered secondary containment systems are designed with positive drainage to preclude runoff.
- Outdoor storage areas may utilize equipment (e.g., spill pallet and pallet) to elevate containers.

The only major runoff foreseen at T Plant would be an event, such as a fire sprinkler activation or pipe breakage. DWMU areas equipped with water fire suppression systems control runoff using drains leading to sumps, foundations with curbs collecting water within the building, and drainage to sumps.

C2.3.5 Exemption from Containment Requirements

No exemption from secondary containment requirements is being requested.

C2.4 Removal of Liquids from Containment System

Liquids found in containment systems from sources, such as rain and fire system water, are collected and handled as nondangerous waste in accordance with the WAP (T Plant Addendum B).

Waste generated from cleanup of spills or releases is also managed in accordance with the WAP (T Plant Addendum B).

C2.5 Requirements for Ignitable, Reactive and Incompatible Wastes

All containers of waste designated as D001 (ignitable) or D003 (reactive) can only be placed in one of the following DWMUs operated to comply with IFC requirements:

- 221-T BY Storage Area
- 2706-T Yard (Including HS-030 and HS-032 Storage Modules)
- 2706-T Outdoor Storage Area
- 2706-TA Outdoor Storage Area
- 2706-T Asphalt Pad
- 243-T Covered Storage Pad
- 211-T Cage
- 214-T Building.

Ignitable or reactive wastes are stored and protected from sources of ignition or reaction including, but not limited to, open flames, smoking, cutting, and welding hot surfaces, frictional heat, sparks, spontaneous ignition, and radiant heat.

Areas where ignitable or reactive waste is stored will be inspected in accordance with WAC 173-303-395(1)(d), “Other General Requirements;” by facility personnel in the presence of a professional person who is familiar with the IFC or in the presence of a local, state, or federal fire marshal.

Incompatible waste will not be accumulated in the same container or placed in an unwashed container that previously held incompatible waste or material. Incompatible wastes are stored in separate containers and segregated by separate containment systems such as spill pallets, separate DWMUs, separate storage modules, or separation by a dike, wall, berm, or other acceptable physical barrier.

Engineering drawings illustrating secondary containment design, general structure layout, and fire suppression systems are located in Appendix C-B. Buffer zones and/or location of containers stored within DWMUs that do not have engineered secondary containment are maintained as part of the Hanford Facility Operating Record (T Plant portion).

T Plant is not authorized to receive shock sensitive or Class 4 oxidizer (IFC) waste. Confirmation and verification processes for ignitable, reactive, and incompatible waste are described in the WAP (T Plant Addendum B).

C2.6 Tank Systems

There are no associated operating tank systems within T Plant. Therefore, the requirements outlined in WAC 170-303-395, WAC 170-303-640, “Tank Systems;” and WAC 170-303-806, “Final Facility Permits,” do not apply.

C2.7 Air Emissions

This section addresses the air emission standards required under WAC 173-303-690, “Air Emission Standards for Process Vents,” incorporated by 40 CFR 264 Subpart AA, “Air Emission Standards for Process Vents;” WAC 173-303-691, “Air Emission Standards for Equipment Leaks,” incorporated by 40 CFR 264, Subpart BB, “Air Emission Standards for Equipment Leaks;” and WAC 173-303-692, “Air Emission Standards for Tanks, Surface Impoundments, and Containers,” incorporated by 40 CFR 264, Subpart CC, “Air Emission Standards for Tanks, Surface Impoundments, and Containers.”

C2.7.1 Applicability of Subpart AA Standards

The air emission standards in 40 CFR 264, Subpart AA apply to process vents associated with distillation, fractionation, thin-film evaporation, solvent extraction, or air or steam stripping operations for hazardous wastes with organic concentrations of at least 10 parts per million (ppm) by weight. Because T Plant does not have any process vents subject to Subpart AA, these standards do not apply.

C2.7.2 Applicability of Subpart BB Standards

The air emission standards in 40 CFR 264, Subpart BB apply to equipment that contains or comes into contact with waste with a total organic concentration of 10 percent by weight or more.

C.2.7.2.1 Demonstrating Compliance with Subpart BB Standards

The only equipment utilized within T Plant that is subject to the provisions of WAC 173-303-691 is the carbon canister associated with the aerosol can venting equipment. This equipment qualifies as a control device subject to the provisions of 40 CFR 264.1060, “Standards: Closed-Vent Systems and Control Devices,” incorporated by WAC 173-303-691.

An exemption is provided in 40 CFR 264.1050(f), “Applicability,” for equipment that contains or contacts hazardous waste with organic concentrations of at least 10 percent by weight for a period of less than 300 hours per calendar year. Because this equipment will be managed in a manner that meets the requirements of this exemption, this equipment is exempt from the requirements of 40 CFR 264.1052, “Standards: Pumps in Light Liquid Service,” through 40 CFR 264.1060. As required by 40 CFR 264.1064(g)(6), “Recordkeeping Requirements,” the aerosol can venting equipment is identified in the Hanford Facility Operating Record, T Plant portion. This equipment will be marked as required by 40 CFR 264.1050(d).

C2.7.3 Applicability of Subpart CC Standards

Air emission standards of 40 CFR 264, Subpart CC apply to tank, surface impoundment, and container storage units that manage waste with average volatile organic concentrations equal to or exceeding 500 ppm by weight, based on the waste composition at the point of origination . However, containers that solely manage MW are exempt per 40 CFR 264.1080(b)(6), “Applicability.”

T Plant does not have tank systems or surface impoundments; therefore, 40 CFR 264, Subpart CC standards for MW containers, tanks, and surface impoundments do not apply. OUG operators are not required to determine the concentration of volatile organic compounds (VOCs) in wastes that are placed in storage and/or treatment areas employing air emission controls in compliance with 40 CFR 264, Subpart CC standards.

C.2.7.3.1 Demonstrating Compliance with Subpart CC Standards

T Plant will meet all container Level 1 and Level 2 standards by managing all hazardous wastes in DOT containers (40 CFR 264.1086(f)). Level 1 controls are required for containers that have a design capacity of more than 0.1 m^3 (approximately 26 gal) and less than or equal to 0.46 m^3 (approximately 120 gal).

Level 2 controls are required for containers that have a design capacity of more than 0.46 m^3 (approximately 120 gal) of waste that is in light material service. Light material service is required where waste in the container has one or more organic constituents with a vapor pressure greater than 0.3 kilopascal at 20°C, and the total concentration of such constituents is greater than or equal to 20 percent by weight.

Monitoring requirements for containers with Level 1 and Level 2 controls include visual inspection under the following conditions:

- Container of hazardous waste is received at any DWMU
- Hazardous waste is initially placed in a container at any DWMU
- At least once every 12 months when stored onsite for 1 year or more.

When DOT noncompliant containers are used at T Plant, alternate container management practices will be used that comply with the Level 1 or Level 2 standards, as applicable. Specifically, Level 1 standards allow the following "container equipped with a cover and closure devices that form a continuous barrier over the container openings such that when the cover and closure devices are secured in the closed position there are no visible holes, gaps, or other open spaces into the interior of the container. The cover may be a separate cover installed on the container or may be an integral part of the container structural design…" (40 CFR 264.1086(c)(1)(ii)). An organic vapor suppressing barrier, such as foam, may also be used (40 CFR 264.1086(c)(1)(iii)).

Level 3 standards apply to a container with the following characteristics:

- Design capacity greater than 0.1 m^3 (approximately 26 gal) that is used for treatment of a hazardous waste by a waste stabilization process (40 CFR 264.1086(b)(2))
- Vented directly through a closed-vent system to a control device (40 CFR 264.1086(e)(1)(i))
- Vented inside an enclosure that is exhausted through a closed-vent system to a control device (40 CFR 264.1086(e)(1)(ii)).

Because T Plant does not conduct treatment of hazardous waste in Level 3 containers, does not vent containers directly to a closed vent-system to a control device, and does not vent containers inside an enclosure exhausted through a closed vent system to a control device, these standards do not apply.

C3 Process Information – Treatment

This section describes treatment technologies conducted at T Plant. Treatment is defined as the physical, chemical, or biological processing of dangerous waste to make such wastes nondangerous or less dangerous, safer for transport, amenable for energy or material resource recovery, amenable for storage, or reduced in volume, with the exception of compacting, repackaging, and sorting as allowed under WAC 173-303-400(2), "Interim Status Facility Standards," and WAC 173-303-600(3), "Final Facility Standards" (WAC 173-303-040, "Definitions").

Treatment is primarily conducted in accordance with 40 CFR 268, "Land Disposal Restrictions," Subpart D, "Treatment Standards," and WAC 173-303-140 for waste subject to land disposal restriction (LDR) requirements. Compliance with LDR is achieved through one or more of the following standards:

- Concentration based treatment standards (40 CFR 268.40, "Applicability of Treatment Standards")
- Technology based standards (40 CFR 268.42, "Treatment Standards Expressed as Specified Technologies")

- Alternative treatment standards for hazardous debris (40 CFR 268.45, "Treatment Standards for Hazardous Debris")
- Alternative LDR treatment standards for soil (40 CFR 268.49, "Alternative LDR Treatment Standards for Contaminated Soil").

Multiple waste codes may require multiple forms of treatment prior to disposal. Treatment residues will be managed in accordance with 40 CFR 268, Subpart D as required. In some instances treatability studies may be performed to ensure that applicable LDR requirements will be met.

T Plant may also partially treat or pretreat waste before shipment to another Hanford OUG, to ERDF, or offsite to another TSDF that could perform additional treatment of the specific waste to meet applicable LDR treatment requirements. Waste(s) requiring additional treatment(s) within T Plant or elsewhere can be repackaged, labeled, transferred, or stored onsite in accordance with the Hanford Facility RCRA Permit.

Treatment effectiveness is verified in accordance with the WAP (T Plant Addendum B.) Waste generated or requiring reclassification, as a result of treatment, is characterized in accordance with the WAP (T Plant Addendum B).

The following sections provide details about the treatment processes summarized in Table C-3.

C3.1 Treatment Equipment and Structures

This section describes modular containment/confinement structures and portable and permanent glovebox units for treatment.

C3.1.1 Perma-Con

Perma-Con® structures are pre-engineered, prefabricated structures designed for containment and isolation of waste operations including repackaging, examination, decontamination, and treatment. Structures are designed to meet international seismic building code and site specific seismic requirements. Interior panels are sheathed with stainless steel to ease decontamination and cleaning. All of the panel-to-panel joints are covered with seam tape. Structures are assembled from modular panel components that can include the following equipment:

- Large equipment rollup doors
- Personnel doors
- Air locks for personnel and material
- Material transfer ports
- Roof openings for large equipment
- Spill control curbing arrangements
- Drip pan floors for containment
- Bridge/monorail cranes
- Fire protection and suppressions systems
- Modular electrical installations
- Integral variable speed HEPA units for maintaining negative pressure
- Exterior lighting modules

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- Integral HVAC systems
- Material handling equipment, such as jib cranes
- Special radiation shielding.

The 221-T Canyon Deck, 221-T Railroad Tunnel, 2706-T Building, 2706-TA Building, and 214-T Building DWMUs can be fitted with temporary modular Perma-Con structures to facilitate management and treatment of waste.

C3.1.2 Work Tents

Work tents are portable pre-engineered structures that are designed to reduce cross-contamination and serve as a barrier between work surfaces and clean areas. Tents are used to create a controlled environment to conduct waste management activities.

The 221-T Canyon Deck, 221-T Railroad Tunnel, 2706-T Building, 2706-TA Building, and 214-T Building DWMUs can be fitted with a temporary work tent to conduct treatment activities.

C3.1.3 Gloveboxes

A glovebox is a sealed unit that provides separation between the waste and individuals conducting waste management activities. Gloves are built into the unit allowing individuals to perform tasks inside the box without breaking containment.

The 221-T Canyon Deck, 221-T Railroad Tunnel, 2706-T Building, 2706-TA Building, and 214-T Building DWMUs may utilize portable gloveboxes to facilitate management and treatment of waste (e.g., opening, sorting, sampling, repackaging, and treating waste).

C3.2 Volume Reduction

Volume reduction is a waste minimization technology that reduces the total volume, quantity, or toxicity of waste to accommodate subsequent treatment, storage, and disposal. Volume reduction is achieved with heavy equipment (e.g., compactors) and hand tools (e.g., hammers), including the following:

- Manual and equipment assisted reduction
- Compaction (i.e., waste compactor and aerosol compactor).

Process descriptions for these technologies are outlined in the following subsections.

C3.2.1 Applicability

Volume reduction is applicable to waste codes listed in the Hanford Facility RCRA Permit Part A for waste minimization processing. Waste minimization technologies (i.e., volume reduction such as compaction, repackaging, and sorting), described in this section, do not meet the WAC 173-303-040 definition of treatment.

C3.2.2 Process Description Overview

Volume reduction may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or gloveboxes. While handling requirements are tailored to each specific waste or waste type, volume reduction is generally preceded by sorting and segregation activities to ensure separation of potentially ignitable, reactive, and/or corrosive materials and/or to meet acceptance criteria for WIPP, another TSDF, and/or other approved facilities. The process can be generally described as follows:

- Debris waste is placed onto the sorting area (e.g., steel lined sorting table or mixing bin).

- Materials are sorted and/or segregated either manually or by equipment (e.g., loader or glove box).
- Debris is stored, reduced in size, and sent for processing and/or disposal.

C.3.2.2.1 Manual and Equipment Assisted Reduction

Manual and equipment assisted volume reduction is generally conducted following the described sorting and segregation activities by reducing debris in size either manually (e.g., segregating by hand) or with heavy equipment (e.g., loader or crane).

C.3.2.2.2 Compaction

Compaction is used to reduce the actual volume of a waste and/or container by applying a force to the material using mechanical equipment. This process is conducted on debris and can generally be described as follows:

- Debris waste is loaded into the compactor, either manually or with drum lifters, and compacted.
- Compacted debris waste is placed into another container or overpack contingent upon size.
- Once the container/overpack is adequately filled, void filler may be added to meet the 90 percent requirement for LDR.

C3.2.3 Limitations

Control measures and limitations include the following:

- Management of waste is solely for the purpose of reducing waste volume and void space or removal of prohibited items.
- If reduction results in material that no longer meets the 60 mm (approximately 2.4 in.) minimum particle size limit for debris, the material will be managed in accordance with waste specific treatment standards for waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and waste prior to size reduction.
- Process activities prevent any release to the environment and are conducted in accordance with WAC 173-303-200(1)(b), “Accumulating Dangerous Waste On-Site,” and WAC 173-303-395(1)(a) and (b).
- Waste must be separated and protected from sources of ignition or reaction including, but not limited to, open flames, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, or mechanical), spontaneous ignition (e.g., from heat-producing chemical reactions), and radiant heat.
- While ignitable or reactive wastes are being handled, sources of ignition or reaction are not allowed within the same area or building.

C3.3 Deactivation

Deactivation is used for treating wastes exhibiting the characteristics of ignitability, corrosivity, and/or reactivity.

C3.3.1 Applicability

Deactivation is applicable to D001, D002, and D003 waste codes listed in the Hanford Facility RCRA Permit Part A and can be used to achieve applicable LDR treatment standards for nonliquid and liquid waste streams.

C3.3.2 Process Description

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While treatment operations may be tailored to specific waste types, the following general process is used:

- Waste is placed in a container capable of holding the waste container and reagents, while maintaining sufficient freeboard to prevent spills or releases from overtopping or splashing. This may be the container in which waste was shipped to the facility.
- Volume or mass of reagents required to complete deactivation of the waste is added to the container.
- Waste and reagents are mixed to provide contact between the components.
- Chemical reactions that provide deactivation effects are completed.

C3.3.3 Limitations

Waste must meet the definition of ignitable, reactive, or corrosive in accordance with WAC 173-303-090.

C3.4 Extraction Technologies

Extraction technologies use various treatments to remove contaminated debris surface layers (e.g., paint, other coatings, or corrosion such as rust from a surface) and/or to prepare a surface for a new coating (e.g., sealing). Treatment is achieved through one of the following physical and/or chemical techniques:

- Abrasive blasting is the use of air (e.g., compressed) or water (e.g., steam or pressurized water) with added abrasives. Examples of additives used during the treatment process include, but are not limited to, steel shot, aluminum oxide grit, and plastic beads.
- Scarification, grinding and planning utilizes striking piston heads, saws, or rotating grinding wheels.
- Spalling uses equipment to drill and/or chip holes at certain locations and depth in the debris surface and applying a tool which exerts a force on the sides of those holes. The surface layer removed remains hazardous debris subject to the debris treatment standards.
- High pressure steam and/or water sprays are combined with sufficient temperature, pressure, residence time, agitation, surfactants, and detergents to remove hazardous contaminants from debris surfaces or to remove contaminated debris surface layers.
- Water washing (e.g., water bath) and spraying are combined with sufficient temperature, pressure, residence time, agitation, surfactants, acids, bases, and detergents to remove hazardous contaminants from debris surfaces and surface pores or to remove contaminated debris surface layers.

C3.4.1 Applicability

Extraction technologies are applicable to all waste codes listed in the Hanford Facility RCRA Permit Part A and can be used to achieve applicable LDR treatment standards.

C3.4.2 Process Description Overview

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While treatment operations may be tailored to specific waste types, the following general process is used:

- Debris waste is placed in a container capable of facilitating the applicable extraction technology, while maintaining sufficient freeboard to prevent spills or releases from overtopping and splashing. This may be the container in which the waste was shipped to the facility.
- The applicable extraction technology is conducted to clean waste items to achieve a clean debris surface.

C3.4.3 Limitations

Waste must meet the definition of debris in accordance with 40 CFR 268.2(g), "Definitions Applicable in This Part." Treatment to a clean debris surface using materials (e.g., cloth or concrete) requires debris to be no more than 1.2 cm (0.50 in.) in one dimension (i.e., thickness limit), and debris surfaces must be in contact with water solution for at least 15 minutes.

If treatment results in material that no longer meets the 60 mm (approximately 2.4 in.) minimum particle size limit for debris, the material will be managed in accordance with waste-specific treatment standards for the waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and waste prior to size reduction.

C3.5 Deactivation and Recovery of Organics

Treatment for aerosol cans and cylinders include the following treatment technologies:

- Deactivation (DEACT) for ignitable compressed gas using a low capacity, manually operated, can puncturing device, and
- Recovery of organics (RDGAS) through use of carbon adsorption and decanting:
  - Carbon Adsorption – The design and operation of the low-capacity can puncturing device includes an activated carbon adsorption canister to capture any VOC propellants during the treatment process.
  - Physical Phase Separation – Decanting is a process of actively moving or separating materials from one container to another and is used to drain liquids and render aerosol cans and cylinders empty.

C3.5.1 Applicability

Deactivation and removal of organics as described in this section is exclusively for ignitable waste code D001 (for low total organic carbon [TOC]) listed in the Hanford Facility RCRA Permit Part A for nonpunctured aerosol cans and cylinders to achieve applicable LDR treatment standards.

C3.5.2 Process Description

The treatment process for safely depressurizing nonpunctured aerosol cans and cylinders and collecting liquids during the decanting process includes the following items:

- Aerosol cans and/or cylinders identified with incompatible constituents will be segregated based on compatibility, then punctured and decanted (drained) into separately grouped containers lined with plastic.

C3.5.3 Limitations

Control measures and limitations include the following:

- Waste must meet the definition of ignitable in accordance with WAC 173-303-090.

- Waste must be separated and protected from sources of ignition or reaction including, but not limited to, open flames, smoking, cutting and welding, hot surfaces, frictional heat, sparks (static, electrical, or mechanical), spontaneous ignition (e.g., from heat producing chemical reactions), and radiant heat.
- While ignitable wastes are being handled, sources of ignition or reaction must be confined to specially designated locations.

C3.6 Neutralization

Neutralization is a deactivation technology that reduces a materials corrosivity by using reagents, such as acids (e.g., hydrochloric acid or sulfuric acid), bases (e.g., sodium hydroxide or calcium carbonate), or water (including wastewaters) to adjust the pH. The objective of neutralization is to conclude with a treatment residual that displays a pH greater than 2 and less than 12.5.

C3.6.1 Applicability

Neutralization is applicable to the waste codes listed in the Hanford Facility RCRA Permit Part A that meet the definition of corrosivity in WAC 173-303-090, or are listed in either WAC 173-303-081, “Discarded Chemical Products,” or WAC 173-303-082, “Dangerous Waste Sources,” specifically for this reason. Neutralization can be used to achieve applicable LDR treatment standards for nonliquid and liquid waste streams.

C3.6.2 Process Description

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While treatment operations may be tailored to specific waste types, the following general process is used:

- Waste is placed in a container capable of holding the waste container and reagents, while maintaining sufficient freeboard to prevent spills or releases from overtopping or splashing. This may be the container in which the waste was shipped to the facility.
- Volume or mass of reagents required to complete neutralization of the waste is added to the container.
- Waste and reagents are mixed to provide contact between the components.
- Chemical reactions that provide neutralization effects are completed.

C3.6.3 Limitations

Waste must meet the definition of corrosivity in accordance with WAC 173-303-090. Treatment may only be performed within mixing bins or containers.

C3.7 Absorption

Absorption is a deactivation technology for liquids exhibiting the characteristics of ignitability by which contaminants are taken into and soaked up by absorbent materials (e.g., polyacrylates, polypropylene, super absorbent polymer, and various inorganic based absorbents). This includes waste that is liquid and has low TOC content (less than 10 percent).

Absorption may also be used for solidification/stabilization technologies utilizing the same process described in this treatment section.

C3.7.1 Applicability

Absorption is applicable to all waste codes listed in the Hanford Facility RCRA Permit Part A and can be used to achieve applicable LDR treatment standards for liquid waste.

C3.7.2 Process Description

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While treatment operations may be tailored to specific waste types, the following general process is used:

- Liquid will be absorbed by either rearranging the absorbent originally packed in the container or adding new absorbent materials.
- If necessary, due to volume increase, the additional absorbent and waste will be transferred to a larger container.

The quantity of absorbent materials used varies widely depending on the nature of the liquid phase, original solids content of the waste, moisture level/capability in the sorbent, and availability of any chemical reactions that take up liquids during reaction.

C3.7.3 Limitations

Sorbent materials must be compatible with the characteristics of waste to mitigate reactivity.

C3.8 Controlled Reaction with Water

Controlled reaction with water is a deactivation technology, and the primary method of treatment for highly reactive inorganic or organic chemicals, such as sodium metal.

C3.8.1 Applicability

Controlled reaction with water is exclusively for designated waste codes D001 (Ignitable) based on WAC 173-303-090(5)(a)(ii), and D003 (Water Reactive) based on WAC 173-303-090(7)(a)(ii), (iii), and (iv) listed in the Hanford Facility RCRA Permit Part A to achieve applicable LDR treatment standards.

C3.8.2 Process Description

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While treatment operations may be tailored to specific waste types, the following general process is used:

- Waste is placed in a container capable of holding the waste container and reagents, while maintaining sufficient freeboard to prevent spills or releases from overtopping or splashing. This may be the container in which the waste was shipped to the facility.
- Volume or mass of reagents required to complete reaction of the waste is added to the container.
- Waste and reagents are mixed to provide contact between the components.
- Chemical reactions that provide deactivation effects are completed.

C3.8.3 Limitations

Treatment is exclusively for designated waste codes D001 (Ignitable) and D003 (Water Reactive).

C3.9 Solidification/Stabilization

Solidification and stabilization are processes that reduce the mobility or toxicity of pollutants in the waste. They apply to a wide range of discrete technologies that are closely related in their ability to reduce potential adverse impacts on the environment from the disposal of wastes. The processes of solidification and/or stabilization mixes wastes with treatment agents to physically and/or chemically immobilize the hazardous constituents in the waste.

Solidification refers to processes that encapsulate waste to form a solid material and restrict contaminant migration by decreasing the surface area exposed to leaching and/or by coating the waste with low-permeability materials. Treatment can be accomplished by a chemical reaction between a waste and binding reagents, or by mechanical processes.

Stabilization refers to processes involving chemical reactions with inorganic or organic binders to reduce the leachability of waste. The process chemically immobilizes waste or reduces their solubility via chemical reaction. The physical nature of the waste may or may not be altered through this process. Inorganic binders include cement, fly ash, lime, soluble silicates, and sulfur-based binders, while organic binders include asphalt, epoxide, polyesters, and polyethylene (PE). Organic binders are generally used to solidify MWs or specific hazardous organic compounds.

To meet applicable LDR requirements, waste is often treated prior to solidification/stabilization using one or more technologies for further prevention of leachability of constituents. Development of an appropriate treatment strategy includes the following considerations:

- Waste should be treated to obtain the most chemically inert and insoluble form.
- Sorbent materials should be added to absorb any free liquids present.
- When necessary, a binding agent should also be added.

Binding agents may be selected based on their characteristics to stabilize the waste further (e.g., alkalinity of Portland cement). In cases where waste is extremely soluble or no suitable chemical binder can be found, waste may be encapsulated in a hydrophobic medium (e.g., asphalt or PE).

C3.9.1 Applicability

Solidification/stabilization is applicable to waste codes listed in the Hanford Facility RCRA Permit Part A and can be used to achieve applicable LDR treatment standards for nonliquid and liquid wastes.

C3.9.2 Process Description

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While treatment operations may be tailored to specific waste types, the following general process is used:

- Waste is placed in a container capable of holding the waste container and reagents, while maintaining sufficient freeboard to prevent spills or releases from overtopping or splashing. This may be the container in which the waste was shipped to the facility.
- Volume or mass of reagents required to complete stabilization of the waste is added to the container.
- Waste and reagents are mixed to provide contact between the components.
- Chemical reactions that provide the stabilization effects are completed.

C3.9.3 Limitations

Waste must be solidified using nonbiodegradable binder(s). Criteria for meeting this standard are found in WAC 173-303-140(4)(b)(iv). Treated waste must not contain any free liquids and must resist degradation due to changes in temperature or moisture or exposure to radiation, chemicals, or compression.

C3.10 Mercury Amalgamation

Amalgamation is a physical immobilization technology unique to liquid elemental mercury in which another metal forms a semisolid alloy (amalgam) with mercury. Treatment is conducted as a nonaqueous process where finely divided metal powders are added allowing the mercury to dissolve in the solid metal forming a nonliquid, semisolid amalgam.

C3.10.1 Applicability

Mercury amalgamation is applicable to waste codes listed in the Hanford Facility RCRA Permit Part A for elemental mercury requiring treatment to achieve applicable LDR treatment standards.

C3.10.2 Process Description

The amalgamation treatment system is comprised of temporary portable gloveboxes equipped with negative pressure HVAC systems that vent through HEPA filters. The units are designed for containment purposes preventing release of solid waste and/or vapors into the environment.

Amalgamation of liquid elemental mercury is achieved using inorganic reagents, such as copper, zinc, nickel, gold, and sulfur. The process is described as follows:

- Elemental mercury containers are placed and sealed inside the portable glovebox unit.
- Using the attached gloves, the lid is removed from the elemental mercury container.
- Waste is mixed with the amalgamation reagents in a separate small treatment container or in the original container.
- Container is mixed using a paint shaker for the applicable amount of time.

C3.10.3 Limitations

Treatment may only be conducted in gloveboxes designed specifically for treating elemental mercury.

C3.11 Macroencapsulation

Macroencapsulation is an immobilization technology that is dependent on the ability of the surface coating material (e.g., a stainless steel container or grout reagent) to create a barrier around the waste, thereby reducing exposure to potential leaching media. The encapsulating barrier does not need to be chemically bound to the waste or constituent.

C3.11.1 Applicability

Macroencapsulation per 40 CFR 268.45 is applicable to waste codes listed in the Hanford Facility RCRA Permit Part A. With the exception of radioactive lead solids, waste to be macroencapsulated must meet the definition of hazardous debris in accordance with 40 CFR 268.2(g). Because macroencapsulation is dependent on the properties of the coating rather than the properties of the waste, and because there are no contaminant restrictions specified in Table 1 of 40 CFR 268.45, macroencapsulation can effectively treat all debris types.

Macroencapsulation (MACRO) per 40 CFR 268.42 is applicable to radioactive lead solids including, but not limited to, all forms of lead shielding and other elemental forms of lead (nonwastewaters only). These lead solids do not include treatment residuals such as hydroxide sludges, other wastewater treatment residuals, or incinerator ashes that can undergo conventional pozzolanic stabilization, nor do they include organo-lead materials that can be incinerated and stabilized as ash. Macroencapsulation per 40 CFR 268.42 specifically does not include any material that would be classified as a tank or container as defined in 40 CFR 260.10, "Hazardous Waste Management System: General," "Definitions."

C3.11.2 Process Description

Containers are expected to come in all shapes, sizes, and physical forms. As a result, it is not feasible to prescribe all possible methods to macroencapsulate waste. The primary objective of this section is to ensure that waste(s) will be encapsulated using surface coating materials resistant to degradation by the waste and its contaminants, and any substances it may come into contact with after final placement (i.e., leachate and microbes).

While reagents, mixing, and handling requirements are tailored to each specific waste or waste type, the processes described in the following subsections provide two examples of containerized waste treatment.

C.3.11.2.1 Grout Filled Overpack

- Approximately 5 to 8 cm (2 to 3 in.) of the following surface coating material (grout reagent) is poured into the macroencapsulation container to create a grout foundation: Portland cement or lime/pozzolans (e.g., fly ash and cement kiln dust).
- Prior to placement of containerized waste, the preformed grout foundation is provided approximately 72 hours to initially cure. Additional reagents (e.g., iron salts, silicates, carbon, or clays) may be utilized to enhance the set/cure time and working properties of the grout.
- Containerized waste is placed inside the prepared macroencapsulation container ensuring that a minimum of approximately 5 cm (2 in.) annulus and head space will be maintained.
- If needed, to mitigate floating of containerized waste during deployment of reagent, a restriction tool is placed across the inside of the macroencapsulation container to ensure that containerized waste remains stationary.
- Volume or mass of grout reagent required to complete macroencapsulation is deployed into the macroencapsulation container to ensure complete covering of the containerized waste.
- Initial curing is performed in the same manner described.

Large pieces of debris (e.g., long length equipment) may be encapsulated with approved materials (e.g., polymeric organic resins/plastics). When encapsulating debris in plastic, it may be double wrapped with a PE liner (or equivalent) that meets the minimum specifications required.

C.3.11.2.2 Polyethylene Lined Macroencapsulation System

A typical system contains a PE containment liner that resides within a steel box. Waste containers can be loaded directly into the system, thereby reducing the need to repackage or directly handle the waste. The following provides a general description of treatment utilizing the Ultra-MacroEncapsulation, High Modulus Polymeric Packaging System for radioactive lead solids:

- Container(s) of radioactive lead solids are added to macroencapsulation macroliner systems comprised of HDPE/low-density PE liners.

- Filler material (e.g., vermiculite) is added to eliminate void space within macroliner.
- Once filled, the PE macroencapsulation lid is put in place and bonded (sealed) to the PE liner body.
- Macroencapsulation bond is verified.

C3.11.3 Limitations

Control measures and limitations include the following:

- For alternative treatment standards (40 CFR 268.45), waste must meet the definition of debris in accordance with 40 CFR 268.2(g), with the exception of radioactive lead solids.
- With the exception of radioactive lead solids, no other wastes with specific treatment standards may be macroencapsulated unless requirements under 40 CFR 268.42 are met.
- Radioactive lead solids will be treated via macroencapsulation (MACRO), as required by 40 CFR 268.40 and defined in 40 CFR 268.42.

C3.12 Microencapsulation

Microencapsulation is an immobilization technology that encapsulates waste with low-permeability materials and restricts contaminant migration through decreasing the surface area exposed to leaching.

C3.12.1 Applicability

Microencapsulation is applicable to waste codes listed in the Hanford Facility RCRA Permit Part A to achieve applicable LDR treatment standards. Microencapsulation has no contaminant restrictions specified in Table 1 of 40 CFR 268.45.

C3.12.2 Process Description

Where the precise volume of waste in a container is unknown (e.g., contains irregular shaped debris), microencapsulation will be utilized for void filler to ensure that the container meets the 90 percent full requirement.

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While reagents, mixing, and handling requirements are tailored to each specific waste or waste type, the following general process is used:

- Waste in the containers can be accessed by removing the lid or through the top via drilled holes or grout ports.
- Microencapsulating reagent (e.g., flowable grout) is added directly into the containerized waste filling in void/interstitial areas in the debris waste.
- Microencapsulating reagent is in direct contact with the waste where it chemically and physically stabilizes the waste contaminants, reducing their leachability.
- Microencapsulating reagent is provided approximately 72 hours to initially cure. Additional reagents (e.g., iron salts, silicates, carbon, or clays) may be utilized to enhance the set/cure time or reduce the leachability of debris constituents.

C3.12.3 Limitations

Control measures and limitations include the following:

- Waste must meet the definition of debris in accordance with 40 CFR 268.2(g).
- Debris that is not conducive to microencapsulation where surfaces are not exposed such that it is not reasonable to expect appropriate coating to occur such as:
  - Internally contaminated surfaces (e.g., piping)
  - Complex shapes (e.g., pumps)
- Containers must demonstrate that they are not leaking and have sufficient integrity to contain the material being added into and mixed within the container.
- Treatment may not be performed on process residuals (i.e., slag) or waste with specific treatment standards.
- If treatment results in material that no longer meets the 60 mm (approximately 2.4 in.) minimum particle size limit for debris, the material will be managed in accordance with waste specific treatment standards for the waste contaminating the material, unless the debris has been cleaned and separated from contaminated soil and waste prior to size reduction.

C3.13 Sealing

Sealing is an immobilization technology and is the application of materials (e.g., epoxy, silicone, and urethane compounds) that adhere tightly to the debris surface to avoid exposure of the surface to potential leaching media. When necessary for effective sealing of the surface, debris surface is pretreated to remove foreign matter and/or to clean and roughen the surface.

C3.13.1 Applicability

Sealing is applicable to waste codes listed in the Hanford Facility RCRA Permit Part A to achieve applicable LDR treatment standards. Sealing has no contaminant restrictions specified in Table 1 of 40 CFR 268.45.

C3.13.2 Process Description

Containers are expected to come in all shapes, sizes, and physical forms. As a result, it is not feasible to prescribe all possible methods to seal debris. The primary objective of this section is to ensure that sealed materials adhere tightly to the container and avoid exposure of the surface to potential leaking media. Polyurea, or other similar materials, may be used for treatment.

Treatment may be performed within modular containment/confinement structures, such as Perma-Cons and work tents, or within gloveboxes. While sealing materials, mixing, and handling requirements are tailored to each specific waste or waste type, the following process provides a general explanation of containerized waste debris treatment utilizing polyurea:

- Polyurea material is applied to the container or debris utilizing an applicator (e.g., polyurea spray gun).
- Container or debris is initially cured per manufacturer direction and recommendation.

Large pieces of debris (e.g., long length equipment) may be sealed with approved materials (e.g., epoxy, silicone, and urethane compounds). When sealing the debris with polymer (or equivalent), sealing material will be applied by hand or with spray devices.

C3.13.3 Limitations

Waste must meet the definition of debris in accordance with 40 CFR 268.2(g). Containerized MW debris must have an adequate surface for the materials to adhere.

C4 Recordkeeping

The Permittees will place documentation into the Hanford Facility Operating Record (T Plant portion) as required by Permit Condition II.I (WAC 173-303-380, "Facility Recordkeeping") to include approved waste profile documentation (Hanford Facility RCRA Permit Condition II.I.1.j) and confirmation records (Hanford Facility RCRA Permit Condition II.I.1.b). LDR records will be maintained in the Hanford Facility Operating Record (T Plant portion) in accordance with WAC 173-303-380(1)(m).

C5 Training

For training requirements related to duties described in the T Plant Process Information, refer to T Plant Addendum G.

C6 References

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40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol25/xml/CFR-2010-title40-vol25-part264.xml.

264.1050, "Applicability."
264.1052, "Standards: Pumps in Light Liquid Service."
264.1060, "Standards: Closed-Vent Systems and Control Devices."
264.1064, "Recordkeeping Requirements."
264.1080, "Applicability."
264.1086, "Standards: Containers."
Subpart AA, "Air Emission Standards for Process Vents."
Subpart BB, "Air Emission Standards for Equipment Leaks."
Subpart CC, "Air Emission Standards for Tanks, Surface Impoundments, and Containers."
Subpart DD, "Containment Buildings."

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*. Available at: http://www.gpo.gov/fdsys/pkg/CFR-2010-title40-vol26/xml/CFR-2010-title40-vol26-part268.xml.

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268.40, "Applicability of Treatment Standards."
268.42, "Treatment Standards Expressed as Specified Technologies."
268.45, "Treatment Standards for Hazardous Debris."
268.49, "Alternative LDR Treatment Standards for Contaminated Soil."
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WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit*, as amended, Washington State Department of Ecology, Richland, Washington.

WAC 173-303, "Dangerous Waste Regulations," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303.

303-040, "Definitions."
303-081, "Discarded Chemical Products."
303-082, "Dangerous Waste Sources."
303-090, "Dangerous Waste Characteristics."
303-140, "Land Disposal Restrictions."
303-160, "Containers."
303-161, "Overpacked Containers (Labpacks)."
303-200, "Accumulating Dangerous Waste On-Site."
303-380, "Facility Recordkeeping."
303-395, "Other General Requirements."
303-400, "Interim Status Facility Standards."
303-600, "Final Facility Standards."
303-630, "Use and Management of Containers."
303-640, "Tank Systems."
303-690, "Air Emission Standards for Process Vents."
303-691, "Air Emission Standards for Equipment Leaks."
303-692, "Air Emission Standards for Tanks, Surface Impoundments, and Containers."
303-695, "Containment Buildings."
303-806, "Final Facility Permits."

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Appendix C-A

Topographic Map

Overall Facility Map of the Hanford Site

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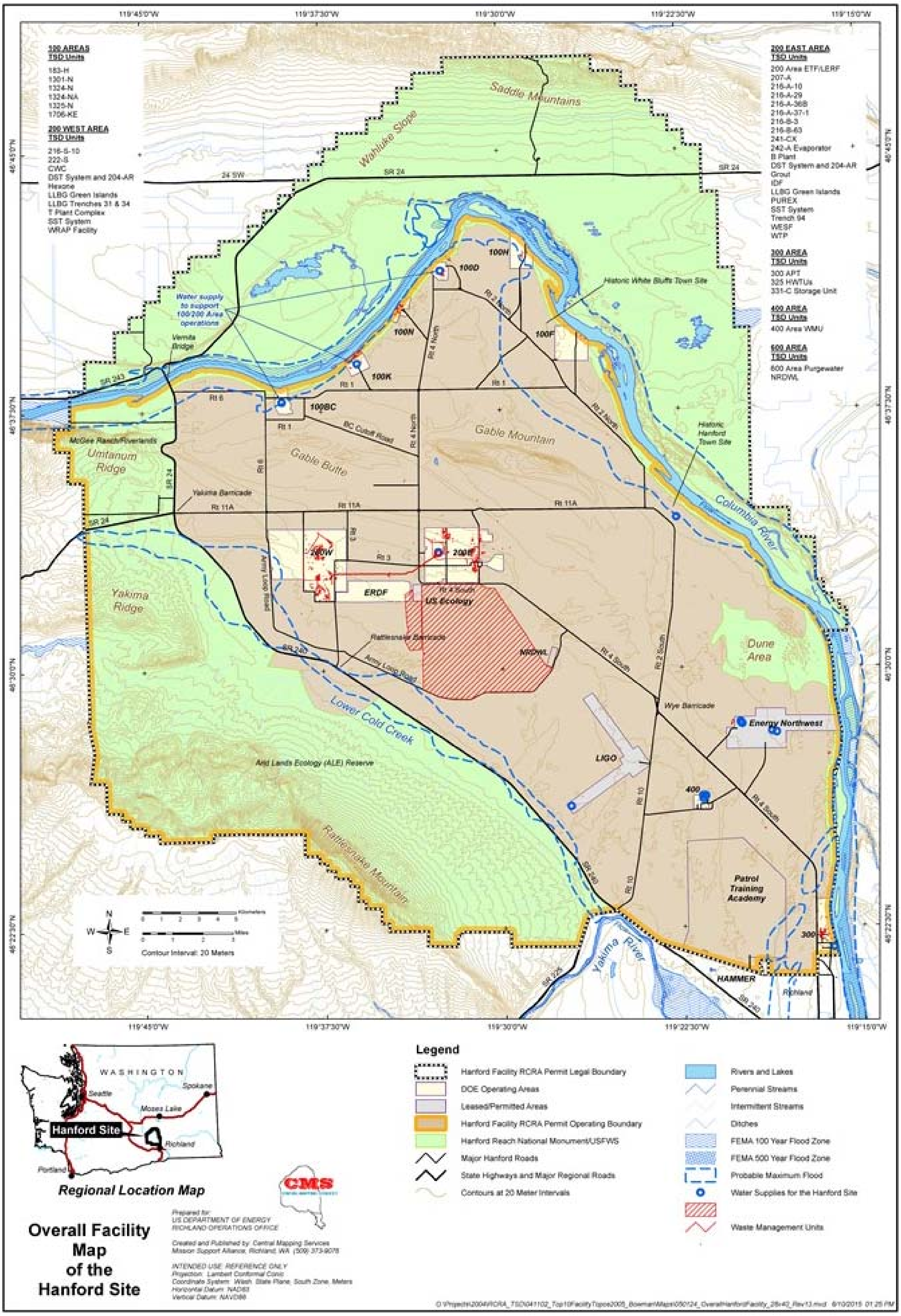

Figure C-A1. Topographic Map Overall Facility Map of the Hanford Site

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Appendix C-B

Engineering Drawings

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221-T Head End DWMU

221-T Operations Gallery Storage DWMU

221-T BY Storage Area DWMU

2706-T Yard (Including HS-030 and HS-032 Storage Modules) DWMU

2706-T Outdoor Storage Area DWMU

2706-TA Outdoor Storage Area DWMU

2706-T Asphalt Pad DWMU

243-T Covered Storage Pad DWMU

211-T Cage DWMU

221-T Canyon Deck DWMU

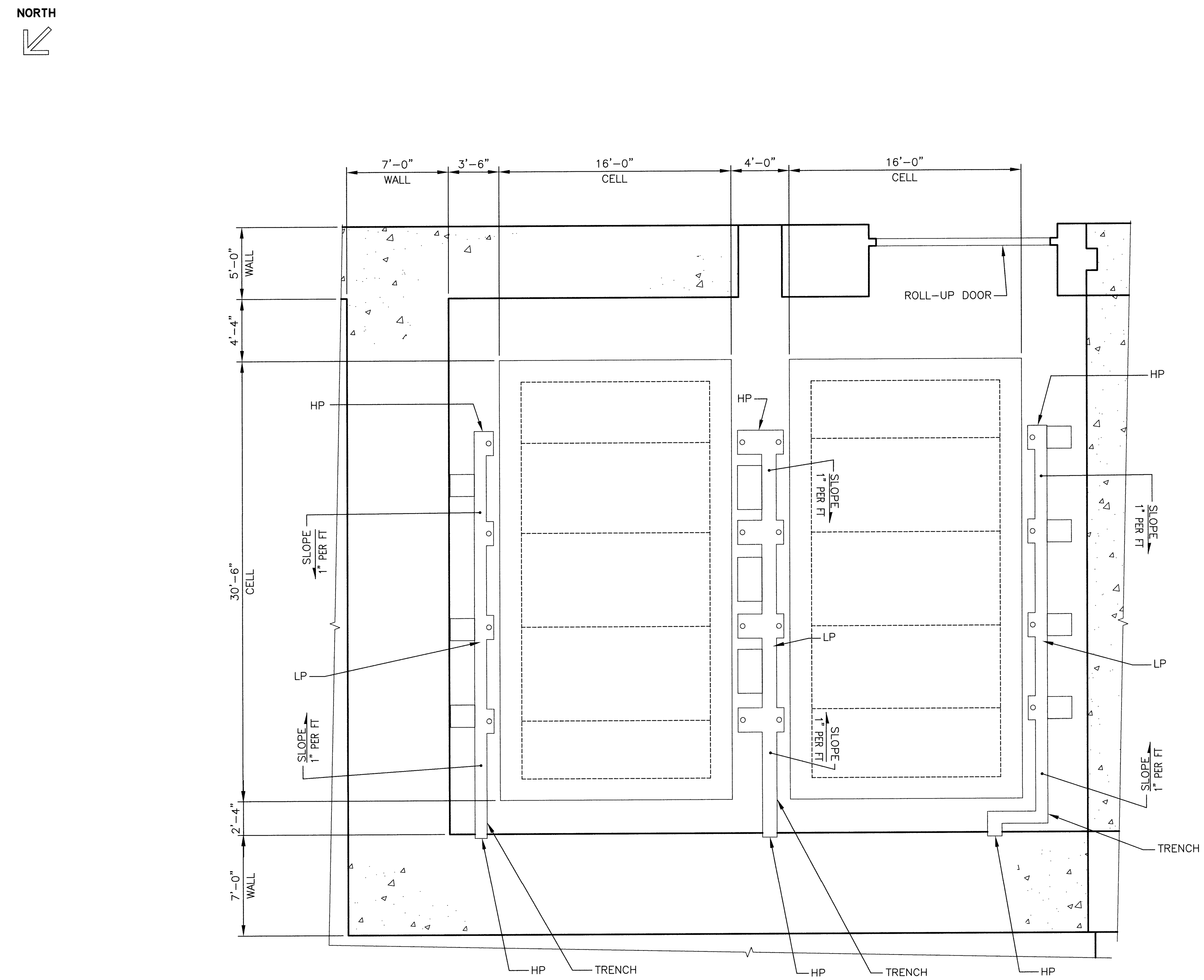
221-T Cells (7L, 13R, 16R, and 17R) DWMU

221-T Railroad Tunnel DWMU

2706-T Building DWMU

2706-TA Building DWMU

214-T Building DWMU



221-T HEAD END/DECK LEVEL GENERAL STRUCTURE/AREA

SCALE: 1/4"=1'-0"

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REF NUMBER	TITLE
W-69333-1	SECTIONS 1 & 2 CONCRETE SECTIONS & DETAILS
H-2-826344	STRUC CONCRETE PLANS & DETAILS
NEXT USED ON	REFERENCES

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
	REVISIONS

BLDG. NO. 221T
INDEX NO. 0900

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	COMPANY
DRAFTER	B PETRILLO	ARES
DRAFTING CHECKER	J BYERS	ARES
DISCIPLINE ENGINEER	T SALZANO	ARES
DESIGN AUTHORITY	JR Rosser	

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HEAD END
GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836729 | SHEET 1 | REV 0
SCALE AS SHOWN
17473

THOMAS B. SALZANO, STATE OF WASHINGTON, 29211, REGISTERED PROFESSIONAL ENGINEER

NOV 11 2015
HANFORD RELEASE
11

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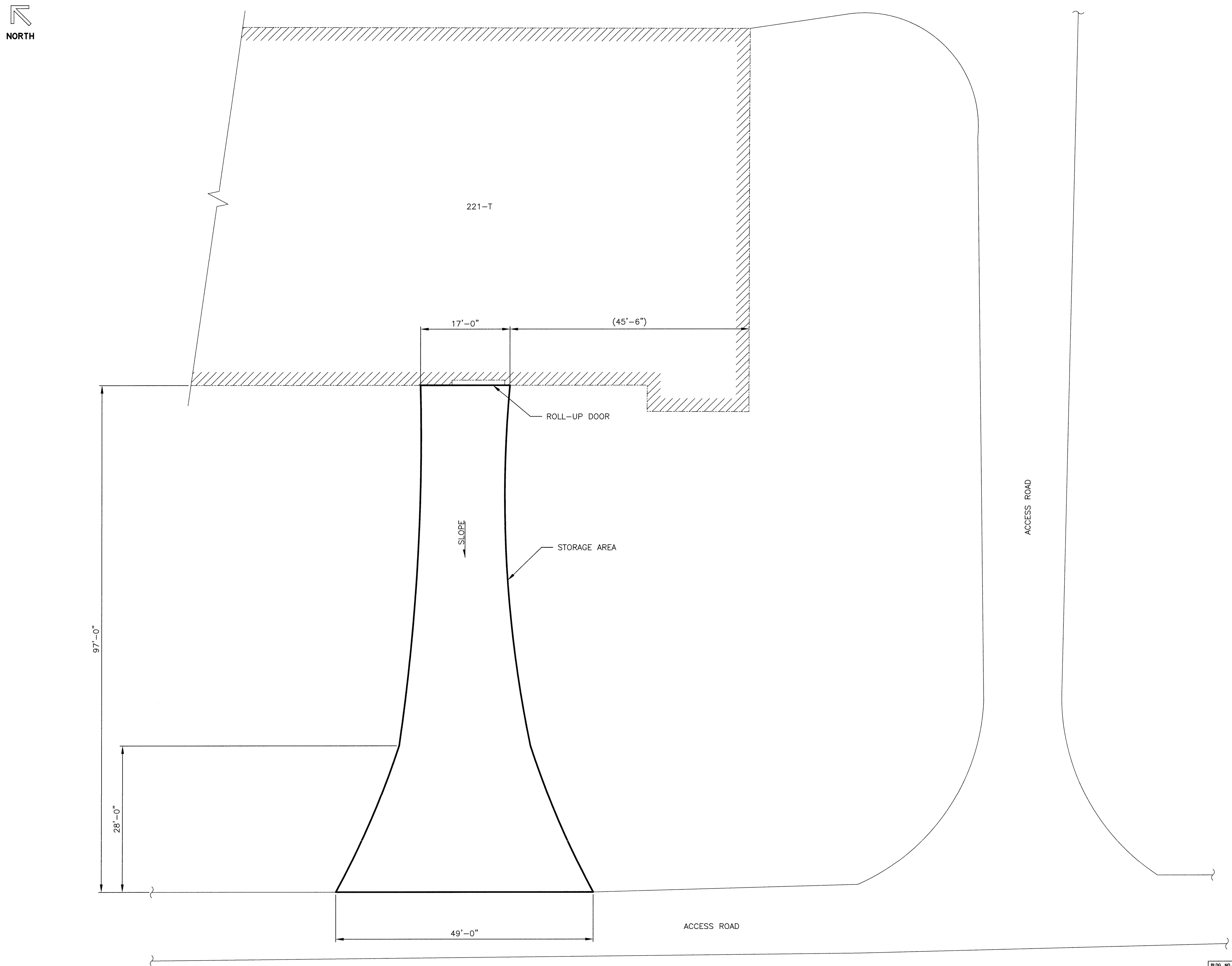

221-T HEAD END OUTSIDE CONCRETE RAMP
SCALE: 1/8"=1'-0"

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REF NUMBER	TITLE
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DRAFTING CHECKER J BYERS	9/11/15	ARES
DISCIPLINE ENGINEER T SALZANO	9-11-15	ARES
DESIGN AUTHORITY JR Rosser	11/4/15	CHPRC

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HEAD END
OUTSIDE CONCRETE RAMP
GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836729 | SHEET 2 | REV 0
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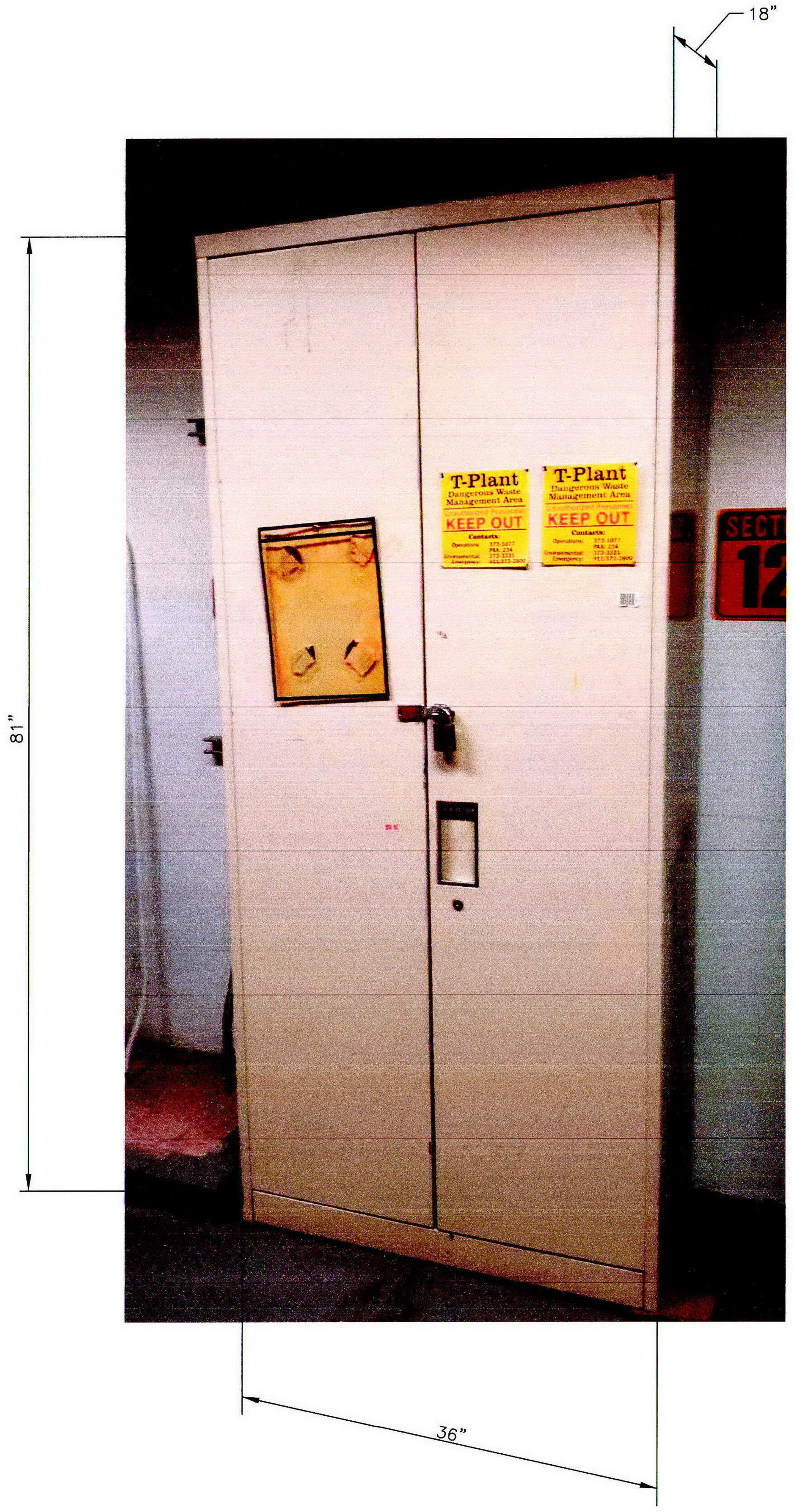

OPERATIONS GALLERY STORAGE CABINET
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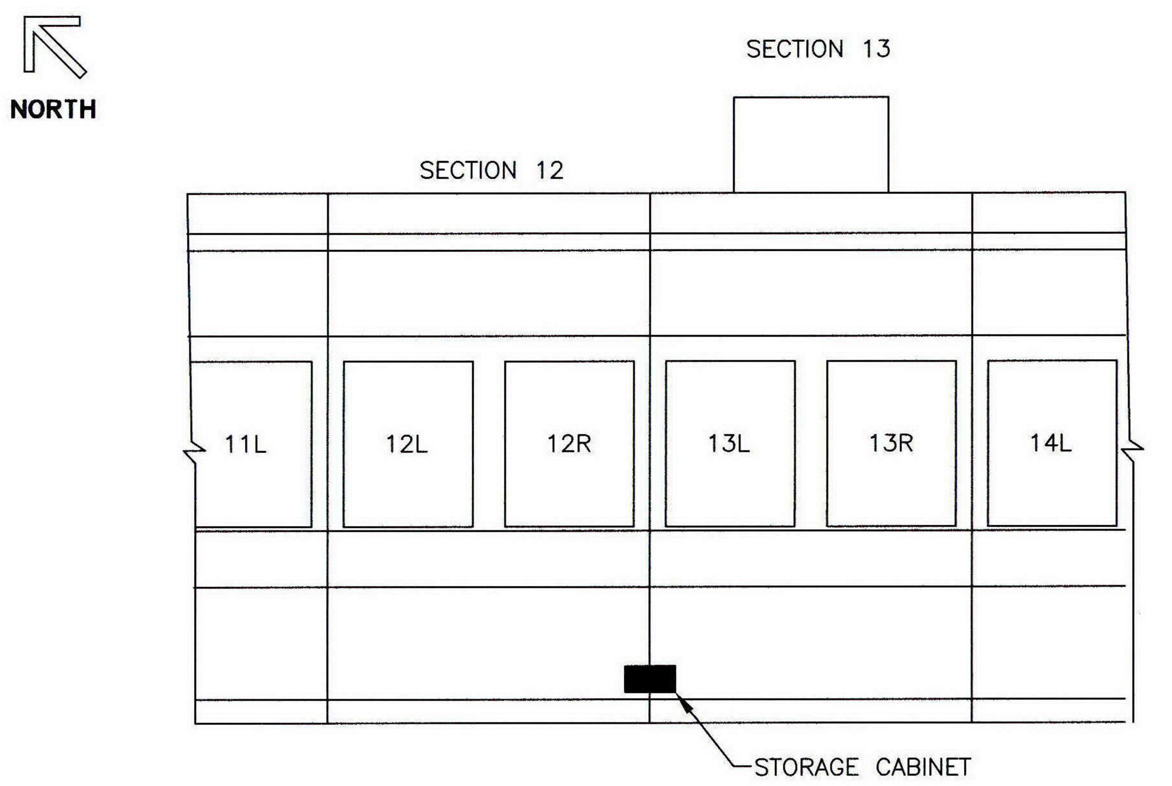

KEY PLAN
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H-2-836723-1

NOV 11 2015
DATE:
STA: 4
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NEXT USED ON	

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BLDG. NO. 221T
INDEX NO. 0900

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DRAFTING CHECKER J BYERS	10-19-15	ARES
DISCIPLINE ENGINEER T SALZANO	10-15-15	ARES
DESIGN AUTHORITY JR Rosser	11/4/15	CHPRC

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OPERATION GALLERY STORAGE GENERAL STRUCTURE/AREA

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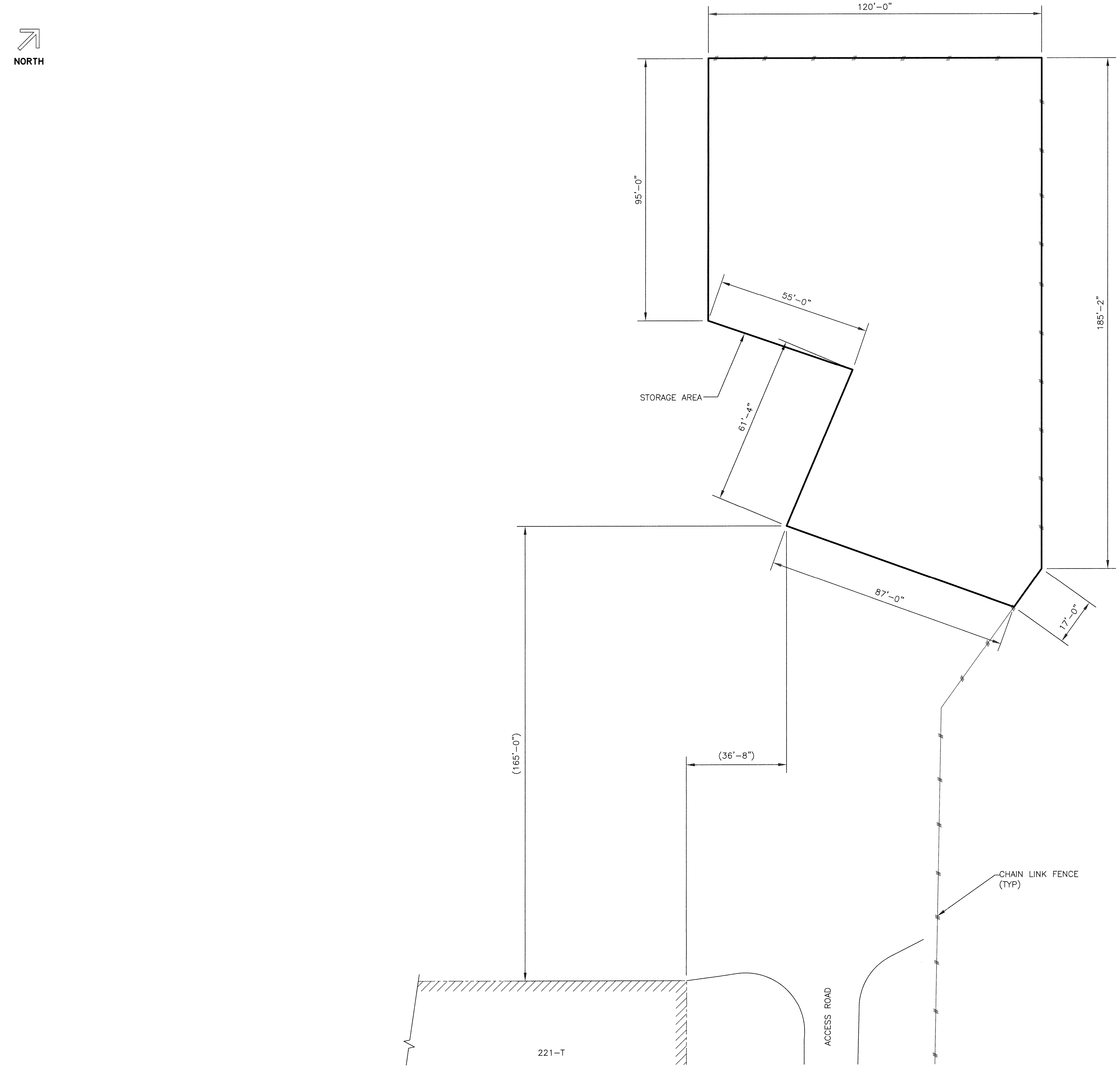

221-T BY STORAGE AREA

SCALE: 1/16"=1'-0"

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REVISIONS

NOV 18 2015
DATE: HANFORD RELEASE
STA: 4 ID: 11

BLDG. NO. 221T

INDEX NO. 0401

CAUTION
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NAME	DATE / COMPANY
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DRAFTING CHECKER J BYERS	11-13-15 ARES
T SALZANO	11-13-15 ARES
DESIGN AUTHORITY J R ROSSER	11/16/15 CHPRC

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BY STORAGE
GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836731 | SHEET 1 | REV 1

SCALE AS SHOWN

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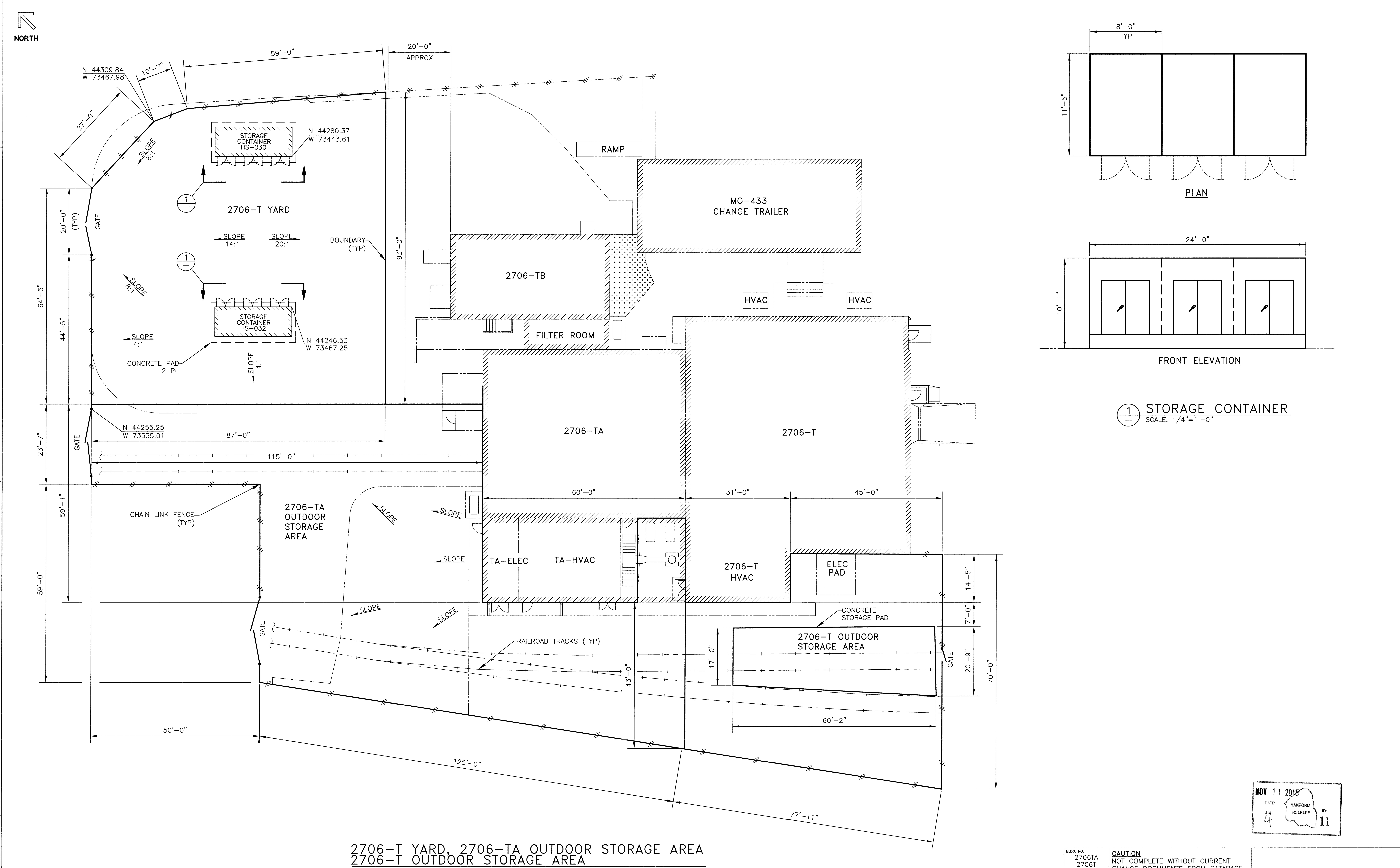

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NEXT USED ON	REFERENCES

REV NO.	DESCRIPTION
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	REVISIONS

BLDG. NO. 2706TA 2706T

CAUTION
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DRAFTING CHECKER J. BYERS	
DISCIPLINE ENGINEER T. SALZANO	
DESIGN AUTHORITY JR Rosser	

INDEX NO. 0401

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YARD & OUTDOOR STORAGE GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836734 | SHEET 1 | REV 0

SCALE AS SHOWN

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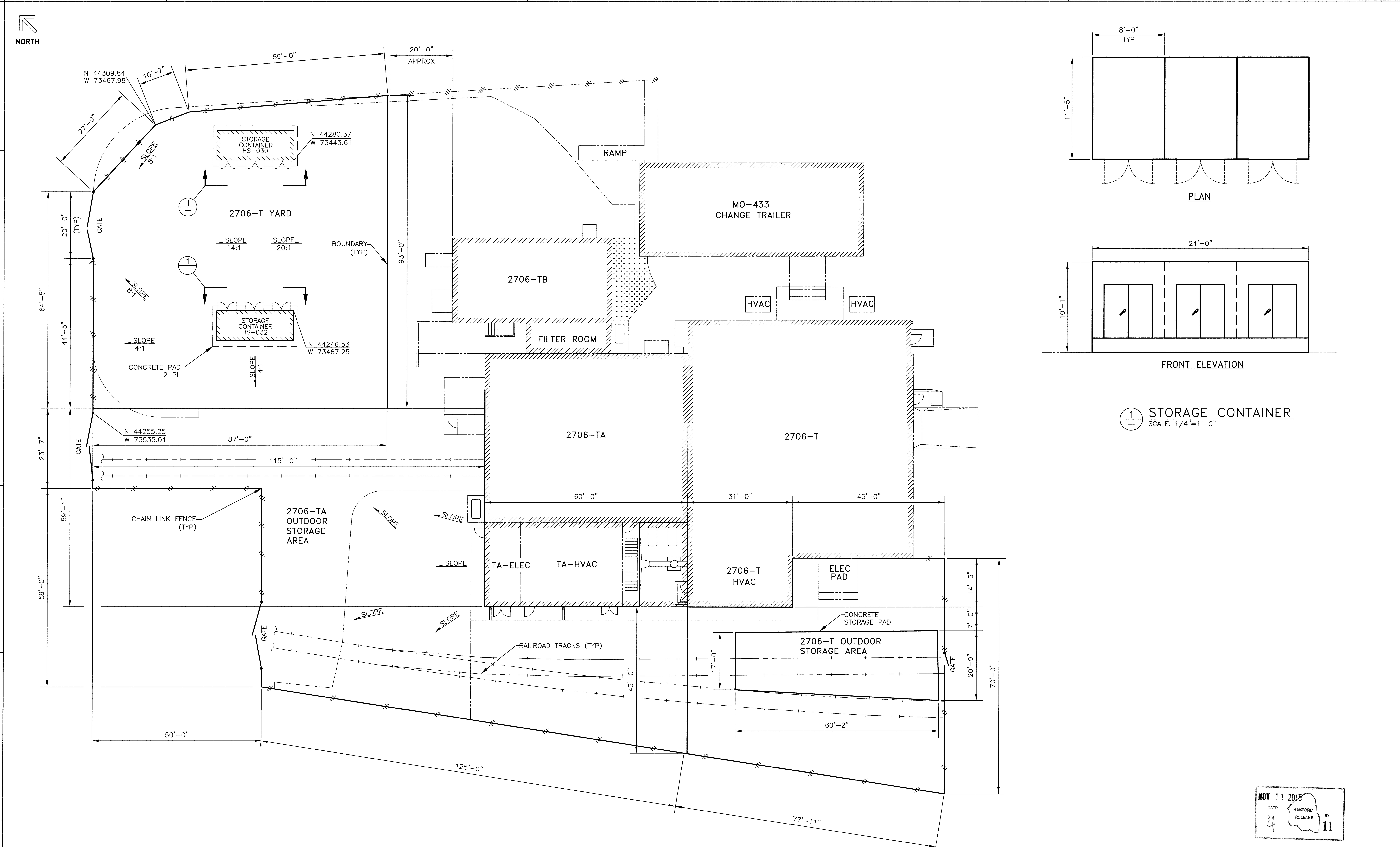
DOE_TB_F.DWG (JAN 2015)



2706-T YARD, 2706-TA OUTDOOR STORAGE AREA
2706-T OUTDOOR STORAGE AREA
SCALE: 3/32"=1'-0"

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DRAFTER	J. SHEATS
DRAFTING CHECKER	J. BYERS
DISCIPLINE ENGINEER	T. SALZANO
INDEX NO.	0401
DESIGN AUTHORITY	JR Rosser

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YARD & OUTDOOR STORAGE
GENERAL STRUCTURE/AREA

SIZE	DRAWING NUMBER	SHEET	REV
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SCALE AS SHOWN

4820

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H-2-826517	CIVIL SITE PLAN GENERAL LAYOUT

REFERENCES

REV NO.	DESCRIPTION
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REVISIONS

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

NEXT USED ON

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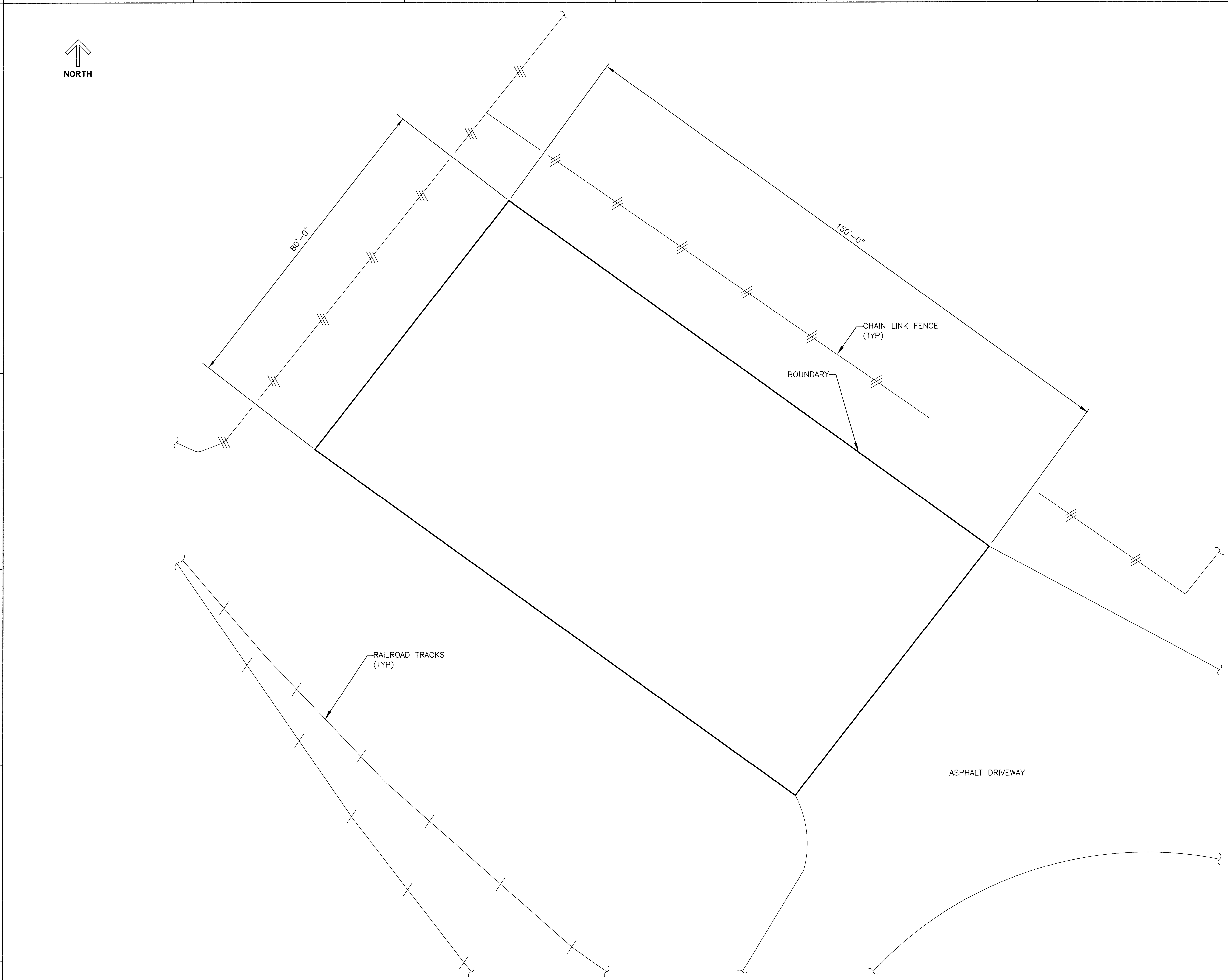
20'-0"
APPROX
27'-0"
SLOPE 8:1
STORAGE CONTAINER HS-030
N 44280.37
W 73443.61
RAMP
MO-433
CHANGE TRAILER
2706-T YARD
SLOPE 14:1
SLOPE 20:1
BOUNDARY (TYP)
93'-0"
GATE
20'-0" (TYP)
64'-5"
44'-5"
2706-TB
HVAC
HVAC
STORAGE CONTAINER HS-032
N 44246.53
W 73467.25
SLOPE 4:1
CONCRETE PAD 2 PL
FILTER ROOM
N 44255.25
W 73535.01
87'-0"
115'-0"
23'-7"
2706-TA
2706-T
60'-0"
31'-0"
45'-0"
59'-1"
59'-0"
CHAIN LINK FENCE (TYP)
2706-TA OUTDOOR STORAGE AREA
SLOPE
TA-ELEC
TA-HVAC
2706-T HVAC
ELEC PAD
14'-5"
7'-0"
20'-9"
70'-0"
CONCRETE STORAGE PAD
2706-T OUTDOOR STORAGE AREA
17'-0"
43'-0"
RAILROAD TRACKS (TYP)
60'-2"
50'-0"
125'-0"
77'-11"
8'-0" TYP
11'-5"
PLAN
24'-0"
10'-1"
FRONT ELEVATION
1 STORAGE CONTAINER
SCALE: 1/4"=1'-0"
2706-T YARD, 2706-TA OUTDOOR STORAGE AREA
2706-T OUTDOOR STORAGE AREA
SCALE: 3/32"=1'-0"
NOV 11 2015
HANFORD RELEASE
4
11
BLDG. NO. 2706TA 2706T
CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE
NAME
DRAFTER J. SHEATS
DRAFTING CHECKER J. BYERS
DISCIPLINE ENGINEER T. SALZANO
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
YARD & OUTDOOR STORAGE
GENERAL STRUCTURE/AREA
INDEX NO. 0401
DESIGN AUTHORITY JR Rosser
SIZE F
DRAWING NUMBER H-2-836734
SHEET 1
REV 0
SCALE AS SHOWN
4820
0 INITIAL RELEASE PER ECR-15-000699
DESCRIPTION
REVISIONS
H-2-826517 CIVIL SITE PLAN GENERAL LAYOUT
REF NUMBER
TITLE
REFERENCES
NEXT USED ON
DWG NUMBER
TITLE
DRAWING TRACEABILITY LIST
DOE_TB_F.DWG (JAN 2015)



2706-T ASPHALT PAD
SCALE: 3/32"=1'-0"

NOV 11 2015
DATE:
STA: 4
HANFORD RELEASE
ID: 11

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
H-13-000080	TOPOGRAPHIC MAP T PLANT COMPLEX
REFERENCES	
NEXT USED ON	

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
REVISIONS	

BLDG. NO. 2706T
INDEX NO. 0401

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE / COMPANY
DRAFTER J SHEATS	10/15/15 ARES
DRAFTING CHECKER J BYERS	10-19-15 ARES
DISCIPLINE ENGINEER T SALZANO	10-15-15 ARES
DESIGN AUTHORITY JR Rosser	11/4/15 CHPRC

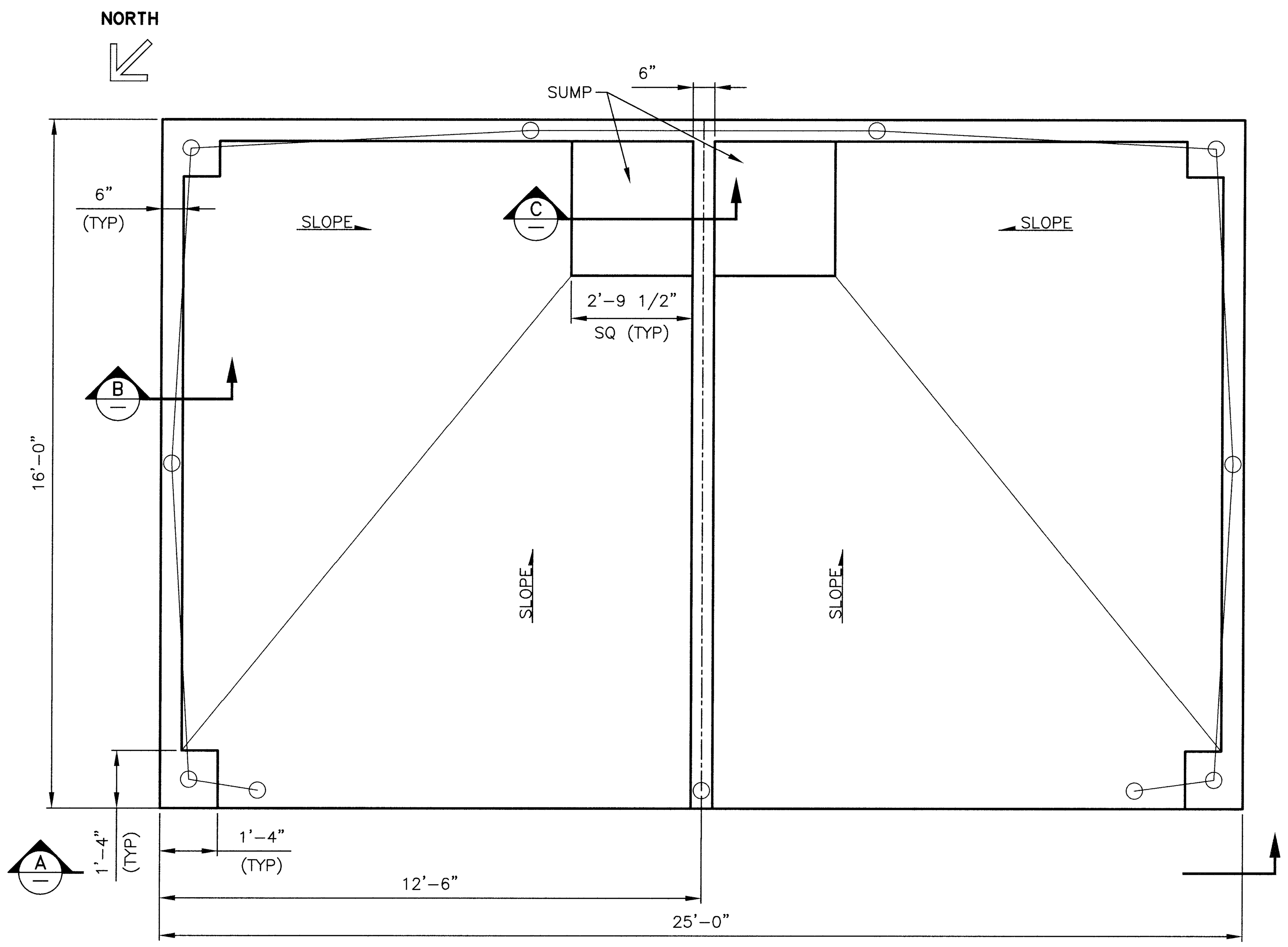
U.S. DEPARTMENT OF ENERGY
Richland Operations Office

ASPHALT PAD
GENERAL STRUCTURE/AREA

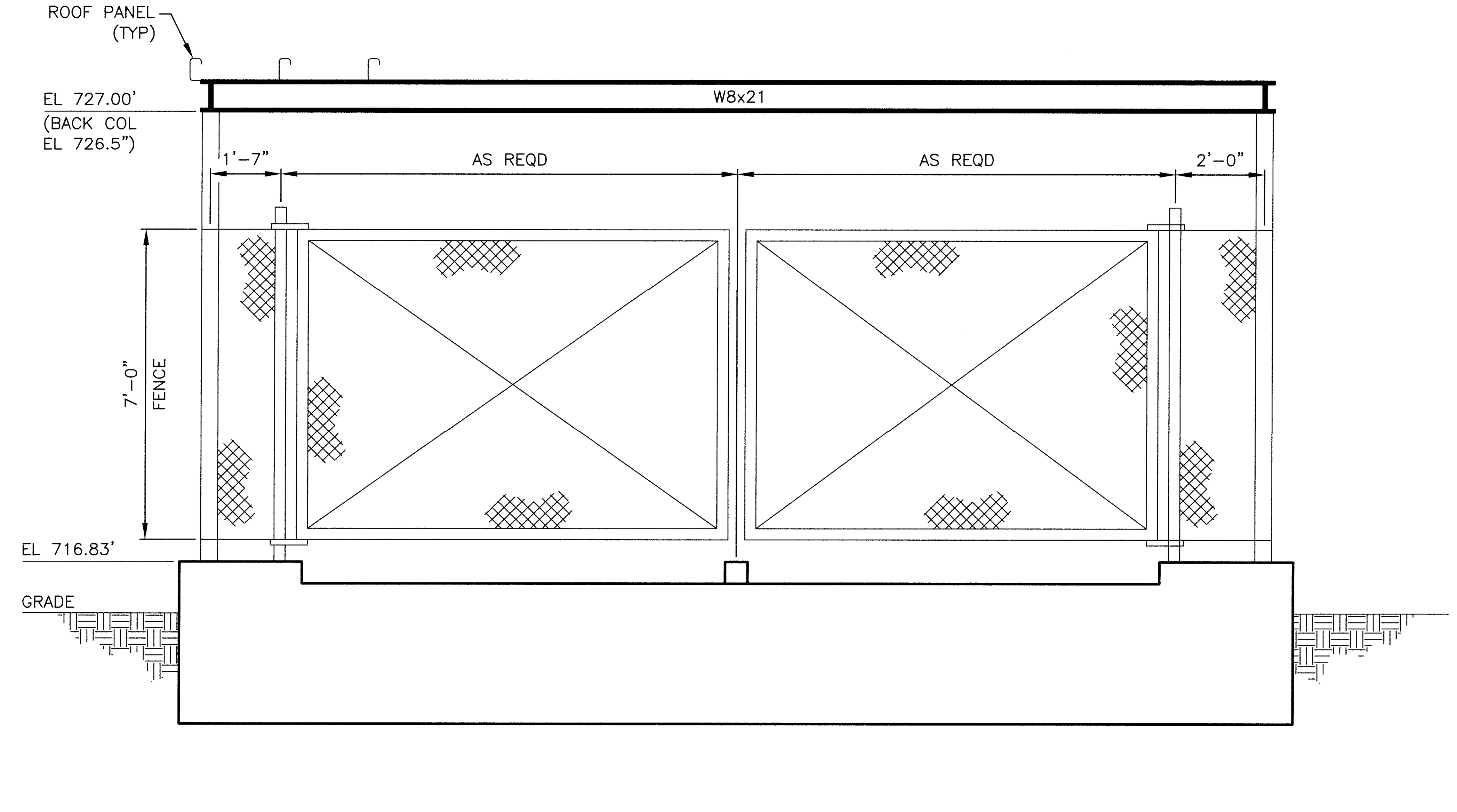
SIZE F | DRAWING NUMBER H-2-836735 | SHEET 1 | REV 0
SCALE AS SHOWN

9963
DOE_TB_F.DWG (JAN 2015)

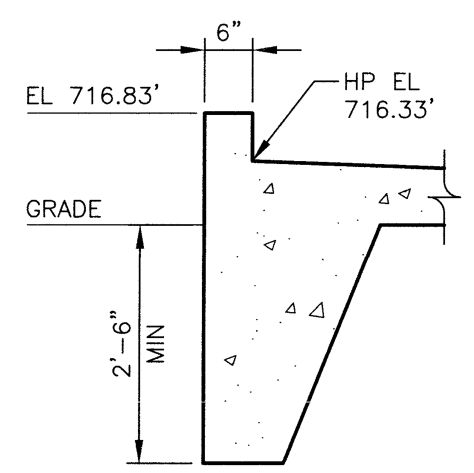

NORTH
ELEVATION
A 243–T COVERED STORAGE PAD
SCALE: 1/16"=1'–0"
200'–0"
20'–0" (TYP)
3" (TYP)
(1'–4")
(16'–0")
DBL WIDE TRL
PARKING
PARKING
PARKING
22'–0"
118'–0"
75'–0"
64'–0"
200'–0"
155'–0"
83'–0"
71'–0"
132'–0"
243–T
T–PLANT WASTE
STORAGE STRUCTURE
243–T
STORAGE AREA
GRASS
&
SHRUBS
CHAIN LINK FENCE (TYP)
243–T STORGE PAD
SCALE: 1"= 20'–0"
NOV 11 2015
DATE:
HANFORD
RELEASE
STA: 4
ID: 11
H–2–826533 STRUCTURAL SUMP LINERS
H–2–833190 CIVIL/STRUCTURAL WASTE STORAGE STRUCTURE SITE PLAN
REF NUMBER
TITLE
REFERENCES
NEXT USED ON
DWG NUMBER
TITLE
DRAWING TRACEABILITY LIST
0 INITIAL RELEASE PER ECR–15–000699
REV NO.
DESCRIPTION
REVISIONS
BLDG. NO. 243T
INDEX NO. 0901
CAUTION
NOT COMPLETE WITHOUT CURRENT
CHANGE DOCUMENTS FROM DATABASE
NAME
B SALZANO
J BYERS
T SALZANO
DESIGN AUTHORITY
JR Rosser
U.S. DEPARTMENT OF ENERGY
Richland Operations Office
STORAGE PAD
GENERAL STRUCTURE/AREA
SIZE F
DRAWING NUMBER H–2–836736
SHEET 1
REV 0
SCALE AS SHOWN
14574
DOE_TB_F.DWG (JAN 2015)



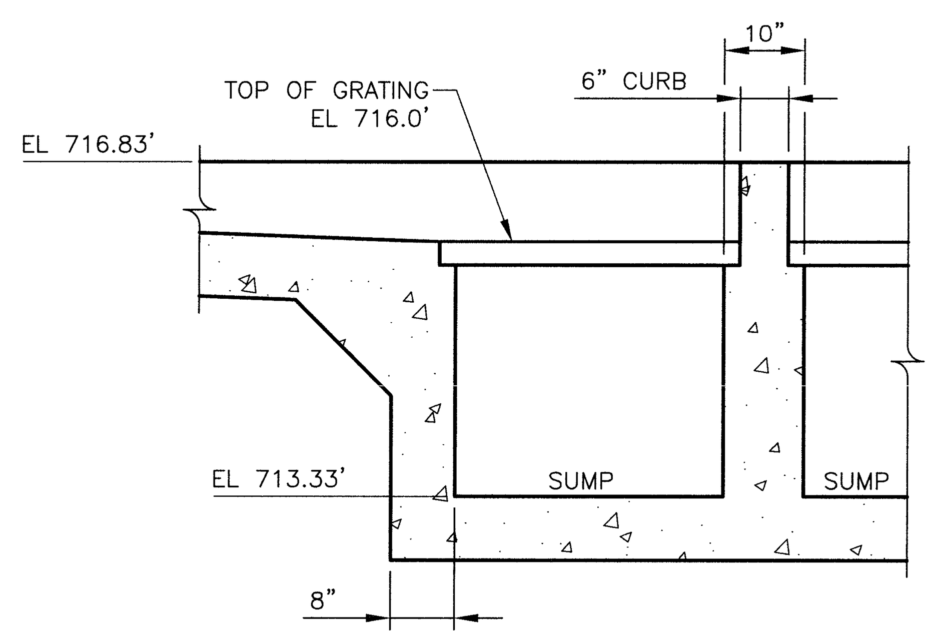
211-T CAGE SECONDARY CONTAINMENT
SCALE: 1/2"=1'-0"



A SECTION
SCALE: 1/2"=1'-0"



B SECTION
SCALE: 3/4"=1'-0"



C SECTION
SCALE: 3/4"=1'-0"

NOV 11 2015
HANFORD
RELEASE
11

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

H-2-78252-1	STRL ENLARGED PLAN & DETAILS
REF NUMBER	TITLE
REFERENCES	
NEXT USED ON	

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
REVISIONS	

BLDG. NO. 211T
INDEX NO. 0900

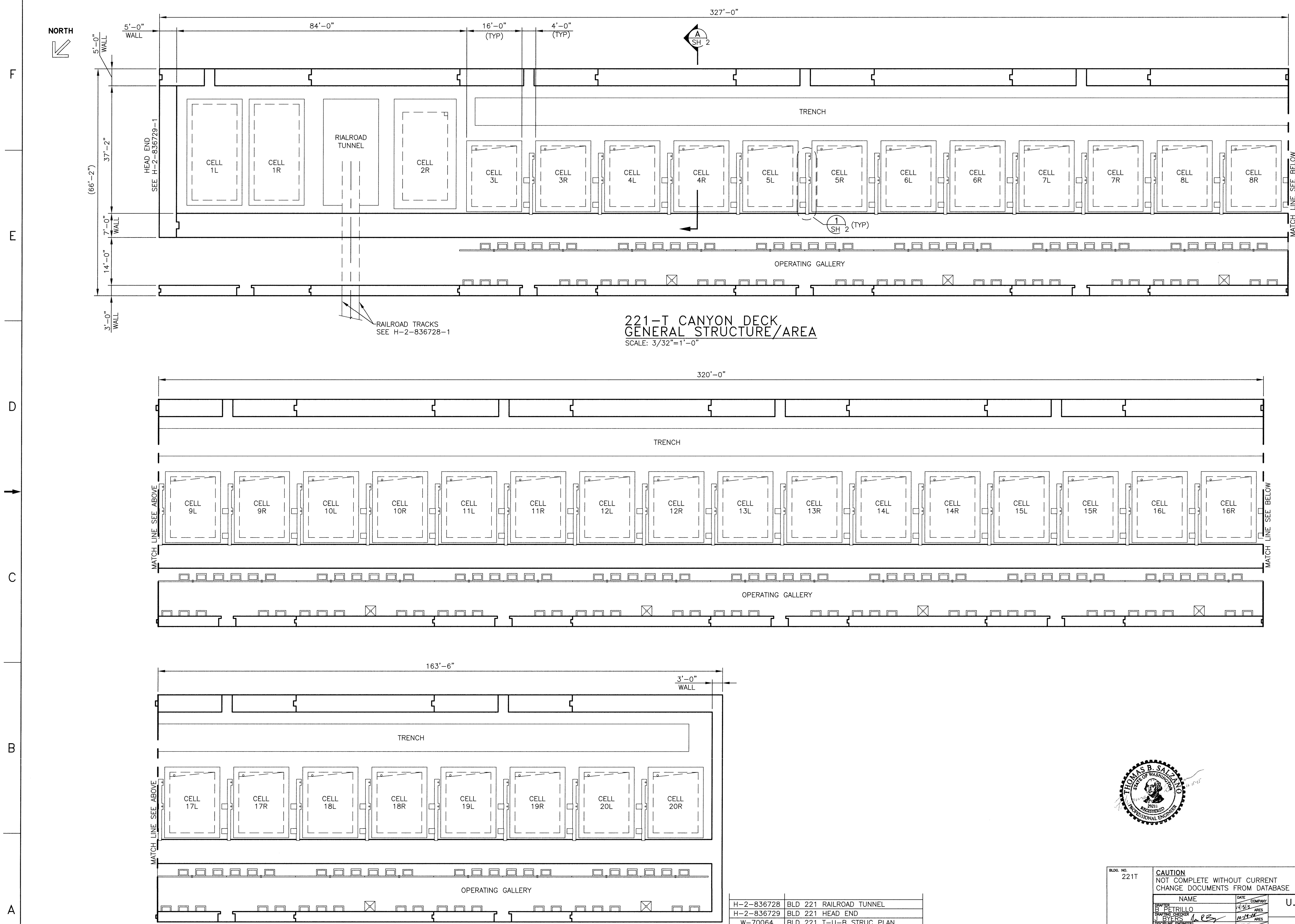
CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER B SALZANO	9/11/15	ARES
DRAFTING CHECKER J BYERS	9/11/15	ARES
DISCIPLINE ENGINEER T SALZANO	9-11-15	ARES
DESIGN AUTHORITY JR Rosser	11/4/15	CHPRC

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

SECONDARY CONTAINMENT DESIGN

SIZE F | DRAWING NUMBER H-2-836738 | SHEET 1 | REV 0
SCALE AS SHOWN
21682



NOV 11 2015
HANFORD RELEASE
STA: 4
ID: 11

REF NUMBER	TITLE
H-2-836728	BLD 221 RAILROAD TUNNEL
H-2-836729	BLD 221 HEAD END
W-70064	BLD 221 T-U-B STRUC PLAN
W69566	STD.SECTS. CONCRETE SECTIONS & DETAILS
W-69334	CONCRETE PLANS & DETAILS SECTIONS 1 & 2

REFERENCES

NEXT USED ON

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

MFD	REV NO.	DESCRIPTION
	0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

BLDG. NO. 221T

INDEX NO. 0900

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER B PETRILLO	10/15/15	ARES
DRAFTING CHECKER J BYERS	10-19-15	ARES
DISCIPLINE ENGINEER T SALZANO	10-15-15	ARES
DESIGN AUTHORITY JR Rosser	11/4/15	CHPRC

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

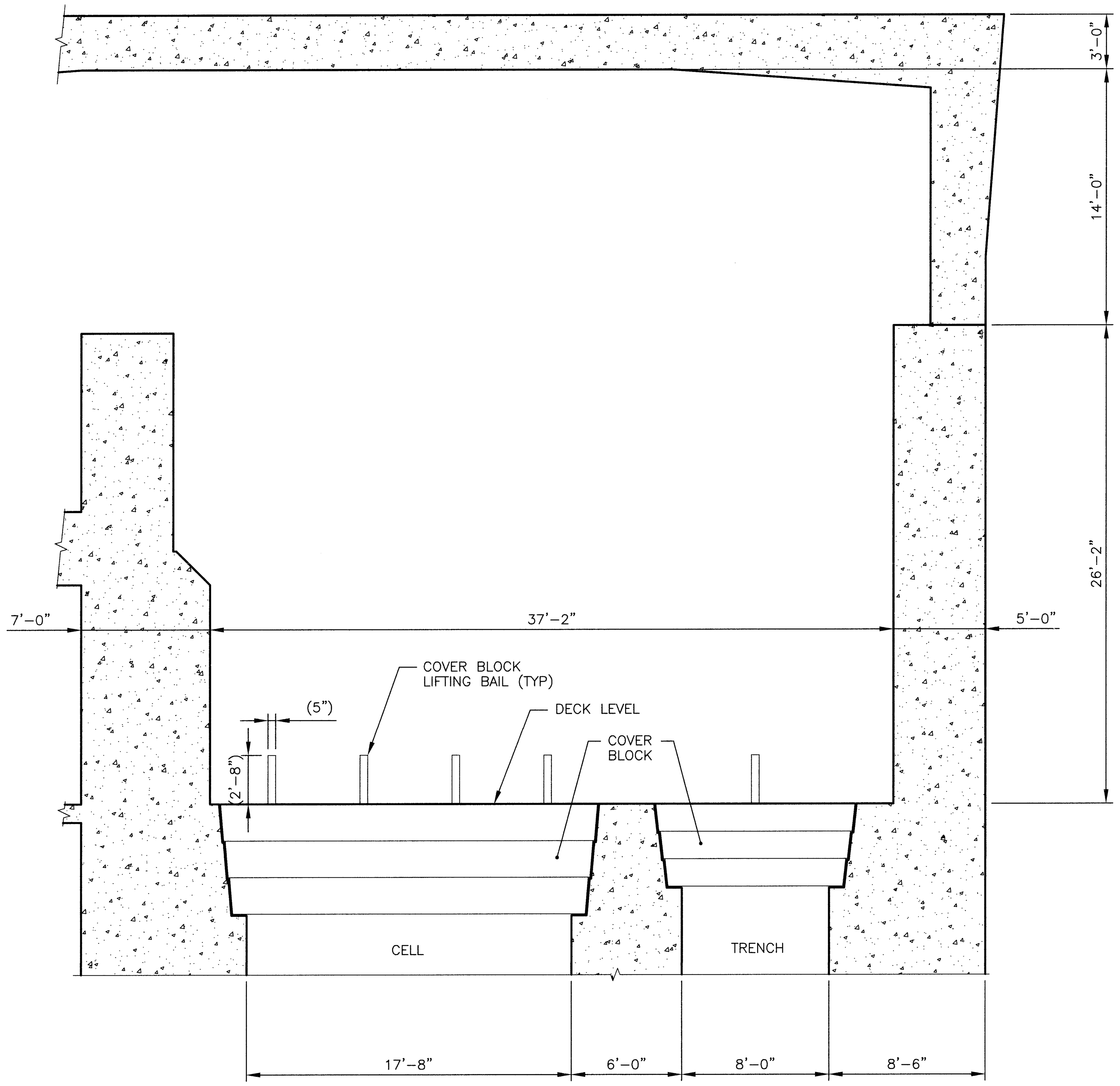
CANYON DECK
GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836723 | SHEET 1 | REV 0

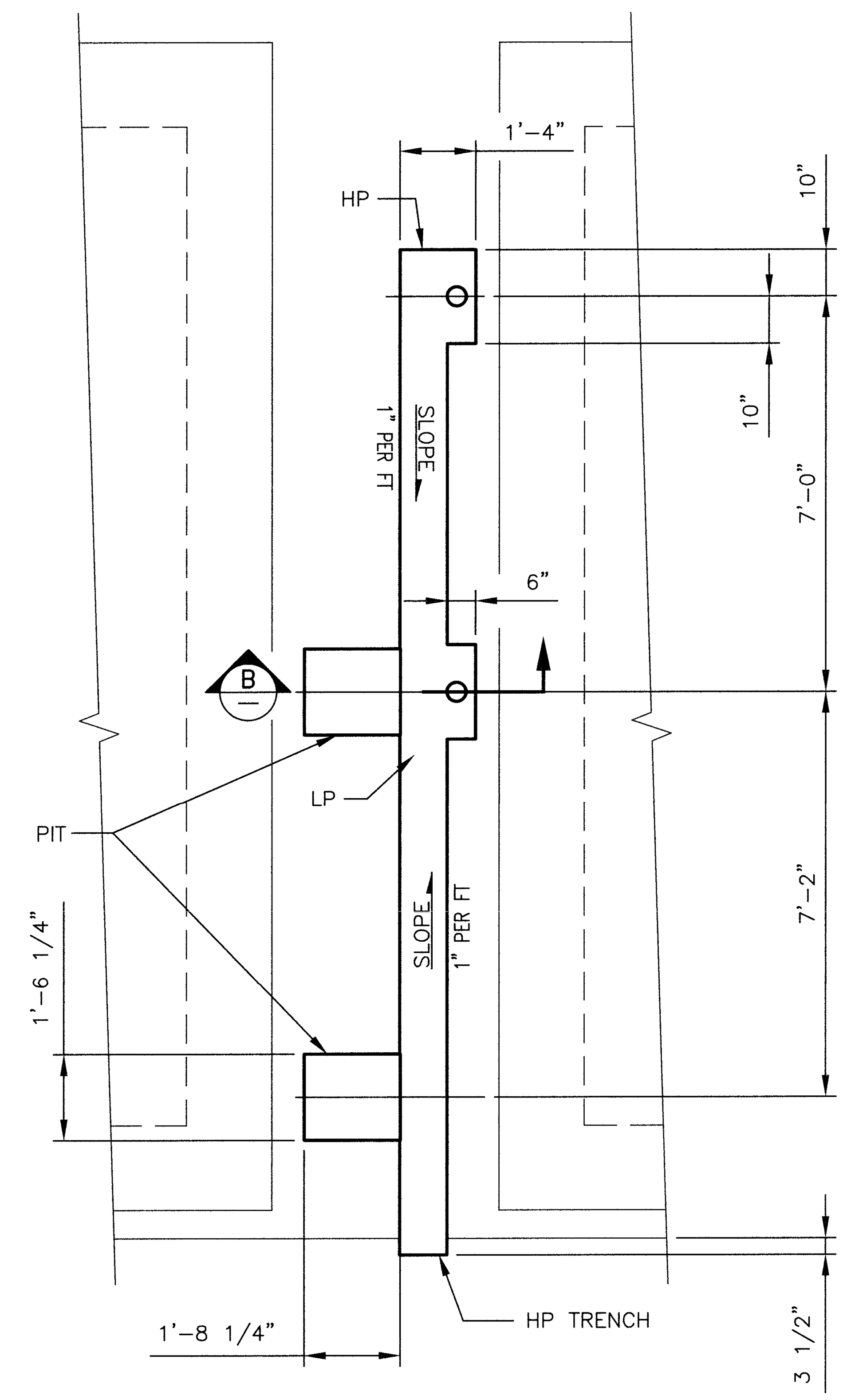
SCALE AS SHOWN

13359

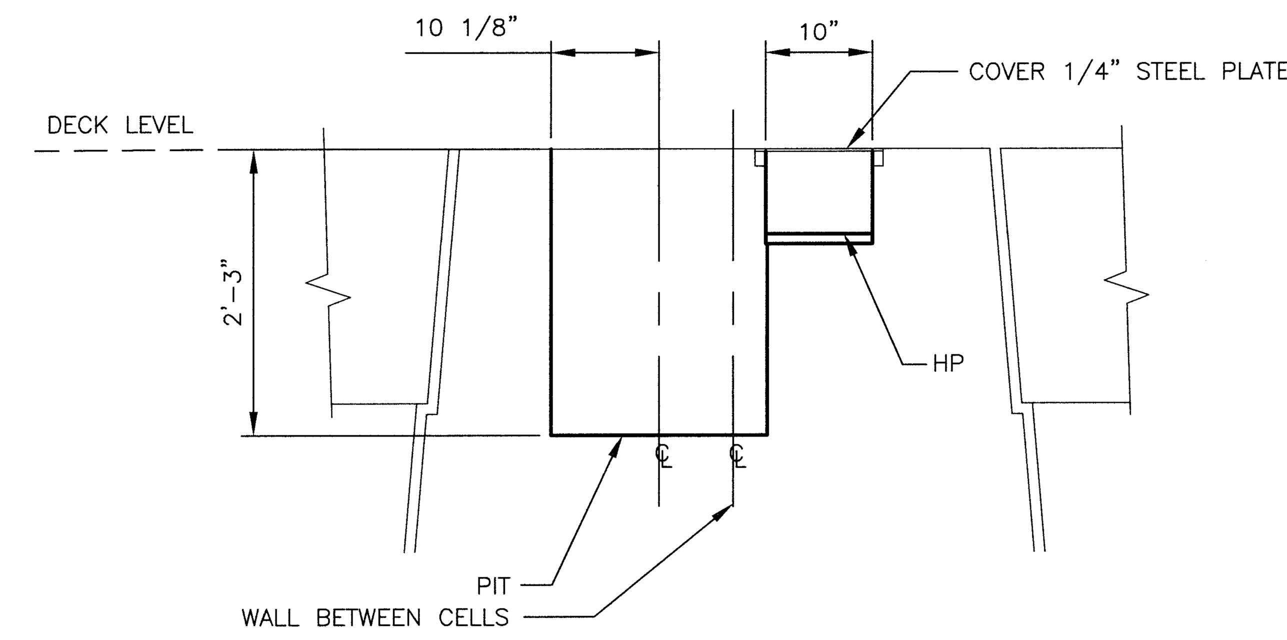
DOE_TB_F.DWG (JAN 2015)



A SECTION
SH 1 SCALE: 1/4"=1'-0"



1 TRENCH DETAIL
SH 1 SCALE: 1/2"=1'-0"



B SECTION
— SCALE: 1"=1'-0"

THOMAS B. SALZANO STATE OF WASHINGTON 29211 REGISTERED PROFESSIONAL ENGINEER

NOV 11 2015
DATE: HANFORD RELEASE
STA: 4 ID: 11

BLDG. NO.	CAUTION
221T	NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER B. PETRILLO	9/11/15	ARES
DRAFTING CHECKER J. BYERS	9/11/15	ARES
DISCIPLINE ENGINEER T. SALZANO	9-11-15	ARES
DESIGN AUTHORITY JR Rosser	11/4/15	

INDEX NO. 0901

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CANYON DECK
GENERAL STRUCTURE/AREA
SECTION

SIZE	DRAWING NUMBER	SHEET	REV
F	H-2-836723	2	0

SCALE AS SHOWN

18840

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

DWG NUMBER	TITLE

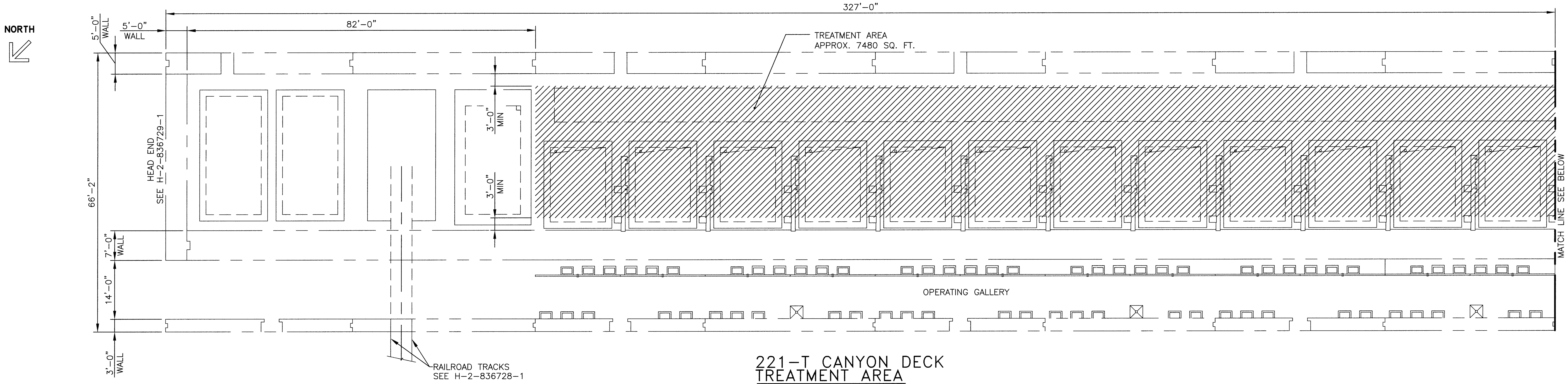
DRAWING TRACEABILITY LIST

REF NUMBER	TITLE

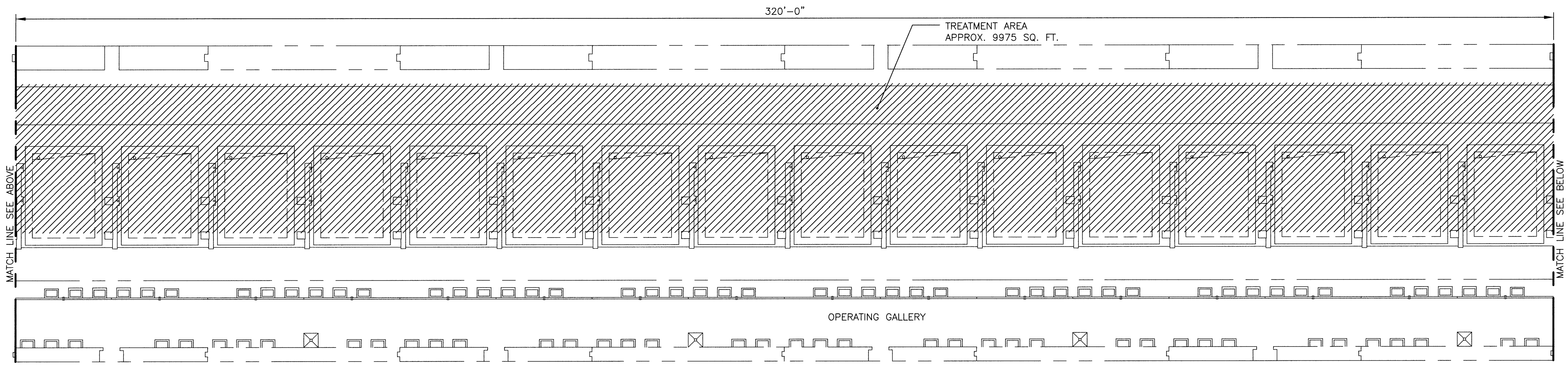
REFERENCES

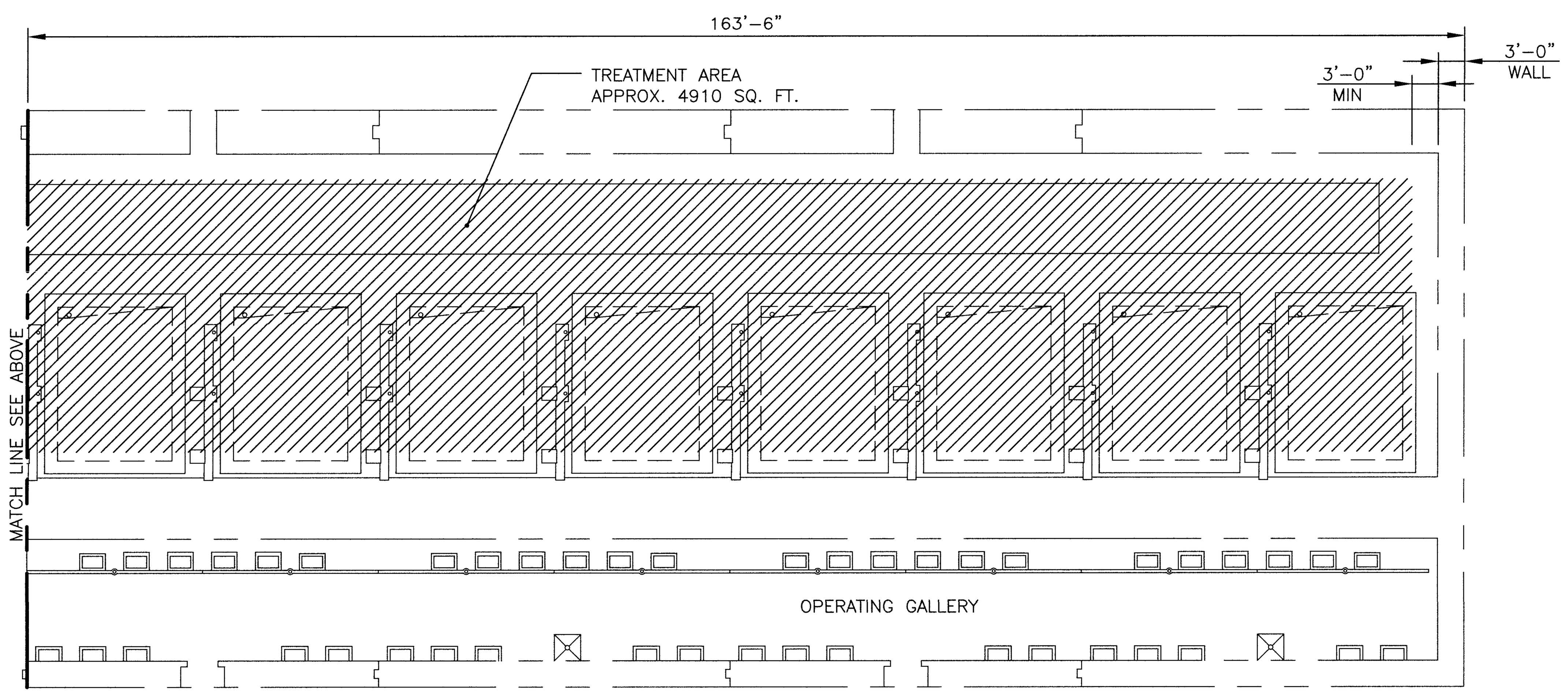
NEXT USED ON

DOE_TB_F.DWG (JAN 2015)



221-T CANYON DECK
TREATMENT AREA
SCALE: 3/32"=1'-0"





NOTE: TOTAL TREATMENT AREA APPROX. 22,365 SQ. FT.

NOV 11 2015
DATE: HANFORD RELEASE
STA: 4 ID: 11

BLDG. NO.	221T
INDEX NO.	0900

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	DATE	COMPANY
DRAFTER	B. PETRILLO		ARES
DRAFTING CHECKER	J. BYERS		ARES
DISCIPLINE ENGINEER	T. SALZANO		ARES
DESIGN AUTHORITY	JR Rosser		

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CANYON DECK
TREATMENT AREA
GENERAL LAYOUT

SIZE	DRAWING NUMBER	SHEET	REV
F	H-2-836723	3	0

SCALE AS SHOWN

19551

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

DWG NUMBER	TITLE

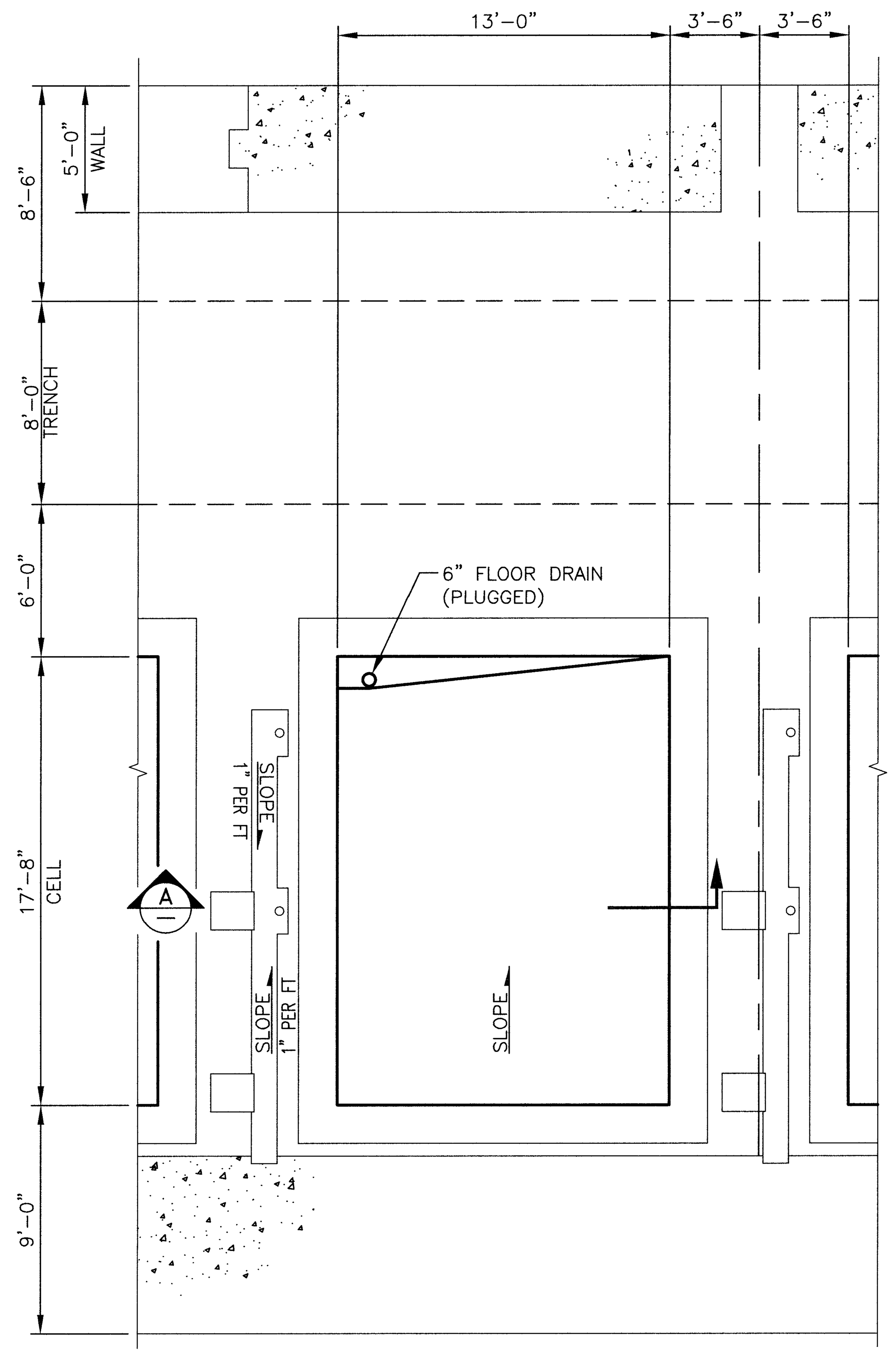
DRAWING TRACEABILITY LIST

REF NUMBER	TITLE

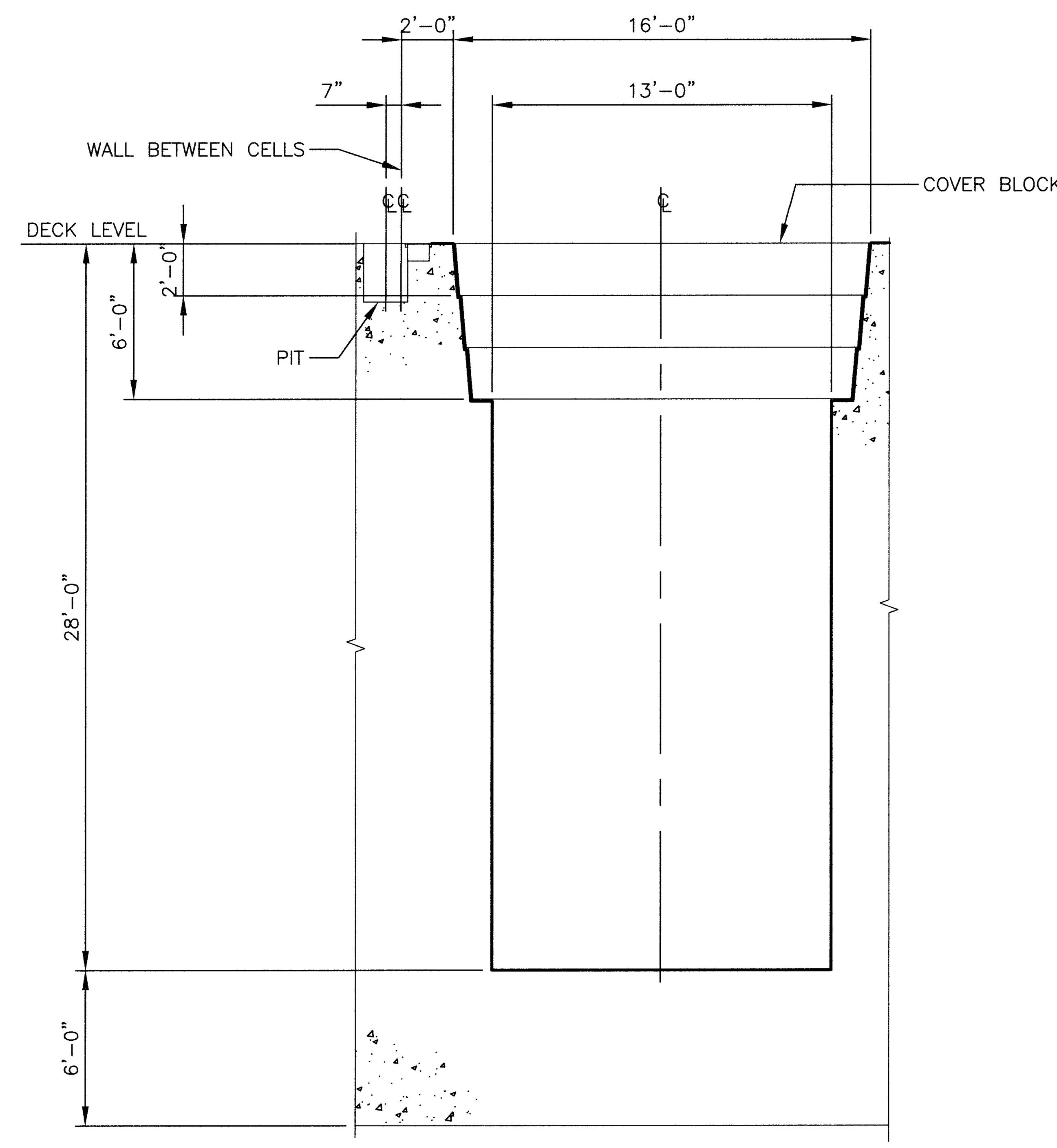
REFERENCES

NEXT USED ON

DOE_TB_F.DWG (JAN 2015)



CELL 7L
GENERAL STRUCTURE/AREA
SCALE: 1/4"=1'-0"



A SECTION
SCALE: 1/4"=1'-0"

NOV 11 2015
HANFORD RELEASE
11

BLDG. NO.	221T
INDEX NO.	0900

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	COMPANY
DRAFTER	B PETRILLO	ARES
DRAFTING CHECKER	J BYERS	ARES
DISCIPLINE ENGINEER	T SALZANO	ARES
DESIGN AUTHORITY	JR Rosser	

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CELL 7L
GENERAL STRUCTURE/AREA

SIZE	DRAWING NUMBER	SHEET	REV
F	H-2-836725	1	0

SCALE AS SHOWN

31162

REF NUMBER	TITLE
H-2-88633	STRUCTURAL CONCRETE PLANS & DETAILS

REFERENCES

NEXT USED ON

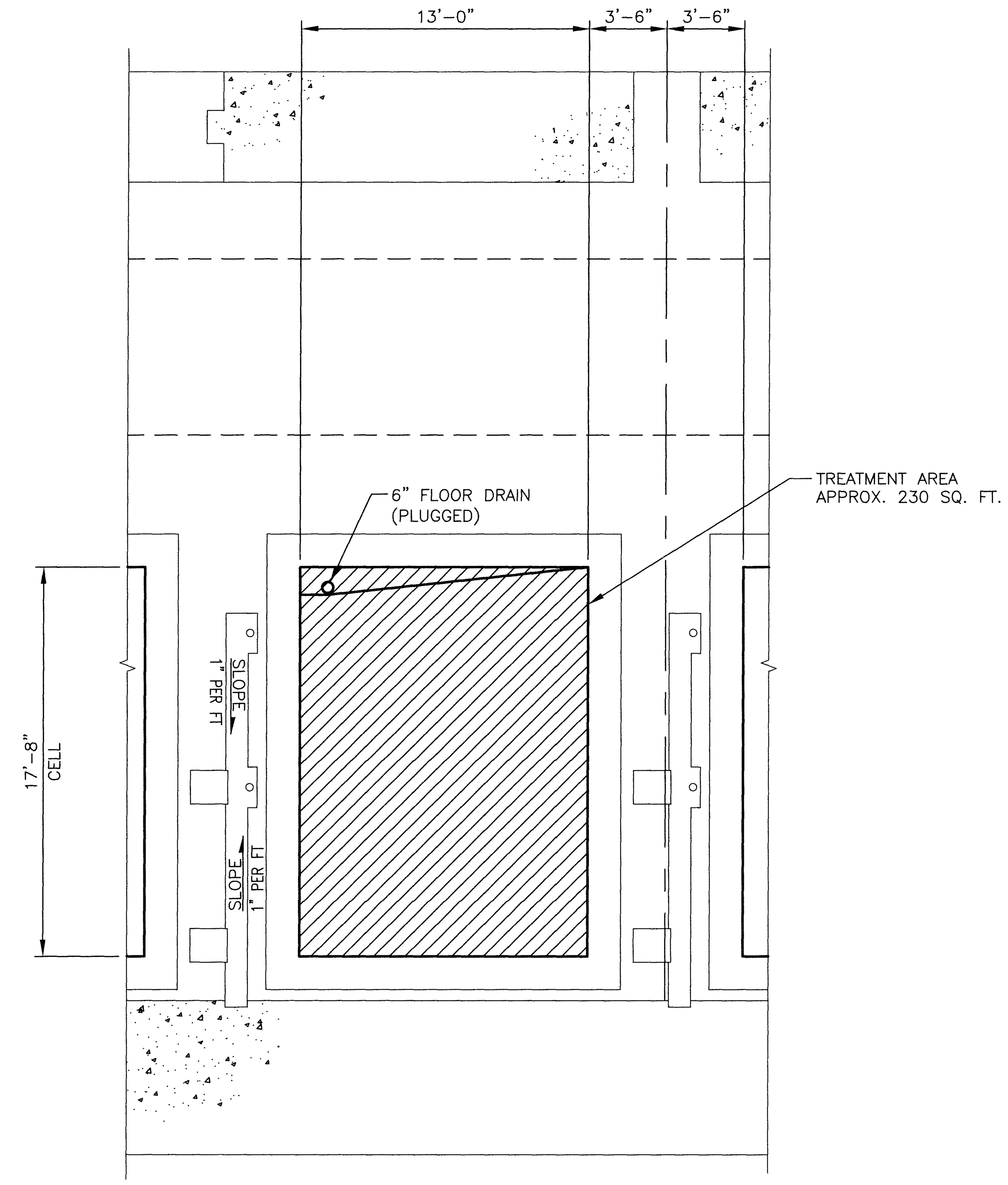
DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

DOE_TB_F.DWG (JAN 2015)



CELL 7L
TREATMENT AREA
SCALE: 1/4"=1'-0"

NOV 11 2015
DATE:
HANFORD
RELEASE
STA: 4
ID: 11

BLDG. NO.	221T
INDEX NO.	0900

CAUTION
NOT COMPLETE WITHOUT CURRENT
CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER B PETRILLO	9/10/15	ARES
DRAFTING CHECKER J BYERS		ARES
DISCIPLINE ENGINEER T SALZANO	9-11-15	ARES
DESIGN AUTHORITY JR Rosser	11/9/15	

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CELL 7L
TREATMENT AREA
GENERAL LAYOUT

SIZE	DRAWING NUMBER	SHEET	REV
F	H-2-836725	2	0

SCALE AS SHOWN
24759

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

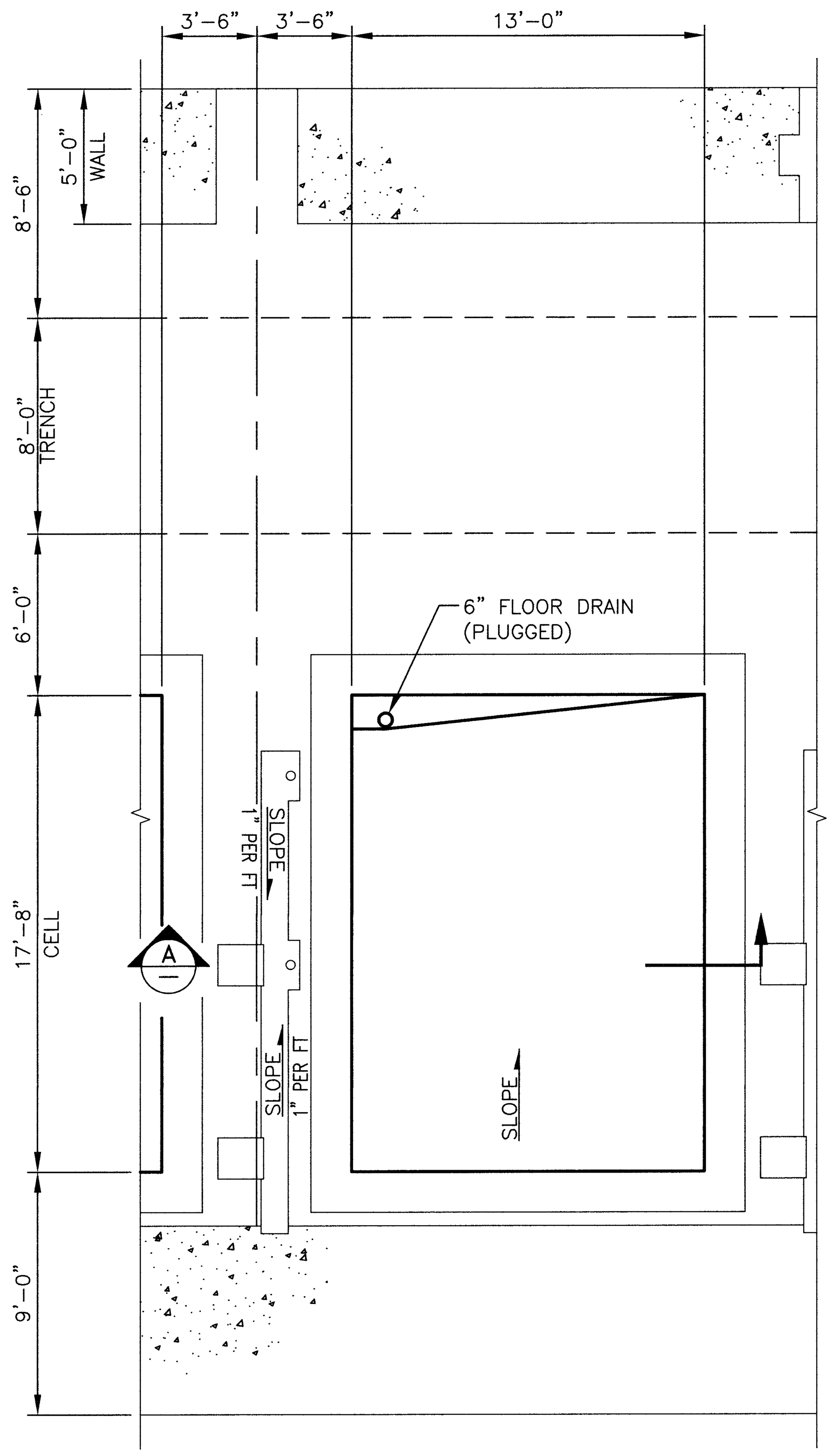
REF NUMBER	TITLE
NEXT USED ON	

REFERENCES

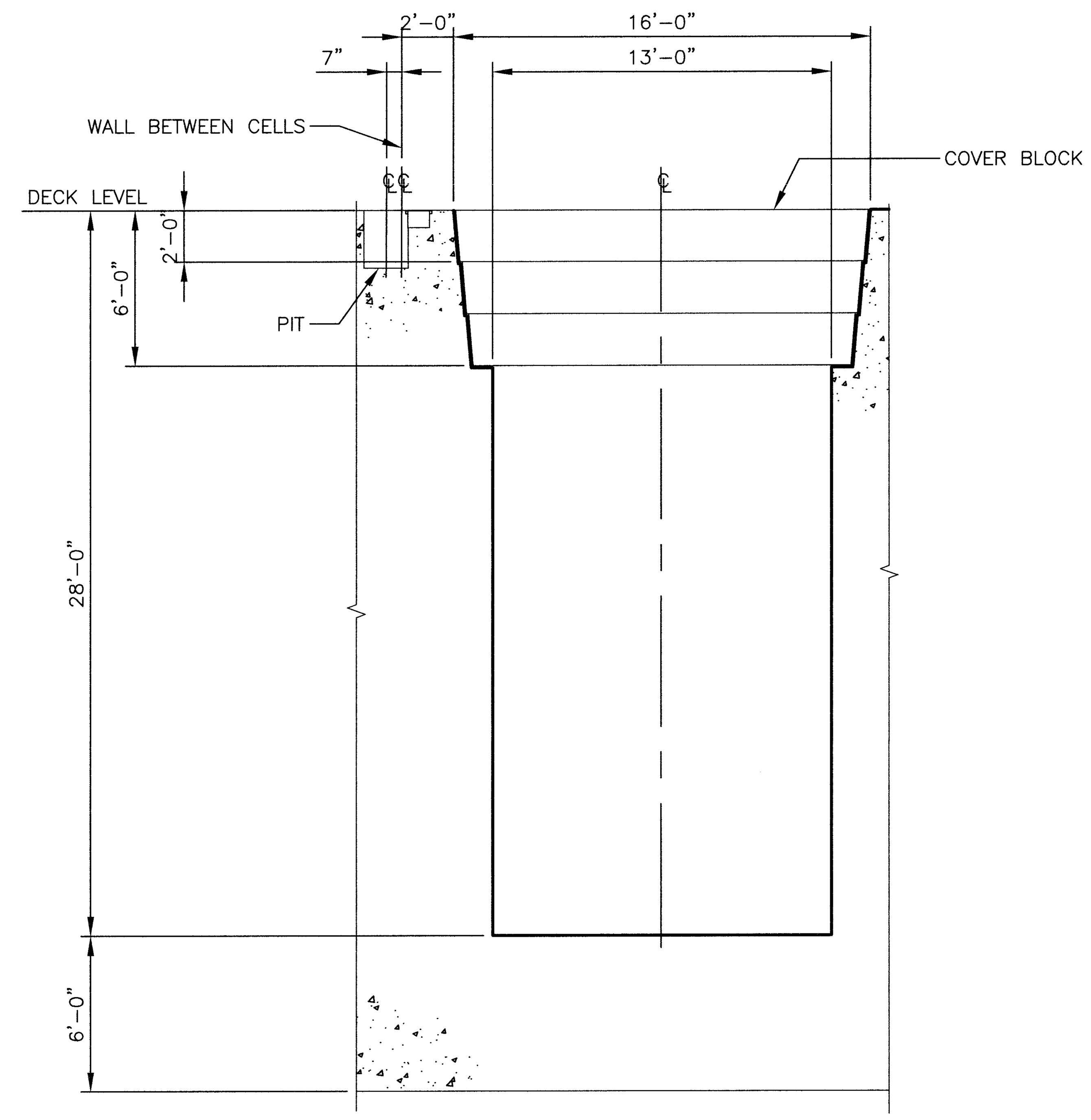
DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

DOE_TB_F.DWG (JAN 2015)



CELL 13R
GENERAL STRUCTURE/AREA
SCALE: 1/4"=1'-0"



(A) SECTION
SCALE: 1/4"=1'-0"

NOV 11 2015
DATE: HANFORD RELEASE
11

BLDG. NO. 221T	CAUTION: NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE
INDEX NO. 0900	U.S. DEPARTMENT OF ENERGY, Richland Operations Office

NAME	DATE	COMPANY
DRAFTER: B. PETRILLO	9/11/15	ARES
DRAFTING CHECKER: J. BYERS	9/11/15	ARES
DISCIPLINE ENGINEER: T. SALZANO	9-11-15	ARES
DESIGN AUTHORITY: JR Rosser	11/4/15	

CELL 13R
GENERAL STRUCTURE/AREA

SIZE: F | DRAWING NUMBER: H-2-836726 | SHEET: 1 | REV: 0

SCALE: AS SHOWN | 17607 | DOE_TB_F.DWG (JAN 2015)

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

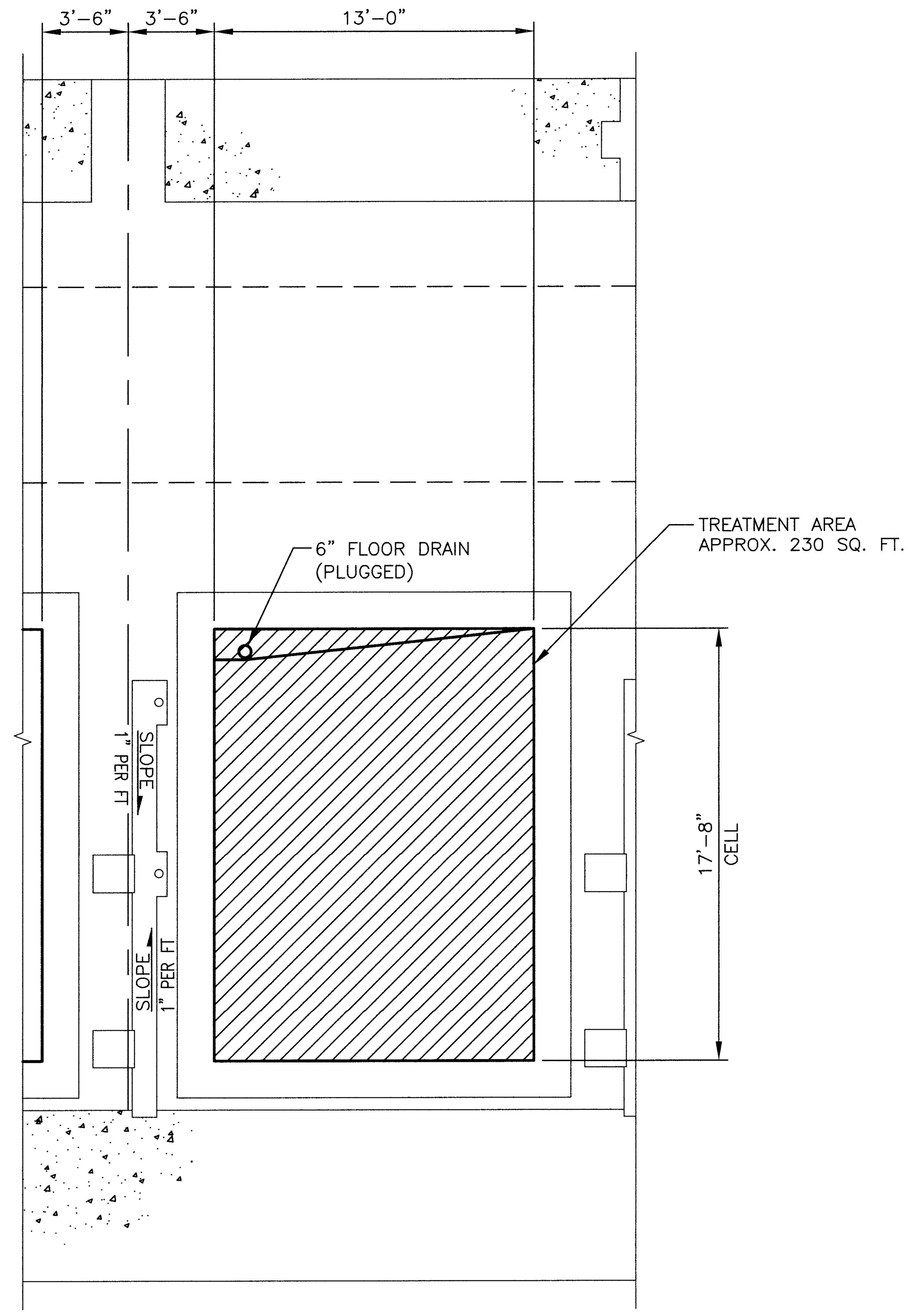
REF NUMBER	TITLE
H-2-88633	STRUCTURAL CONCRETE PLANS & DETAILS

REFERENCES

NEXT USED ON

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST



CELL 13R
TREATMENT AREA
SCALE: 1/4"=1'-0"

NOV 11 2015
DATE: HANFORD RELEASE
STA: 4 ID: 11

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
REFERENCES	
NEXT USED ON	

REV	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
REVISIONS	

BLDG. NO. 221T
INDEX NO. 0900

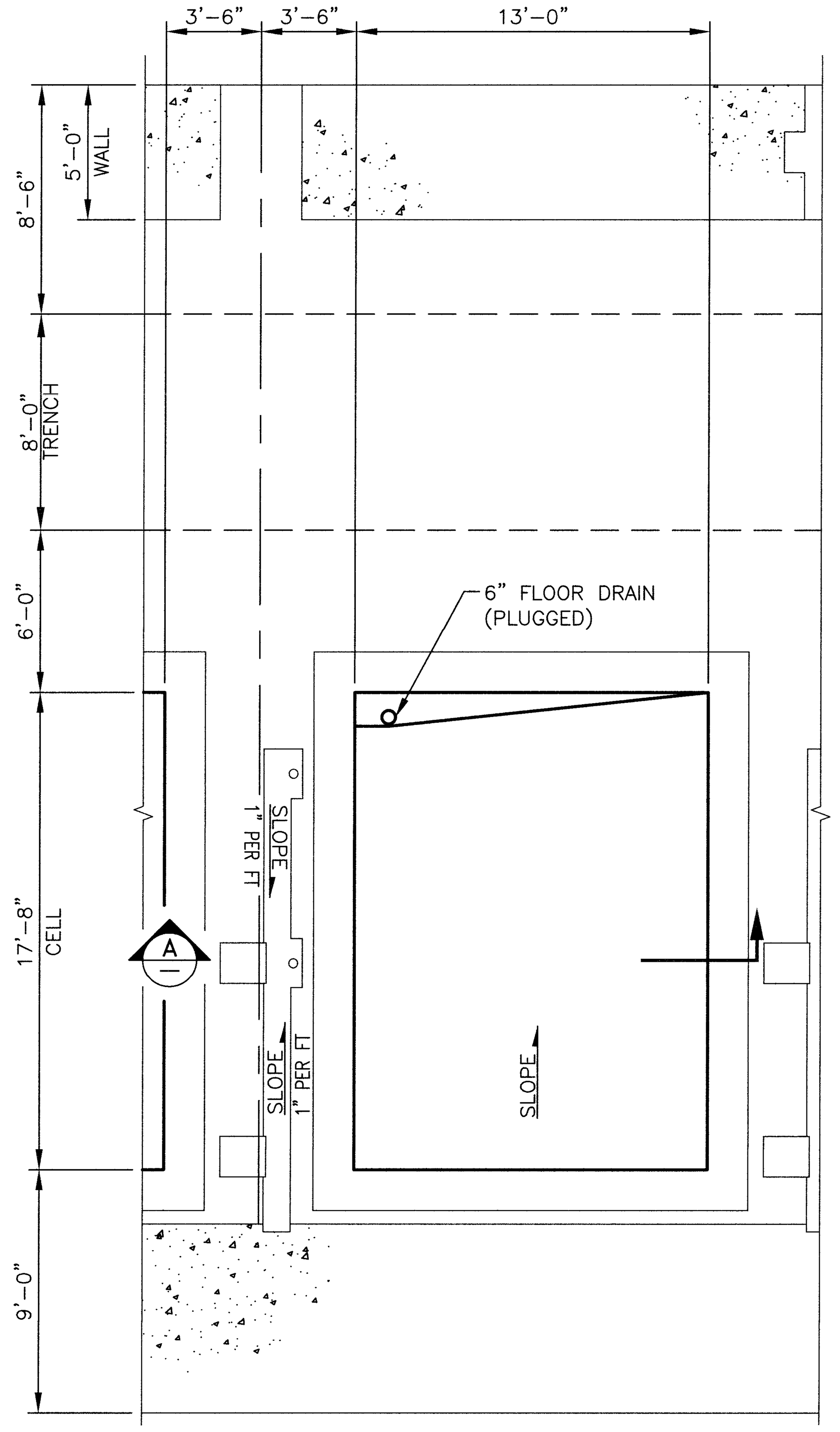
CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER B PETRILLO		ARES
DRAFTING CHECKER J BYERS		ARES
DISCIPLINE ENGINEER T SALZANO		ARES
DESIGN AUTHORITY JR Rosser		CHPRC

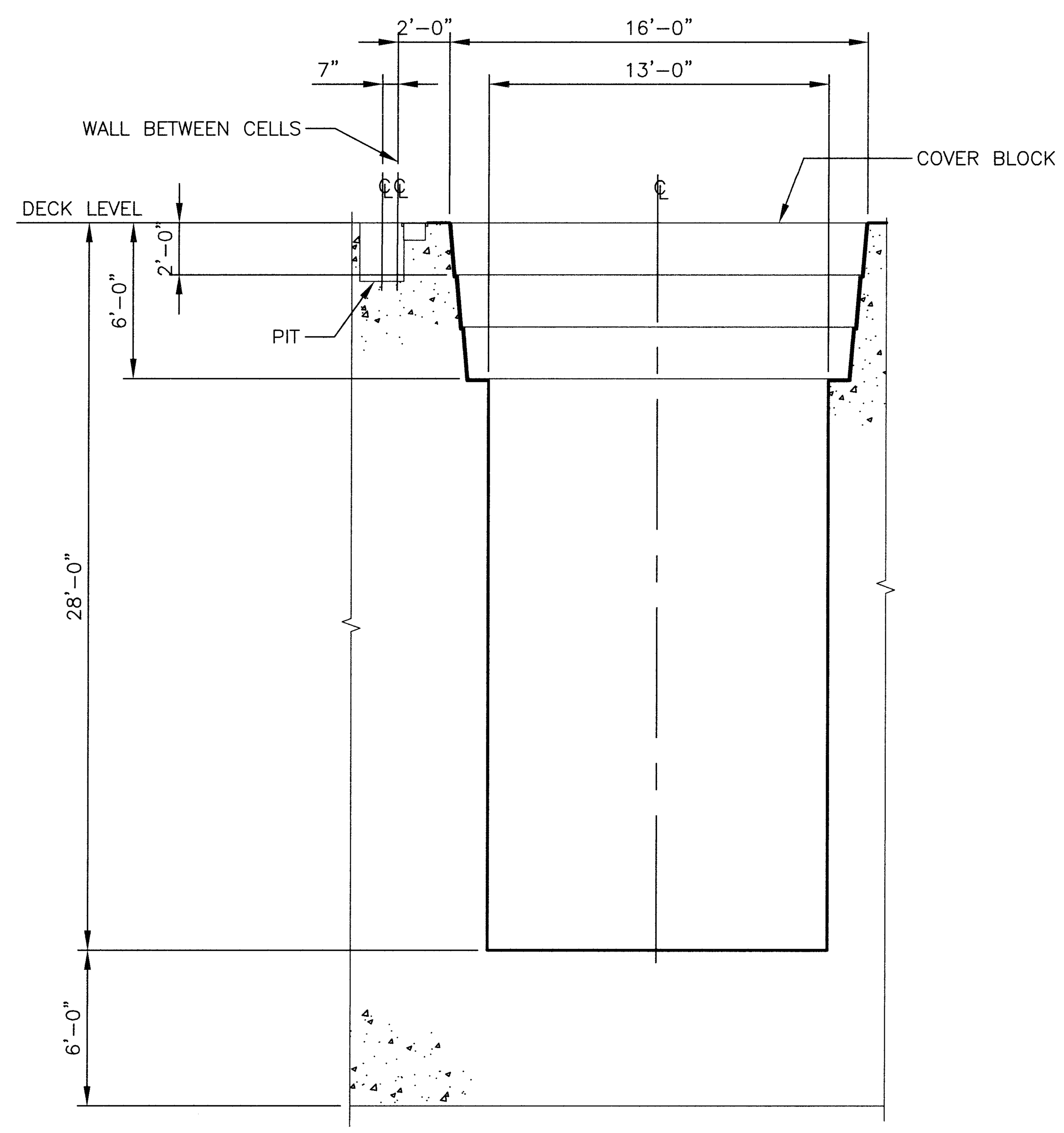
U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CELL 13R
TREATMENT AREA
GENERAL LAYOUT

SIZE F | DRAWING NUMBER H-2-836726 | SHEET 2 | REV 0
SCALE AS SHOWN
7385
DOE_TB_F.DWG (JAN 2015)



CELL 16R
GENERAL STRUCTURE/AREA
SCALE: 1/4"=1'-0"



(A) SECTION
SCALE: 1/4"=1'-0"

MOV 11 2015
HANFORD RELEASE
11

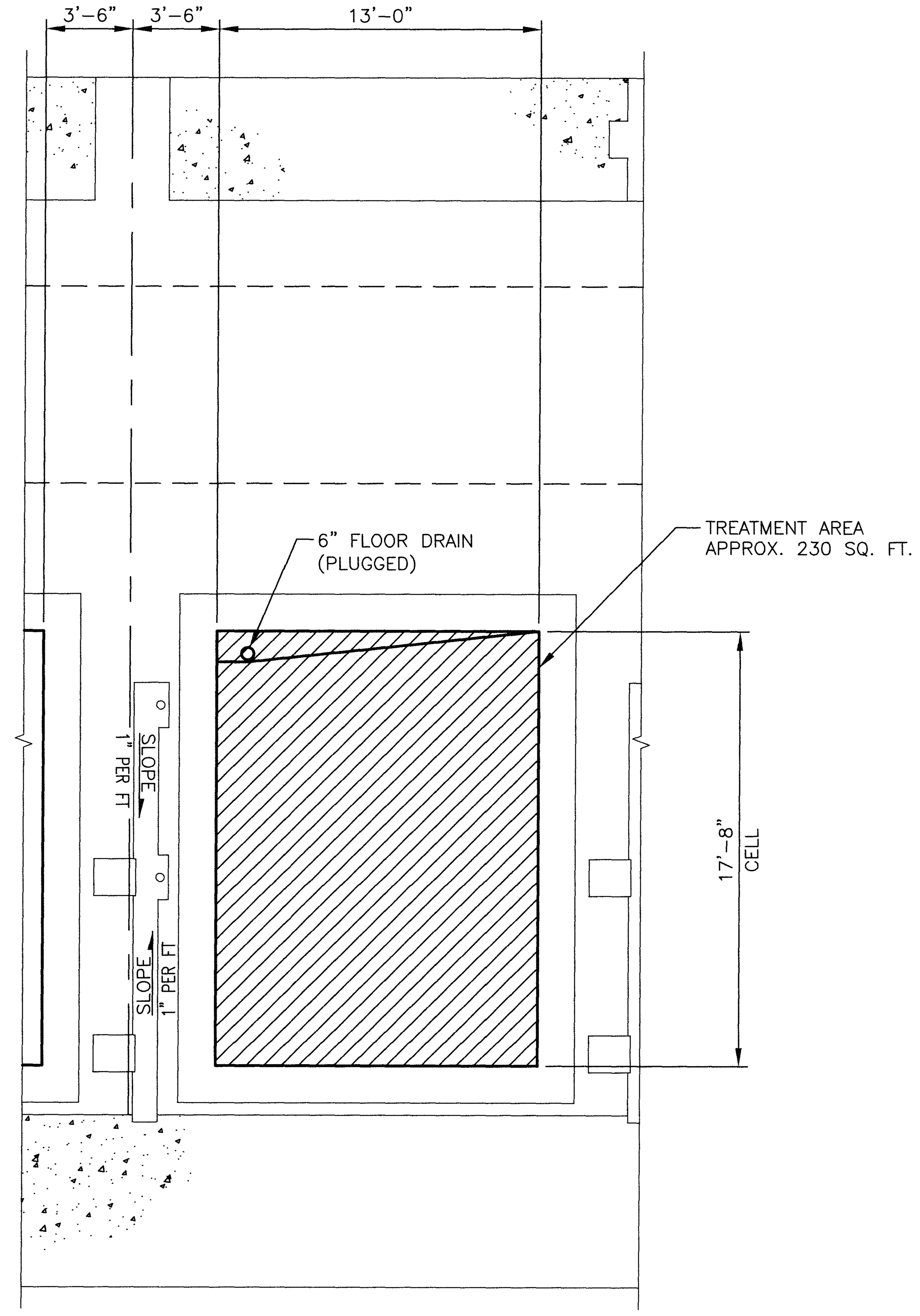
BLDG. NO. 221T	CAUTION NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE		
	NAME	DATE / COMPANY	U.S. DEPARTMENT OF ENERGY Richland Operations Office
	DRAFTER B PETRILLO	ARES	CELL 16R
	DRAFTING CHECKER J. BYERS	ARES	GENERAL STRUCTURE/AREA
	DISCIPLINE ENGINEER T SALZANO	ARES	
INDEX NO. 0900	DESIGN AUTHORITY JR Rosser		SIZE F; DRAWING NUMBER H-2-836724; SHEET 1; REV 0
			SCALE AS SHOWN
			23136

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
	REVISIONS

REF NUMBER	TITLE
H-2-88633	STRUCTURAL CONCRETE PLANS & DETAILS
	REFERENCES
NEXT USED ON	

DWG NUMBER	TITLE
	DRAWING TRACEABILITY LIST

DOE_TB_F.DWG (JAN 2015)



CELL 16R
TREATMENT AREA
SCALE: 1/4"=1'–0"

NOV 11 2015
DATE:
HANFORD
RELEASE
STA: 4
ID: 11

BLDG. NO. 221T

INDEX NO. 0900

CAUTION
NOT COMPLETE WITHOUT CURRENT
CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER B. PETRILLO	9/10/15	ARES
DRAFTING CHECKER J. BYERS	9/15/15	ARES
DISCIPLINE ENGINEER T. SALZANO	9-16-15	ARES
DESIGN AUTHORITY JR Rosser	11/9/15	

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CELL 16R
TREATMENT AREA
GENERAL LAYOUT

SIZE F | DRAWING NUMBER H–2–836724 | SHEET 2 | REV 0

SCALE AS SHOWN

2879

DOE_TB_F.DWG (JAN 2015)

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR–15–000699

REVISIONS

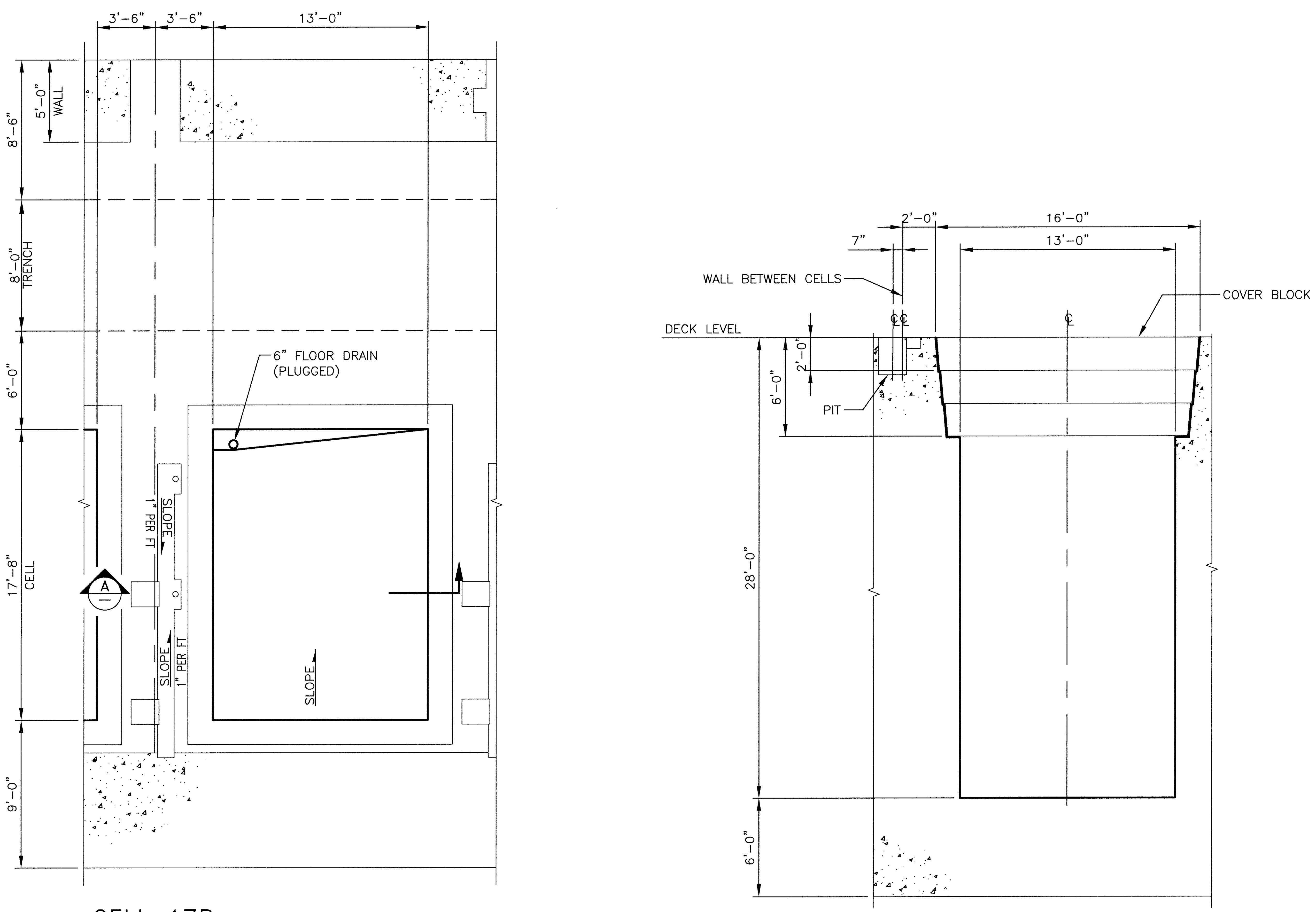
REF NUMBER	TITLE

REFERENCES

NEXT USED ON

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST



CELL 17R
GENERAL STRUCTURE/AREA
SCALE: 1/4"=1'-0"

A SECTION
SCALE: 1/4"=1'-0"

NOV 11 2015
HANFORD RELEASE
ID: 11

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
H-2-88633	STRUCTURAL CONCRETE PLANS & DETAILS
NEXT USED ON	REFERENCES

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
	REVISIONS

BLDG. NO. 221T
INDEX NO. 0900

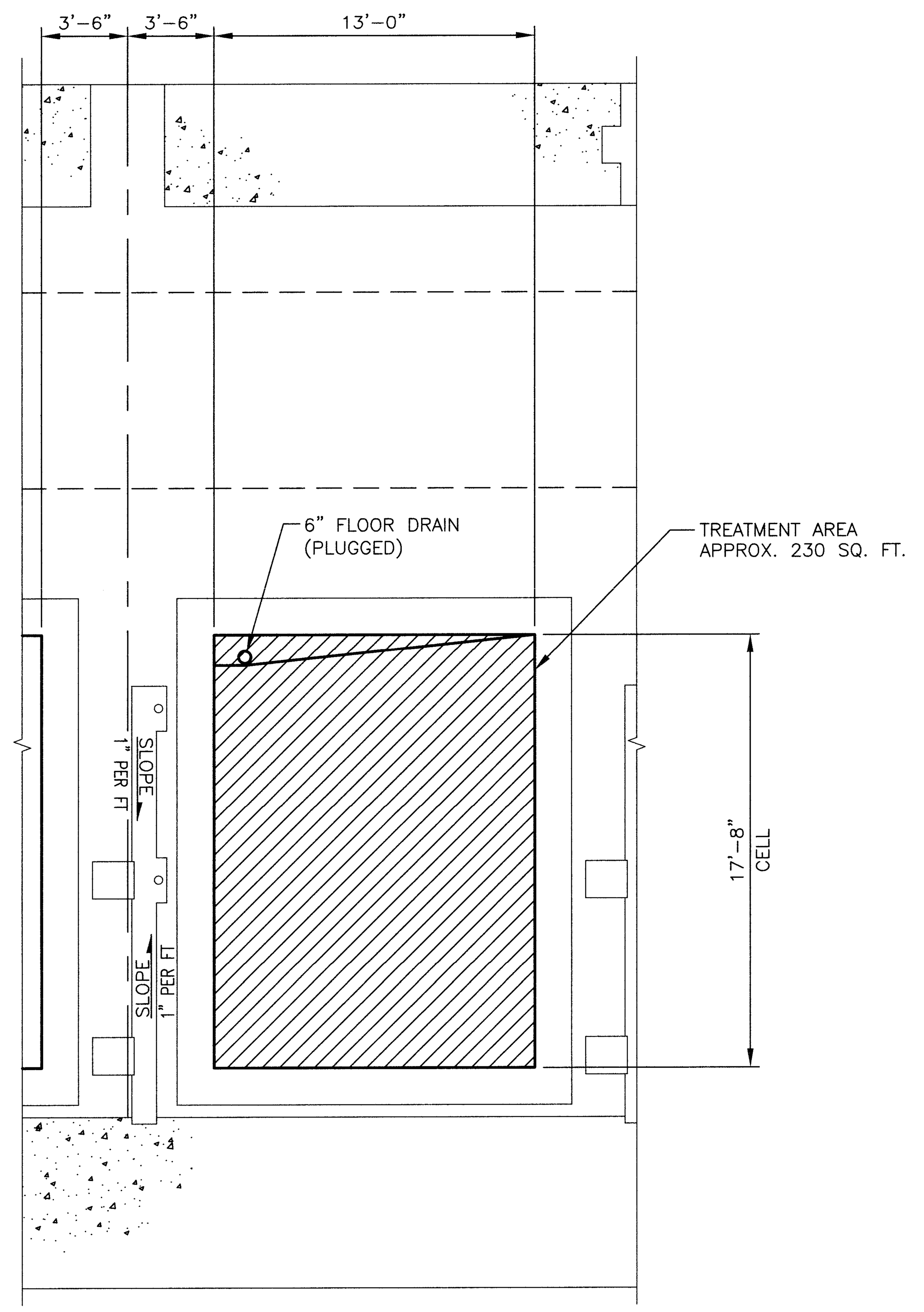
CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	DATE	COMPANY
DRAFTER	B PETRILLO		ARES
DRAFTING CHECKER	J BYERS		ARES
DISCIPLINE ENGINEER	T SALZANO		ARES
DESIGN AUTHORITY	JR Rosser		CHPRC

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

CELL 17R
GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836727 | SHEET 1 | REV 0
SCALE AS SHOWN
21425



CELL 17R
TREATMENT AREA
SCALE: 1/4"=1'-0"

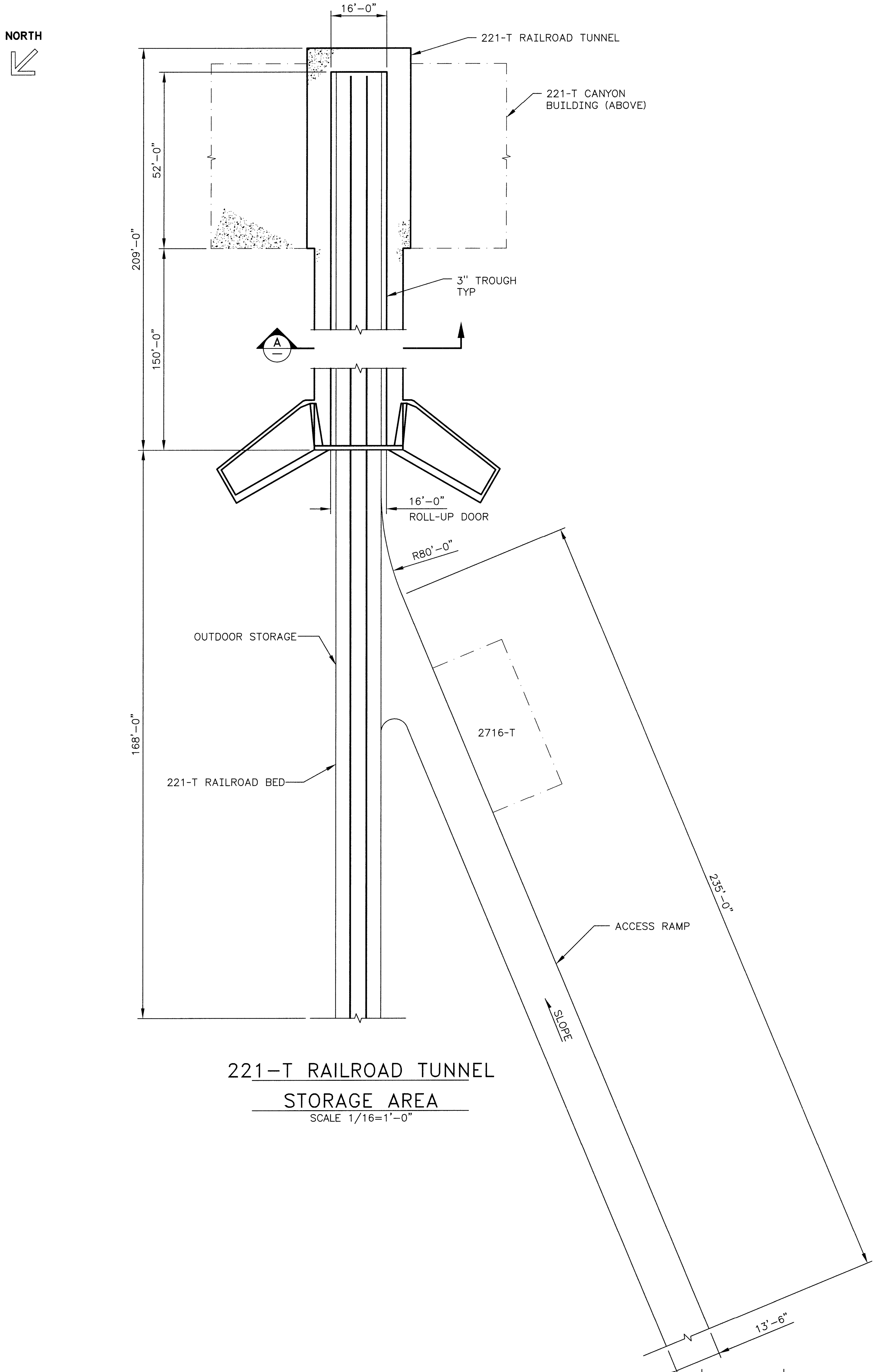
BLDG. NO.	CAUTION	
221T	NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE	
	NAME / DATE / COMPANY	U.S. DEPARTMENT OF ENERGY Richland Operations Office
	DRAFTER: B PETRILLO — ARES	CELL 17R TREATMENT AREA GENERAL LAYOUT
	DRAFTING CHECKER: J BYERS — ARES	
	DISCIPLINE ENGINEER: T SALZANO — ARES	
INDEX NO. 0900	DESIGN AUTHORITY: JR Rosser	SIZE F — DRAWING NUMBER H-2-836727 — SHEET 2 — REV 0
		SCALE AS SHOWN

REV	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

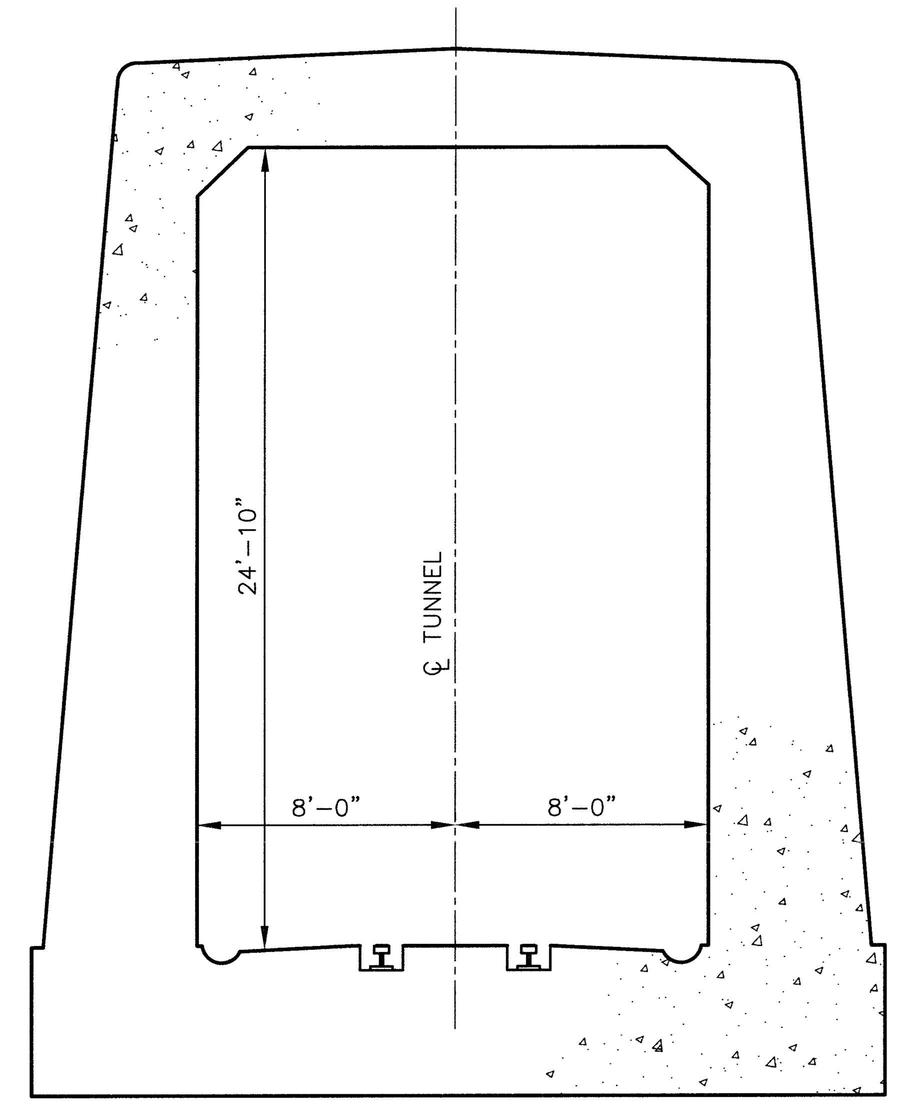
REVISIONS

DWG NUMBER	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		NEXT USED ON	REFERENCES

NOV 11 2015 — HANFORD RELEASE



221-T RAILROAD TUNNEL STORAGE AREA
SCALE 1/16=1'-0"



A ELEVATION
SCALE: 1/4"=1'-0"

REF NUMBER	TITLE
H-2-886339-9	STRUCTURAL CONCRETE SECTIONS 1 & 2 TUNNEL
H-2-80738-1	M STRL/ACHOR BOLT PLANS, SECTIONS & DETAILS
W-69334-1	CONCRETE PLANS & DETAILS SECTIONS 1 & 2

REFERENCES

NEXT USED ON

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

MFD / REV REL	REV NO.	DESCRIPTION
	0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

BLDG. NO. 221T

INDEX NO. 0901

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER D BOOTHROYD	10/19/15	ARES
DRAFTING CHECKER J BYERS	10.19.15	ARES
DISCIPLINE ENGINEER T SALZANO	10-15-15	ARES
DESIGN AUTHORITY JR Rosser	11/4/15	

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

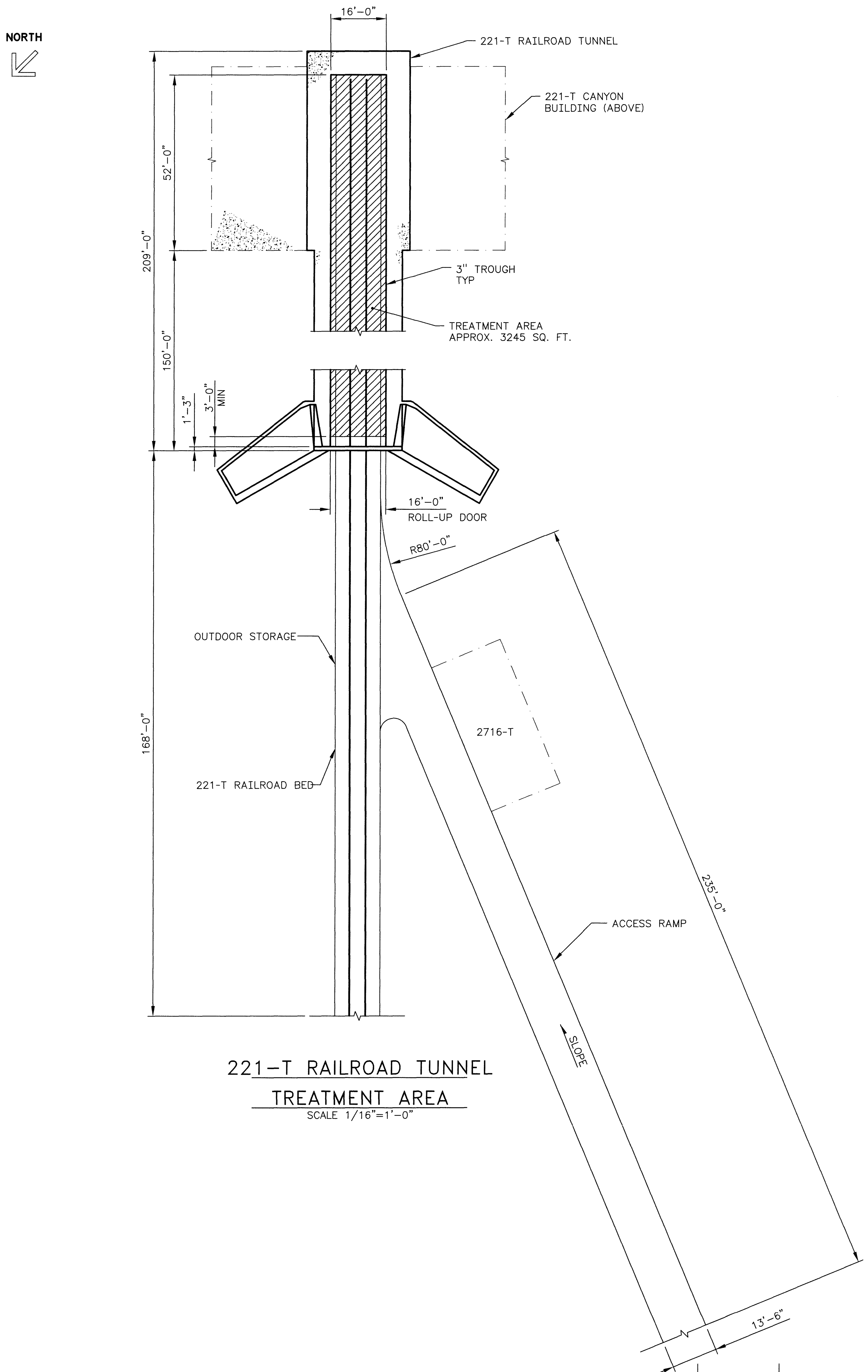
RAILROAD TUNNEL
GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836728 | SHEET 1 | REV 0
SCALE AS SHOWN

3852 DOE_TB_F.DWG (JAN 2015)

THOMAS B. SALZANO, STATE OF WASHINGTON, 29211, REGISTERED PROFESSIONAL ENGINEER

NOV 11 2015 DATE: HANFORD RELEASE STA: 4 ID: 11



221-T RAILROAD TUNNEL TREATMENT AREA
SCALE 1/16"=1'-0"

HANFORD RELEASE — NOV 11 2015 — STA: 4 — ID: 11

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
REFERENCES	
NEXT USED ON	

MFD REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
REVISIONS	

BLDG. NO. 221T
INDEX NO. 0900

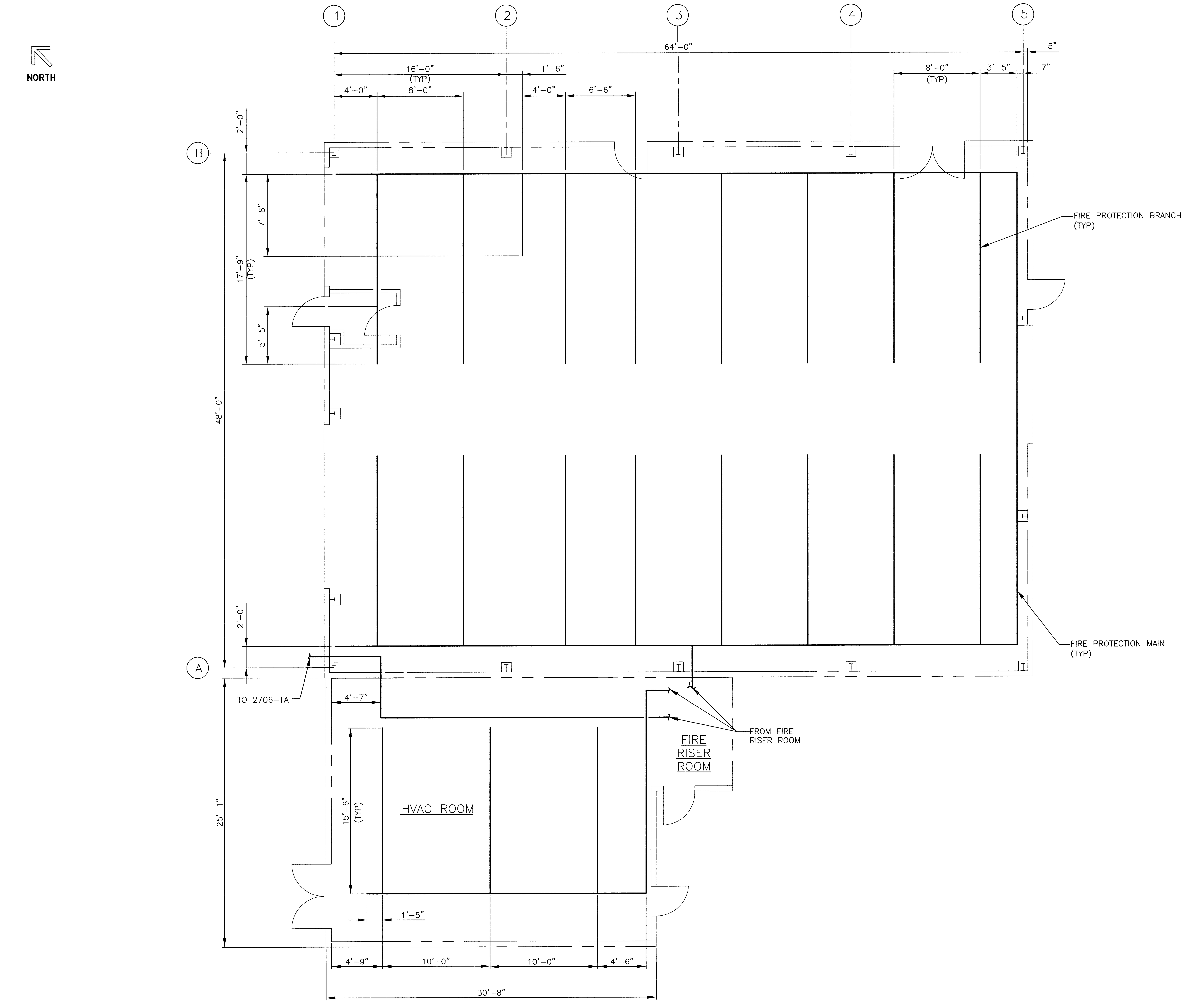
CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER D. BOOTHROYD		
DRAFTING CHECKER J. BYERS		ARES
DISCIPLINE ENGINEER T. SALZANO		ARES
DESIGN AUTHORITY JR Rosser		

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

RAILROAD TUNNEL
TREATMENT AREA
GENERAL LAYOUT

SIZE F — DRAWING NUMBER H-2-836728 — SHEET 2 — REV 0
SCALE AS SHOWN
27013
DOE_TB_F.DWG (JAN 2015)



2706-T FIRE PROTECTION SYSTEM

SCALE: 1/4"=1'-0"

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
H-2-83094	ARCH FOUNDATION PLAN
H-2-83139	FIRE PROTECTION SPRINKLER SYSTEM PLAN
REFERENCES	
NEXT USED ON	

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
REVISIONS	

BLDG. NO. 2706T

INDEX NO. 1201

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE	COMPANY
DRAFTER J. SHEATS		ARES
DRAFTING CHECKER J. BYERS		ARES
DISCIPLINE ENGINEER T. SALZANO		ARES
DESIGN AUTHORITY JR Rosser		

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

FIRE PROTECTION SYSTEM
GENERAL LAYOUT

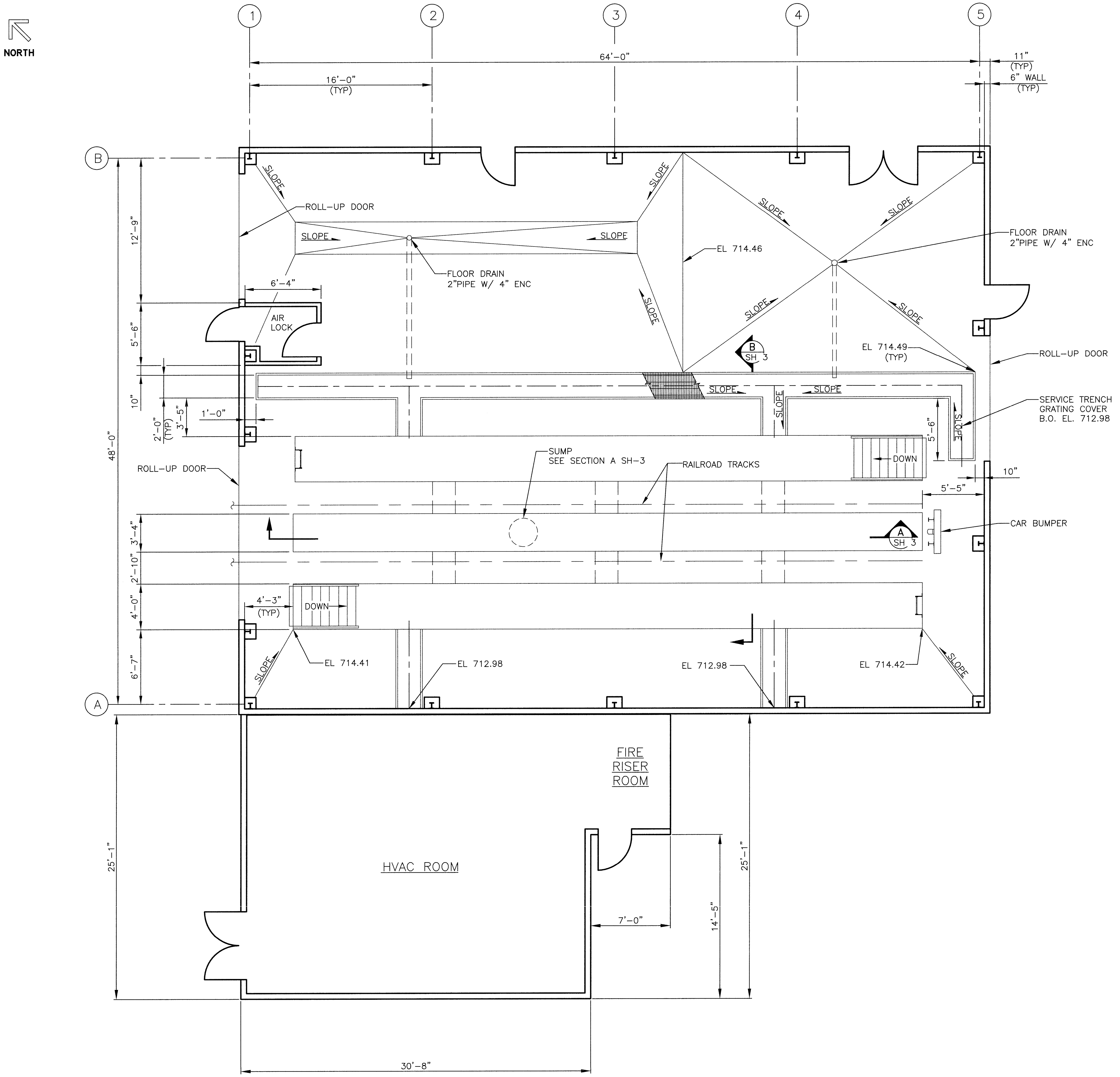
SIZE	DRAWING NUMBER	SHEET	REV
F	H-2-836732	1	0

SCALE AS SHOWN

4224

DOE_TB_F.DWG (JAN 2015)

NOV 11 2015
DATE: HANFORD RELEASE
STA: 4 ID: 11



2706-T SECONDARY CONTAINMENT

SCALE: 1/4"=1'-0"

NOTES:
1. DATUM ELEVATION FINISH FLOOR = APPROX 714'-5"

THOMAS B. SALZANO, STATE OF WASHINGTON, REGISTERED PROFESSIONAL ENGINEER, 29211

NOV 11 2015 HANFORD RELEASE ID: 11

REF NUMBER	TITLE
H-2-83094	ARCH FOUNDATION PLAN
H-2-3794	ARCH STRUCTURAL FLOOR PLAN
H-2-83088	ARCH FLOOR PLAN

REFERENCES

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

NEXT USED ON

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

BLDG. NO. 2706T

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	COMPANY
DRAFTER	J SHEATS	ARES
DRAFTING CHECKER	J BYERS	ARES
DISCIPLINE ENGINEER	T SALZANO	ARES

INDEX NO. 0900

DESIGN AUTHORITY JR Rosser

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

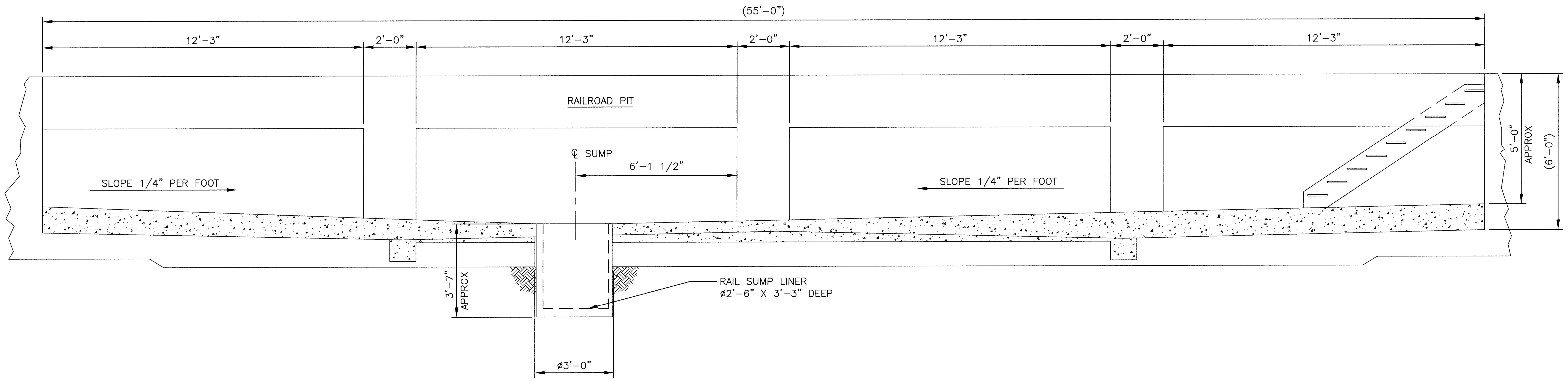
SECONDARY CONTAINMENT DESIGN

SIZE F DRAWING NUMBER H-2-836732 SHEET 2 REV 0

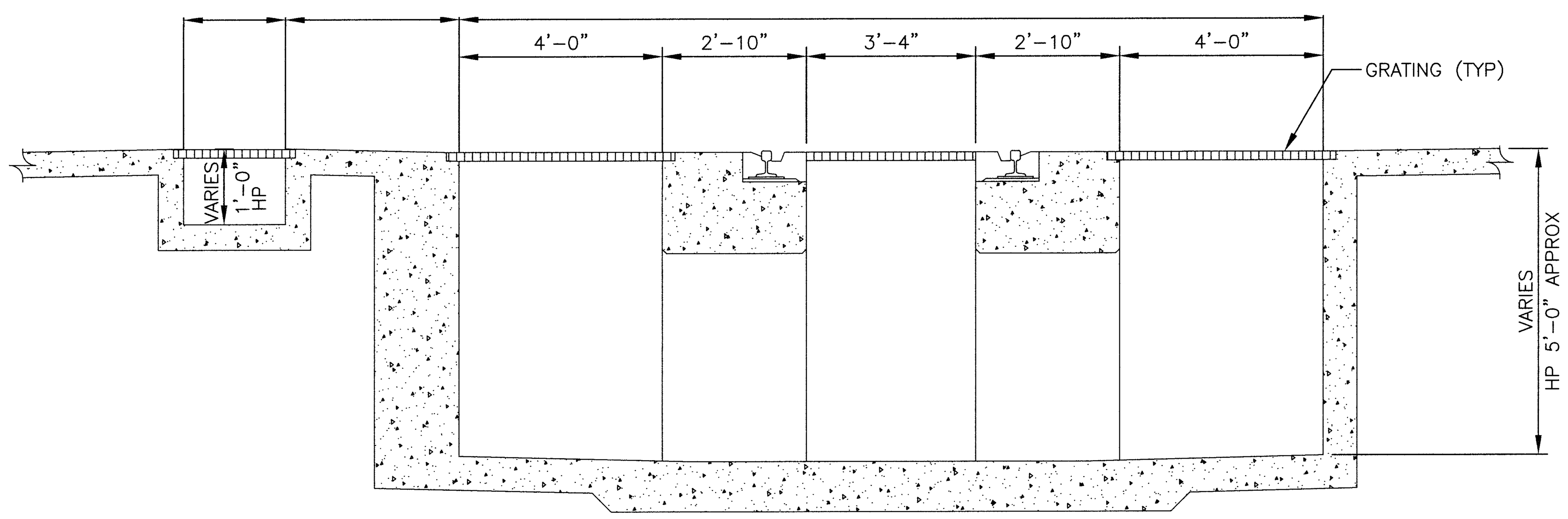
SCALE AS SHOWN

23045

DOE_TB_F.DWG (JAN 2015)



A SECTION
SH 2 SCALE: 1/2"=1'-0"



B SECTION
SH 2 SCALE: 1/2"=1'-0"

NOV 11 2015
HANFORD RELEASE
4
11

BLDG. NO. 2706T	CAUTION NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE
	DRAFTER J. SHEATS ARES
	DRAFTING CHECKER J. BYERS ARES
	DISCIPLINE ENGINEER T. SALZANO ARES
INDEX NO. 0901	DESIGN AUTHORITY JR Rosser

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

SECONDARY CONTAINMENT DESIGN SECTIONS

SIZE F | DRAWING NUMBER H-2-836732 | SHEET 3 | REV 0
SCALE AS SHOWN
11695

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

REF NUMBER	TITLE
H-2-3793	ARCH-STRUCTURAL FOUNDATION PLAN

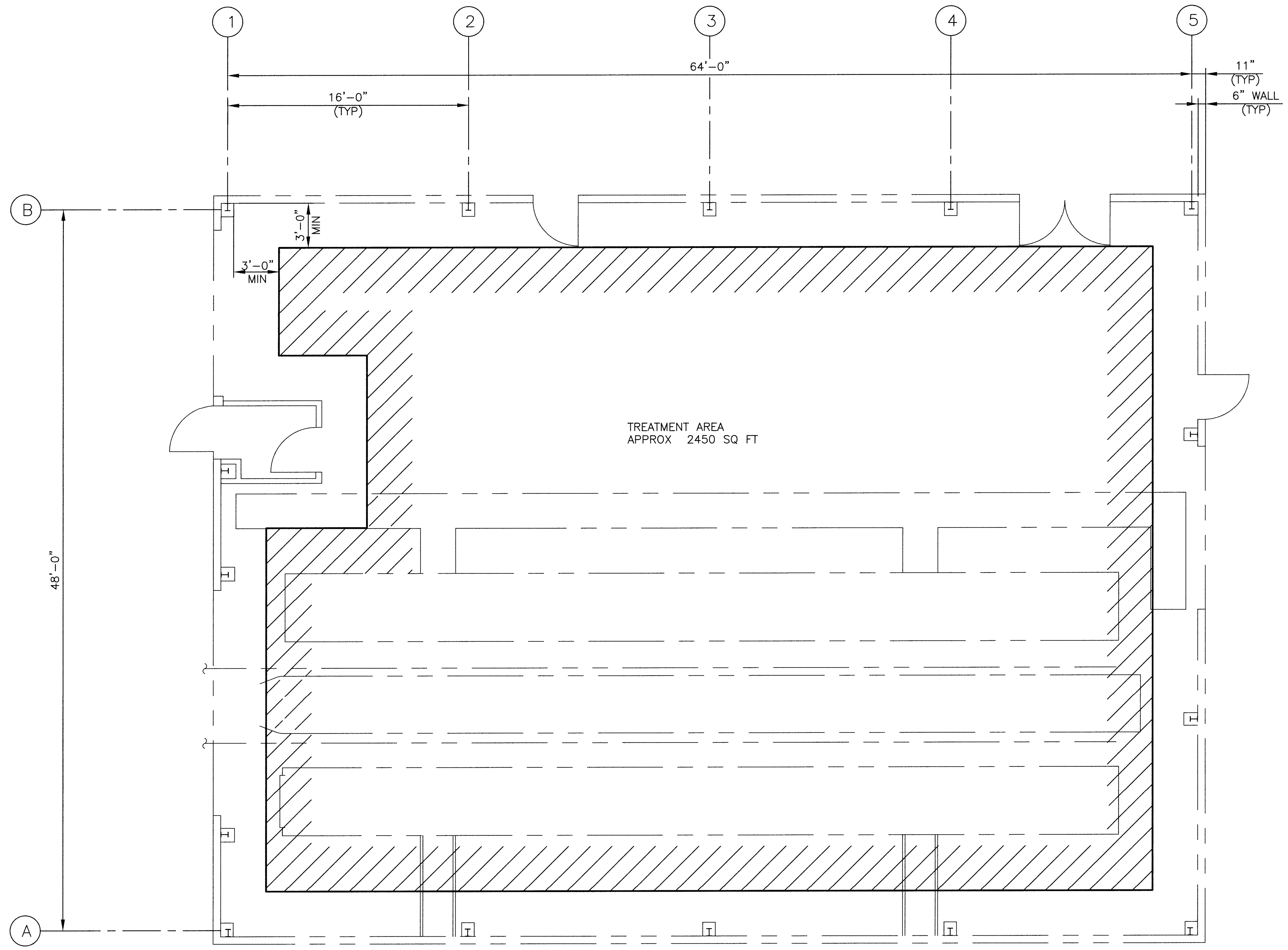
REFERENCES

NEXT USED ON

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

NORTH



2706-T TREATMENT AREA
SCALE: 1/4"=1'-0"

NOV 11 2015 HANFORD RELEASE 11

BLDG. NO.	CAUTION
2706T	NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	DATE	COMPANY
DRAFTER	J. SHEATS		ARES
DRAFTING CHECKER	J. BYERS		ARES
DISCIPLINE ENGINEER	T. SALZANO		ARES
DESIGN AUTHORITY	JR Rosser		

INDEX NO. 0900

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

TREATMENT AREA
GENERAL LAYOUT

SIZE	DRAWING NUMBER	SHEET	REV
F	H-2-836732	4	0

SCALE AS SHOWN
8772

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

DWG NUMBER	TITLE	REF NUMBER	TITLE

DRAWING TRACEABILITY LIST | REFERENCES | NEXT USED ON

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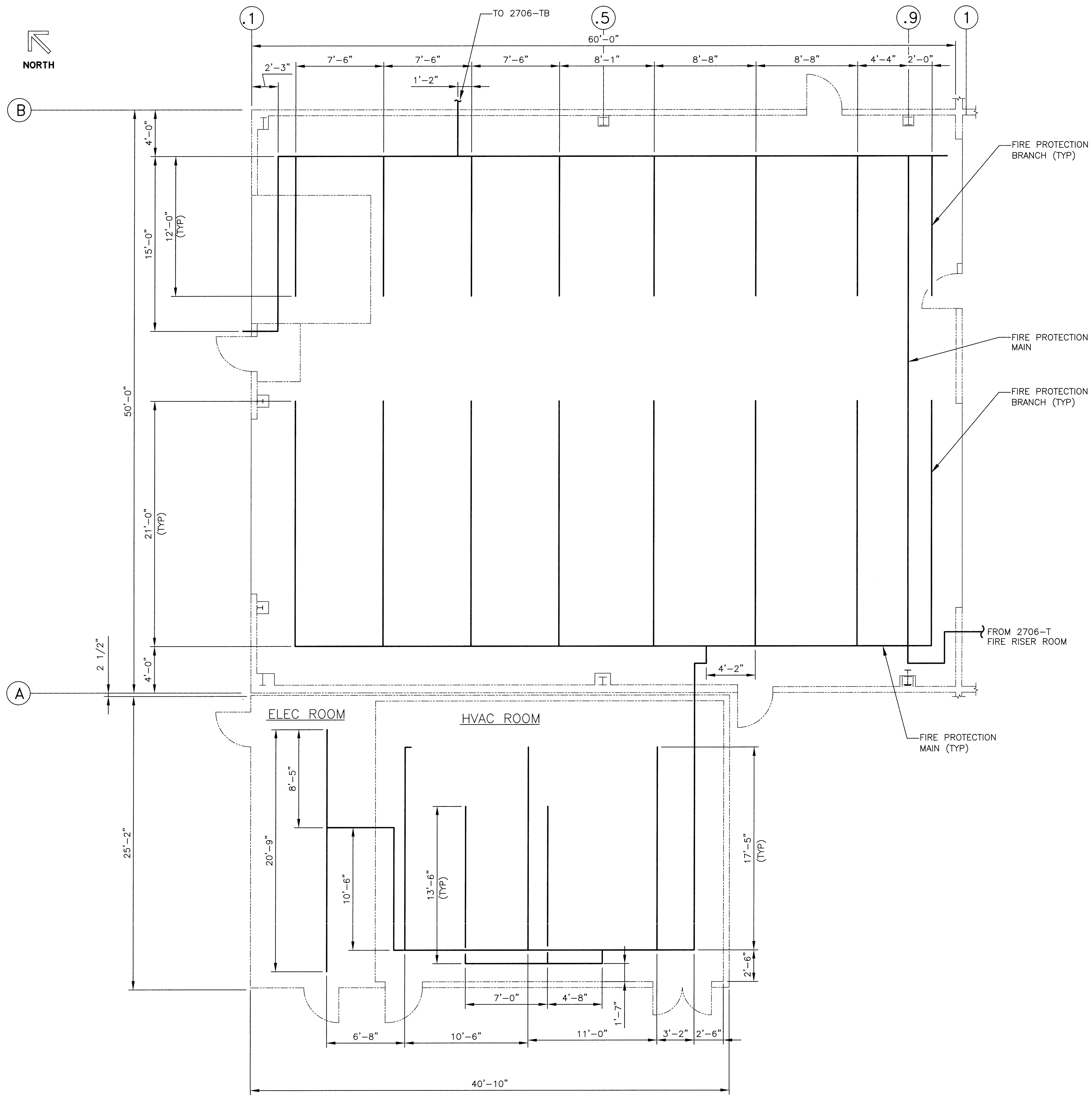


2706-TA FIRE PROTECTION SYSTEM

SCALE: 1/4"=1'-0"

NOV 11 2015 HANFORD RELEASE 4 11

REF NUMBER	TITLE
H-2-821534	STRUCTURAL FDN & ROOF PLANS
H-2-826545	FIRE PROTECTION SPRINKLER SYSTEM PLAN

REFERENCES

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

NEXT USED ON

REV	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

BLDG. NO. 2706TA

INDEX NO. 1201

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	DATE	COMPANY
DRAFTER	B PETRILLO		ARES
DRAFTING CHECKER	J BYERS		ARES
DISCIPLINE ENGINEER	T SALZANO		ARES
DESIGN AUTHORITY	JR Rosser		CHPRC

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

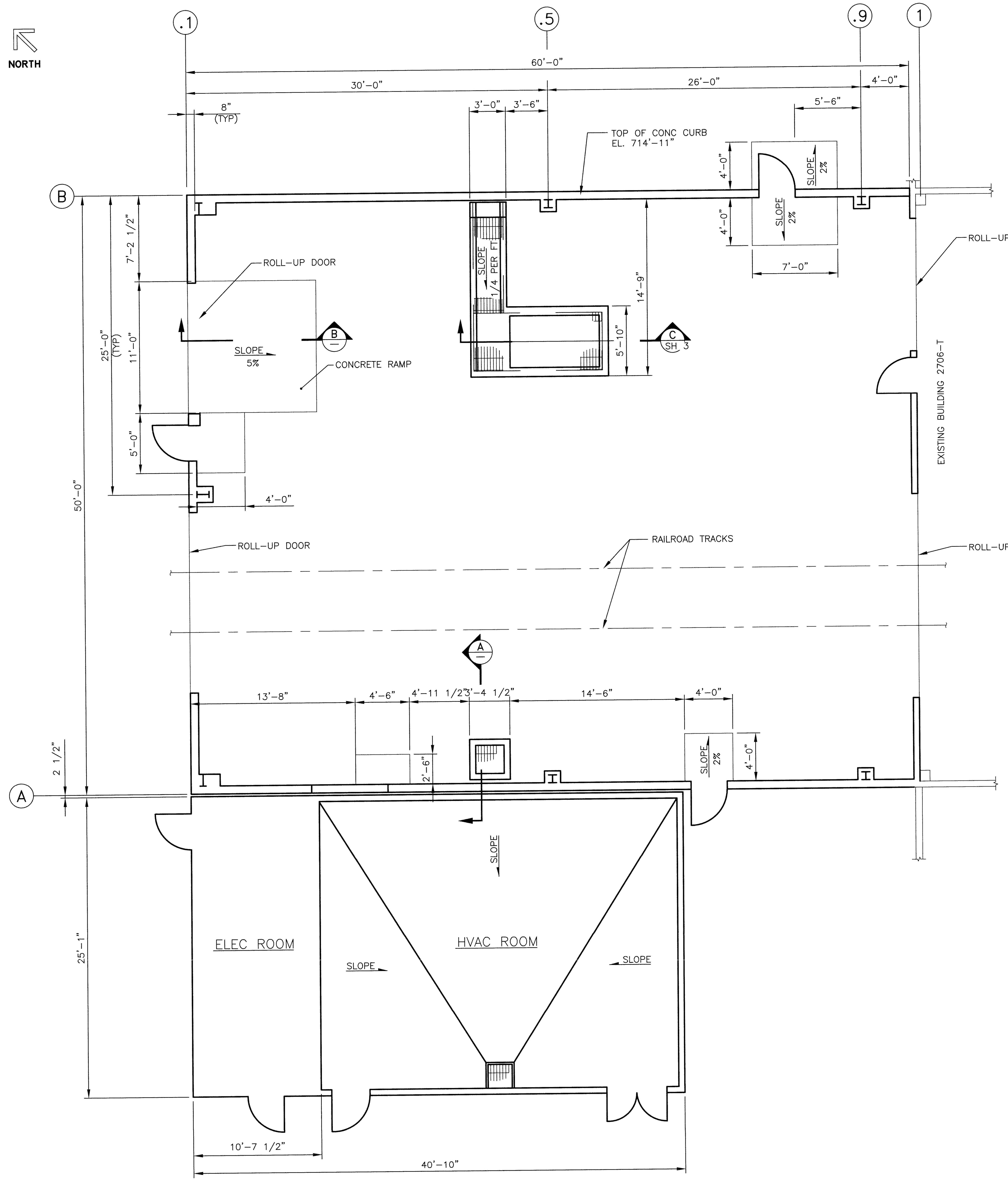
FIRE PROTECTION SYSTEM GENERAL LAYOUT

SIZE F | DRAWING NUMBER H-2-836733 | SHEET 1 | REV 0

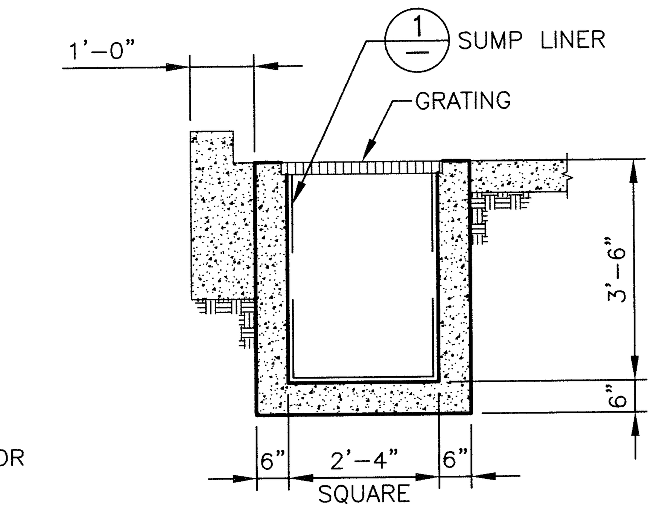
SCALE AS SHOWN

17672

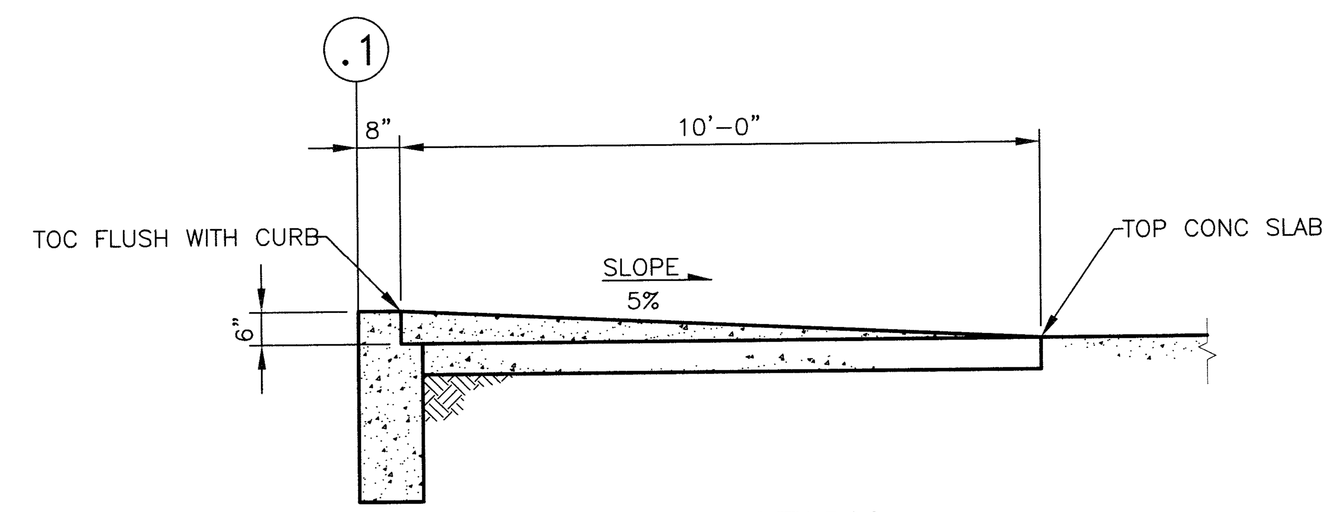
DOE_TB_F.DWG (JAN 2015)



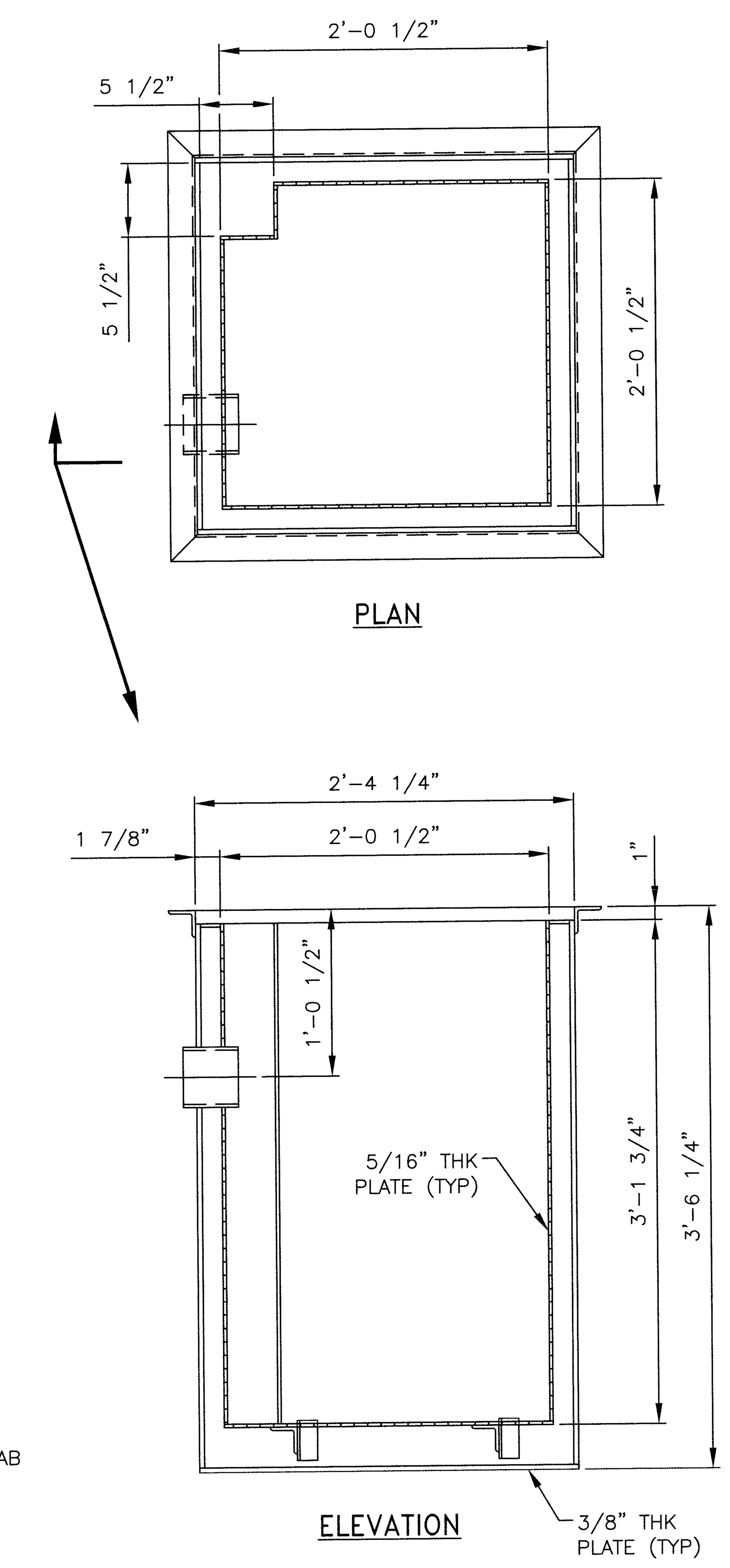
2706-TA SECONDARY CONTAINMENT
SCALE: 1/4"=1'-0"



A — SUMP SECTION
SCALE: 1/2"=1'-0"



B — SECTION
SCALE: 1/2"=1'-0"



1 — SUMP LINER
SCALE: 1 1/2"=1'-0"

NOV 11 2015 HANFORD RELEASE STA: 4 ID: 11

REF NUMBER	TITLE
H-2-821534	STRUCTURAL FDN & ROOF PLANS
H-2-821229	FOUNDATION PLAN SECTIONS & DETAIL
H-2-826518	CIVIL/STRUCTURAL DOOR RAMP

REFERENCES — NEXT USED ON

DWG NUMBER | TITLE — DRAWING TRACEABILITY LIST

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

BLDG. NO. 2706TA — INDEX NO. 0900

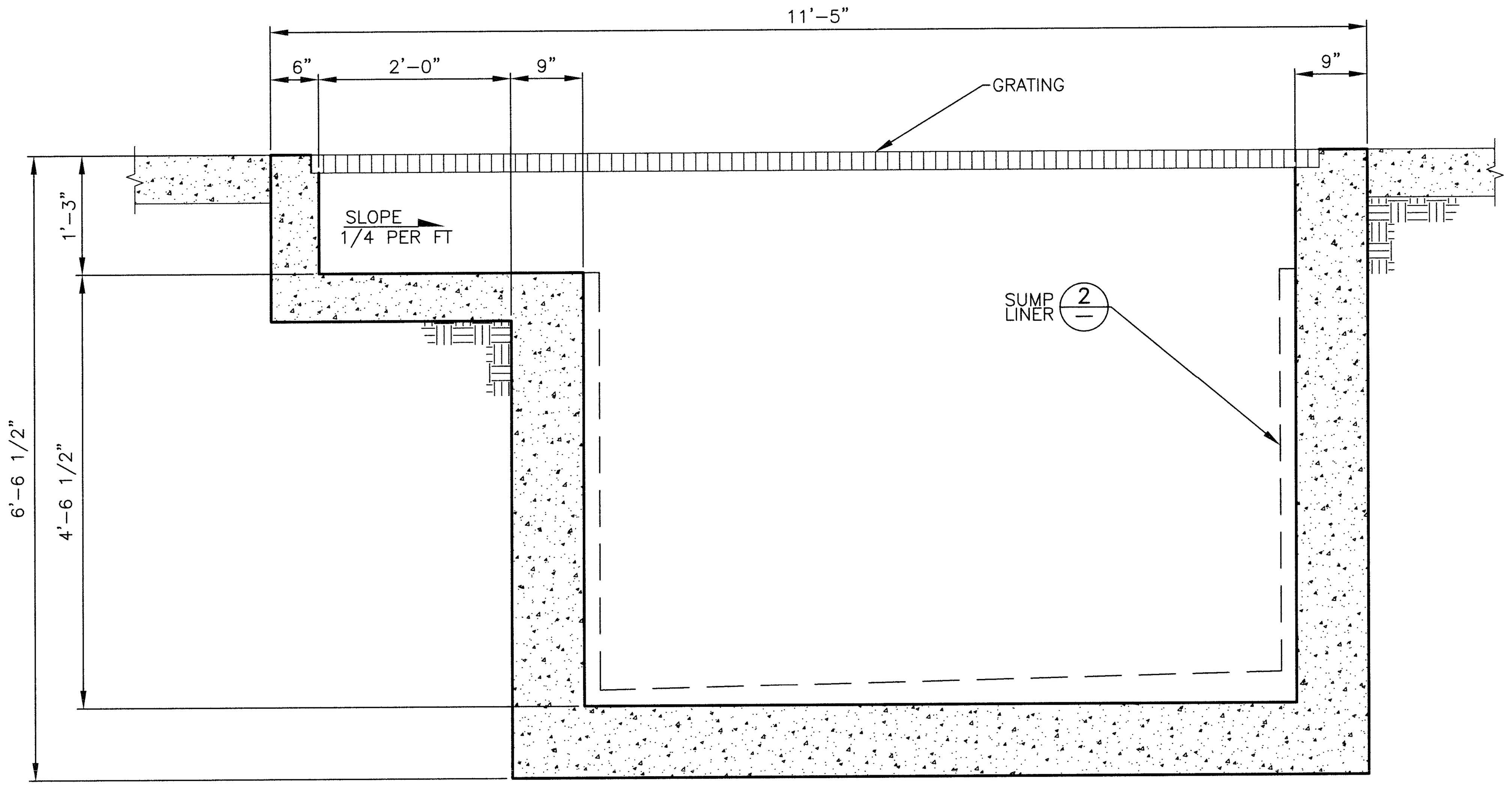
CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	DATE	COMPANY
DRAFTER	B PETRILLO		ARES
DRAFTING CHECKER	J BYERS		ARES
DISCIPLINE ENGINEER	T SALZANO		ARES
DESIGN AUTHORITY	JR Rosser		

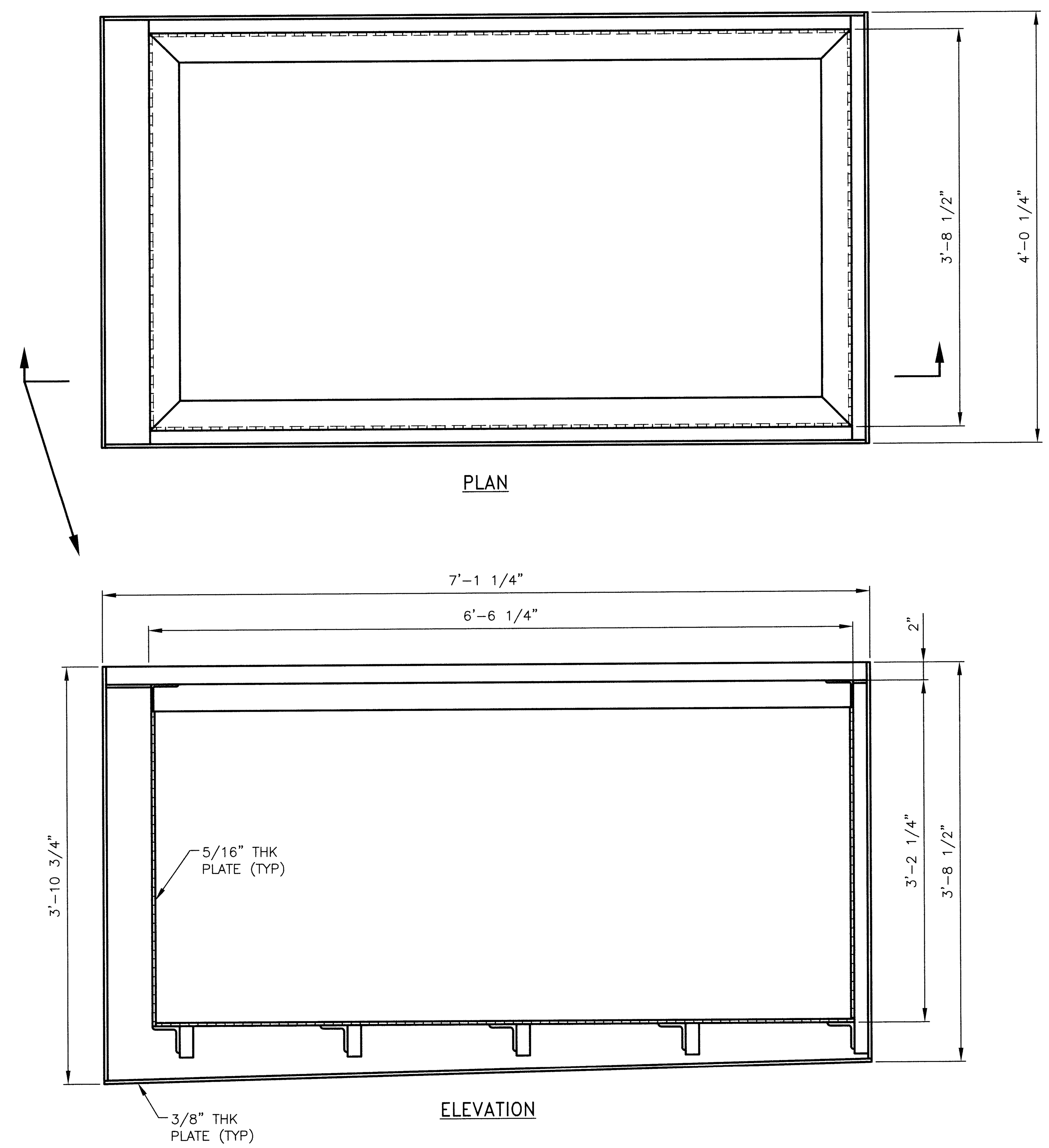
U.S. DEPARTMENT OF ENERGY
Richland Operations Office

SECONDARY CONTAINMENT DESIGN

SIZE F — DRAWING NUMBER H-2-836733 — SHEET 2 — REV 0
SCALE AS SHOWN
19148



C SH-2 SUMP SECTION
SCALE: 1"=1'-0"



2 SUMP LINER
SCALE: 1 1/2"=1'-0"

THOMAS B. SALZANO, STATE OF WASHINGTON, 29213, REGISTERED PROFESSIONAL ENGINEER

NOV 11 2015
DATE: HANFORD RELEASE
STA: 4 ID: 11

DWG NUMBER	TITLE
	DRAWING TRACEABILITY LIST

REF NUMBER	TITLE
H-2-826533	SUMP LINERS
H-2-826531	STRUCTURAL CONC FLOOR MOD SUMP
	REFERENCES
NEXT USED ON	

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
	REVISIONS

BLDG. NO. 2706TA

CAUTION
NOT COMPLETE WITHOUT CURRENT
CHANGE DOCUMENTS FROM DATABASE

	NAME	DATE	COMPANY
DRAFTER	B PETRILLO		ARES
DRAFTING CHECKER	J BYERS		ARES
DISCIPLINE ENGINEER	T SALZANO		ARES
DESIGN AUTHORITY	JR Rosser		

INDEX NO. 0901

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

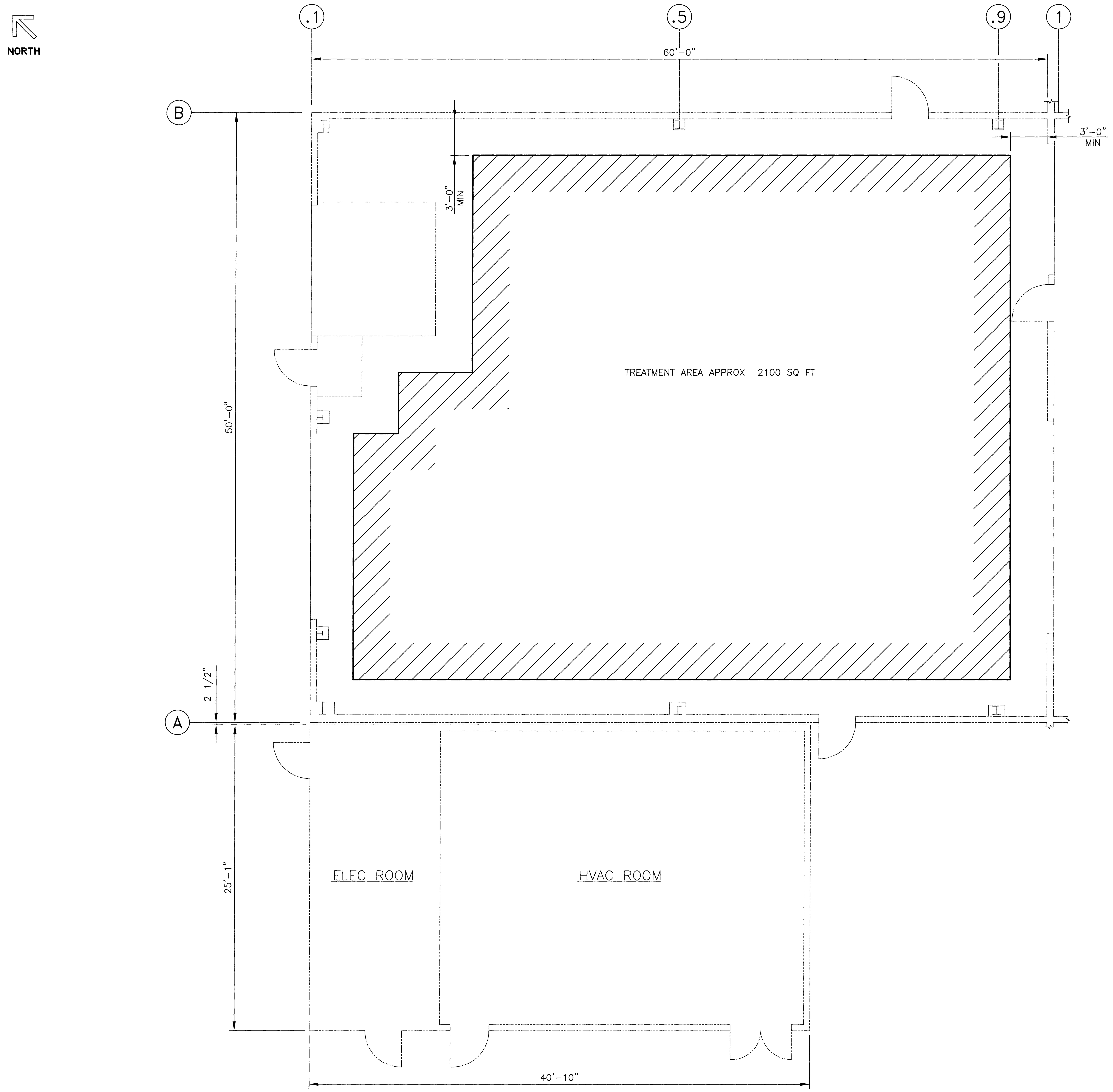
SECONDARY CONTAINMENT
SECTION & DETAILS

SIZE	DRAWING NUMBER	SHEET	REV
F	H-2-836733	3	0

SCALE AS SHOWN

29218

DOE_TB_F.DWG (JAN 2015)



2706-TA TREATMENT AREA
SCALE: 1/4"=1'-0"

NOV 11 2015
DATE:
STA: 4
HANFORD RELEASE
ID: 11

REF NUMBER	TITLE
H-2-821229	FOUNDATION PLAN SECTIONS & DETAIL
H-2-826518	CIVIL/STRUCTURAL DOOR RAMP
H-2-821534	STRUCTURAL FDN & ROOF PLANS

REFERENCES

NEXT USED ON

DWG NUMBER	TITLE

DRAWING TRACEABILITY LIST

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

BLDG. NO. 2706TA

INDEX NO. 0900

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE / COMPANY
DRAFTER B PETRILLO	10/15/15 ARES
DRAFTING CHECKER J BYERS	10-19-15 ARES
DISCIPLINE ENGINEER T SALZANO	10-15-15 ARES
DESIGN AUTHORITY JR Rosser	11/4/15 CHPRC

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

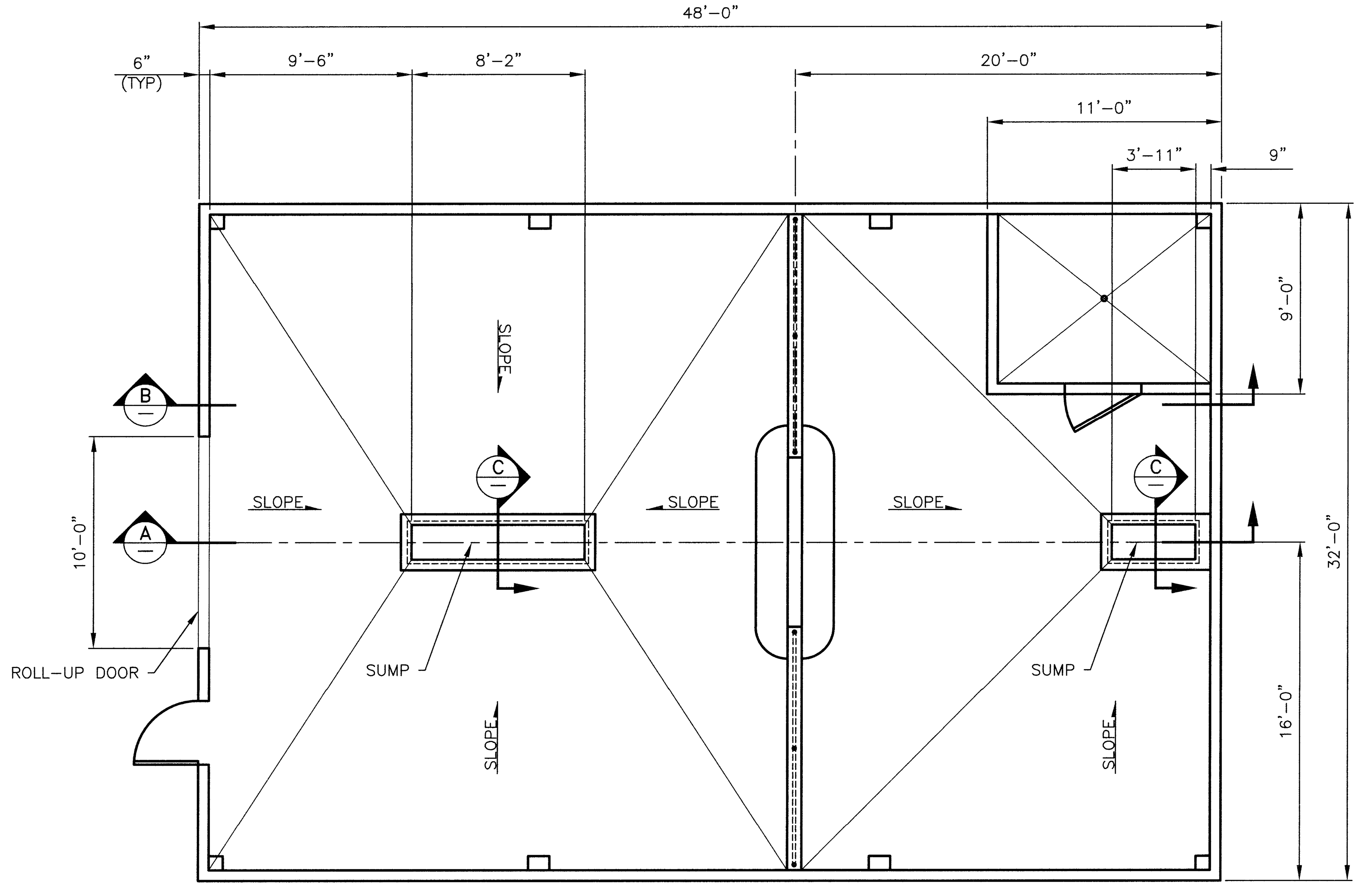
TREATMENT AREA
GENERAL LAYOUT

SIZE F | DRAWING NUMBER H-2-836733 | SHEET 4 | REV 0

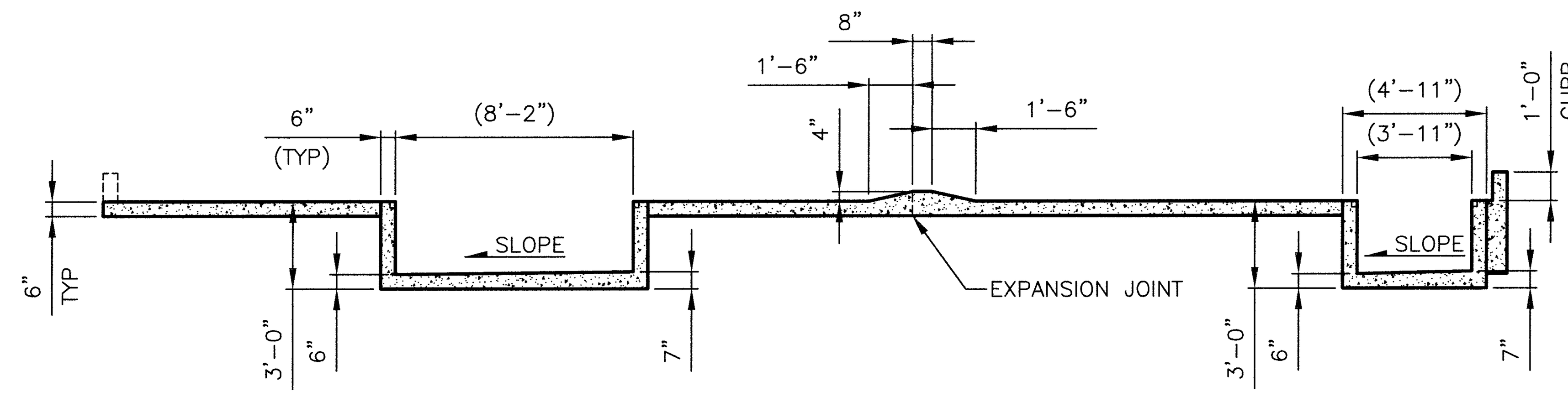
SCALE AS SHOWN

17136

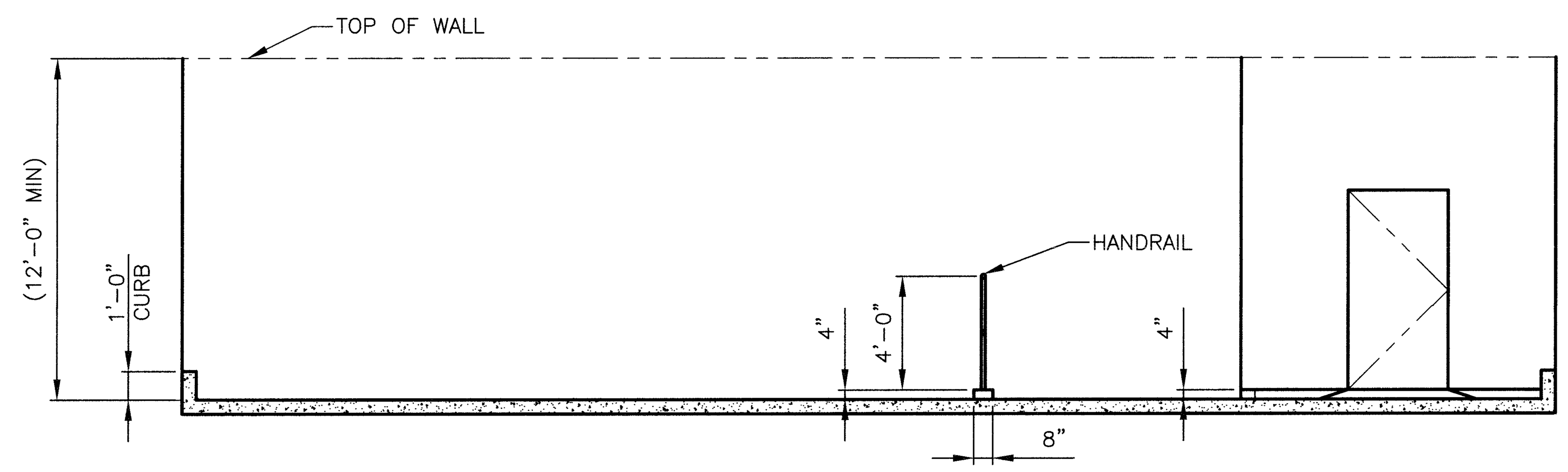
DOE_TB_F.DWG (JAN 2015)



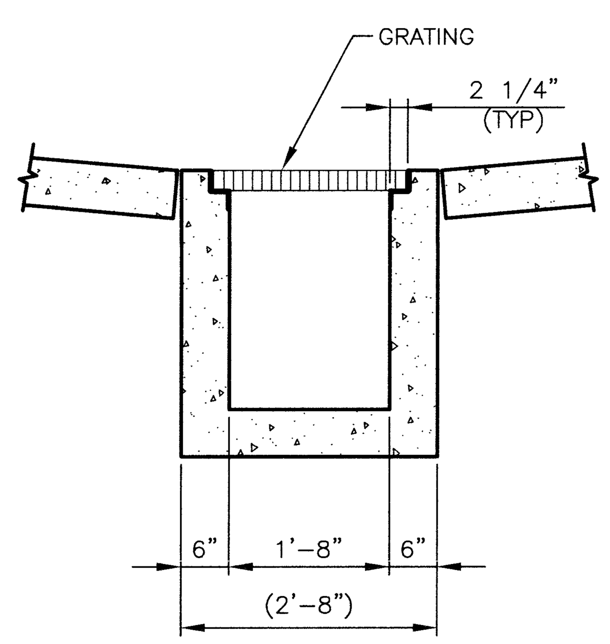
214-T SECONDARY CONTAINMENT
SCALE: 1/4"=1'-0"



A SECTION
SCALE: 1/4"=1'-0"



B SECTION
SCALE: 1/4"=1'-0"



C SECTION
SCALE: 3/4"=1'-0"

THOMAS B. SALZANO
STATE OF WASHINGTON
23211
REGISTERED
PROFESSIONAL ENGINEER

NOV 11 2015
DATE: HANFORD RELEASE
STA: 4 ID: 11

BLDG. NO. 214T

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

	NAME	DATE	COMPANY
DRAFTER	B SALZANO		ARES
DRAFTING CHECKER	J BYERS		ARES
DISCIPLINE ENGINEER	T SALZANO		ARES
DESIGN AUTHORITY	JR Rosser	11/4/15	

INDEX NO. 0900

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

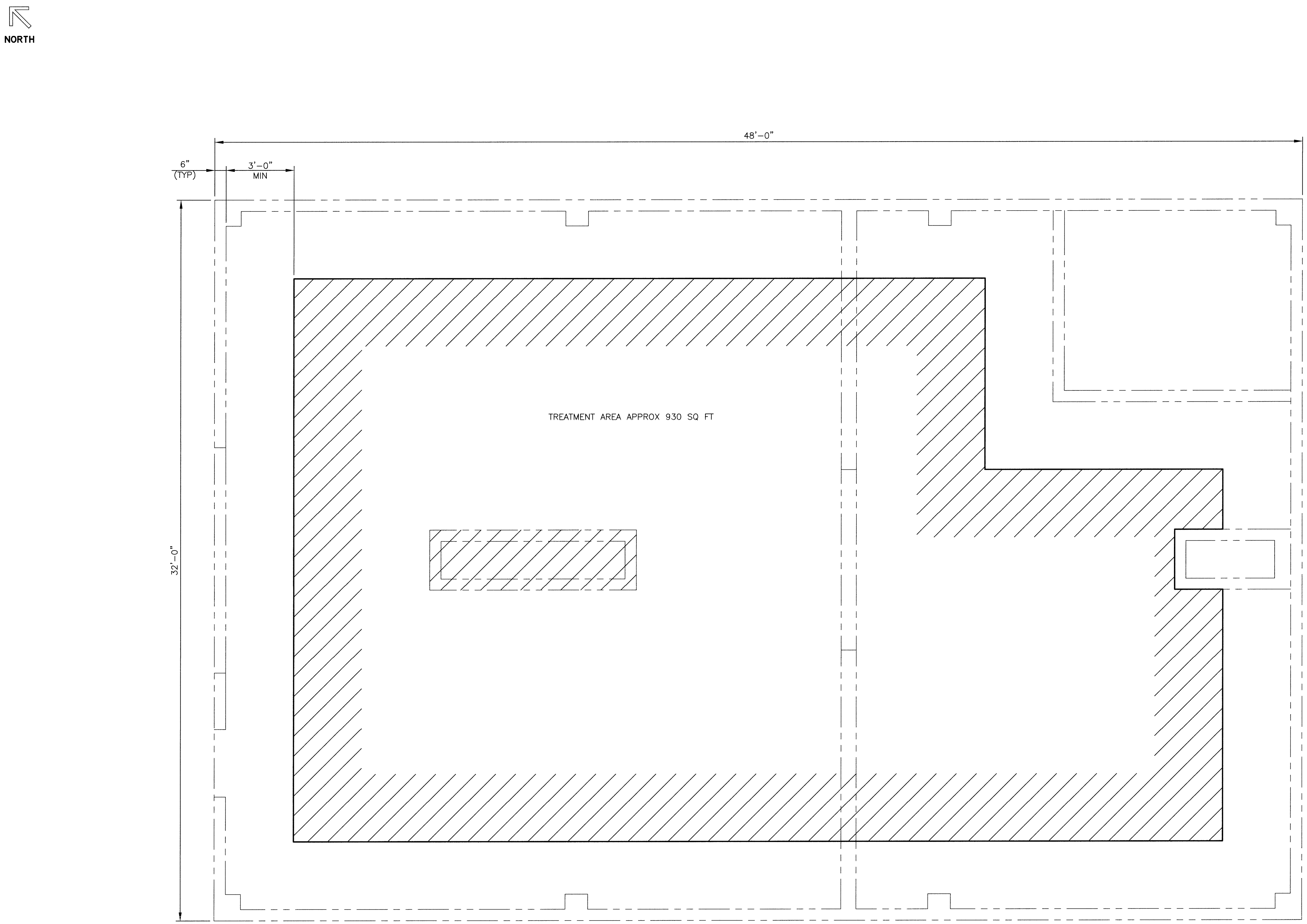
SECONDARY CONTAINMENT DESIGN

SIZE F | DRAWING NUMBER H-2-836737 | SHEET 1 | REV 0
SCALE AS SHOWN
25903

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
H-2-46806	STRL SECTIONS & DETAILS
H-2-46805	STRL FDN PLAN, EL & SECTION
REFERENCES	
NEXT USED ON	

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
REVISIONS	



214-T TREATMENT AREA
SCALE: 1/2"=1'-0"

NOV 11 2015
DATE:
STA: 4
HANFORD RELEASE
ID: 11

DWG NUMBER	TITLE
DRAWING TRACEABILITY LIST	

REF NUMBER	TITLE
REFERENCES	
NEXT USED ON	

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699

REVISIONS

BLDG. NO. 214T
INDEX NO. 0900

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

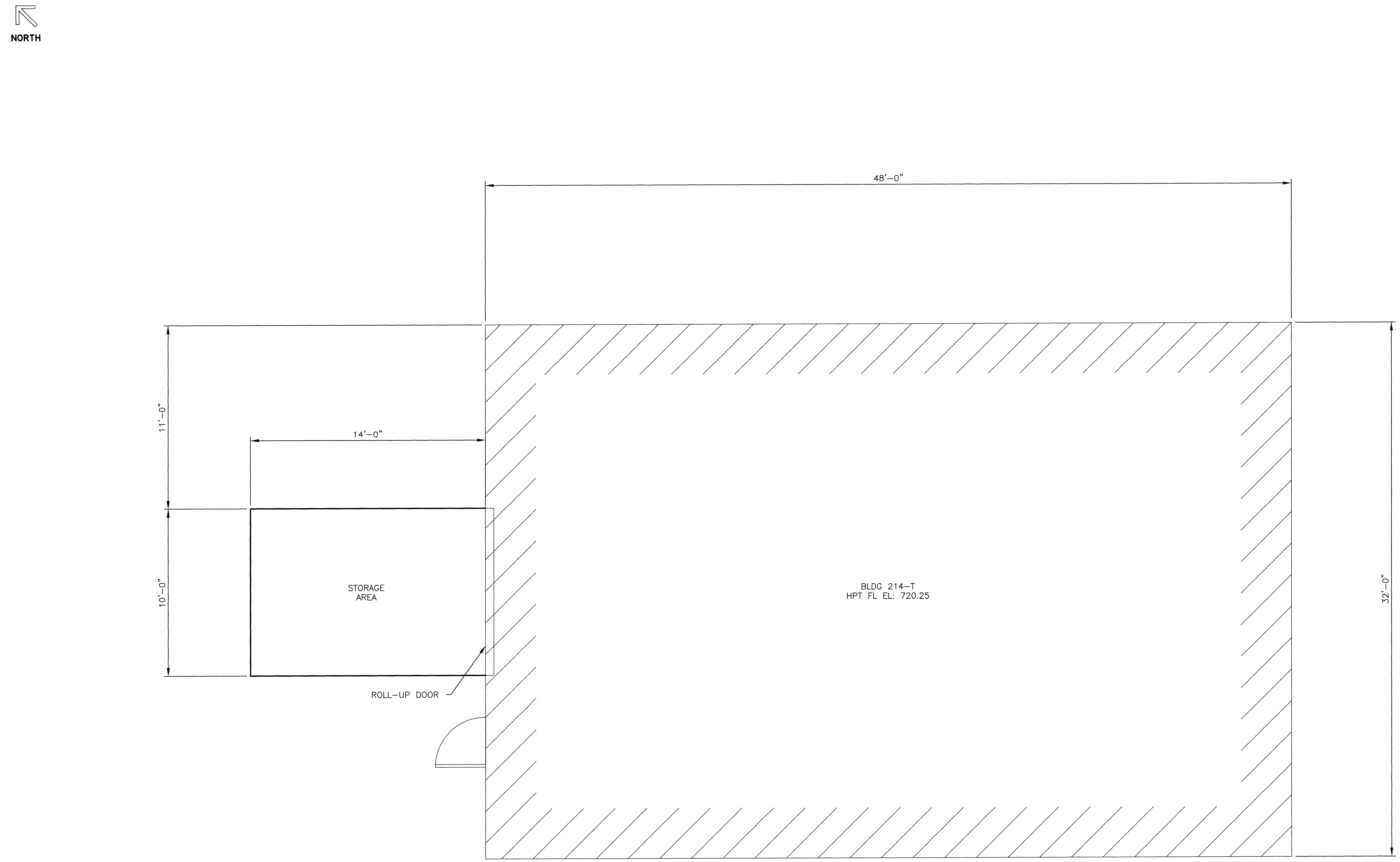
NAME	DATE	COMPANY
DRAFTER B SALZANO	10/15/15	ARES
DRAFTING CHECKER J BYERS	10-19-15	ARES
DISCIPLINE ENGINEER T SALZANO	10-15-15	ARES
DESIGN AUTHORITY JR Rosser	11/4/15	CHPRC

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

TREATMENT AREA
GENERAL LAYOUT

SIZE F | DRAWING NUMBER H-2-836737 | SHEET 2 | REV 0
SCALE AS SHOWN

31908
DOE_TB_F.DWG (JAN 2015)



214-T OUTDOOR STORAGE AREA
SCALE: 3/8"=1'-0"

NOV 11 2015
DATE: HANFORD RELEASE
STA: 4
ID: 11

DWG NUMBER	TITLE	REF NUMBER	TITLE
DRAWING TRACEABILITY LIST		REFERENCES	
		NEXT USED ON	

REV NO.	DESCRIPTION
0	INITIAL RELEASE PER ECR-15-000699
	REVISIONS

BLDG. NO. 214T

INDEX NO. 0900

CAUTION
NOT COMPLETE WITHOUT CURRENT CHANGE DOCUMENTS FROM DATABASE

NAME	DATE / COMPANY
DRAFTER D BOOTHROYD	10/15/15 ARES
DRAFTING CHECKER J BYERS	10-19-15 ARES
DISCIPLINE ENGINEER T SALZANO	10-28-15 ARES
DESIGN AUTHORITY JR Rosser	11/4/15 CHPRC

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

OUTDOOR STORAGE
GENERAL STRUCTURE/AREA

SIZE F | DRAWING NUMBER H-2-836737 | SHEET 3 | REV 0

SCALE AS SHOWN

14341

DOE_TB_F.DWG (JAN 2015)

Addendum D

[Reserved]

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Addendum E

Security

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Contents

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E1 Security

The following sections document security measures in effect at the T Plant Complex (T Plant) Operating Unit Group (OUG). T Plant consists of the following active dangerous waste management units (DWMUs): 221-T Canyon Deck, 221-T Cells (7L, 13R, 16R, and 17R), 221-T Railroad Tunnel, 221-T Head End, 221-T Operations Gallery Storage, 221-T BY Storage Area, 2706-T Building, 2706-TA Building, 2706-T Yard (including HS-030 and HS-032 Storage Modules), 2706-T Asphalt Pad, 243-T Covered Storage Pad, 214-T Building, 211-T Cage, 2706-T Outdoor Storage Area, and 2706-TA Outdoor Storage Area.

E1.1 Security Provisions

T Plant, located within the 200 West Area of the Hanford Facility, complies with access control and warning sign requirements pursuant to *Washington Administrative Code* (WAC) 173-303-310(1) and (2), "Dangerous Waste Regulations," "Security." Hanford Facility access is controlled by 24-hour surveillance as described in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit*, Attachment 3, "Security."

E1.1.1 T Plant Complex Access

Unknowing entry and the possibility for unauthorized entry of persons or livestock onto the active portions of the T Plant are minimized through implementation and maintenance of the following security measures:

- Hanford Patrol forces will maintain 24-hour surveillance of the Hanford Facility and OUGs located within. A continuous presence of protective force personnel will provide access controls to active portions of the Hanford Facility, thus meeting WAC 173-303-310(2)(b) requirements.

- Access to T Plant DWMUs is controlled by an approximate 2 m (8 ft) high chain link fence encircling the operating boundary. A two-part swinging chain link gate at the T Plant main entrance allows vehicle and personnel ingress to the parking lot and outdoor areas. This gate is closed and locked when personnel are away from T Plant. Alternate vehicle access gates, found about the fenced perimeter, are closed and locked except when in use. Access to the 221-T Canyon Deck, 221-T Cells, and 221-T Operations Gallery Storage DWMUs within the 221-T Building is controlled by locked doors. Keys to gates and doors are controlled and accessible only by authorized, trained personnel. [WAC 173-303-310(2)(c)]

Upon arrival at T Plant, visitors are required to sign in at the 271-T Building administration office, must adhere to all personal protection requirements, and are subject to escorting protocols.

Personnel training requirements for T Plant operators and workers are found in T Plant Addendum G, "Personnel Training."

E1.1.2 Warning Signs

Warning signs, stating "Danger-Unauthorized Personnel Keep Out," are posted near the entrance gate of T Plant. Identical signs are posted intermittently on the fence surrounding the T Plant operating boundary and on or near doors controlling access to DWMUs within the 221-T Building. Permittees must maintain warning signs at points described in this Addendum and ensure that signs are written in English, legible from a distance of approximately 7.6 m (25 ft) or more, and visible from all angles of approach. [WAC 173-303-310(2)(a)]

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Addendum F

Preparedness and Prevention

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Contents

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F1 Introduction

This addendum addresses preparedness and prevention measures in effect at the T Plant Complex (T Plant) Operating Unit Group (OUG). T Plant is comprised of the following dangerous waste management units (DWMUs):

- 221-T Canyon Deck
- 221-T Cells (7L, 13R, 16R, and 17R)
- 221-T Operations Gallery Storage
- 221-T Head End
- 221-T Railroad Tunnel
- 221-T BY Storage Area
- 2706-T Building
- 2706-TA Building
- 2706-T Yard (including HS-030 and HS-032 Storage Modules)
- 2706-T Asphalt Pad
- 2706-T Outdoor Storage Area
- 2706-TA Outdoor Storage Area
- 243-T Covered Storage Pad
- 214-T Building
- 211-T Cage.

For descriptions and details of T Plant DWMUs, refer to WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter Hanford Facility RCRA Permit) Addendum C, "Process Information."

The purposes of preparedness and prevention are to minimize the damage caused by a fire or explosion and help avoid or mitigate any unplanned sudden or nonsudden release of dangerous waste constituents to air, soil, surface water, or groundwater. This addendum complies with regulations set forth in *Washington Administrative Code* (WAC) 173-303-340, "Dangerous Waste Regulations," "Preparedness and Prevention;" WAC 173-303-806(4)(a)(viii), "Final Facility Permits;" and WAC 173-303-395(4), "Other General Requirements."

F2 Preparedness and Prevention Requirements

Preparedness and prevention requirements of WAC 173-303-340 are addressed in the following subsections.

F2.1 Required Equipment

Communications equipment, fire suppression systems and equipment, spill control equipment, and decontamination equipment are available for use at T Plant, in accordance with the requirements of WAC 173-303-340(1).

F2.1.1 Internal Communications

T Plant is equipped with internal communications devices used to provide immediate emergency instruction to personnel. Whenever waste handling operations occur at T Plant, all personnel involved must have immediate access to hand-held two-way radios and/or cellular phones capable of direct emergency communications with another employee. Communications devices described in this section meet the internal communications requirements of WAC 173-303-340(1)(a), (1)(b), and (2)(a).

Telephones, hand-held two-way radios, cellular phones, and a public address system are interfaced for voice paging throughout all indoor and outdoor DWMUs at T Plant.

Three separate audible alarm systems are available to provide warnings to T Plant personnel. A fire detection system with audible alarms throughout the 221-T Building, 271-T Building, 214-T Building, 2706-T Building, and 2706-TA Building provide personnel notification to evacuate. Manual fire alarm pull boxes are located in each building equipped with overhead sprinklers and in the 214-T Building. Activation of manual fire alarm pull boxes triggers an audible fire alarm (siren or bells) and alerts the Hanford Fire Department via radio fire alarm reporter or the 271-T fire alarm control panel.

T Plant is equipped with a manually activated take cover/evacuate siren system audible throughout all indoor and outdoor DWMUs warning personnel to take cover or evacuate.

F2.1.2 External Communications

As required by WAC 173-303-340(1)(b), the communications equipment (described in Section F2.1.1) must have the capability for contacting the Hanford Patrol Operations Center and Hanford Fire Department to request the assistance of local emergency response organizations. The Hanford Patrol Operations Center Point of Contact can be contacted for 24-hour emergency communications and for information relays by landline telephone, cellular phone, or two-way radio.

State and local response organizations are contacted through the Hanford Patrol Operations Center by dialing emergency number 911 from site telephones, or 509-373-0911 from cellular phones; or for non-emergencies, by dialing the main contact number for the Hanford Patrol Operations Center at 509-373-3800. Onsite responders are notified and/or dispatched through the Hanford Patrol Operations Center.

In the instance that just one employee is at any T Plant DWMU during operations, the individual must have immediate access to a hand-held two-way radio or cellular phone capable of summoning external emergency assistance [WAC 173-303-340(2)(b)].

F2.1.3 Emergency Equipment

T Plant operations personnel are trained in the use of emergency equipment. T Plant Addendum G, “Personnel Training,” provides details of personnel emergency training.

Portable fire extinguishers (at least one in each waste storage or treatment building), fire control equipment, spill control equipment, and decontamination equipment required by WAC 173-303-340(1)(c) are available for use throughout T Plant. A list of emergency equipment is found in T Plant Addendum J, “Contingency Plan.”

Emergency response trailers available at the Solid Waste Operations Complex OUGs, including T Plant, contain emergency supplies as well as personal protective equipment (PPE). Decontamination equipment and spill control equipment, including sorbents, spill socks and pillows, and magnetic mats (for sealing floor drains) are available in the 221-T Building emergency response cage. Also available in the 221-T Building emergency response cage are nonsparking tools, sampling containers, pH test strips, protective masks, and PPE.

Heat detectors are located in the administrative areas of the 271-T and 221-T Buildings as well as in the 2706-T, 2706-TA, and 214-T Buildings. Smoke detectors are located in ventilation ducting within the 271-T Building and administrative areas of the 221-T Building.

Automatic fire suppression is a key control in minimizing the damaged caused by fire. Fire suppression for the 2706-T Building, 2706-TA Building, 271-T Building, and 221-T Building administrative areas consists of wet-pipe sprinkler systems.

Communications and alarm systems, fire protection equipment, spill control equipment, and decontamination equipment are tested and maintained to assure proper operation in time of emergency [WAC 173-303-340(1)(d)].

F2.2 Water for Fire Control

Water for fire control at the 200 West Area is pumped from the Columbia River then delivered to T Plant by two separate delivery pipelines. A raw water system provides water to exterior fire hydrants east of the 221-T Building. A sanitary water pipeline system supplies water for overhead sprinklers inside DWMU buildings as well as for fire hydrants to the west of the 221-T Building. Underground pipeline installations are designed in accordance with National Fire Protection Association (NFPA) standards and maintained to ensure adequate water volume and pressure to supply T Plant fire sprinklers, hydrants, and fire control equipment. In the event that water pressure is lost, alternative water source equipment for fire control will be deployed from the Hanford Fire Department.

F2.3 Aisle Space Requirement

Aisle spacing requirements in WAC 173-303-630(5)(c), "Use and Management of Containers," mandate a minimum of approximately 0.76 m (30 in.) between rows of containers stored at T Plant. This allows the unobstructed movement of personnel, fire protection equipment, spill control equipment, and decontamination equipment during mitigation of emergency situations. Containers are stored on rows of pallets and/or, when required, portable secondary containment or other structures, depending on container size. Rows of drums will be placed no more than two drums wide. Waste container boxes, modules, and long length containers must be spaced to allow unobstructed movements of personnel and emergency equipment [WAC 173-303-340(3)].

F3 Preventive Procedures, Structures, and Equipment

The following subsections describe preventive procedures, structures, and equipment, including spill control measures, in effect at T Plant.

F3.1 Container Loading, Unloading and Handling Preventative Measures

Containers loaded onto, or unloaded from, transport vehicles are handled and/or stored at T Plant. To minimize potential for container damage or accidental opening during loading, unloading, and/or handling operations, the following preventative measures are observed by T Plant personnel:

- Containers are U.S. Department of Transportation (DOT) and/or U.S. Department of Energy compliant.
- Operators conduct physical inspections for container damage and abnormal appearance that are performed prior to loading and unloading operations.
- All containers, including bulk and long length, are handled by appropriate equipment for loading, unloading, and container movement (e.g., forklift, high weight capacity forklift, or crane).
- Waste is not loaded or unloaded without the approval of operations supervision.
- Pathways from unloading locations to storage or treatment areas must remain clear of obstructions.

- Transport vehicles are positioned in a manner that provides an unobstructed work space to load and unload containers.
- Collected wastes resulting from spills and leaks will be removed, as soon as possible, in a manner that prevents release of dangerous waste constituents.
- Operators must comply with container stacking, aisle space, and segregation requirements.

F3.2 Prevention of Run-on, Run-off, and Contamination to Water Supplies

T Plant processing and container storage areas and buildings are designed and/or operated to mitigate run-on and run-off, minimize the generation of potentially contaminated leachate, and prevent migration into local groundwater resources. Detailed descriptions of the design, construction, and operation of each DWMU are provided in T Plant Addendum C. A general description for preventing run-on, run-off, and contamination of water supplies and groundwater is provided in the following paragraphs.

Spill pallets or portable containment systems are required for containers holding liquids or waste designated with the D001 through D003 waste codes in areas where engineered secondary containment is not available, such as outdoor container staging areas. Run-off of spills, container leaks, and sources of potentially contaminated liquids are controlled from migration out of secondary containment areas at T Plant by observing containment volume limits, removing sump liquids, and when necessary, utilizing available containment and spill equipment.

Run-on sources at T Plant typically consist of rainfall or storm water. Water migrations into secondary containment or into other areas of possible contamination are minimized by containment berms, drainage structure, and building design. Additional information and details on run-on/run-off can be found in T Plant Addendum C.

F3.3 Equipment and Power Failure

Loss of electrical power at T Plant is mitigated by the availability of two independent, interchangeable electrical power sources. If one electrical power source fails, then backup power is supplied by the second source. In the instance that both electrical power sources fail, protective measures are observed to minimize personnel exposure to danger and protect the environment from unplanned dangerous waste releases.

Loss of electrical power may result in the loss of negative air pressure within 221-T Building Canyon Deck, 221-T Railroad Tunnel, 2706-T Building, and 2706-TA Building. Disrupted air pressure from the shutdown of ventilation fans requires discontinuation of waste handling operations and personnel evacuation from affected rooms. Waste handling equipment and waste containers are maintained in a safe configuration. With the exception of fire watch personnel, waste treatment or storage buildings must not be occupied during power outages. Battery backup for alarms, computers (which may control equipment operations), and instrumentation ensures that fire alarm signals to the Hanford Fire Department will remain uninterrupted for a minimum of 6 hours. Battery powered lighting units, located near DWMU building exits and at points of personnel egress (e.g., 221-T Building Canyon Deck, galleries, halls, and stairwells), provide emergency illumination.

F3.4 Personal Protective Equipment

T Plant minimizes personnel exposure to occupational injury, dangerous wastes, and hazardous chemicals by ensuring the availability and use of adequate PPE during normal operations and emergencies. All personnel must use PPE in accordance with work documentation specifications and in compliance with posted requirements. Protective clothing use requirements will vary, depending on the form, content, and handling of waste. When possible, engineering and/or administrative controls are first implemented to minimize the possibility of exposure to dangerous wastes or chemicals.

Protective masks, including air purifying respirators and powered air purifying respirators, are stored and available for personnel in the 271-T Building. Gloves, safety glasses, protective clothing, and other PPE may be procured at the 221-T Building emergency response cage or from PPE storage cabinets at locations within the boundaries of T Plant. Emergency response trailers contain a wide variety of PPE for emergency use. Ear protection is available at door entrances of rooms with elevated noise levels (e.g., compressor or heating, ventilating, and air conditioning mechanical rooms).

F4 Prevention of Ignition or Reaction of Ignitable, Reactive, and/or Incompatible Waste

The following section describes prevention measures in effect at T Plant to minimize the possibilities of ignition or reaction of ignitable, reactive, and/or incompatible waste. Records generated from the handling or treatment of ignitable, reactive, and/or incompatible waste must be added to the facility operating record [WAC 173-303-380(1)].

F4.1 Precautions to Prevent Ignition or Reaction of Ignitable or Reactive Waste

Precautions to prevent ignition or reaction of ignitable or reactive waste involve separating ignitable/reactive waste from ignition sources and using preventive measures to minimize potential for accidental ignition or reaction. There are no routine sources of ignition or open flames at T Plant. Work activities conducted with ignition or heat sources, if required, are limited and controlled in the following ways:

- Activities involving open flames, cutting, welding, or hot surfaces must be controlled by an approved hot work permit.
- Smoking is prohibited inside T Plant buildings and DWMUs. “NO SMOKING” signs are posted in conspicuous locations, legible at approximately 7.6 m (25 ft) or greater.
- Ambient temperatures at administrative areas within the 271-T and 221-T Buildings are controlled by heat pump with no sources of ignition. Portable heating or cooling units at locations where dangerous waste is handled or stored (e.g., inside 221-T Building Canyon Deck Perma-Con® structures) are placed in a safe configuration.
- Vehicles carrying more than approximately 151 L (40 gal) of propane are not allowed inside T Plant buildings or within approximately 7.6 m (25 ft) of stored containers.
- Only noncombustible containers are used for storage of waste in T Plant buildings.
- All static electricity sources require grounding in areas where ignitable vapors might be present.
- Electrical equipment used in flammable atmospheres is required to comply with NFPA 70, *National Electric Code*.
- Compatibility between wastes is ensured prior to mixing waste streams (e.g., documentation review, container label review, or testing).

® Perma-Con is a registered trademark of Radiation Protection Systems, Groton, Connecticut.

- No empty wooden pallets are stored inside T Plant buildings.
- Containers holding incompatible waste are stored and segregated by dikes, walls, berms, or other facility approved devices.

The following waste is not accepted at T Plant:

- Explosive, pyrophoric, shock sensitive, or NFPA Class 4 oxidizer waste
- Waste reasonably expected to become unstable or explosive
- Waste that may generate excessive heat or toxic gases, vapors, or fumes in a quantity sufficient to present a danger to human health and the environment
- Waste that contains gases packaged at pressures in excess of established facility limits
- Infectious waste.

F4.1.1 Precautions for Handling Ignitable or Reactive Waste and Mixing Incompatible Wastes

T Plant observes the following waste handling measures to prevent the ignition or reaction of ignitable or reactive waste and minimize the possibility of mixing incompatible waste:

- Incompatible wastes are not packaged within the same container.
- Containers emptied of reactive agents are thoroughly flushed with an appropriate solution prior to reuse, thus minimizing incompatible waste mixing. If inadvertent mixing of incompatible wastes occurs, toxic or noxious fumes produced will be mitigated by negative pressure ventilation.
- Containers of waste that are incompatible or potentially reactive to other containers of stored waste are stored in covered buildings or areas and segregated by dikes, walls, berms, or other facility approved devices. For information on incompatible waste, refer to T Plant Addendum C, "Process Information."
- Explosive, shock sensitive, or pyrophoric materials are prohibited at T Plant. Notwithstanding, should this type of waste be identified, segregation will occur immediately. Handling and packaging of these materials must be conducted under the direction of the Hanford Fire Department or other approved organization. If a discovery meets the conditions in T Plant Addendum J, then the Hanford Facility Contingency Plan will be implemented.
- Upon receipt of ignitable waste, sampling, processing, and solidification may occur. Flammable and/or ignitable liquid waste may be immobilized, using absorbent material, to facilitate future treatment.
- Mixed waste containers within T Plant may be vented with filters to prevent the buildup of gases.
- Wastes shipped to T Plant are segregated for transportation, as required by DOT, to ensure that reactions cannot occur during transportation or receipt.
- Areas where ignitable and/or reactive wastes are treated and stored must be inspected at least yearly by facility personnel in the presence of a professional, who is familiar with the International Fire Code, or in the presence of the Hanford Fire Marshal [WAC 173-303-395(1)(d)].

F5 Arrangements with Local Authorities

Written emergency assistance agreements exist with local authorities that include arrangements to familiarize and furnish local hospitals, police departments, fire departments, and city and county emergency response teams with Hanford Facility information [WAC 173-303-340(4)(a) through (c)]. The response agreements designate primary emergency authority [WAC 173-303-340(4)(d)]. If state or local authorities decline to enter into a response agreement or familiarization arrangement with the Hanford Facility, the Permittees will record the refusal in the Hanford Facility Operating Record, T Plant portion, as required by Hanford Facility RCRA Permit Condition II.I.1.g [WAC 173-303-340(5)].

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Addendum G

Personnel Training

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Contents

Table

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G1 Personnel Training

This addendum describes the personnel training requirements for the T Plant Complex (T Plant) Operating Unit Group.

Permittees will ensure that personnel training meets the requirements of *Washington Administrative Code* (WAC) 173-303-330, "Dangerous Waste Regulations," "Personnel Training." Specific requirements for the "Hanford Facility Personnel Training Program" are described in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act* (hereinafter Hanford Facility RCRA Permit) Attachment 5.

Permittees will comply with the training matrix in Table G-1, which provides training requirements for Hanford Facility personnel associated with T Plant. Training requirements are only for personnel that perform waste management duties at T Plant. Refer to the T Plant Dangerous Waste Training Plan (DWTP) for a complete description of the personnel training requirements. As required by Hanford Facility RCRA Permit Condition II.I.1 (WAC 173-303-380, "Facility Recordkeeping"), which satisfies the training records requirements set forth in WAC 173-303-330(3), a copy of the T Plant DWTP will be placed in the Hanford Facility Operating Record, T Plant portion, and will be updated by the Permittees as unit-specific conditions change.

Training received by facility personnel will commensurate with the duties they perform. Individuals are not required to receive training for work duties they do not perform. Continuing training is administered annually, or at 2-year or 3-year retraining frequencies. A course is administered annually if it is administered not less than 30 days after the retraining date set for that course.

Table G-1. T Plant Complex Training Matrix

Training Category Course Description[a]	Frequency of Training	Training Type[b]	Job Title/Position								
			Non-T Plant Personnel or Visitor	FWS	SPOC	Waste Service Provider[c]	Maintenance Craft	RCT	NCO	ECO	BED
General Training	Annual	GHFT, CPT	X	X	X	X	X	X	X	X	X
Container Management	Annual	GHFT, OT		X		X	X	X	X		
Building Emergency	Annual	ECT									X
ECO Training	Initial	OT								X	
Inspections	Every 2 years	OT		X					X		
Health and Safety	Annual	GHFT, CPT	X[d]	X	X[d]	X	X	X	X	X	X
Waste Designation	Annual	OT				X					
Waste Services	Initial	OT				X					
Waste Shipper	Every 3 years	OT				X					
Waste Management	Every 2 years	GHFT, CPT, OT		X			X[e]	X[e]	X		

a. See T Plant DWTP for a complete description of coursework in each training category.

b. Permit Attachment 5 training types.

c. Waste Service Providers include TSDRs, Verifiers, Shippers, and WMRs. Different Waste Service Providers are only required to take the necessary courses specific to their waste management duties.

d. This training is required only if workers are unescorted in the facility.

e. Maintenance Crafts and RCTs take only initial Waste Management Training.

BED = Building Emergency Director
CPT = Contingency Plan Training
DWTP = Dangerous Waste Training Plan
ECO = Environmental Compliance Officer
ECT = Emergency Coordinator Training
FWS = Field Work Supervisor
GHFT = General Hanford Facility Training
NCO = Nuclear Chemical Operator
OT = Operations Training
RCT = Radiological Control Technician
SPOC = Single Point of Contact
TSDR = Treatment, Storage, and Disposal Unit Acceptance Representative
WMR = Waste Management Representative

Addendum H

Closure Plan

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Contents

Appendices

Figures

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H1 Introduction

Addendum H discusses closure activities for the T Plant Complex (T Plant) Operating Unit Group (OUG).

Please note, the terms “mixed waste” and/or “waste”, when seen in this document, refers to dangerous waste or hazardous waste, as applicable.

H1.1 Hanford Facility Contact Information

The Hanford Facility is owned by the U.S. Government and operated by the U.S. Department of Energy (DOE). The contact information is as follows:

U.S. Department of Energy, Richland Operations Office
P.O. Box 550
Richland, WA 99352
(509) 372-2400

H1.2 Hanford Facility Description

The Hanford Facility, located in southeastern Washington State, is owned by the U.S. Government and is managed and operated by DOE. Dangerous waste and mixed waste (containing both dangerous and radioactive components) are generated and managed at the Hanford Facility.

H1.3 Unit History, Function, Location and Layout

The T Plant OUG (Figure H-1 and Figure H-2) is located in the Hanford Facility 200 West Area. T Plant was constructed in 1943 for chemical separation of plutonium from uranium fusion and activation products, using the bismuth-phosphate/lanthanum-fluoride process. Beginning in 1957, T Plant was used for decontamination operations. Currently, T Plant provides container storage and treatment services for waste generated both on and off the Hanford Facility.

H1.4 Products and Production Processes

The T Plant OUG does not produce products and does not have production processes.

H1.5 Dangerous Waste Management Units

T Plant dangerous waste management units (DWMUs) are designed for storage and treatment of waste. Waste treatment will consist of volume reduction, deactivation, extraction technologies, deactivation and recovery of organics (i.e., puncture and decant aerosol cans/cylinders), neutralization, absorption, controlled reaction with water, solidification/stabilization, mercury amalgamation, macroencapsulation, microencapsulation, and sealing.

The Addendum A, Part A Form corresponding to the DWMUs in the T Plant OUG, identifies various *Resource Conservation and Recovery Act of 1976* permitted capabilities for the DWMUs, as well as operating DWMUs and closing DWMUs.

T Plant includes the following operating DWMUs:

- 214-T Building (Storage and Treatment)
- 221-T Canyon Deck (Storage and Treatment)
- 221-T Cells (7L, 13R, 16R, and 17R) (Storage and Treatment)

- 221-T Railroad Tunnel (Storage and Treatment)
- 221-T Head End (Storage)
- 221-T Operations Gallery Storage (Storage)
- 2706-T Building (Storage and Treatment)
- 2706-T Asphalt Pad (Storage)
- 2706-TA Building (Storage and Treatment)
- 2706-T Yard (Including HS-030 and HS-032 Storage Modules) (Storage)
- 243-T Covered Storage Pad (Storage)
- 211-T Cage (Storage)
- 221-T BY Storage Area (Storage)
- 2706-T Outdoor Storage Area (Storage)
- 2706-TA Outdoor Storage Area (Storage).

T Plant includes the following closing DWMUs:

- 271-T Cage
- 211-T Pad
- 221-T Sand Filter Pad
- 221-T-R5 Waste Storage Area
- 277-T Building
- 277-T Outdoor Storage Area
- 2706-TB Tank System
- 221-T Railroad Cut
- 221-T Pipe Gallery Storage
- 221-T Tank System.

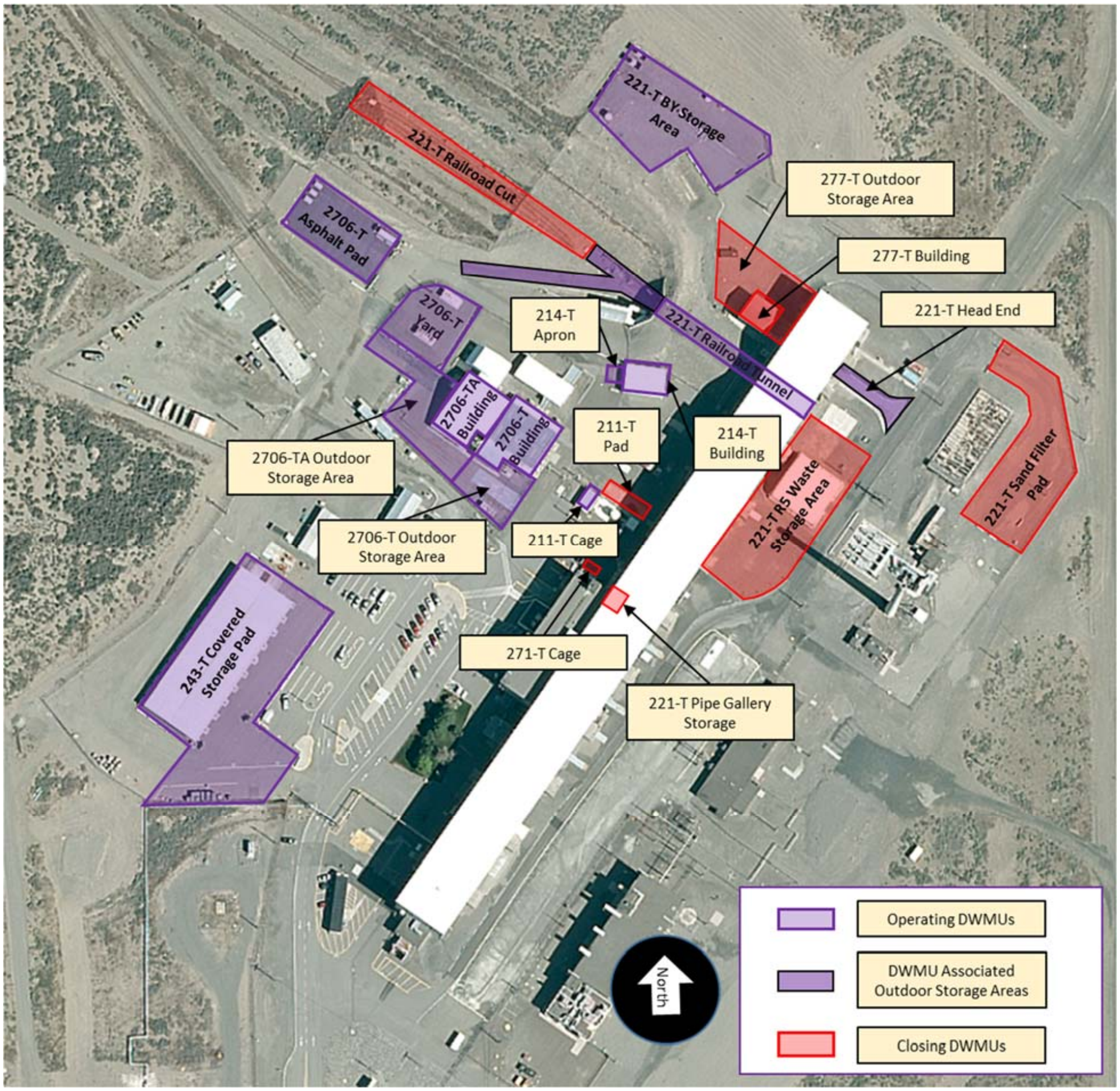

Figure H-1. T Plant Complex Operating and Closing Dangerous Waste Management Units (Aerial 2012)

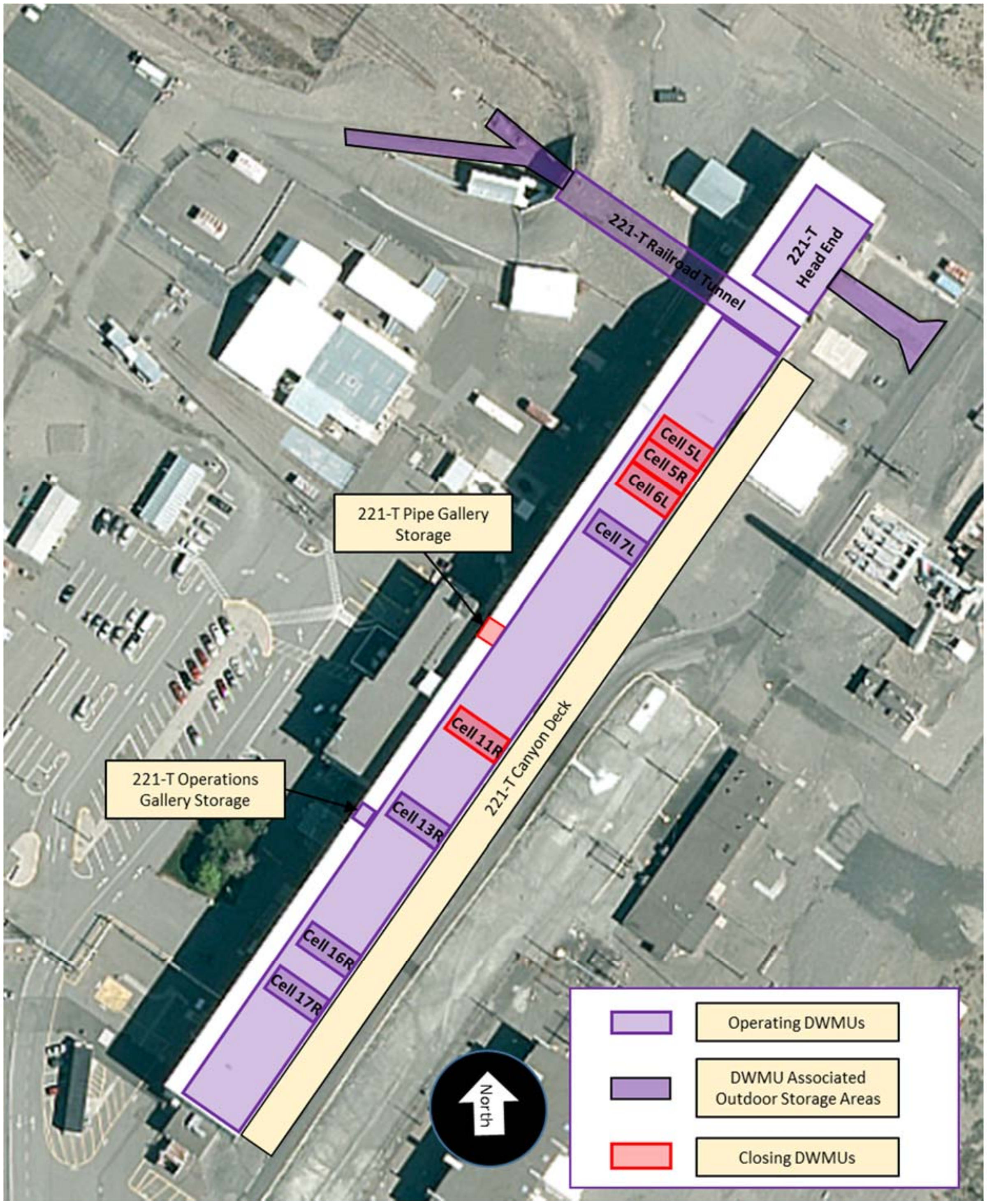

Figure H-2. 221-T Building Operating and Closing Dangerous Waste Management Units (Aerial 2012)

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303-610, "Closure and Post-Closure."

303-620, "Financial Requirements."

303-630, "Use and Management of Containers."

303-665, "Landfills."

303-670, "Incinerators."

303-695, "Containment Buildings."

303-830, "Permit Changes."

WAC 173-340, "Model Toxics Control Act—Cleanup," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-340.

340-200, "Definitions."

340-700, "Overview of Cleanup Standards."

340-745, "Soil Cleanup Standards for Industrial Properties."

340-747, "Deriving Soil Concentrations for Groundwater Protection."

340-7490, "Terrestrial Ecological Evaluation Procedures."

340-7494, "Priority Contaminants of Ecological Concern."

340-760, "Sediment Cleanup Standards."

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Appendix H-A

214-T Building Dangerous Waste Management Unit

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Contents

Attachment

Figures

Tables

H-A1 Introduction

This appendix discusses closure activities for the T Plant Complex Operating Unit Group (OUG) (T Plant) 214-T Building dangerous waste management unit (DWMU), hereinafter referred to as the 214-T Building.

This plan describes in detail the closure activities necessary to establish clean closure levels for the 214-T Building. Such closure activities include removal of all waste, records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste, visual inspection of the concrete flooring and outdoor asphalt pad after waste removal to evaluate the likelihood of potential contamination of the underlying soil, demolition of the 214-T Building and associated outdoor storage area, and soil sampling and analysis to confirm that clean closure standards have been achieved.

Please note, the terms “mixed waste” and/or “waste”, when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

Closure of the 214-T Building will be performed in accordance with the closure schedule provided in Section H-A4. Within 60 days upon completion of closure activities, the Permittees shall provide the Washington State Department of Ecology (hereinafter referred to as Ecology) a certification of closure in accordance with *Washington Administrative Code* (WAC) 173-303-610(6), “Dangerous Waste Regulations,” “Closure and Post-Closure”. Closure certification will provide supportive evidence that the 214-T Building has met established clean closure standards.

This closure plan complies with the requirements of WAC 173-303-610(2) through (6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

H-A1.1 Unit Description

The 214-T Building is located on the west side of the 221-T Building, near the 221-T Railroad Tunnel, and is permitted for waste container storage and mixed waste treatment (Figure H-A1). The DWMU consists of one building and associated outdoor storage area.

The building, enclosed totally to protect containers from precipitation or run-on, is approximately 9.8 m (32 ft) wide by 15 m (48 ft) long (Figure H-A2), for a total footprint and available waste storage area of approximately 140 m^2 (1,500 ft^2). The building is constructed of corrugated steel overlaying I-beams and has a concrete floor. The concrete floor is covered with a chemical resistant coating (e.g., epoxy resin) and divided by a raised concrete berm to allow for the separation of incompatible waste types. The building contains two floor areas that are sloped to prevent mixing of incompatible materials and direct any spills to separate floor sumps and a third floor area for flammable storage. The sumps are not connected to any piping system. The 214-T Building is equipped with an engineered secondary containment system; therefore, containers requiring secondary containment can be stored in this container storage area without portable secondary containment. Treatment of waste is conducted within the building using a variety of technologies to meet the disposal requirements of WAC 173-303-140, “Land Disposal Restrictions (LDR),” and/or to meet acceptance criteria for the Waste Isolating Pilot Plant; another treatment, storage, and/or disposal facility, and/or other approved facilities.

The uncovered/unenclosed outdoor storage area measures approximately 3 m (10 ft) wide by 4.3 m (14 ft) long, is constructed of asphalt, and does not contain an engineered secondary containment system. Containers stored in the outside storage area that do not meet the criteria specified in WAC 173-303-630(7)(c) (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems. This storage area provides a place to stage containers prior to placement inside the building for storage or in preparation for transfer.

H-A1.1.1 Maximum Waste Inventory

The maximum storage capacity of the 214-T Building is a total volume of 94.8 m^3 (94,800 liters).

H-A2 Closure Performance Standards

Closure performance standards for the 214-T Building will be based on WAC 173-303-610(2), which requires closure of the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate, to the extent necessary, to protect human health and the environment, post-closure escape of waste, dangerous constituents, leachate, contaminated runoff, or waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous waste activity.

These performance standards are addressed in Sections H-A2.1 and H-A3.9 of this closure plan and furthermore identified in Table H-A4.

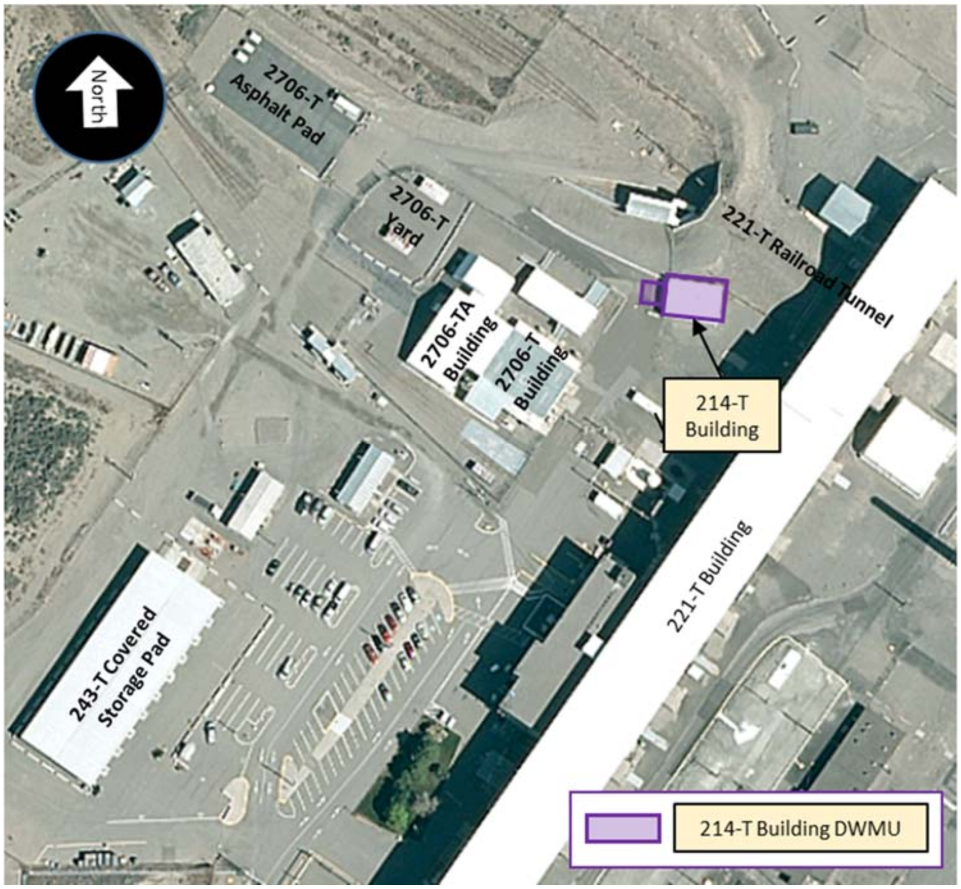

Figure H-A1. T Plant Building (Aerial View 2012)

Figure H-A2. T Plant 214-T Building Exterior (September 2013)

H-A2.1 Clean Closure Levels

The 214-T Building will be clean closed using clean closure levels required for soil. After removal of all waste, contents of the building will be removed, and the area will be visually inspected. The concrete foundation of the building and outdoor asphalt will be visually inspected to identify any waste related staining, major cracks, crevices, seams, and low points. The structure, concrete, and asphalt will be removed and managed as a newly generated waste stream. Section H-A3.7 details waste generated during closure.

The soil underlying the concrete and asphalt will be sampled and must meet clean closure levels. In accordance with WAC 173-303-610(2)(b)(i), the clean closure levels for soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to WAC 173-340, "Model Toxics Control Act—Cleanup," hereinafter called MTCA, regulations (WAC 173-340-700, "Overview of Cleanup Standards," through WAC 173-340-760, "Sediment Cleanup Standards," excluding WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties"). These numeric cleanup levels have been calculated according to the requirements of WAC 173-303-610(2)(b)(i) using the MTCA (WAC 173-340) Method B closure performance standard for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-A4 provides the MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte (Table H-A1).

A null hypothesis is generally assumed to be true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, "Definitions," for the 214-T Building, is that soil underlying the concrete and asphalt is assumed to be above MTCA (WAC 173-340) Method B cleanup levels. Therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means that sampling and analysis results of the site indicated soil contamination below the MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that soil meets closure performance standards (MTCA [WAC 173-340] Method B).

Should sampling and analysis provide a basis that the null hypothesis can be accepted, the soil would be removed, identified as contaminated environmental media, and managed in accordance with Section H-A3.8.

H-A3 Closure Activities

The 214-T Building will be clean closed under the *Resource Conservation and Recovery Act of 1976* (RCRA), and confirmation sampling will be performed to verify that closure performance standards (Table H-A4) are met. As a waste storage and treatment unit, clean closure determinations for the 214-T Building will be based on successfully completing the closure activities in this section. Sampling and analysis activities were developed utilizing the U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection (QA/G-5S)*, and Ecology Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-A3.10). The objective of sampling described in this document is to determine if MTCA (WAC 173-340) Method B closure performance standards were met, demonstrating clean closure of the 214-T Building.

The following closure activities are required to achieve and verify clean closure for soil:

- Remove all waste storage.
- Review waste container storage, operating, and inspection records for documented spills or releases of waste.
- Remove all materials and equipment from within the 214-T Building.
- Perform visual inspection of concrete and asphalt to identify any waste related staining, major cracks, crevices, seams, and low points for purposes of focused sampling.
- Remove building structure, concrete, and asphalt.
- Perform waste determination of structure, concrete, and asphalt waste debris.
- Complete and document disposal of the structure, concrete, and asphalt as newly generated waste.
- Perform sampling and analysis of soil under the concrete and asphalt to confirm that clean closure standards are met.
- If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of any contaminated environmental media present.
- Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been met.
- Transmit closure certification to Ecology.

H-A3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment (PPE). Qualified personnel will be trained in applicable safety and environmental procedures and have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 to the *Hanford Facility Resource Conservation Recovery Act Permit*, identification number WA7890008967 (hereinafter referred to as the Hanford Facility RCRA Permit) describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, "Personnel Training," which provides training requirements for Hanford Facility personnel associated with the 214-T Building.

Project specific safety training, addressed explicitly to the project and activities for the day, will include the following:

- Training will provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records for each employee are maintained in an electronic database. The Permittee's training organization maintains the training records system.

H-A3.2 Removal of Wastes and Waste Residues

All waste will be removed from the 214-T Building and associated outdoor storage area. Waste will be managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers meeting the U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with the "Transportation" criteria specified in Title 49 of the *Code of Federal Regulations* (CFR). Waste packaged in non-DOT regulation containers (large or irregular shaped containers) will be shipped in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily occur utilizing highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet the LDR treatment standards specified in WAC 173-303-140, which includes by reference 40 CFR 268, then ultimately disposed of in an appropriate waste disposal facility.

While waste residues are not anticipated, if they are found during clean closure activities, they will be managed in accordance with all applicable requirements of WAC 173-303-170, “Requirements for Generators of Dangerous Waste,” through WAC 173-303-230, “Special Conditions.” Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved facility.

H-A3.3 Unit Components, Parts, and Ancillary Equipment

The 214-T Building does not have any component, parts, or ancillary equipment. Once closure activities begin, all equipment and material will be removed from the 214-T Building.

H-A3.4 Inspection of Units before Decontamination

Although decontamination of the 214-T Building is not planned, a visual inspection will be performed following the removal of all waste and waste residues to determine the presence of cracks, holes, or other breaches in the asphalt sufficient to reach the underlying soil. These cracks, holes, or other breaches will be documented to determine focused sampling of the underlying soil during confirmation sampling.

During the closure period, to prevent threats to human health and the environment, the 214-T Building will be inspected according to WAC 173-303-320(2), “General Inspection.” Inspections of the 214-T Building will be performed annually, until clean closure certification is accepted by Ecology, and will verify the following:

- Posted warning signs at each entrance to T Plant are present, legible, and visible at 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-A3.5 Decontamination

Decontamination of the 214-T Building is not planned.

H-A3.6 Demolition

Once concrete and asphalt visual inspections are completed, demolition of the 214-T Building can be initiated, which will include the following primary activities:

- Location of utilities
- Mobilization of equipment
- Removal and disposal of the 214-T Building
- Removal and disposal of the concrete and asphalt.

H-A3.6.1 Location of Utilities

Prior to demolition, any in-use utilities will be located to ensure that there are no disruptions to the surrounding activities.

H-A3.6.2 Equipment Mobilization

The resources, equipment, and materials necessary to perform demolition will be staged in designated laydown areas.

H-A3.6.3 Demolition Activities for the 214-T Building

Demolition of the 214-T Building will be accomplished utilizing the primary method of shearing and rubblizing. Demolition of the building will require the use of heavy equipment (e.g., excavator with various attachments) to demolish the structure. Other standard industry or conventional demolition practices also may be used (e.g., hydraulic shears with steel shear jaws, concrete pulverizer jaws, or breaker jaws). Demolition of the concrete and asphalt will primarily be accomplished utilizing large equipment to rubblize the concrete and asphalt.

Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and high efficiency particulate air filtered vacuum cleaners may be used. Additional storm water run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

H-A3.6.3.1 Shearing and Rubblizing

During shearing and rubblizing of the 214-T Building, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and run-off. The shears will size reduce/cut components of the building, such as roofing, wall paneling, and concrete flooring, while front end loaders or grapples will load the debris into roll-off containers.

Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and a concrete pulverizer jaws or breaker jaws, will be used to perform any rubblizing. Rubble debris from the 214-T Building will be loaded into roll-off boxes for transportation to an approved disposal facility.

H-A3.7 Identifying and Managing Waste Generated During Closure Activities

Closure activities for the 214-T Building will result in the generation of one known waste stream (debris from demolition), requiring management and disposal. Waste generated during closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. The newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-A3.12).

H-A3.7.1 Debris from Demolition

Debris from demolition generated during the closure period will be managed onsite and transported to an approved disposal facility. Debris includes, but is not limited to, the following types of wastes:

- Concrete and associated rubblized debris

- Asphalt and associated rubblized debris
- Building materials
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)
- Equipment and construction materials.

The preferred management of debris resulting from demolition of the structure, concrete, and asphalt is in bulk form. Bulk waste will be placed into bulk containers, such as roll-off boxes, for disposal. These bulk containers will be stored in a suitable area in proximity to the DMWU area or, if debris contains waste, may be accumulated for up to 90 days in another suitable location. Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

The debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-A3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Soil surrounding the node location, which identified contamination above clean closure levels, will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU. Following removal of contaminated soil, additional confirmatory sampling will be conducted in the location of the original node which identified contamination above the clean closure level in accordance with the approved closure plan SAP. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. The contaminated soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved facility.

Management and disposal of the contaminated environmental media will be documented and included with the clean closure documentation included in Section H-A3.12.

H-A3.9 Confirming Clean Closure

The 214-T Building will be clean closed. Demonstration of clean closure standards will be accomplished through removal of the building structure, concrete, and asphalt and sampling and analysis of the underlying soil.

Once removal of the building, concrete, and asphalt is complete, sampling will be performed in accordance with the SAP (Section H-A3.10) and will consist of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where waste related staining, cracks, or other openings in the concrete and asphalt may have allowed a release of waste to the underlying soil).

Once removal of the 214-T Building is complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards (MTCA [WAC 173-340-730] Method B) have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-A3.8. Once analytical results confirm clean closure levels of the target analytes, a clean closure certification will be prepared in accordance with Section H-A3.12.

H-A3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarizes the sampling design of the 214-T Building. After the 214-T Building has been demolished, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-A3.10.1 Sampling and Analysis Plan

Sampling and analysis of the 214-T Building underlying soil will be conducted to confirm that clean closure levels have been achieved. All sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/ Chemical Methods, Third Edition; Final Update V*; ASTM International (formerly the American Society for Testing and Materials), *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM International standards, EPA approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), at the time of closure. This SAP was also developed using Ecology Publication #94-111, Section 7.0, “Sampling and Analysis for Clean Closure,” and EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan (QA/G-5S)*.

H-A3.10.2 Target Analytes

The 214-T Building is an active portion of T Plant; therefore, target analytes at closure may include any or all analytes based on the waste codes permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV-Description of Dangerous Wastes). A waste management report, identifying waste codes historically managed at the 214-T Building, was run to identify the existing target analytes. Table H-A1 details the waste codes identified for the waste containers stored at the 214-T Building and associated outdoor storage area and target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the DWMU upon receipt of the final waste. A permit modification, updating the SAP with specific target analytes will be submitted, as necessary, 45 days prior to DWMU closure if in accordance with WAC 173-303-610(3)(b).

Table H-A1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3

Table H-A1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Endrin (D012)	72-20-8	Lindane (D013)	58-89-9
Benzene (D018) (F005)	71-43-2	Carbon Tetrachloride (D019) (F001)	56-23-5
Chloroform (D022) (U044)	67-66-3	*o*-Cresol (D023) (F004)	95-48-7
Cresol (Cresylic Acid) (D026) (F004)[a,d]	1319-77-3	1,2-Dichloroethane (D028)	107-06-2
2,4-Dinitrotoluene (D030)	121-14-2	Heptachlor (D031)	76-44-8
Heptachlor Epoxide (D031)	1024-57-3	Hexachlorobenzene (D032)	118-74-1
Hexachlorobutadiene (D033)	87-68-3	Nitrobenzene (F004) (U169)	98-95-3
Methyl Ethyl Ketone (D035) (F005)	78-93-3	Tetrachloroethylene (D039) (F001) (F002)	127-18-4
Vinyl Chloride (D043)	75-01-4	1,1,1-Trichloroethane (F001) (F002) (U226)	71-55-6
Trichloroethylene (F001) (F002)	79-01-6	CFCs (F001) (F002)[g]	Not Applicable
Methylene Chloride (F001) (F002)	75-09-2	Chlorobenzene (F002)	108-90-7
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-133) (F002)[g]	76-13-1	*Ortho*-Dichlorobenzene (F002)	95-50-1
Trichlorofluoromethane (CFC-11) (F002)[g]	75-69-4	1,1,2 Trichloroethane (F002)	79-00-5
Xylene (F003)	1330-20-7	Ethyl Acetate (F003)	141-78-6
Ethyl Benzene (F003)	100-41-4	Ethyl Ether (F003) (U117)	60-29-7
Cyclohexanone (F003)	108-94-1	Methanol (F003)	67-56-1
n-Butyl Alcohol (F003) (U031)	71-36-3	Methyl Isobutyl Ketone (F003) (U161)	108-10-1
m-Cresol (F004)	108-39-4	*p*-Cresol (F004)	106-44-5
Toluene (F005)	108-88-3	Carbon Disulfide (F005) (P022)	75-15-0
Isobutanol (F005)	78-83-1	Pyridine (F005)	110-86-1
2-Nitropropane (F005)[c,d]	79-46-9	2-Ethoxyethanol (F005) (U359)[e]	110-80-5

Table H-A1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Chloroacetaldehyde (P023)[d]	107-20-0	Copper Cyanide (P029)[b]	544-92-3
Cyanides (P030)	57-12-5	Potassium Cyanide (P098)[b]	151-50-8
Sodium Cyanide (P106)[b]	143-33-9	Vanadium Pentoxide (P120)[f]	1314-62-1
Acetaldehyde (U001)[d]	75-07-0	Acetone (F003) (U002)	67-64-1
Acetyl Chloride (U006)[d]	75-36-5	Dichloroethyl Ether (U025)	111-44-4
1,4-Dioxane (U108)	123-91-1	Formic Acid (U123)	64-18-6
Methyl Ethyl Ketone Peroxide (U160)[d]	1338-23-4	N-Nitroso-di-n-butylamine (U172)	924-16-3
Phosphorous Sulfide (U189)[d]	1314-80-3	Tetrahydrofuran (U213)[d]	109-99-9

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol, and *p*-cresol.

b. Analyzed as total cyanide.

c. The closure performance standard for 2-nitropropane was removed in May 2014 EPA CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

d. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

e. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

f. Vanadium pentoxide will be analyzed as vanadium.

g. A CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

CFC = chlorinated fluorocarbons

CLARC = Cleanup Levels and Risk Calculations

EPA = U.S. Environmental Protection Agency

H-A3.10.3 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-A4.

H-A3.10.4 Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

H-A3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-A3.

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned project managers responsible for oversight of 214-T Building closure.

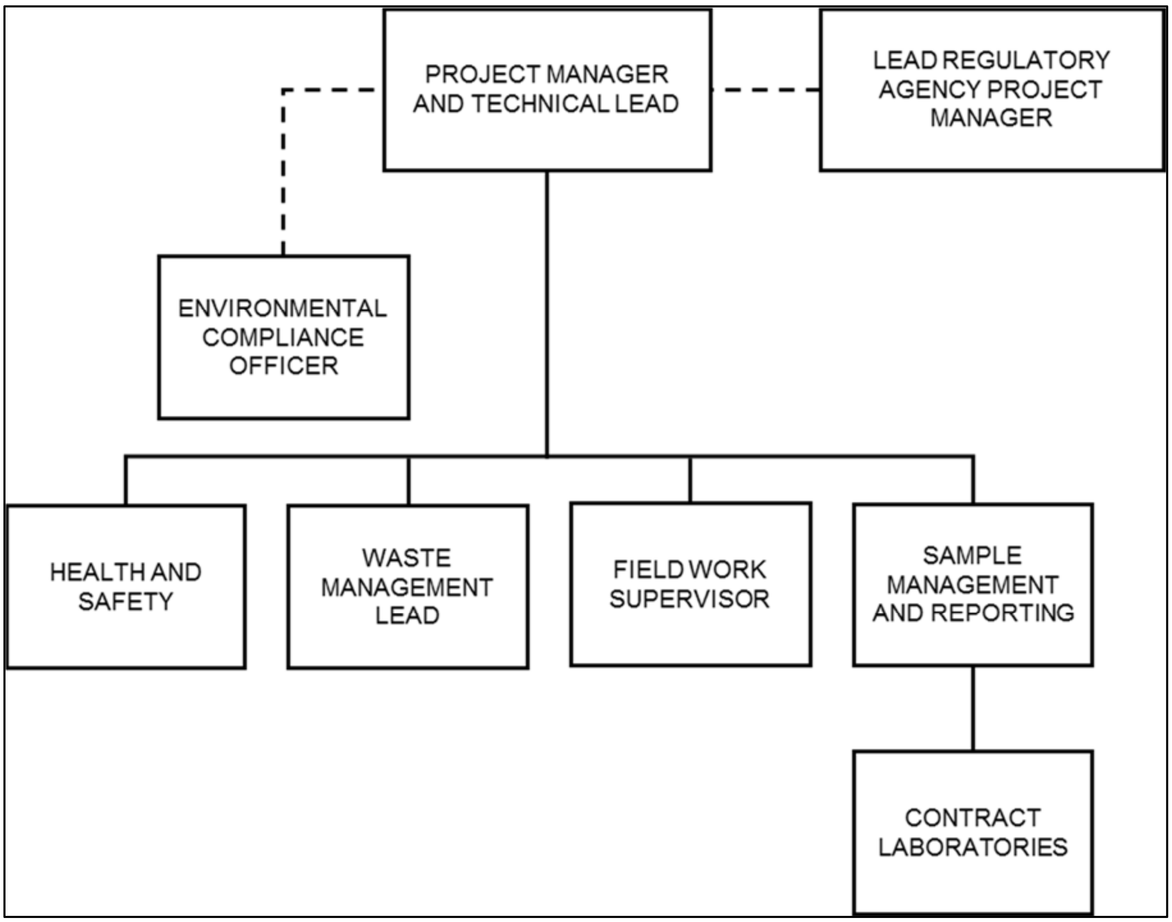

Figure H-A3. 214-T Building Sampling and Analysis Plan Project Organization

- **Project Manager:** The Project Manager provides oversight for activities and coordinates with the DOE Richland Operations Office (DOE-RL), EPA, Ecology, and contract management. The Project Manager (or designee) for 214-T Building closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management on all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.

- **Environmental Compliance:** The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.
- **Health and Safety:** The Health and Safety organization is responsible for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.
- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives analytical data from the laboratories, performs data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.
- **Contract Laboratories:** Contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation.
- **Waste Management:** The Waste Management organization communicates policies and protocols and ensures project compliance for storage, transportation, disposal, and waste tracking.
- **Field Work Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

H-A3.10.5 Sampling Design

The primary purpose of sampling the 214-T Building underlying soil is to determine if analytical data values exceed MTCA (WAC 173-340) Method B clean closure performance standards (Table H-A4).

This SAP utilized Ecology Publication #94-111 (Section 7.0, "Sampling and Analysis for Clean Closure") to determine the type of sampling design that will be utilized to demonstrate clean closure. When designing the sampling plan, both focused and area wide (grid) sampling methods were considered. Ecology Publication #94-111 (Section 7.2.1) identifies that area wide sampling is appropriate when the spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication #94-111 (Section 7.3, "Sampling to Determine or Confirm Clean Closure") identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling is further defined below.

Area Wide (Grid) Sampling. In grid sampling, samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen, at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication #94-111, is selective sampling of areas where contamination is expected or releases have been documented. Once visual inspections have been performed and any waste related staining, cracks, crevices, seams, and low points have been identified, focused sampling may be deemed necessary and added to the SAP. The location of focused samples, if any, will be identified and recorded as required in Section H-A3.10.12. Judgmental (focused) sampling is further defined below.

Judgmental (Focused) Sampling. In focused sampling, the selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and professional judgment. Focused sampling is distinguished from probability based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined utilizing Visual Sample Plan (VSP) software. The VSP tool, used throughout Washington State and nationally, statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 214-T Building, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and utilized for the input parameters for the 214-T Building. VSP parameter inputs and the basis for those inputs are detailed in Table H-A2.

The decision rule for demonstrating compliance with the MTCA (WAC 173-340) Method B clean closure level for area wide grid sampling has the following three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-A2, VSP calculated that at least 22 samples are required for the 214-T Building and associated outdoor storage area to reject the null hypotheses with 95 percent confidence and ensure that the DWMU would not be mistakenly released as clean. For the purpose of utilizing VSP software, the null hypothesis compares a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Sample locations were determined using the area wide grid with a random start sampling method run in VSP software (Figure H-A4). Statistical analysis of systematically collected data is valid if a random start to the grid is used. The 214-T Building dimensions were entered into VSP to determine the locations of samples. The triangular grid sampling layout was determined to have an even distribution over the entire sampling area providing the most representative data set including coverage of the middle portion of the sampling area. Samples will be taken from the node locations indicated by VSP software, and sample location identifications and sample numbers will be assigned using HEIS. The northwest corner of the 214-T Building is considered the (0,0) point of the sampling location map in Attachment H-A.a.

The first node location was chosen at random by VSP software, and the subsequent 21 sample locations were assigned by VSP software using a triangular grid sampling layout. Supporting documentation and the sampling grid map automatically generated by VSP software are provided in Attachment H-A.a.

As a conservative approach, focused sampling will be performed on the low point in the floor, along with the low points in each sump.

Table H-A2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value at the site exceeds the threshold (WAC 173-340 "Model Toxics Control Act—Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the 214-T Building dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user-defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

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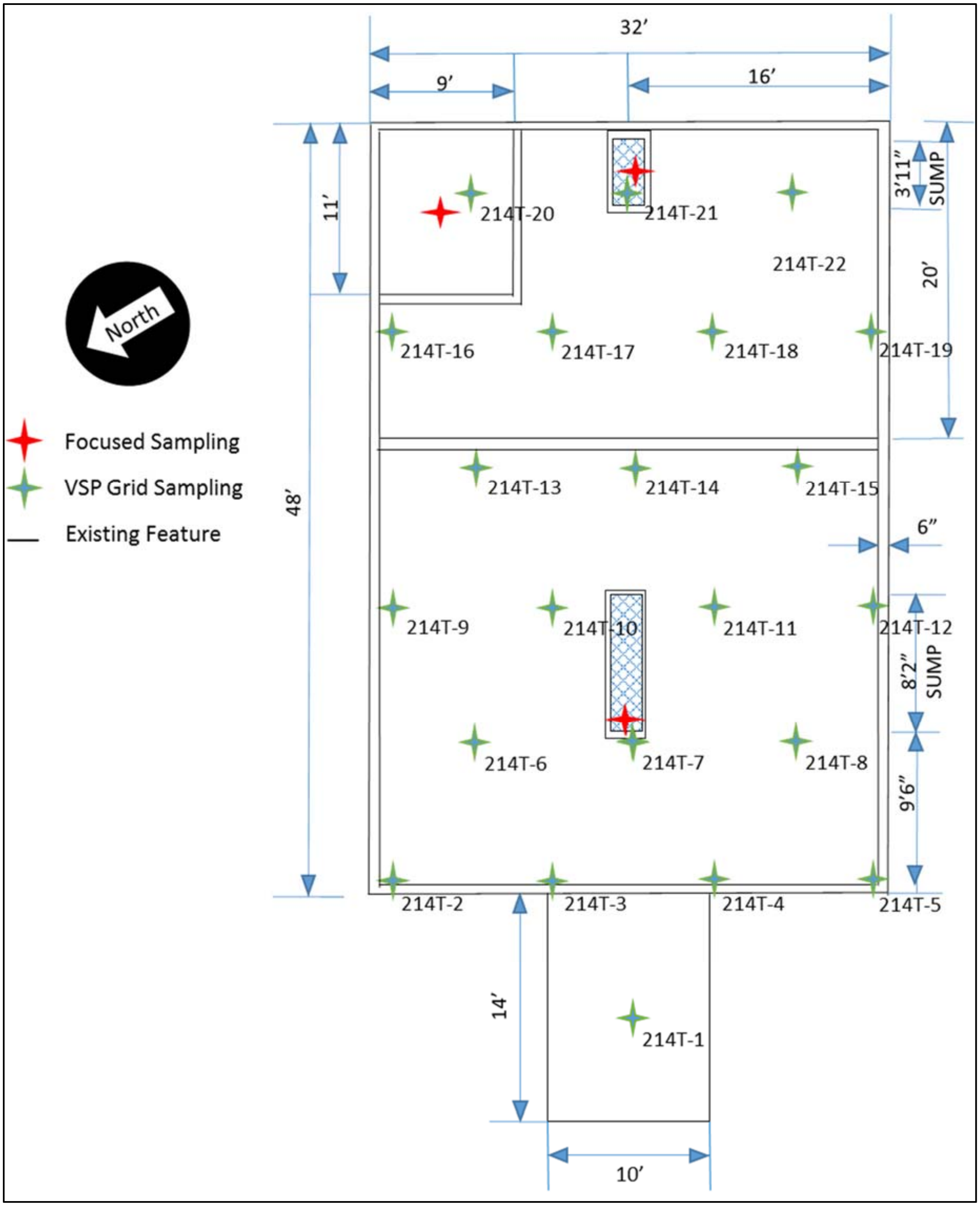

Figure H-A4. Sample Locations for the 214-T Building

H-A3.10.6 Sampling Methods and Handling

Grab sample matrix will consist of soil samples collected in precleaned sample containers taken at a depth of approximately 0 to 15 cm (0 to 6 in.) below ground surface and within an approximate 0.6 m (2 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer once the concrete and asphalt have been removed. Subsurface sampling (samples collected at depths greater than approximately 15 cm [6 in.] below ground surface) will be evaluated, based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-A3.10.14.

Once the soil is sampled, sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter which allows for a larger surface area to volume ratio; therefore, increasing the likelihood of identifying any potential contamination in the sample. Soil samples will be collected directly into containers at the chosen sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation
- Field walk down of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Sample container, preservation, and holding time requirements are specified in Table H-A3 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the sampling authorization form and chain-of-custody form.

Table H-A3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction; 24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE lined lid	250 g
EPA 9012	Cyanide	Cool≤4°C	14 days	G/P/PTFE	15 g

Table H-A3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 9056	Anions	Cool ≤6°C	28 days prior to extraction; 48 days after extraction	G/P	250 g

AG = amber glass
EPA = Environmental Protection Agency
G = glass
GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
OES = optical emission spectrometry
P = plastic
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

To prevent potential contamination of samples, decontaminated equipment will be used for each sampling activity.

Level I EPA precleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary depending on laboratory specific volumes/requirements for meeting analytical quantitation limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- Sampling authorization form and form number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable).

Sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste generated by sampling activities subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved facility.

H-A3.10.7 Analytical Methods

All analyses and testing will be performed consistent with this closure plan, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Analytical methods and performance requirements associated with the target analytes are outlined in Table H-A4.

H-A3.10.8 Quality Control

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

Laboratory QC samples estimate the precision and bias of analytical data. Field and laboratory QC samples are summarized in Table H-A5. A data quality assessment will be performed utilizing the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide (EPA QA/G-9R)*, and implementing the specific requirements in Sections H-A3.10.8 through H-A3.10.10.

Data verification, data validation, and data quality assessment will include both primary samples and QC samples.

H-A3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

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

H-A3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Table H-A4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
72-20-8	Endrin	SW-846 Method 8270	--	2.40E+01	3.30E-03	±30	≤30
58-89-9	Lindane	SW-846 Method 8270	9.09E-01	2.40E+01	1.65E-03	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
107-06-2	1,2-Dichloroethane	SW-846 Method 8260	1.10E+01	4.80E+02	5.00E-03	±30	≤30
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30
76-44-8	Heptachlor	SW-846 Method 8270	2.22E-01	4.00E+01	1.65E-03	±30	≤30
1024-57-3	Heptachlor Epoxide	SW-846 Method 8270	1.10E-01	1.04E+00	1.65E-03	±30	≤30

Table H-A4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
118-74-1	Hexachlorobenzene	SW-846 Method 8270	6.25E-01	6.40E+01	3.30E-01	±30	≤30
87-68-3	Hexachlorobutadiene	SW-846 Method 8270	1.28E+01	8.00E+01	3.30E-01	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30
75-01-4	Vinyl Chloride	SW-846 Method 8260	1.75E+02	2.40E+02	1.00E-02	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
1330-20-7	Xylene	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30

Table H-A4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+03	1.00E-02	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30
57-12-5	Cyanide	SW-846 Method 9012	--	4.80E+01	1.00E+00	±30	≤30
7440-62-2	Vanadium	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30
111-44-4	Dichloroethyl Ether [Bis (2-Chloroethyl) Ether]	SW-846 Method 8270	9.09E-01	--	3.30E-01	±30	≤30

Table H-A4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
123-91-1	1,4-Dioxane	SW-846 Method 8260	1.00E+01	2.40E+03	5.00E-01	±30	≤30
64-18-6	Formic Acid	SW-846 Method 9056	--	7.20E+04	2.00E+00	±30	≤30
924-16-3	N-Nitroso-di-n-butylamine	SW-846 Method 8270	1.85E-01	--	3.30E-01	±30	≤30

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

Note: Due to the quantity and nature of waste stored in the 214-T Building not presenting a threat to groundwater and not having soil or the presence of plants within the DWMU, no groundwater or ecological indicator MTCA cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equation 740-1 and Equation 740-2 from MTCA (WAC 173-340-740(3)(b)) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon

MTCA = "Model Toxics Control Act—Cleanup"

Req't = requirement

WAC = Washington Administrative Code

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Table H-A5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The laboratory control sample measures the accuracy of the analytical method.

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

Controls are in place to preserve the data sent to validators, and only additions to be made, not changes to the raw data, are allowed.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

H-A3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP software. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP software uses the analytical data to determine if the user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software will calculate the true standard deviation and if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-A2.1).

H-A3.10.12 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook, and only authorized persons may make entries in logbooks. Logbooks will be signed by the FWS, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following items will be included in the project file, as appropriate:

- All field logbooks or operational records
- Data forms
- Global positioning system data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports.

The laboratory is responsible for maintaining, and having available upon request, the following items:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-A3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

In the event that sample results based on the MTCA (WAC 173-340) Method B three-part test (Section H-A3.10.5) indicate contamination above clean closure levels, the contaminated soil will be removed in accordance with Section H-A3.8. Following removal of contaminated soil, additional samples will be taken at the same grid location as identified in Attachment H-A.a. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-A3.10.12, and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-A4, with accompanying QC samples as discussed in Section H-A3.10.8, to confirm that the MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-A3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to this SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, “Permit Changes.”

H-A3.11 Role of the Independent Qualified Registered Professional Engineer

An Independent, Qualified, Registered, Professional Engineer (IQRPE) will be retained to provide certification of the closure, as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 214-T Building. At a minimum, the following activities would be completed:

- Observation or review of visual inspections
- Observation or review of building demolition
- Observation or review of sampling activities
- Review of sampling procedures and results
- Observation or review of contaminated environmental debris removal (as applicable)
- Verification that locations of samples are as specified in the SAP
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-A3.12 Certification of Clean Closure

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 214-T Building, certification that the DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities.
- Description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of any unanticipated contaminated environmental media.
- All laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for all samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.
- Summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.
- Description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-A3.13 Conditions That Will Be Achieved When Closure Is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 214-T Building will be clean closed. The building, concrete, and asphalt will be removed, so only bare soil remains. A permit modification request will be submitted after clean closure has been confirmed to remove the 214-T Building DWMU from the Hanford Facility RCRA Permit.

H-A4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), closure activities will be completed no more than 180 days after the start of closure (Table H-A6). Should unexpected circumstances arise and an extension to the 180 day closure activity expiration date be deemed necessary, a permit modification will be submitted to Ecology for approval at least 30 days prior to the 180 day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements and criteria, have been and will continue to be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the 214-T Building, as outlined in Section H-A3.12 (Figure H-A5).

H-A5 Closure Costs

A detailed written estimate outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE and operated by DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), provisions of WAC 173-303-620, “Financial Requirements,” are not applicable to the Hanford Facility.

Table H-A6. 214-T Building Closure Activity Description

Closure Activity Description		Expected Duration
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 214-T Building DWMU	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 214-T Building DWMU	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste	Package and ship waste to approved facility for treatment, storage, and/or disposal. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all wastes in accordance with the approved closure plan. Request extension if necessary.	40 Days (Day 40)
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records.	40 Days (Day 40)
Visual Inspection of Concrete and Asphalt	Identify areas of concern (cracks in concrete and asphalt that could potentially reach the soil below the concrete and asphalt).	10 Days (Day 50)
	Document visual inspection with photos, locations and dimensions of staining and cracks.	
Remove Building, Concrete, and Asphalt	Remove building, concrete, and asphalt with large equipment.	40 Days (Day 90)
	Containerize building and concrete and asphalt waste debris.	
	Perform waste determination on waste debris.	
	Dispose of waste debris in approved disposal facility.	
Sampling and Analysis of Underlying Soil (Following Removal of Concrete and Asphalt; May Be Performed Concurrently with Waste Determination and Disposal of Concrete and Asphalt)	See Section H-A3.10 for details of sampling and analysis.	90 Days (Day 180)
	Data validation and verification.	
	If necessary, remove contaminated environmental media (soil), and resample and analyze to confirm that clean closure levels have been achieved.	

Table H-A6. 214-T Building Closure Activity Description

Closure Activity Description		Expected Duration
Primary Activity	**Secondary Activity**	**Duration**
Final Closure of the 214-T Building DWMU	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (See Section H-A3.12 for more details on the clean closure certification).	60 Days (Day 240)

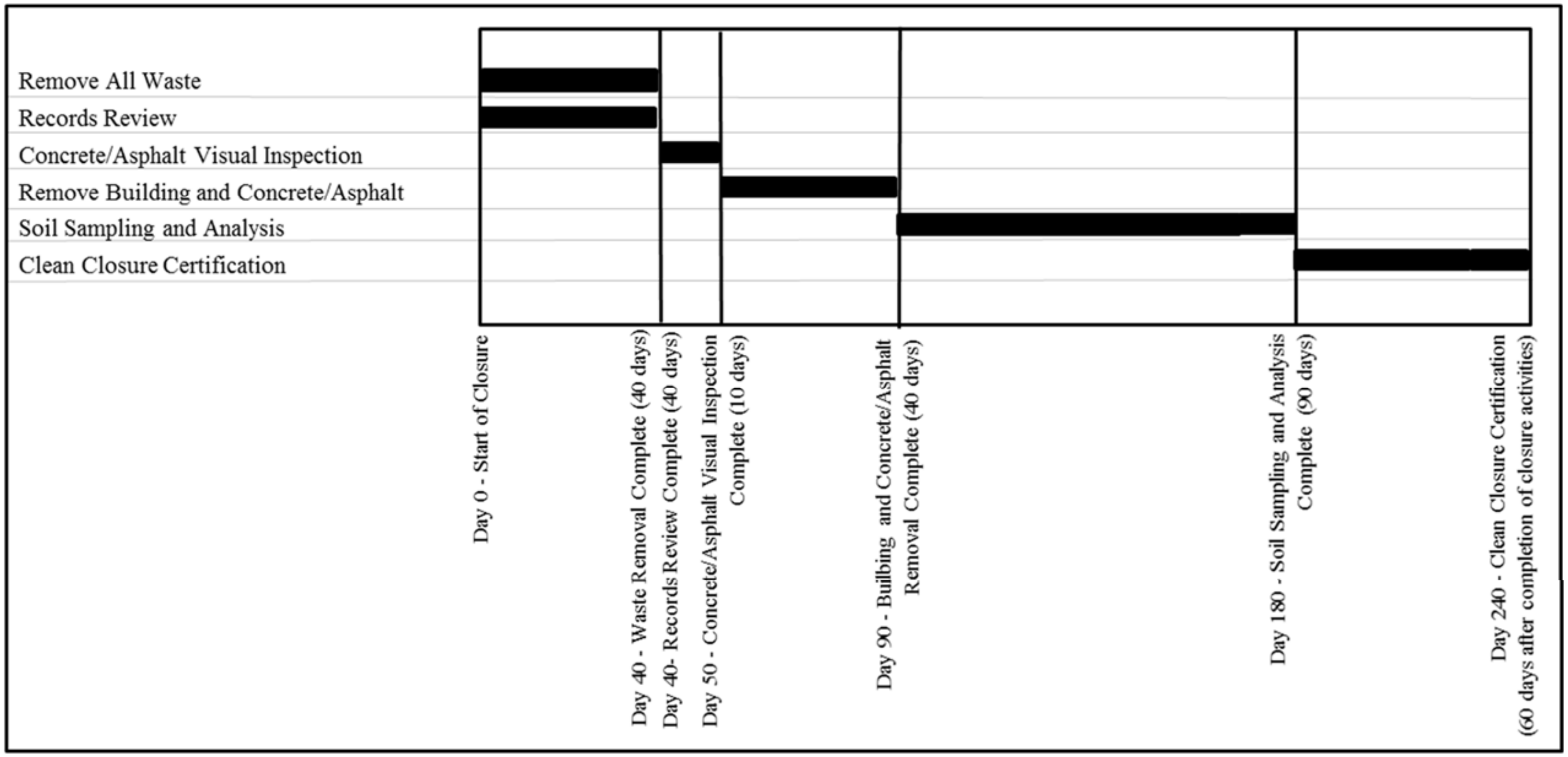

Figure H-A5. 214-T Building Closure Schedule Activities

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Attachment H-A.a

214-T Building
Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

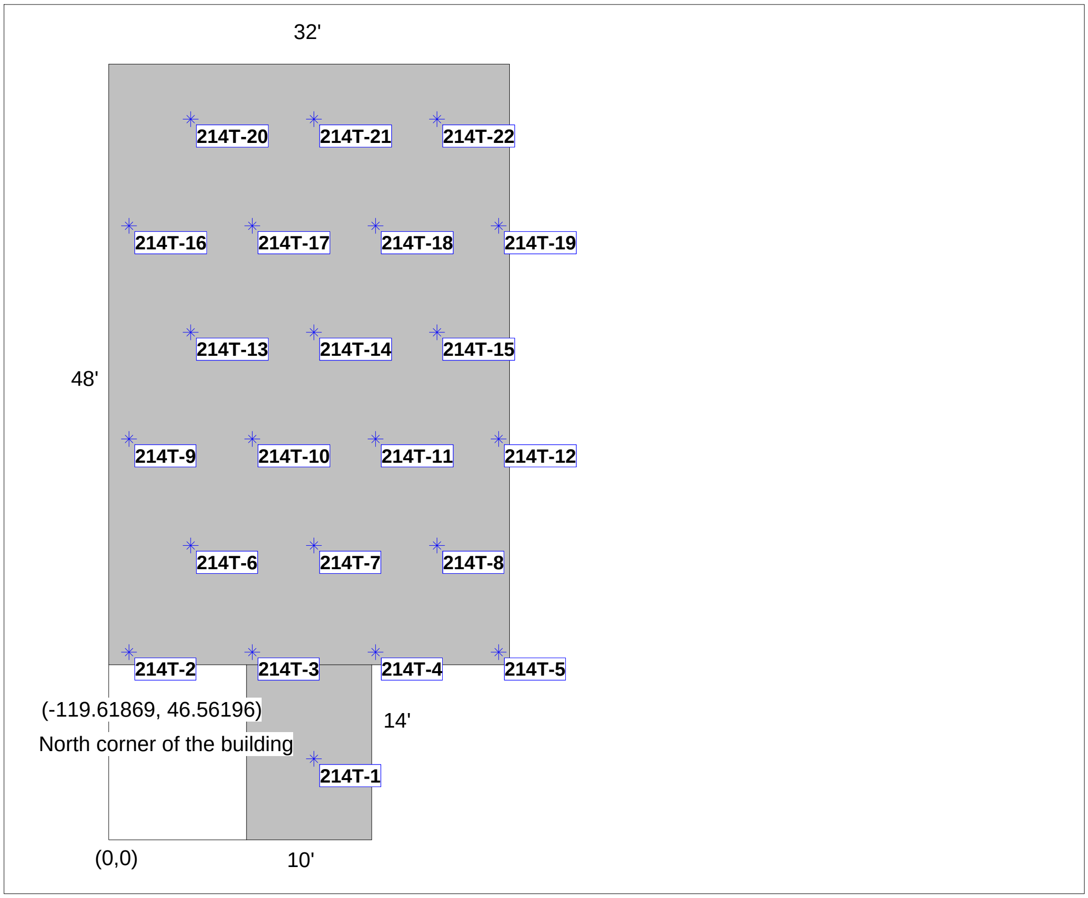
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	22
Number of selected sample areas [b]	1
Specified sampling area [c]	1676.00 ft^2
Size of grid / Area of grid cell [d]	9.83686 feet / 83.8 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 214-T Building					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
16.3787	6.4860	214T-1		Systematic	
1.6234	15.0050	214T-2		Systematic	
11.4603	15.0050	214T-3		Systematic	
21.2972	15.0050	214T-4		Systematic	
31.1340	15.0050	214T-5		Systematic	
6.5419	23.5239	214T-6		Systematic	
16.3787	23.5239	214T-7		Systematic	
26.2156	23.5239	214T-8		Systematic	
1.6234	32.0429	214T-9		Systematic	
11.4603	32.0429	214T-10		Systematic	
21.2972	32.0429	214T-11		Systematic	
31.1340	32.0429	214T-12		Systematic	
6.5419	40.5619	214T-13		Systematic	
16.3787	40.5619	214T-14		Systematic	
26.2156	40.5619	214T-15		Systematic	
1.6234	49.0809	214T-16		Systematic	
11.4603	49.0809	214T-17		Systematic	

21.2972	49.0809	214T-18		Systematic	
31.1340	49.0809	214T-19		Systematic	
6.5419	57.5998	214T-20		Systematic	
16.3787	57.5998	214T-21		Systematic	
26.2156	57.5998	214T-22		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

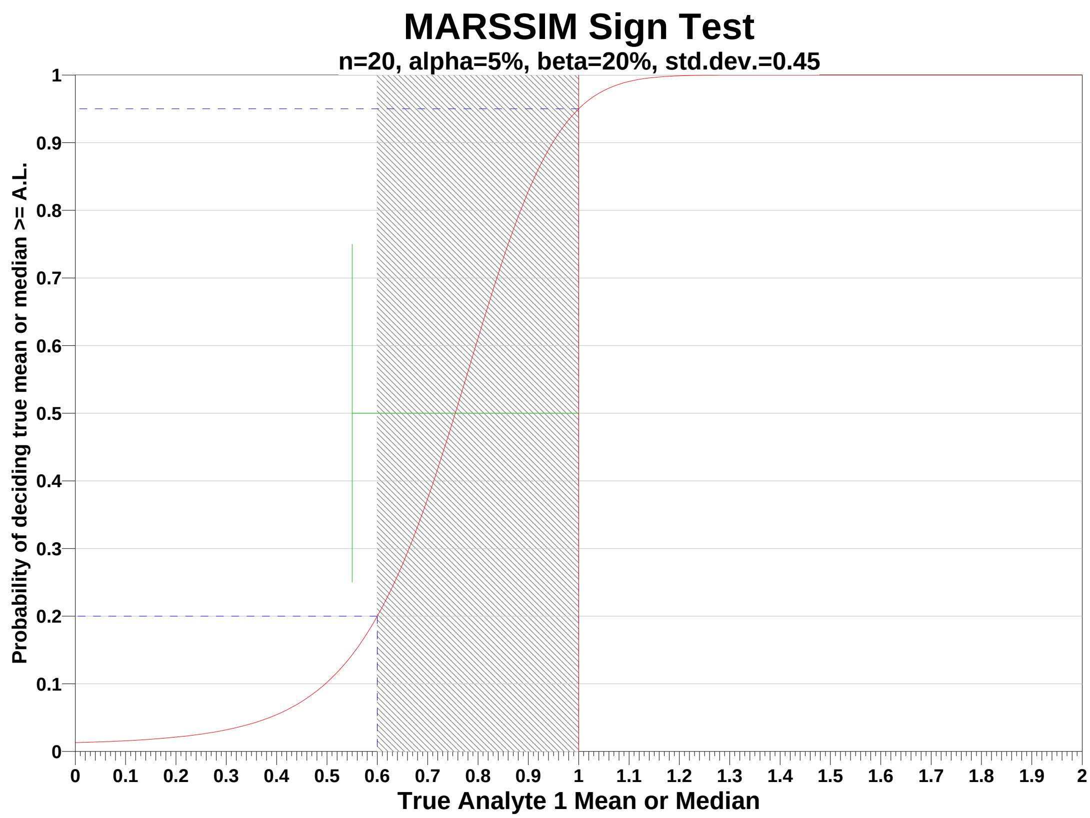
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions
The assumptions associated with the formulas for computing the number of samples are:
1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis
The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**22 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Appendix H-B

221-T Building Dangerous Waste Management Units

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Contents

Figure

Tables

H-B1 Introduction

This appendix discusses closure activities for the T Plant Complex (T Plant) Operating Unit Group (OUG) 221-T Canyon Deck, 221-T Cells (7L, 13R, 16R, and 17R), 221-T Railroad Tunnel, 221-T Head End, and 221-T Operations Gallery Storage Area dangerous waste management units (DWMUs), herein referred to collectively as the 221-T Building DWMUs. The 221-T Building DWMUs are located within the operating 221-T Canyon.

T Plant 221-T Building contains both *Resource Conservation and Recovery Act of 1976* (RCRA) and *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) operating units. Only closure activities for the RCRA operating units identified in Section H-B1.1 will be addressed in this closure plan. However, due to the supporting functions for ongoing activities in T Plant and the location of the 221-T Building DWMUs, final closure actions will be coordinated with final closure of the T Plant OUG. Closure of the 221-T Building DWMUs will be performed in accordance with the closure schedule outlined in Table H-B3 and Figure H-B2; however, individual DWMU closure may be performed independently from other DWMUs within the collective group (221-T Building DWMUs).

This closure plan describes in detail the closure activities necessary to establish closure for each of the 221-T Building DWMUs. Such closure activities include removal of waste, records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste, visual inspections, decontamination, and macroencapsulation.

Within 60 days upon completion of closure activities, the Permittees will provide the Washington State Department of Ecology (Ecology) with a certification of closure in accordance with the *Washington Administrative Code* (WAC) 173-303-610(6), "Dangerous Waste Regulations," "Closure and Post-Closure." Closure certification will provide supportive evidence that the 221-T Building DWMUs have met established clean closure standards.

This closure plan complies with WAC 173-303-610(2) through (10). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Please note, the terms "mixed waste" and/or "waste," when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

H-B1.1 Unit Description

T Plant, located in the Hanford Facility 200 West Area, was constructed in 1943 and operated to provide chemical separation of plutonium from uranium fission and activation products until 1956, using the Bismuth-Phosphate/Lanthanum-Fluoride process. Beginning in 1957, T Plant was used for decontamination operations. Currently, the primary mission of T Plant is the treatment and storage of waste. T Plant will store and treat sludge retrieved from the K Basins. Waste received and processed by T Plant has been generated both on and off the Hanford Facility.

The 221-T Building DWMUs (Figure H-B1) include the following individual DWMUs:

- 221-T Canyon Deck
- 221-T Cells (7L, 13R, 16R, and 17R)
- 221-T Railroad Tunnel
- 221-T Head End
- 221-T Operations Gallery Storage.

H-B1.1.1 221-T Canyon Deck

The 221-T Canyon Deck DWMU is permitted as a container storage and treatment area, and also as a containment building storage and treatment area for dry (i.e., nonliquid), noncontainerized waste in accordance with WAC 173-303-695, "Containment Buildings" (incorporated by 40 *Code of Federal Regulations* [CFR] 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart DD, "Containment Buildings"), as described in HNF-19668, *T Plant Complex, 221-T Building Dangerous Waste Containment Building Certification*.

The 221-T Canyon Deck is approximately 11 m (37 ft) wide by over 244 m (800 ft) long. The tops of the cell cover blocks serve as the floor surface in much of the 221-T Canyon Deck. Each of the 20 sections is numbered according to the 221-T Building section number and consists of two cells: one designated right (R), and the other designated left (L).

Sections 4 through 10 of the 221-T Canyon Deck are the canyon service areas used as staging and storage areas for contaminated and decontaminated equipment. Primary staging and storage areas for pumps and agitators are located in Sections 4 and 6 of the 221-T Canyon Deck. However, these locations within the canyon can change to support waste operations.

The 221-T Canyon Deck can be used for packaging, decontamination, repair, treatment, and storage.

The 221-T Canyon Deck does not have an engineered secondary containment operating in accordance with WAC 173-303-630,"Use and Management of Containers." Waste containers that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) and/or the criteria specified in the containment building certification (HNF-19668) are managed with portable secondary containment systems or modular confinement structures, as described in WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter referred to as the Hanford Facility RCRA Permit), Addendum C, "Process Information."

H-B1.1.2 221-T Cells (7L, 13R, 16R, and 17R)

The 221-T Cells (7L, 13R, 16R, and 17R) are designed and operated to meet the requirements of WAC 173-303-695 (40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," Subpart DD, "Containment Buildings,") as described in HNF-19668, to store and/or treat dry (i.e., nonliquid), noncontainerized waste, and does not facilitate or support liquid waste management. The 221-T Cells (7L, 13R, 16R, and 17R) DWMU does not have an engineered secondary containment system operating in accordance with WAC 173-303-630. Waste containers stored and/or mixed waste containers treated in this area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) and/or the criteria specified in the containment building certification (HNF-19668) must be managed with portable secondary containment systems, as described in Addendum C. Waste in the containment cells is accessed through an overhead crane. Access by surveillance personnel to the cell floor is not feasible.

Each of the four cells measure approximately 5.4 m (18 ft) long, by 4.0 m (13 ft) wide, by 6.7 m (22 ft) deep. Standard canyon cells normally are covered by four approximately 2 m (7 ft) thick concrete cover blocks. Each cover block has a carbon steel lifting bail to allow access into the cells. Shielding walls made of approximately 3 m (10 ft) thick reinforced concrete separate the cells from the electrical and pipe galleries. Each section in the canyon is numbered according to building section and consists of two cells: one is designated (R), and one is designated (L). Cells within each section are separated by an approximately 2 m (7 ft) thick reinforced concrete wall.

H-B1.1.3 221-T Railroad Tunnel

The 221-T Railroad Tunnel DWMU enters the 221-T Canyon Building on the west side at Cell 2L and consists of an area located within the 221-T Canyon Building, as well as the associated ramp and outdoor storage area. The area located within the 221-T Canyon Building is permitted in accordance with WAC 173-303-695 (40 CFR 264, Subpart DD), as described in HNF-19668, to store and/or treat dry (i.e., nonliquid), noncontainerized waste.

The 221-T Railroad Tunnel measures approximately 63.7 m (209 ft) long by 4.9 m (16 ft) wide. The floor, walls, and ceiling are constructed of reinforced concrete. The railroad tunnel is overburdened with a minimum of approximately 0.9 m (3 ft) of native rock and soil. At the west end of the 221-T Railroad Tunnel, an approximate 4.9 m (16 ft) wide by 7 m (23 ft) high overhead roll-up door provides vehicular and railway access. A stairway provides access between the 221-T Railroad Tunnel and 221-T Canyon Deck.

The 221-T Railroad Tunnel does not have an engineered secondary containment system operating in accordance with WAC 173-303-630. Waste containers stored and/or mixed waste containers treated in this area that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) and/or the criteria specified in the containment building certification (HNF-19668) must be managed with portable secondary containment systems or modular confinement structures, as described in T Plant Addendum C.

H-B1.1.4 221-T Head End

The 221-T Head End DWMU is located at the north end of the 221-T Canyon Building, and consists of a large high bay work area located inside the building, measuring approximately 12 m (39 ft) wide by 13 m (44 ft) long, as well as the associated outdoor storage area, and concrete ramp that provides vehicular access into the building. At the canyon deck level, the head end provides a working space for contamination control activities and container storage. The northernmost portion of the head end is a mezzanine level accessed by open metal stairs with direct access to a portion of the craneway. An overhead rolling door provides direct access to the associated outdoor storage area constructed of concrete used for container staging.

The floor, roof, and other walls are continuations of the canyon construction. A metal wall of corrugated sheet metal on steel beams isolates the head end from the canyon at the beginning of Section 2 of the 221-T Canyon Building. A double-wide door has been added to the sheet metal wall separating the head end from the balance of the canyon.

The 221-T Head End does not have an engineered secondary containment system. Waste containers that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems, as described in T Plant Addendum C.

H-B1.1.5 221-T Operations Gallery Storage

The 221-T Operations Gallery Storage DWMU is located in the 221-T Operations Gallery (Section 14 of the 221-T Canyon Building) and is permitted for nonflammable waste container storage. This unit consists of two metal cabinets, each measuring approximately 2.0 m (6.5 ft) tall by 0.9 m (3 ft) wide by 0.46 m (1.5 ft) deep. Both cabinets have multiple shelves used for waste container storage. Waste containers stored inside the cabinets that do not meet WAC 173-303-630(7)(c) criteria (e.g., waste packages that contain free liquids) are placed on portable secondary containment systems, such as spill tubs. All other waste codes are acceptable. Liquid waste is stored and segregated by using portable secondary containment systems such as plastic spill tubs.

H-B1.1.6 Maximum Waste Inventory

The maximum storage capacities of the 221-T Building DWMUs are identified in Table H-B1.

Table H-B1. Maximum Waste Inventory of the 221-T Building DWMUs

DWMU	Maximum Waste Inventory
221-T Canyon Deck	858.6 m^3 (858,600 L)
221-T Cells (7L, 13R, 16R, and 17R)	494 m^3 (494,000 L)
221-T Railroad Tunnel	345.3 m^3 (345,300 L)
221-T Head End	167.2 m^3 (167,200 L)
221-T Operations Gallery Storage	0.82 m^3 (820 L)

H-B2 Closure Performance Standard

Closure performance standards for the 221-T Building DWMUs will be based on WAC 173-303-610(2), which requires closure of the facility in the following manner that accomplishes the following objectives:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate, to the extent necessary, to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous dangerous waste activity.

These performance standards are addressed in the Sections H-B2.1 and H-B3.8 of this closure plan.

H-B2.1 Closure Levels

The 221-T Building DWMUs will be closed to the performance standards identified in WAC 173-303-610(2) and WAC 173-303-665, “Landfills.” Wastes will be removed during closure activities from all DWMUs. The 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End will be decontaminated, in accordance with WAC 173-303-610(5), and clean closed to the clean debris surface standards under RCRA. However, due to the difficulty accessing the inside of 221-T Cells (7L, 13R, 16R, and 17R) for decontamination and verification to demonstrate clean closure to the clean debris surface standard, 221-T Cells (7L, 13R, 16R, and 17R) will undergo closure as a landfill through the use of the macroencapsulation treatment standard (Section H-B3.5). The 221-T Building DWMUs closure performance standards will include the requirements outlined in WAC-173-303-610(1)(b) concerning post-closure care for units where waste residues will remain after closure (Section 0).

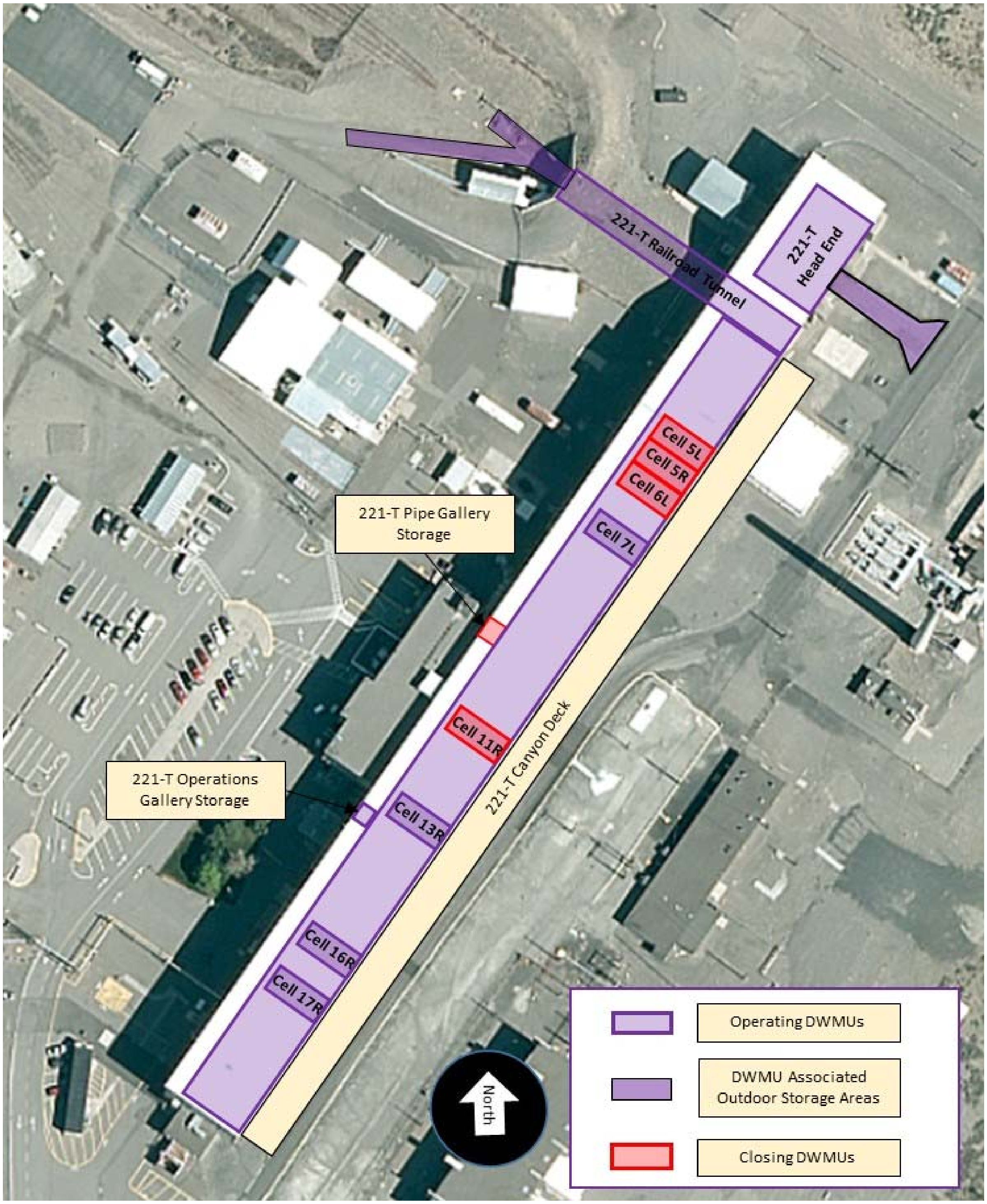

Figure H-B1. 221-T Building Dangerous Waste Management Units (Aerial from 2012)

H-B3 Closure Activities

The 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End DWMUs will be clean closed using the closure performance standards under WAC 173-303-610(2)(b)(ii). Under WAC 173-303-610(2)(b)(ii), clean closure standards in this closure plan coordinate with Ecology Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, Section 5.0, “Debris,” which indicates that hazardous debris must be treated to comply with applicable land disposal restriction (LDR) treatment standards.

Debris is managed through the following three options:

- Debris can be removed from a closing unit and managed as a dangerous waste, treated to comply with applicable LDR treatment standards, and disposed of at an appropriate dangerous waste disposal facility.
- Debris can be managed in special types of units in waste that do not constitute placement in a land disposal unit and, therefore, do not trigger LDR treatment standards.
- Facility owners/operators, generators, and transporters can decontaminate debris and ask Ecology to make a determination that debris does not contain dangerous waste.

The 221-T Building DWMUs are part of the 221-T Canyon Building and will remain in place after closure until final disposition of T Plant and the 221-T Canyon Building. The 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End will be decontaminated in accordance with LDR treatment standards for hazardous debris established in 40 CFR 268.45, “Land Disposal Restrictions,” “Treatment Standards for Hazardous Debris,” Table 1. Ecology Publication #94-111, Section 5.3.1, “Alternative Treatment Standards,” recognizes materials requiring decontamination that will not be removed, including structures such as concrete containment structures, and may not meet the regulatory definition of debris. However, alternative treatment standards for hazardous debris represent the best demonstrated available technology for materials typically subject to decontamination during closure and, as such, are appropriate minimum clean closure decontamination standards.

The 221-T Operations Gallery Storage cabinets will be clean closed through removal and managed in accordance with Section H-B3.6.3.

H-B3.1 Health and Safety Requirements

Closure will be performed to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Qualified personnel will be trained in applicable safety and environmental procedures identified in T Plant Addendum G, “Personnel Training,” and must have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements. Personnel will be equipped with appropriate personal protective equipment (PPE) for the closure activity being performed.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. The Hanford Facility RCRA Permit, Attachment 5, describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, which provides training requirements for Hanford Facility personnel associated with 221-T Building DWMUs.

Project-specific safety training, addressed explicitly to the project and day’s activity, will include the following:

- Training will provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering many factors, including the following:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records are maintained for each employee in an electronic database. The Permittees training organization maintains the training records system.

H-B3.2 Removal of Wastes and Waste Residues

All waste removed from the DWMUs will be managed in accordance with WAC 173-303 and T Plant waste management practices. Waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers that meet U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with Title 49 of the CFR. Waste packaged in non-DOT regulation (large or irregular shaped) containers will be shipped in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily occur utilizing highway transportation but may also include shipping by rail.

Waste subject to the LDR requirements of WAC 173-303-140, “Land Disposal Restrictions,” which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved facility.

Waste residues are not anticipated after decontamination of the 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End. Waste residues remaining in the 221-T Cells (7L, 13R, 16R, and 17R) DWMU will be immobilized utilizing the immobilization technology of macroencapsulation and will not be removed from the 221-T Canyon Building.

Waste generated during decontamination of the 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End DWMUs will be managed as detailed in Section H-B3.6.

H-B3.3 Unit Components, Parts, and Ancillary Equipment

The 221-T Cells (7L, 13R, 16R, and 17R) DWMU contains original operating equipment such as tanks, piping, jumpers, and other miscellaneous equipment. Table H-B2 contains the inventory of each cell based on HNF-8812, *T Plant Cell Investigation Phase II Report*. During closure, cell contents will be removed and managed in accordance with Section H-B3.6.

Table H-B2. 221-T Cell Legacy Contents

221-T Cell	Contents
7L	Two plutonium-uranium extraction tube bundles, thin tank, large tank, centrifuge, and 9 jumpers
13R	Skiff with residues, large tank, and centrifuge
16R	Cell contains one mixed waste box
17R	Large tank with jumpers attached, centrifuge pedestal block, centrifuge base, approximate 3 m (9 ft) by 2 m (5 ft) by 2 m (5 ft) box with centrifuge lid, and silver reactor

H-B3.4 Inspection of Units Before Decontamination

After waste is removed from the 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End, a visual inspection will be performed to identify cracks or other openings in the DWMU structure where waste or debris could be released to the environment. Locations and dimensions of cracks or other openings, which could have led to release of waste during storage or treatment, will be documented in the facility operating record and provided as information in the closure certification in Section H-B3.11.

221-T Operations Gallery Storage consists of metal storage cabinets that will be removed; therefore, no decontamination will take place.

H-B3.5 Decontamination

As specified in Ecology Publication #94-111, Section 5.3, “Decontaminating Debris,” and Section 5.6, “Decontamination of Concrete Containment Structures,” decontamination will be performed using the debris specific, technology based Alternative Treatment Standard for Hazardous Debris specified in 40 CFR 268.45, Table 1 (incorporated by reference at WAC 173-303-140(2)(a)) and will meet debris specific performance standards specified therein.

The 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End DWMU areas of contamination will be physically extracted to a minimum depth of 0.6 cm (0.25 in.) of the surface layer. Physical extraction techniques will include one of the following methods as defined in Table 1 of 40 CFR 268.45:

- Abrasive blasting
- Scarification, grinding, and planing
- Spalling.

221-T Cells (7L, 13R, 16R, and 17R) will be closed using the 40 CFR 268.45, Table 1 alternative treatment standards for hazardous debris immobilization technology of macroencapsulation to encapsulate any remaining waste residue inside of the cells. Ecology Publication #94-111, Section 5.3.1, “Alternative Treatment Standards for Hazardous Debris,” identifies the use of an immobilization technology, which could be subject to long-term monitoring requirements under a post-closure scenario; therefore, post-closure monitoring will be performed for the 221-T Cells (7L, 13R, 16R, and 17R) in accordance with Section 0.

The 221-T Operations Gallery Storage cabinets will be removed; therefore, decontamination will not be performed.

H-B3.6 Identifying and Managing Waste Generated from Closure Activities

Closure activities for the 221-T Building DWMUs will result in the generation of three known waste streams: material from decontamination, excess grout generated during grouting activities, and debris resulting from the removal of legacy materials from the cells.

H-B3.6.1 Material from Decontamination

Concrete surface removal is required for decontamination (Section H-B3.5). The resulting material will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. The newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170, “Requirements for Generators of Dangerous Waste,” through WAC 173-303-230, “Special Conditions.” The material will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-B3.6.2 Excess Grout

Excess grout remaining when grouting operations are completed for the 221-T Cells (7L, 13R, 16R, and 17R) will most likely be generated during closure activities. This excess grout is anticipated to be a nondangerous solid waste stream and will be managed and disposed at an approved disposal site as newly generated nondangerous waste.

H-B3.6.3 Debris

Once the determination has been made that the 221-T Cells (7L, 13R, 16R, and 17R) will close, materials and equipment within the cells will be removed. Debris will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal. Debris includes, but is not limited to, the following types of wastes:

- Equipment and materials identified in Table H-B2
- Storage cabinets from the 221-T Operations Gallery Storage
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal).

Preferred management of the debris resulting from closure activities is in a bulk form. Bulk debris will include large tanks. Tanks removed from the cells will be cut up to meet the definition of debris. Other miscellaneous bulk debris will be placed into bulk containers, such as roll-off boxes, for disposal. These bulk containers will be stored in a suitable area in proximity to the 221-T Canyon Building, or they may be accumulated for up to 90 days in another suitable location.

Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

Waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. Debris will be containerized, labeled, and sampled (if necessary) for characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-B3.7 Identifying and Managing Contaminated Environmental Media

The 221-T Building DWMUs are located inside the 221-T Canyon Building; therefore, contaminated environmental media are not anticipated. Should the visual inspection prior to decontamination identify cracks or other openings that lead to environmental media below the building, it would be considered an unanticipated event during closure and Ecology will be notified in accordance with WAC 173-303-610(3)(b)(ii).

H-B3.8 Confirming Closure

The 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End will be decontaminated in accordance with WAC 173-303-610(5) and clean closed under RCRA. Decontamination of debris, in accordance with 40 CFR 268.45, is a performance based technology and will be verified through the use of the clean debris surface standard identified in 40 CFR 268.45, Table 1. A visual inspection will be performed post-decontamination to verify that surfaces of the DWMUs are free of all waste, with the exception that residual staining from waste consisting of light shadows, slight streaks, or minor discolorations, and waste in cracks, crevices, and pits are limited to no more than 5 percent of each square inch of surface area. The 221-T Operations Gallery Storage cabinets will be removed.

The 221-T Cells (7L, 13R, 16R, and 17R) will be filled with grout, which will effectively macroencapsulate any remaining waste residues on the surfaces of the cells. Macroencapsulation is a performance based technology. Visual verification will be conducted to ensure that cells are filled with grout, thereby encapsulating any remaining waste residues and substantially reducing surface exposure to any potential leaching media.

H-B3.9 Sampling and Analysis and Constituents to Be Analyzed

The 221-T Building DWMUs clean closure is being determined by performance based standards (Section **Error! Reference source not found.**); therefore, sampling is not anticipated. During visual verification to confirm clean closure to the clean debris surface standards, if sampling is deemed necessary, this will be considered an unusual event and a permit modification will be submitted to Ecology in accordance with WAC 173-303-610(3)(b)(ii).

H-B3.10 Role of the Independent, Qualified, Registered, Professional Engineer

An independent, qualified, registered, professional engineer (IQRPE) will be retained to provide certification of the closures, as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 221-T Building DWMUs. At a minimum, the following activities will be performed by the IQRPE:

- Review of project documentation during closure activities
- Observe and/or review decontamination activities
- Review of documentation or inspection of the grouted 221-T Cells (7L, 13R, 16R, and 17R)
- Observe and/or review waste disposal documentation
- Observe and/or review contaminated environmental media removal (as applicable)
- Review of groundwater sampling procedures and results during the closure period
- Observation or review of groundwater sampling activities during the closure period
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the closure certification that will be provided to Ecology.

H-B3.11 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 221-T Building DWMUs, a certification that each DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities, including the results of the various visual inspections.
- Description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of waste and debris.
- Documentation of decontamination activities, including grouting activities for macroencapsulation.
- Documentation of the visual verification to the clean debris surface.
- Summary report that identifies and describes data reviewed by the IQRPE.
- Description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-B3.12 Conditions that will be Achieved when Closure is Complete

Upon completion of the closure activities, the 221-T Building DWMUs will remain in an as-is state. RCRA portions of the 221-T Canyon Building will be considered closed, and a permit modification will be submitted to remove the DWMUs from the active portion of the Hanford Facility RCRA Permit. Post-closure requirements for the 221-T Cells (7L, 13R, 16R, and 17R) will be required and are documented in Section H-B6.7.

H-B4 Closure Schedule and Time Frame

Closure activities will take place in conjunction with final closure for T Plant OUG. The Hanford Facility has an ongoing need for the operation of T Plant. Decontamination activities will by nature and size of the DWMUs take longer than the allowable 180 days in accordance with WAC 173-303-610(4)(b).

Approval of this closure plan will grant the Hanford Facility an extended closure period for performance of the closure activities, in accordance with WAC 173-303-610(4)(b), and a separate extension request will not be filed.

During the extended closure period, the Hanford Facility will comply with all applicable requirements of the permit. Additionally, DWMUs will be maintained in a manner that prevents threats to human health and the environment and monitored through routine surveillances.

Closure activities and extended closure period expected durations are outlined in Table H-B3 and Figure H-B2.

H-B5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE, and operated by DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), the provisions of WAC 173-303-620, "Financial Requirements," are not applicable to the Hanford Facility.

Table H-B3. 221-T Building DWMUs Closure Activities

Closure Activity Description		**Expected Duration**
Primary Activity	**Secondary Activity**	
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 221-T Building DWMU(s)	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 221-T Building DWMU(s)	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste and Debris	Package and ship waste to an approved facility for treatment, storage, and/or disposal. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all wastes in accordance with the approved closure plan. Request extension if necessary.	180 days (Day 180)
Perform Decontamination of 221-T Canyon Deck, 221-T Railroad Tunnel, and 221-T Head End	Equipment mobilization	180 days (Day 360)
	Decontamination	
	Waste management	
	Visual verification to clean debris surface	
Perform Macroencapsulation of the 221-T Cells (7L, 13R, 16R, and 17R)	Isolation of utilities	90 days (Day 450)
	Grouting of cells	
	Visual verification of grouting	
Closure Activities Complete		
Owner/Operator and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (see Section H-B3.11 for more details on the clean closure certification)	60 days (Day 510)

H-B6 Post-Closure

Post-closure activities will begin for the 221-T Cells (7L, 13R, 16R, and 17R) after acceptance of final closure by Ecology. After receipt of the closure certification, Ecology will verify that the facility has been closed in accordance with the approved closure plan. Once Ecology verification is complete, post-closure activities will begin. In general, post-closure will include the following activities:

- Groundwater monitoring, as required in WAC 173-303-665
- Periodic inspections of the facility
- Maintenance activities to maintain groundwater monitoring
- Continued security of the 221-T Canyon Building.

As required by WAC 173-303-610(7), post-closure activities will continue for a period of 30 years.

H-B6.1 Post-Closure Use of Property

After closure of the 221-T Cells (7L, 13R, 16R, and 17R), the area in which the cells are located will continue to be monitored 24 hours a day per the requirements of T Plant Addendum E, “Security.” The 221-T Cells (7L, 13R, 16R, and 17R) will be closed to industrial standards and maintained in conjunction with final closure of the T Plant OUG; however, no post-closure use of the land is anticipated.

H-B6.2 Groundwater Monitoring and Reporting

The existing groundwater monitoring system will be evaluated for compliance with closure and post-closure groundwater monitoring requirements. After evaluation of the existing well system, modifications will be made, as necessary, to ensure compliance with closure and post-closure monitoring of a landfill. The updated monitoring network will be maintained throughout the closure and post-closure periods.

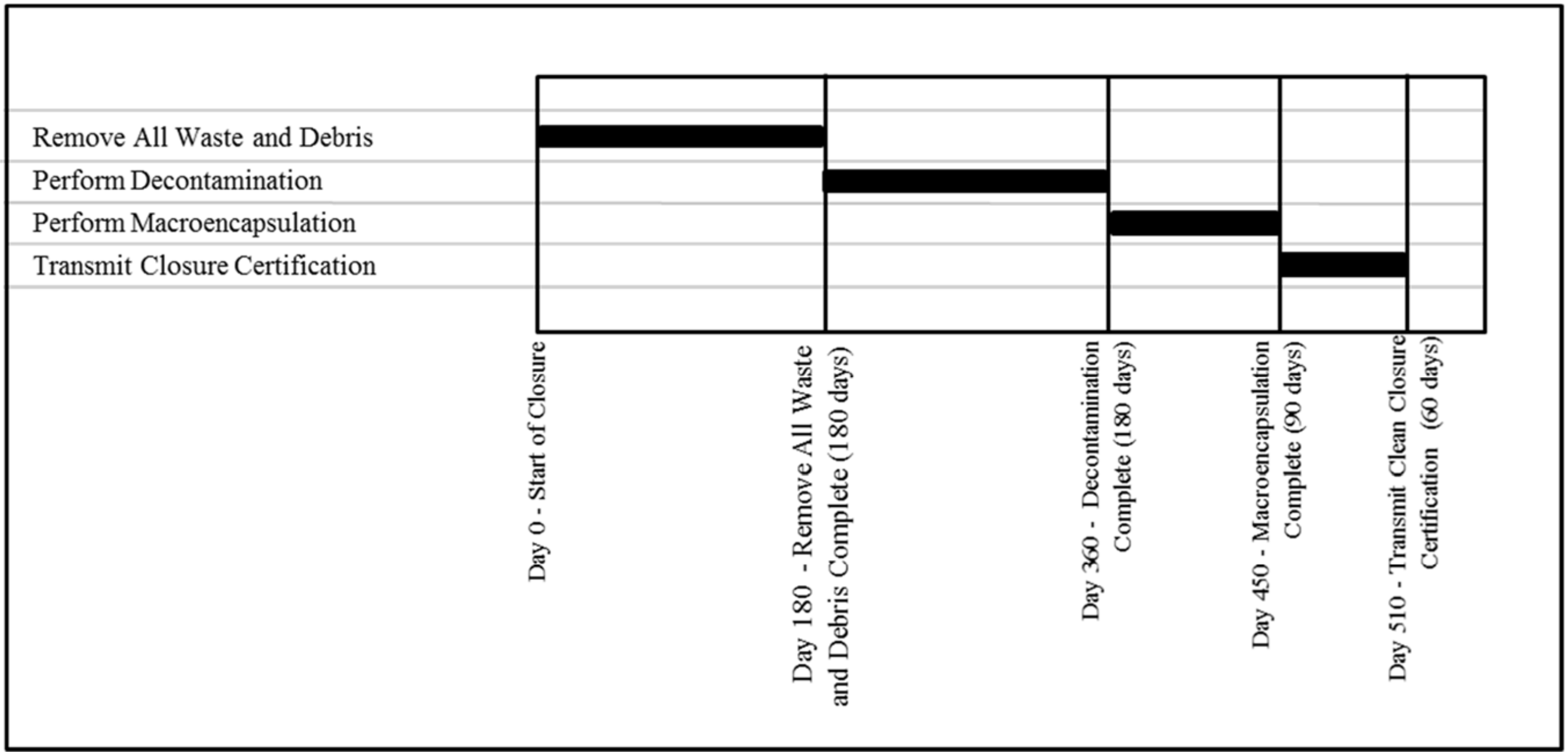

Figure H-B2. Closure Activities for the 221-T Building DWMUs

H-B6.2.1 Facility Maintenance

The 221-T Cells (7L, 13R, 16R, and 17R) are located inside the 221-T Canyon Building and will be closed in conjunction with closure of the 221-T Canyon Building. T Plant facility periodic inspections and required maintenance will be performed throughout the post-closure period and will include the 221-T Canyon Building. Maintenance will be performed in a timely manner to ensure compliance with post-closure requirements for structural integrity and groundwater monitoring. Inspections will focus on evaluating the following:

- Maintenance and monitoring of the 221-T Canyon Building
- Groundwater monitoring system integrity.

As required by WAC 173-303-610(8)(b)(ii), this section also provides for maintenance of the closed area throughout the post-closure period. Facility maintenance is based on observations made during inspection and monitoring.

H-B6.2.2 Inspection and Maintenance

221-T Canyon Building inspections will be performed annually to evaluate the building for cracks, breaches in the surface, or other disruptions that would cause a potential release of waste residues to the environment.

Annual inspections will be performed through visual inspections by personnel. Maintenance will be performed in a timely manner to ensure that there are no releases of waste residues to the environment.

H-B6.2.3 Monitoring Well Inspection and Maintenance

Post-closure inspection and maintenance of the monitoring well system will be established in accordance with the requirements in WAC 173-303-610(7)(a)(i) during modification to the existing groundwater monitoring system.

H-B6.3 Post-Closure Security

During the post-closure period, 24 hour security requirements outlined in T Plant Addendum E will continue. This will assist in preventing access, which may disturb the closure area.

H-B6.4 Contact Information

Facility Operator:

Stacy Charboneau, Manager
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, WA 99352

(509) 376-7395

H-B6.5 Amendment of the Plan

If an amendment of this post-closure plan is required, a permit modification will be prepared by the DOE Richland Operations Office (DOE-RL) and submitted to Ecology in accordance with WAC 173-303-610(8)(d) for approval. The Hanford Facility groundwater monitoring reports provide annual results and interpretations of groundwater monitoring. Sampling data are placed in the Hanford Environmental Information System database.

H-B6.6 Survey Plat and Notice in Deed

Upon submission of the certification of closure of 221-T Building DWMUs, DOE-RL will submit a survey plat indicating the location and dimensions of the 221-T Canyon Building with respect to permanently surveyed benchmarks. This survey will be prepared and certified by a professional land survey as required in WAC 173-303-610(9). No later than 60 days after certification of closure, DOE-RL will submit a survey plat to the Benton County Planning Department in accordance with WAC 173-303-610(10). Additionally, DOE-RL will submit a notice in deed to the Benton County Auditor no later than 60 days after certification of closure of the 221-T Cells (7L, 13R, 16R, and 17R) in accordance with WAC 173-303-610(10). After submitting this notice, a certification signed by the Permittees will be submitted to Ecology stating that notification has been recorded along with a copy of the notice in deed. The notice in deed will specify the type, location, and quantity of wastes remaining after closure actions have been completed.

H-B6.7 Certification of Completion of Post-Closure Care

No later than 60 days after completion of the 30 year post-closure period, a certification stating the post-closure period was performed in accordance with the approved post-closure plan and signed by an IQRPE and DOE-RL will be submitted to Ecology. Supporting documentation will be provided along with the signed certification, which may include the following examples:

- Groundwater analysis results
- Final inspection results
- Facility maintenance.

Post-closure will be considered complete upon Ecology acceptance of the post-closure certification. Post-closure monitoring, inspections, and maintenance will be discontinued when authorized by Ecology.

Appendix H-C

2706-T Building and 2706-TA Building Dangerous Waste Management Units

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Contents

Attachments

Figures

Tables

H-C1 Introduction

This appendix discusses closure activities for the 2706-T Building and 2706-TA Building dangerous waste management units (DWMUs) associated with the T Plant Complex (T Plant) Operating Unit Group (OUG).

This plan describes in detail the closure activities necessary to establish clean closure levels for the 2706-T Building and 2706-TA Building DWMUs. Such closure activities include removal of all waste, records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste, visual inspection of the buildings after waste removal to evaluate the likelihood of potential contamination of the underlying soil, demolition of the 2706-T and 2706-TA Buildings, visual inspection of the underlying soil, and soil sampling and analysis to confirm that clean closure standards have been achieved.

Closure for the 2706-T Building and 2706-TA Building DWMUs will be performed in accordance with the closure schedule provided in Section H-C4 but may be performed independently of each other. Within 60 days upon completion of closure activities, the Permittees will provide the Washington State Department of Ecology (Ecology) with a certification of closure in accordance with the *Washington Administrative Code* (WAC) 173-303-610(6), "Dangerous Waste Regulations," "Closure and Post-Closure." Closure certification will provide supportive evidence that the 2706-T Building and 2706-TA Building DWMUs have met established clean closure standards.

This closure plan complies with the requirements outlined in WAC 173-303-610(2) through (6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Please note, the terms "mixed waste" and/or "waste," when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

H-C1.1 Unit Description

The 2706-T Building DWMU is located to the west of the 221-T Building, while the 2706-TA Building DWMU was installed over the concrete pad located west of the 2706-T Building (Figure H-C1). Both the 2706-T Building and adjoining 2706-TA Building DWMUs are permitted for waste storage and treatment.

The 2706-T Building is constructed of prefabricated steel, measuring approximately 15 m (48 ft) wide by 20 m (64 ft) long, with concrete floors (Figure H-C2). The exterior walls of the 2706-T Building are approximately 15 cm (6.0 in.) thick and consist of insulation sheathed in prefabricated steel. The 2706-T Building has openings on the east and west (leading to 2706-TA Building) ends fitted with roll-up metal doors. The west side has two roll-up doors; the larger door is the entrance to the railroad pit area from the 2706-TA Building, which measures approximately 3.7 m (12 ft) wide by 4.9 m (16 ft) high. The other door on the west end, which leads to the 2706-TA Building, and the east end roll-up doors are approximately 2.7 m (9.0 ft) wide by 4.3 m (14 ft) high.

A railroad pit, measuring approximately 17 m (55 ft) long by 5.2 m (17 ft) wide by 1.5 m (5.0 ft) deep, runs the length of the 2706-T Building. The pit floor is sloped to drain to an approximate 450 L (119 gal) below grade lined sump (2706-T railroad pit sump). This cylindrical sump liner has a diameter of approximately 0.76 m (2.5 ft) and a depth of 0.991 m (3.25 ft).

An overhead rolling bridge crane runs the length of the 2706-T Building along the east-west axis. A pendant control console allows the crane to be operated from the floor.

Lean-tos are located on the north and south sides of the 2706-T Building. The lean-to on the north side extends the full length of the 2706-T Building and is used as a maintenance and storage area. Each of these areas measures approximately 9.8 m (32 ft) long by 3.20 m (10.5 ft) wide. A double door connects the storage area to the operations bay, while single and double doors provide direct exterior access.

The lean-to on the south side of the 2706-T Building houses the heating, ventilating, and air conditioning (HVAC) room and fire riser room. The HVAC room measures approximately 8.3 m (25 ft) wide by 10 m (31 ft) long and houses the atmosphere cleanup train one (ACT-1). The fire riser room measures approximately 3.7 m (11 ft) wide by 2 m (7 ft) long.

The 2706-TA Building is constructed of prefabricated steel, measuring approximately 15 m (50 ft) wide by 18 m (60 ft) long, with concrete floors (Figure H-C3). Along with the roll-up doors on the east end of the building, which lead to the 2706-T Building, the 2706-TA Building has two other metal roll-up doors located on the west end of the building: an equipment roll-up door measuring approximately 3.7 m (12 ft) wide by 4.6 m (15 ft) high, and a larger door measuring approximately 5.5 m (18 ft) wide by 6.1 m (20 ft) high. Exterior egress doors can be accessed on the north, west, and south sides of the operations area. On the east side of the building, there is an airlock to the 2706-TB Building.

Two sumps are located within the 2706-TA Building. One of the sumps is for condensate from the adjacent HVAC room, while the other includes a service trench sloped to an approximate 2,200 L (581 gal) below grade lined sump. This rectangular sump liner is approximately 1.13 m (3.71 ft) wide by 1.99 m (6.52 ft) long, with a depth of approximately 0.972 m (3.19 ft). The service trench located within the building measures approximately 0.6 m (2 ft) wide by 4.6 m (15 ft) long and has a depth of approximately 0.3 m (1 ft).

A lean-to attached to the south side of the 2706-TA Building houses the HVAC and electrical rooms, having a combined area measuring approximately 8.3 m (25 ft) wide by 14 m (41 ft) long. The larger room houses the atmosphere cleanup train two (ACT-2) high-efficiency particulate air (HEPA) filter system, while the smaller room houses the electronic controllers and electrical switchgear. Figure H-C4 provides a generic floor plan of the 2706-T and 2706-TA Buildings and associated lean-tos.

Both the 2706-T and 2706-TA Buildings manage various types of wastes. For a comprehensive list of waste managed in accordance with *Resource Conservation and Recovery Act of 1976* (RCRA) regulations, including classification and estimated annual quantities, refer to WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter called Hanford Facility RCRA Permit), Part A.

Treatment is conducted within the building, using a variety of technologies, to meet the land disposal restrictions (LDRs) outlined in WAC 173-303-140, "Land Disposal Restrictions," and/or the acceptance criteria for the Waste Isolation Pilot Plant and/or other approved disposal facilities. For an extensive list of treatment activities conducted within the 2706-T and 2706-TA Buildings, refer to the T Plant Addendum C, "Process Information."

H-C1.2 Maximum Waste Inventory

The maximum storage capacities of the two DWMUs associated with this closure plan are identified in Table H-C1.

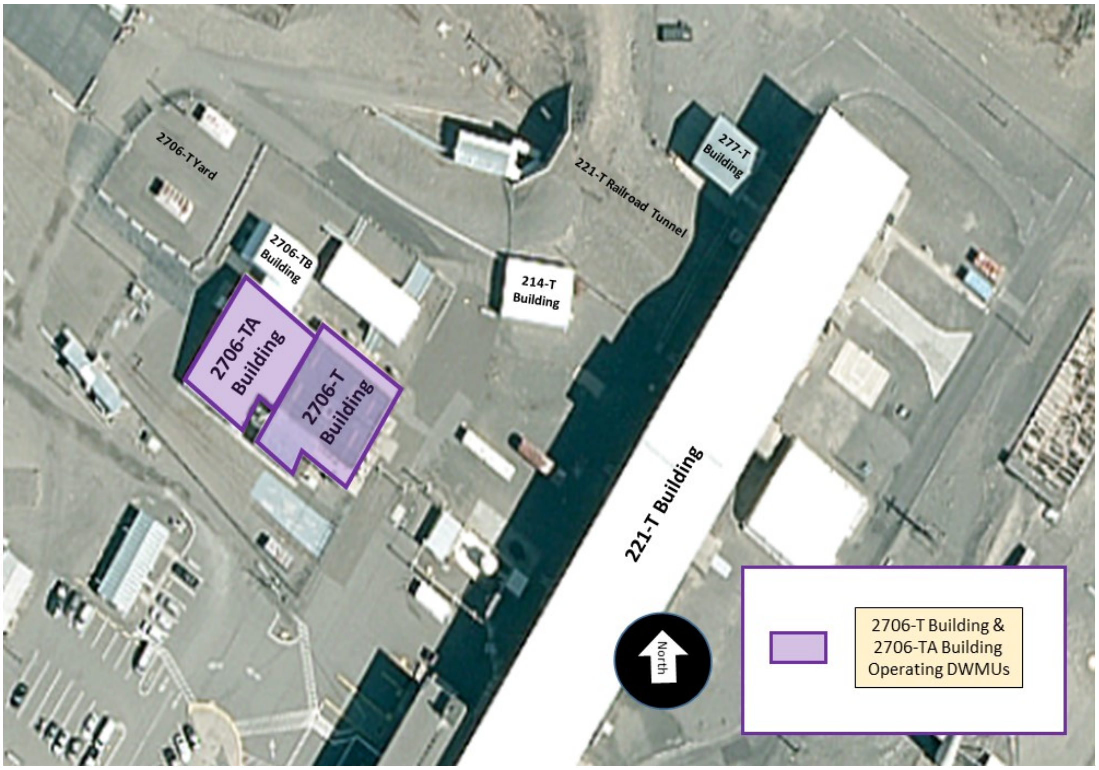

Figure H-C1. 2706-T Building and 2706-TA Building Dangerous Waste Management Units (Aerial View 2012)

Figure H-C2. 2706-T Building (September 2013)

Figure H-C3. 2706-TA Building (September 2013)

Table H-C1. Dangerous Waste Management Unit Maximum Storage Capacity

DWMU	Building	Maximum Permitted Storage Capacity
2706-T Building DWMU	2706-T Building	56.6 m^3 (56,600 L)
2706-TA Building DWMU	2706-TA Building	48.3 m^3 (48,300 L)

DWMU = dangerous waste management unit

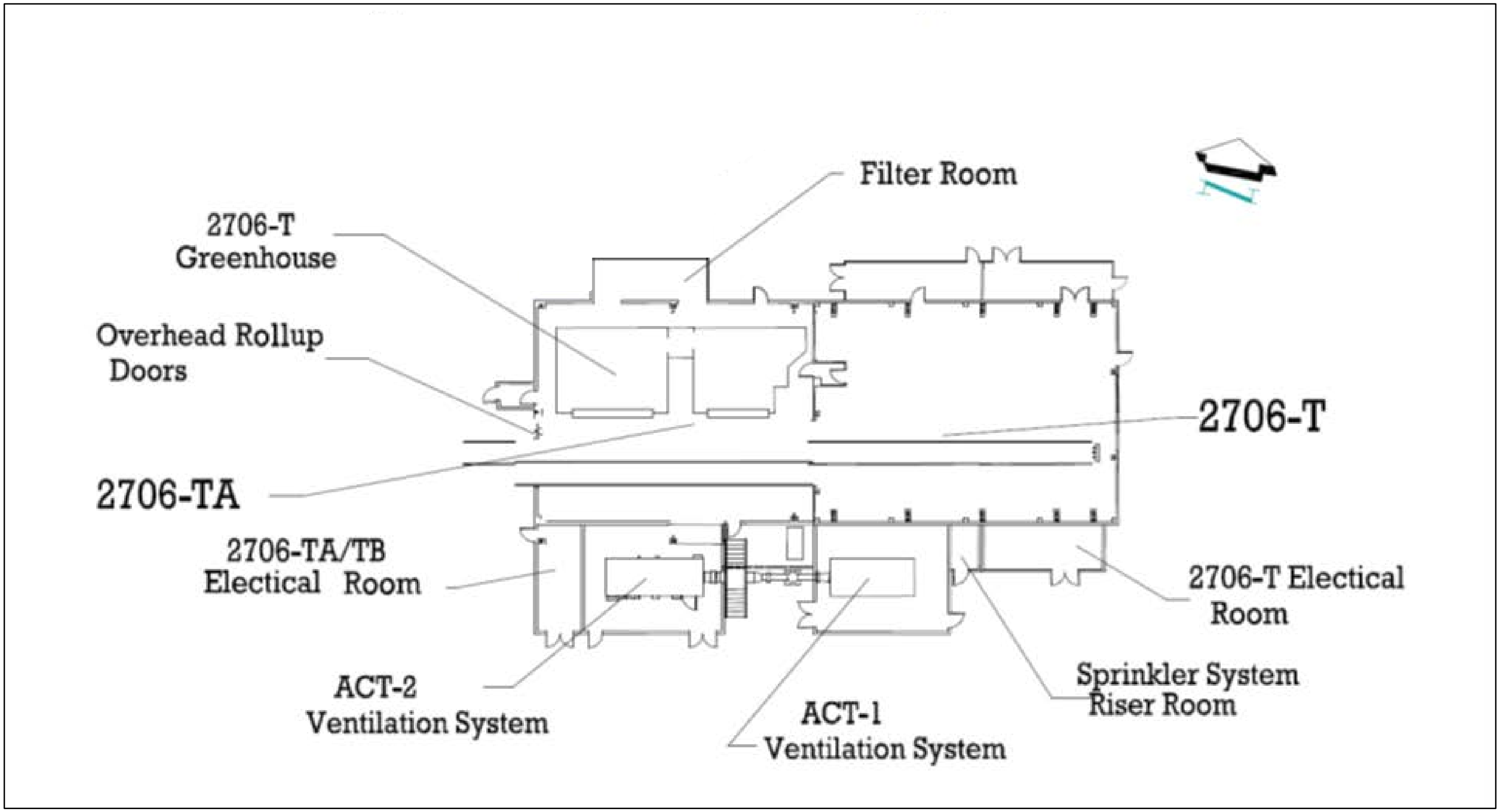

Figure H-C4. General Floor Plan of the 2706-T and 2706-TA Buildings

H-C2 Closure Performance Standards

Closure performance standards for the 2706-T Building and 2706-TA Building DWMUs will be based on WAC 173-303-610(2), which require closure of the facility in a manner that accomplishes the following objectives:

1. Minimize the need for further maintenance.
2. Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or dangerous waste decomposition products to the ground, surface water, groundwater, or atmosphere.
3. Return the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous dangerous waste activity.

These performance standards are addressed in Sections H-C2.1 and H-C3.9 of this closure plan and are further identified in Table H-C5.

H-C2.1 Clean Closure Levels

The 2706-T Building and 2706-TA Building DWMUs will be clean closed. After removal of all waste, the buildings will be demolished (Section H-C3.6) and managed as newly generated waste debris.

Once the buildings are removed, the underlying soil will be sampled and analyzed to ensure that clean closure levels are achieved. In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for the soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the "*Model Toxics Control Act—Cleanup*" (MTCA) Regulations (chapter 173-340 of the WAC) (i.e., WAC 173-340-700, "*Overview of Cleanup Standards*," through WAC 173-340-760, "*Sediment Cleanup Standards*," excluding WAC 173-303-745, "*Soil Cleanup Standards for Industrial Properties*"). These numeric cleanup levels have been calculated according to the requirements of WAC 173-303-610(2)(b)(i), using the MTCA (WAC 173-340) Method B closure performance standard for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-C5 provides the MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte identified in Table H-C2.

A null hypothesis is generally assumed to be true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, "*Definitions*," for the 2706-T Building and 2706-TA Building DWMUs is that the soil underlying the buildings is assumed to be above the unrestricted use MTCA (WAC 173-340) Method B cleanup levels; therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means that sampling and analysis results of the site indicated that the underlying soil contains contamination below the MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that the soil meets closure performance standards.

Should sampling and analysis provide a basis that the null hypothesis can be accepted, such an event will be considered an unexpected event during closure, and the soil would then be identified as a newly generated contaminated environmental media and managed in accordance with Section H-C3.8.

H-C3 Closure Activities

As container storage and treatment units, clean closure determinations for the 2706-T Building and 2706-TA Building DWMUs will be based on successful completion of the closure activities outlined in this section. These DWMUs will be candidates for clean closure under RCRA, and confirmation sampling and analysis will be performed to verify that the closure performance standards (Table H-C5) are met. Sampling and analysis activities were developed utilizing the U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection* (QA/G-5S), and Ecology Publication 94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-C3.10.1). The objective of the sampling described in this document is to determine if the MTCA (WAC 173-340) Method B clean closure levels were met, thereby demonstrating clean closure of the 2706-T Building and 2706-TA Building DWMUs.

The following closure activities are required to achieve and verify clean closure:

1. Remove all waste.
2. Review waste container storage, operating, and inspection records for documented spills or releases of waste.
3. Perform visual inspection of the buildings containment system for cracks, holes, or other types of breaches significant enough to reach underlying soil for purposes of focused sampling.
4. Demolition of the storage buildings and concrete containment systems.
5. Perform visual inspection on underlying soil to identify any staining for purposes of focused sampling.
6. Perform soil sampling and analysis to confirm that clean closure levels are met.
7. If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of contaminated environmental media (soil) as necessary.
8. Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been met.
9. Transmit clean closure certification to Ecology.

H-C3.1 Health and Safety Requirements

Closure will be performed in a manner that will ensure safety of personnel and the surrounding environment. Qualified personnel will be trained in and will perform closure activities, in accordance with the applicable safety and environmental procedures identified in T Plant Addendum G, “Personnel Training,” and must have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements. Personnel will be equipped with appropriate personal protective equipment (PPE) for the closure activity being performed.

The Permittees have instituted training and/or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 to the Hanford Facility RCRA Permit describes specific requirements for the Hanford Facility Personnel Training Program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, which provides training requirements for Hanford Facility personnel associated with the 2706-T Building and 2706-TA Building DWMUs.

Project-specific safety training addressed explicitly to the project and the day's activity will include the following:

- Training will provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering many factors, including the following:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records are maintained for each employee in an electronic database. The Permittee's training organization maintains the training records system.

H-C3.2 Removal of Wastes and Waste Residues

All waste will be removed from the 2706-T and 2706-TA Buildings and managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers meeting U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with Title 49 of the *Code of Federal Regulations* (CFR), "Transportation." Waste packaged in non-DOT regulation (large or irregular shaped) containers will be shipped in accordance with the DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily use highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet the LDR treatment standards specified in WAC 173-303-140, which includes by reference 40 CFR 268, then ultimately disposed in an appropriate waste disposal facility.

While waste residues are not anticipated, if found during closure activities, then the waste residues will be managed in accordance with all applicable requirements of WAC 173-303-170, "Requirements for Generators of Dangerous Waste," through WAC 173-303-230, "Special Conditions." Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved waste disposal facility.

H-C3.3 Unit Components, Parts, and Ancillary Equipment

The 2706-T and 2706-TA Buildings are prefabricated steel structures with concrete floors as previously described in Section H-C1.1. Both buildings contain automatic fire suppression systems and active ventilation systems, including associated exhaust HEPA filters.

The 2706-T Building has two metal, equipment roll-up doors on the east and west (leading to 2706-TA Building) ends, and lean-tos located on the north and south ends. The lean-to on the north end houses a maintenance and storage area, while the lean-to on the south end of the 2706-T Building houses the ACT-1, the fire riser room, and the electrical room. A double door connects the storage area to the operations bay, while single and double doors provide direct exterior access.

An overhead rolling bridge crane and a railroad pit run the length of the 2706-T Building. The railroad pit has metal grating and some wooden covers to prevent falls into the pit. The pit floor is sloped to drain to a below grade lined sump (2706-T railroad pit sump). The 2706-T Building includes several leak detection systems, level indicators and controls, and interlock systems. The leak detection systems provide operator notification, via visible and audible alarm annunciators, of liquid entering the sumps. Operator control panels and annunciation panels have been installed in the 2706-T Building.

Along with the roll-up doors on the east end of the building, which lead to the 2706-T Building, the 2706-TA Building has two other metal roll-up doors located on the west end of the building. Exterior egress doors can be accessed on the north, west, and south sides of the operational area, while the east side of the building contains an airlock to the 2706-TB Building. Attached to the south side of the 2706-TA Building is a lean-to consisting of two rooms. The larger room houses the ACT-2 HEPA filter system, while the smaller room houses the electronic controllers and electrical switchgear.

Two sumps are located within the 2706-TA Building. One of the sumps is for condensate from the adjacent HVAC room while the other includes a trench sloped to a below grade lined sump.

The automatic fire suppression systems at the 2706-T and 2706-TA Buildings include wet pipe sprinkler systems and dry chemical suppression systems. Sprinkler systems receive water supply from the approximate 25 cm (10 in.) underground sanitary water main by way of an approximate 15 cm (6.0 in.) lateral. A double check valve assembly protects the sanitary water system from inadvertent contamination from backflow of sprinkler system water. The 2706-T Building contains manual pull stations located at each exit door.

ACT-1 provides exhaust air filtration for the 2706-T Building confinement area (operational bay), while ACT-2 provides air filtration for the 2706-TA Building confinement area (operational bay). The two ACT systems are similar in design and operating range, providing pre-filtration and HEPA-filtration, and share a common exhaust stack. Each system has a standard industrial grade back draft damper that is normally closed due to a gravity operated counterweight but opens when the respective system is in operation. ACT-1 and ACT-2 can be operated independently, depending on the type of operational activities occurring within the respective bay. Each system contains a single bank of 12 nuclear rated (≥99.95 percent efficient media) HEPA filters in a 3 by 4 array. The HEPA filter bank has differential pressure monitoring and alarm annunciation.

Four heat pumps provide HVAC for the 2706-T Building operations area, while three heat pumps provide HVAC for the 2706-TA Building operations area. Heat detectors have been installed on the 2706-T Building exhaust ducting.

The 2706-T and 2706-TA Buildings may use temporary modular Perma-Con® structures, work tents, and/or gloveboxes to facilitate management and treatment of waste. Such equipment is temporary within the buildings and will be removed upon completion of management and treatment activities prior to the start of closure activities.

H-C3.4 Inspection of Units Before Decontamination

Following the removal of all waste and waste residues, a visual inspection will be performed to determine the presence of cracks, holes, or other breaches in the concrete containment system, sufficient to reach the underlying soil. These cracks, holes, or other breaches will be documented to determine if focused sampling of the underlying soil is necessary during confirmation sampling.

During the closure period, the 2706-T Building and 2706-TA Building DWMUs will be inspected in accordance with WAC 173-303-320(2), "General Inspection," to prevent threats to human health and the environment. Inspections of the DWMUs and associated outdoor storage areas will be performed annually, until the clean closure certification is accepted by Ecology, and will verify the following:

- Posted warning signs at each entrance to the OUG are present, legible, and visible at approximately 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-C3.5 Decontamination

Decontamination of the 2706-T Building and 2706-TA Building DWMUs is not planned.

H-C3.6 Demolition of the 2706-T and 2706-TA Buildings

Once all waste has been removed from the 2706-T and 2706-TA Buildings and a visual inspection has been performed in each building, demolition activities can be initiated. Demolition of the 2706-T and 2706-TA Buildings can be done independently of each other, but both will follow the same demolition process, including the following activities:

- Location and isolation of utilities
- Mobilization of equipment
- Removal of the building and concrete containment system.

H-C3.6.1 Location and Isolation of Utilities

Prior to demolition, any in-use utilities will be located as well as the underground fire water line. The fire water line may supply water to other T Plant DWMUs. Fire hydrants may also be used to supply water for dust control during rubblization of the containment system. Utilities, such as electrical connections, will be isolated prior to the start of demolition activities.

H-C3.6.2 Equipment Mobilization

Resources, equipment, and materials necessary to perform demolition will be staged in designated laydown areas in proximity to the building(s) being demolished.

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H-C3.6.3 Demolition Activities for the 2706-T and 2706-TA Buildings

Demolition of the 2706-T and 2706-TA Buildings will be accomplished using the primary method of shearing and rubblizing. Demolition of the buildings will require the use of heavy equipment (e.g., excavator with various attachments). Other standard industry or conventional demolition practices also may be used (e.g., hydraulic shears with steel shear jaws, concrete pulverizer jaws, or breaker jaws). Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and HEPA filtered vacuum cleaners may be used. Additional stormwater run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

3.6.3.1 Shearing and Rubblizing

During shearing and rubblizing of the buildings, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and run-off. The shears will size reduce/cut components of the buildings and equipment, such as roofing, wall paneling, piping, concrete flooring, and conduit, while front end loaders or grapples will load debris into roll-off containers.

Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and concrete pulverizer jaws or breaker jaws, will be used to perform any rubblizing. Rubble debris from the containment system will be loaded into roll-off boxes for transportation to the approved disposal facility.

H-C3.7 Identifying and Managing Waste Generated from Closure Activities

Closure activities for the 2706-T Building and 2706-TA Building DWMUs will result in the generation of one known waste stream (debris from demolition), requiring management and disposal. Waste generated during closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. The newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-C3.12).

H-C3.7.1 Debris from Demolition

Debris from demolition generated during closure will be managed onsite and transported to an approved disposal facility. Debris includes, but is not limited to, the following types of wastes resulting from demolition of the 2706-T and 2706-TA Buildings:

- Equipment and construction materials
- Concrete and associated rubblized debris
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)

The preferred management of debris resulting from demolition of the buildings is in bulk form. Bulk waste will be placed into bulk containers, such as roll-off boxes, to transport for disposal. These bulk containers will be stored in a suitable area in proximity to the DWMU area or may be accumulated for up to 90 days in another suitable location. Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

The debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-C3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Soil surrounding the node location, which identified contamination above clean closure levels, will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU(s). Following removal of contaminated soil, additional confirmatory sampling will be conducted in the location of the original node, which identified contamination above clean closure levels, in accordance with the approved closure plan SAP. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. Contaminated soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

Management and disposal of the contaminated environmental media will be documented and included with the clean closure certification documentation included in Section H-C3.12.

H-C3.9 Confirming Clean Closure

Both the 2706-T Building and the 2706-TA Building DWMUs will be clean closed. Demonstration of clean closure standards will be accomplished through confirmation sampling and analysis performed in accordance with the SAP detailed in Section H-C3.10. The SAP consists of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where cracks or other openings in the containment system may have allowed a release of waste to the underlying soil).

Once building removal is complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards (MTCA [WAC 173-340-730] Method B) have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-C3.8. Once analytical results confirm clean closure levels of the target analytes, a clean closure certification will be prepared in accordance with Section H-C3.12.

H-C3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarizes the sampling design and associated assumptions based on knowledge of the 2706-T Building and 2706-TA Building DWMUs. After the 2706-T and 2706-TA Buildings have been demolished, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-C3.10.1 Sampling and Analysis Plan

Sampling and analysis of the 2706-T Building and 2706-TA Building DWMUs underlying soil will be conducted to confirm that clean closure levels have been achieved. All sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*; ASTM International (formerly the American Society for Testing and Materials) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM International standards, EPA approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), at the time of closure. This SAP was also developed using Ecology Publication 94-111, Section 7.0, "Sampling and Analysis for Clean Closure," and EPA/240/R-02/005.

H-C3.10.2 Target Analytes

The 2706-T Building and 2706-TA Building DWMUs are active portions of the T Plant OUG; therefore, target analytes at closure may include any or all analytes based on the waste codes permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV-Description of Dangerous Waste). A waste management report itemizing waste codes historically managed at the 2706-T and 2706-TA Buildings was run to identify the existing target analytes. Table H-C2 details the waste codes identified and target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the 2706-T Building and 2706-TA Building DWMUs upon receipt of final waste and commencement of closure activities. A permit modification updating the SAP with specific target analytes will be submitted, if necessary, in accordance with WAC 173-303-610(3)(b), 45 days prior to the start of closure.

Table H-C2. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009) (U151)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Endrin (D012)	72-20-8	Lindane (D013)	58-89-9
Benzene (D018) (F005)	71-43-2	Carbon Tetrachloride (D019) (F001)	56-23-5
Chlorobenzene (D021) (F002)	108-90-7	Chloroform (D022)	67-66-3
o-Cresol (D023) (F004)	95-48-7	*m*-Cresol (F004)	108-39-4
p-Cresol (D025) (F004)	106-44-5	Cresol (Cresylic Acid)[a,e] (D026) (F004)	1319-77-3
1,4-Dichlorobenzene (D027)	106-46-7	1,2-Dichloroethane (D028)	107-06-2

Table H-C2. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
1,1-Dichloroethylene (D029)	75-35-4	2,4-Dinitrotoluene (D030)	121-14-2
Heptachlor (D031)	76-44-8	Heptachlor Epoxide (D031)	1024-57-3
Hexachlorobenzene (D032)	118-74-1	Hexachlorobutadiene (D033)	87-68-3
Hexachloroethane (D034)	67-72-1	Methyl Ethyl Ketone (D035) (F005)	78-93-3
Nitrobenzene (D036) (F004)	98-95-3	Pentachlorophenol (D037)	87-86-5
Pyridine (F005)	110-86-1	Tetrachloroethylene (D039) (F001) (F002)	127-18-4
Trichloroethylene (D040) (F001) (F002)	79-01-6	2,4,5-Trichlorophenol (D041)	95-95-4
2,4,6-Trichlorophenol (D042)	88-06-2	Vinyl Chloride (D043)	75-01-4
Methylene Chloride (F001) (F002)	75-09-2	1,1,1-Trichloroethane (F001) (F002)	71-55-6
Chlorinated Fluorocarbons (CFCs)[c] (F001) (F002)	Not Applicable	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)[c] (F002)	76-13-1
Ortho-Dichlorobenzene (F002)	95-50-1	Trichlorofluoromethane (CFC-11)[c] (F002)	75-69-4
1,1,2-Trichloroethane (F002)	79-00-5	Xylenes (F003)	1330-20-7
Acetone (F003) (U002)	67-64-1	Ethyl Acetate (F003)	141-78-6
Ethyl Benzene (F003)	100-41-4	Ethyl Ether (F003)	60-29-7
Methyl Isobutyl Ketone (F003)	108-10-1	*n*-Butyl Alcohol (F003)	71-36-3
Cyclohexanone (F003)	108-94-1	Methanol (F003)	67-56-1
Toluene (F005)	108-88-3	Carbon Disulfide (F005)	75-15-0
Isobutanol (F005)	78-83-1	2-Ethoxyethanol[f] (F005)	110-80-5
2-Nitropropane[d,e] (F005)	79-46-9	Copper Cyanide[b] (P029)	544-92-3
Cyanide (P030)	57-12-5	Potassium Cyanide[b] (P098)	151-50-8
Sodium Cyanide[b] (P106)	143-33-9	Vanadium Pentoxide[g] (P120)	1314-62-1
Polychlorinated Biphenyls (Aroclors) (PCB2)	1336-36-3	Formic Acid (U123)	64-18-6

Table H-C2. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol, and *p*-cresol.

b. Analyzed as total cyanide.

c. A CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

d. The closure performance standard for 2-nitropropane was removed in the May 2014 CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

e. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

f. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

g. Vanadium pentoxide will be analyzed as vanadium.

CAS = Chemical Abstracts Service
CFC = chlorinated fluorocarbon
CLARC = Cleanup Levels and Risk Calculations
EPA = U.S. Environmental Protection Agency
PCB = polychlorinated biphenyl

H-C3.10.3 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-C4.

H-C3.10.4 Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-C5.

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned project managers responsible for oversight of the 2706-T Building and 2706-TA Building DWMUs closure.

- **Project Manager and Technical Lead:** The Project Manager provides oversight of closure activities and coordinates with the DOE Richland Operations Office (DOE-RL), EPA, Ecology, and contract management. The Project Manager (or designee) for the 2706-T Building and 2706-TA Building DWMUs closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management on all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.

- **Environmental Compliance Officer:** The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.

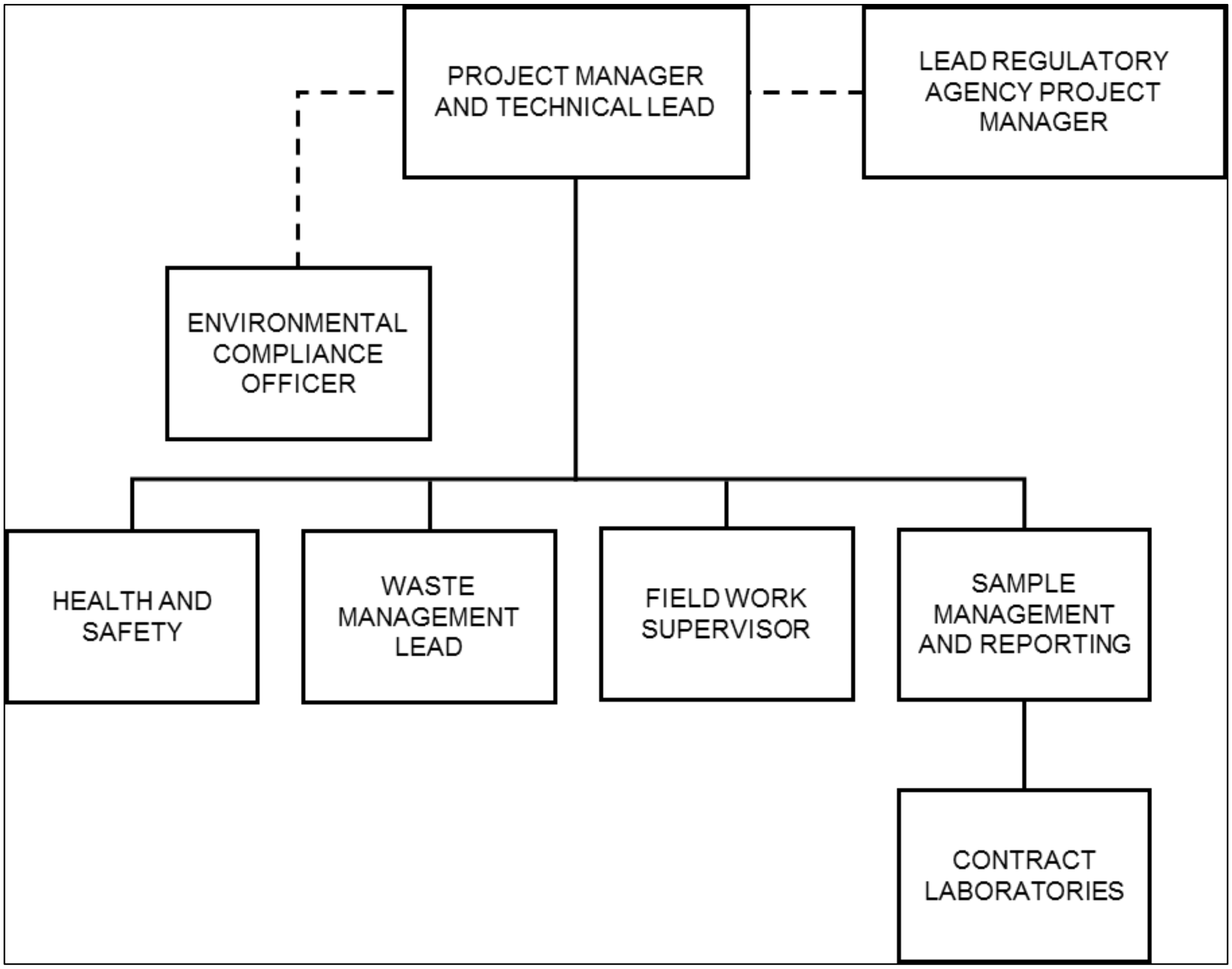

Figure H-C5. 2706-T Building and 2706-TA Building DWMUs Sampling and Analysis Plan Project Organization

- **Health and Safety:** The Health and Safety organization is responsible for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.

- **Waste Management Lead:** The Waste Management organization communicates policies and protocols and ensures project compliance for storage, transportation, disposal, and waste tracking.

- **Field Work Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives the analytical data from the laboratories, performs data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.

- **Contract Laboratories:** The contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation.

H-C3.10.5 Sampling Design

The primary purpose of sampling the underlying soil is to determine if analytical data values exceed MTCA (WAC 173-340) Method B unrestricted use clean closure performance standards (Table H-C5).

This SAP adheres to Ecology Publication #94-111, Section 7.0, "Sampling and Analysis for Clean Closure," to determine the type of sampling design that will be used to demonstrate clean closure. When designing the sampling plan, both judgmental (focused) and area wide (grid) sampling methods were considered. Ecology Publication #94-111, Section 7.2.1, states that, "area wide sampling is appropriate when the spatial distribution of contamination at or from the closure unit is uncertain." Ecology Publication #94-111, Section 7.3, "Sampling to Determine or Confirm Clean Closure," identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling if further defined in the following paragraph.

Area Wide (Grid) Sampling: Samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication #94-111, is selective sampling of areas where contamination is expected or releases have been documented. After completion of the records review and visual inspection for each building, a determination will be made to identify if focused sampling is appropriate. The location of focused samples, if any, will be identified and recorded as required in Section H-C3.10.12. Judgmental (focused) sampling is further defined in the following paragraph.

Judgmental (Focused) Sampling: Selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and on professional judgment. Focused sampling is distinguished from probability based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined using the Visual Sample Plan (VSP) software. VSP is a tool, used throughout Washington State and nationally, that statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 2706-T and 2706-TA Buildings, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and used for the input parameters. VSP parameter inputs and the basis for those inputs are detailed in Table H-C3.

The decision rule for demonstrating compliance with the MTCA (WAC 173-340) Method B clean closure level has three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-C3, VSP calculated that a minimum of 20 samples from the 2706-T Building and 21 samples of the 2706-TA Building underlying soil is required to reject the null hypotheses with 95 percent confidence and ensure that each DWMU would not be mistakenly released as clean. For the purpose of using VSP software, the null hypothesis is used to compare a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Sample locations were determined by VSP using the area wide (grid) sampling approach with a random start sampling location. Statistical analysis of systematically collected data is valid if a random start to the grid is used. Dimensions of the 2706-T and 2706-TA Buildings were entered into VSP to determine the locations of samples. The triangular grid sampling layout was determined to have an even distribution over each sampling area providing the most representative data set including coverage of the middle portion of the sampling area.

The 20 samples of soil underlying the 2706-T Building and the 21 samples of soil underlying the 2706-TA Building will be taken from the node locations indicated by VSP (Attachments H-C.a and H-C.b, respectively). Each soil sample will be assigned sample location identifications and sample numbers using HEIS. The southern corner of each building is considered the (0,0) point of the sampling location map in Attachments H-C.a and H-C.b. The first node location was chosen at random by VSP, while subsequent sampling locations were assigned by VSP using a triangular grid sampling layout. Supporting documentation and the sampling grid map automatically generated by VSP software for the 2706-T and 2706-TA Buildings are documented in Attachments H-C.a and H-C.b, respectively.

H-C3.10.6 Sampling Methods and Handling

A grab sample matrix will consist of soil collected in precleaned sample containers taken at a depth of approximately 0 to 15 cm (0 to 6.0 in.) below ground surface (bgs), and within an approximate 0.6 m (2 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer that has been moved aside. Subsurface sampling (samples collected at depths greater than approximately 15 cm [6.0 in.] bgs) will be evaluated, based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-C3.10.14.

Table H-C3. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value at the site exceeds the threshold (WAC 173-340 "Model Toxics Control Act—Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty, requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over each dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

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Once the soil is sampled, sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter, which allows for a larger surface area to volume ratio; thus, increasing the likelihood of identifying any potential contamination in the sample. Grab samples will be collected into containers at the established node sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation
- Field walk down of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Preservation, container, and holding time requirements are specified in Table H-C4 for soil samples. These requirements are in accordance with the analytical method specified. The final container types and volumes will be identified on the Sampling Authorization Form (SAF) and chain-of-custody form.

To prevent potential contamination of samples, care will be taken to use decontaminated equipment for each sampling activity.

Table H-C4. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction; 24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8082	PCBs by GC	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE lined lid	250 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE lined lid	250 g
EPA 9012	Cyanide	Cool ≤4°C	14 days	G/P/PTFE	15 g
EPA 9056	Anions	Cool ≤6°C	28 days prior to extraction; 48 hours after extraction	G/P	250 g

AG = amber glass
EPA = U.S. Environmental Protection Agency
G = glass
GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
OES = optical emission spectrometry
P = plastic
PCB = polychlorinated biphenyl
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

EPA Level 1 precleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory specific volumes/requirements for meeting analytical quantitation limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- SAF and corresponding number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable).

Sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste (including unexpected waste) generated by sampling activities will be containerized and labeled. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-C3.10.7 Analytical Methods

All analyses and testing will be performed consistent with this closure plan, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Analytical methods and performance requirements associated with the target analytes are outlined in Table H-C5.

H-C3.10.8 Quality Control

Quality control (QC) procedures must be followed in the field and laboratory to ensure that reliable data are obtained. Field QC samples will be collected to evaluate the potential for cross-contamination and provide information pertinent to field sampling variability. Laboratory QC samples estimate the precision and bias of the analytical data. Field and laboratory QC samples are summarized in Table H-C6.

A data quality assessment (DQA) will be performed using the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide* (QA/G-9R), and implementing the specific requirements in Sections H-C3.10.8 through H-C3.10.10

Data verification, data validation, and DQA will include both primary samples and QC samples.

H-C3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

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

H-C3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies the contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to the validators and allow only additions to be made, not changes to the raw data.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

H-C3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP software uses analytical data to determine if the user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software will calculate the true standard deviation and determine if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-C2.1).

Table H-C5. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't(% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
7440-62-2	Vanadium	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
72-20-8	Endrin	SW-846 Method 8270	--	2.40E+01	3.30E-03	±30	≤30
58-89-9	Lindane	SW-846 Method 8270	9.09E-01	2.40E+01	1.65E-03	±30	≤30

Table H-C5. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't(% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
106-46-7	1,4-Dichlorobenzene	SW-846 Method 8270	1.85E+02	5.60E+03	3.30E-01	±30	≤30
107-06-2	1,2-Dichloroethane	SW-846 Method 8260	1.10E+01	4.80E+02	5.00E-03	±30	≤30
75-35-4	1,1-Dichloroethylene	SW-846 Method 8260	--	4.00E+03	1.00E-02	±30	≤30
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30
76-44-8	Heptachlor	SW-846 Method 8270	2.22E-01	4.00E+01	1.65E-03	±30	≤30

Table H-C5. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't(% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
1024-57-3	Heptachlor Epoxide	SW-846 Method 8270	1.10E-01	1.04E+00	1.65E-03	±30	≤30
118-74-1	Hexachlorobenzene	SW-846 Method 8270	6.25E-01	6.40E+01	3.30E-01	±30	≤30
87-68-3	Hexachlorobutadiene	SW-846 Method 8270	1.28E+01	8.00E+01	3.30E-01	±30	≤30
67-72-1	Hexachloroethane	SW-846 Method 8270	2.50E+01	5.60E+01	5.00E-03	±30	≤30
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30
87-86-5	Pentachlorophenol	SW-846 Method 8270	2.50E+00	4.00E+02	3.30E-01	±30	≤30
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
95-95-4	2,4,5-Trichlorophenol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
88-06-2	2,4,6-Trichlorophenol	SW-846 Method 8270	9.09E+01	8.00E+01	3.30E-01	±30	≤30

Table H-C5. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't(% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
75-01-4	Vinyl Chloride	SW-846 Method 8260	1.75E+02	2.40E+02	1.00E-02	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
1330-20-7	Xylenes	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30

Table H-C5. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't(% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+03	1.00E-02	±30	≤30
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30
57-12-5	Cyanide	SW-846 Method 9012	--	4.80E+01	1.00E+00	±30	≤30
1336-36-3	Polychlorinated Biphenyls	SW-846 Method 8082	5.00E-01	--	8.00E-03	±30	≤30
64-18-6	Formic Acid	SW-846 Method 9056	--	7.20E+04	2.00E+00	±30	≤30

Table H-C5. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't(% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			

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

Note: Due to the quantity and nature of waste stored in the 2706-T and 2706-TA Buildings not presenting a threat to groundwater and not having soil or the presence of plants within the buildings, no groundwater or ecological indicator MTCA cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equation 740-1 and Equation 740-2 from WAC 173-340-740(3)(b) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon

MTCA = Model Toxics Control Act—Cleanup

Req't = requirement

WAC = Washington Administrative Code

Table H-C6. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance, and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The laboratory control sample measures the accuracy of the analytical method.

a. Whenever a new type of nondedicated equipment is used, an equipment blank will be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

1

H-C3.10.12 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook, and only authorized persons may make entries in logbooks. Logbooks will be signed by the field manager, supervisor, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following items will be included in the project file, as appropriate:

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

The laboratory is responsible for maintaining, and having available upon request, the following items:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-C3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

In the event that sample results based on the MTCA (WAC 173-340) Method B three-part test (Section 0) indicate contamination above clean closure levels, contaminated soil will be removed in accordance with Section H-C3.8. Following removal of contaminated soil, additional samples will be taken at the same grid location as identified in Attachment H-C-A. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-C3.10.12, and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-C5, with accompanying QC samples as discussed in Section H-C3.10.8, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-C3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to this SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, "Permit Changes."

H-C3.11 Role of the Independent Qualified Registered Professional Engineer

An Independent Qualified Registered Professional Engineer (IQRPE) will be retained to provide certification of closure, as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 2706-T Building and 2706-TA Building DWMUs. At a minimum, the following activities will be performed by the IQRPE:

- Observation or review of building demolition
- Observation or review of visual inspections
- Observation or review of sampling activities
- Review of sampling procedures and results
- Observation or review of contaminated environmental debris removal (if applicable)
- Verification of sample locations as specified in the SAP
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-C3.12 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 2706-T Building and 2706-TA Building DWMUs, certification that the DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. If the two DWMUs are closed independently of each other, then a separate certification will be provided for each DWMU. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support closure certification:

- All field notes and photographs relative to closure activities, including the results of the inspection of the building containment system for cracks and other openings.
- Description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the final disposition of all dangerous and/or mixed wastes and waste residues.
- Laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.

- Summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.
- Description of what the unit area looks like at completion of closure, including a description of what parts of the former unit, if any, will remain after closure.

H-C3.13 Conditions That Will Be Achieved When Closure Is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 2706-T Building and 2706-TA Building DWMUs will be clean closed. Each DWMU may be closed independently of each other, but both DWMUs will follow the same process for closure. The buildings and containment systems will be removed, so only bare soil will remain. A permit modification will be submitted to remove the 2706-T and 2706-TA Buildings DWMUs from the Hanford Facility RCRA Permit.

H-C4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), closure activities for each DWMU will be completed no more than 180 days after the start of closure for each DWMU (Table H-C7 and Figure H-C6). Should unexpected circumstances arise and an extension to the 180 day closure activity period be deemed necessary, a permit modification will be submitted to Ecology for approval at least 30 days prior to expiration of the 180 day closure activity period in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements, have been and will continue to be taken. Within 60 days following completion of closure activities of the 2706-T Building and 2706-TA Building DWMUs, a closure certification will be submitted to Ecology as outlined in Section H-C3.12.

Table H-C7. T Plant 2706-T and 2706-TA Buildings DWMUs Closure Activities

Closure Activity Description		
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 2706-T Building and/or 2706-TA Building DWMU(s)	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 2706-T Building and/or 2706-TA Building DWMU(s)	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste	Package and ship waste to an approved facility for treatment, storage, and/or disposal. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all dangerous wastes in accordance with the approved closure plan. Request extension if necessary.	30 Days (Day 30)

Table H-C7. T Plant 2706-T and 2706-TA Buildings DWMUs Closure Activities

Closure Activity Description		
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records.	30 Days (Day 30)
Perform Visual Inspection of Building(s) Containment System	Inspect secondary containment areas for breaches in integrity.	5 Days (Day 35)
	Inspect structural integrity (visible aspects only).	
	Identify focused sampling locations (as applicable).	
Removal of Building(s) and Concrete Containment System(s)	Disconnect electrical connections and utilities.	80 Days (Day 115)
	Equipment mobilization.	
	Demolition and removal of waste generated.	
Visual Inspection of Underlying Soil	Identify areas of concern (waste related staining).	5 Days (Day 120)
	Document visual inspection with photos, locations, and dimensions of staining.	
Sampling and Analysis of Underlying Soil (Following Demolition of Buildings, May be Performed Concurrently with Waste Determination and Disposal of Debris)	See Section H-C3.10 for details of sampling and analysis.	60 Days (Day 180)
	Data validation and verification.	
	If necessary, remove contaminated environmental media (soil), and resample and analyze to confirm that clean closure levels have been achieved.	
Final Closure of the 2706-T Building and/or 2706-TA Building DWMU(s)	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (see Section H-C3.12 for more details on the clean closure certification).	60 Days (Day 240)

H-C5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for Hanford Facility treatment, storage and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE, and operated by DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), the provisions of WAC 173-303-620, "Financial Requirements," are not applicable to the Hanford Facility.

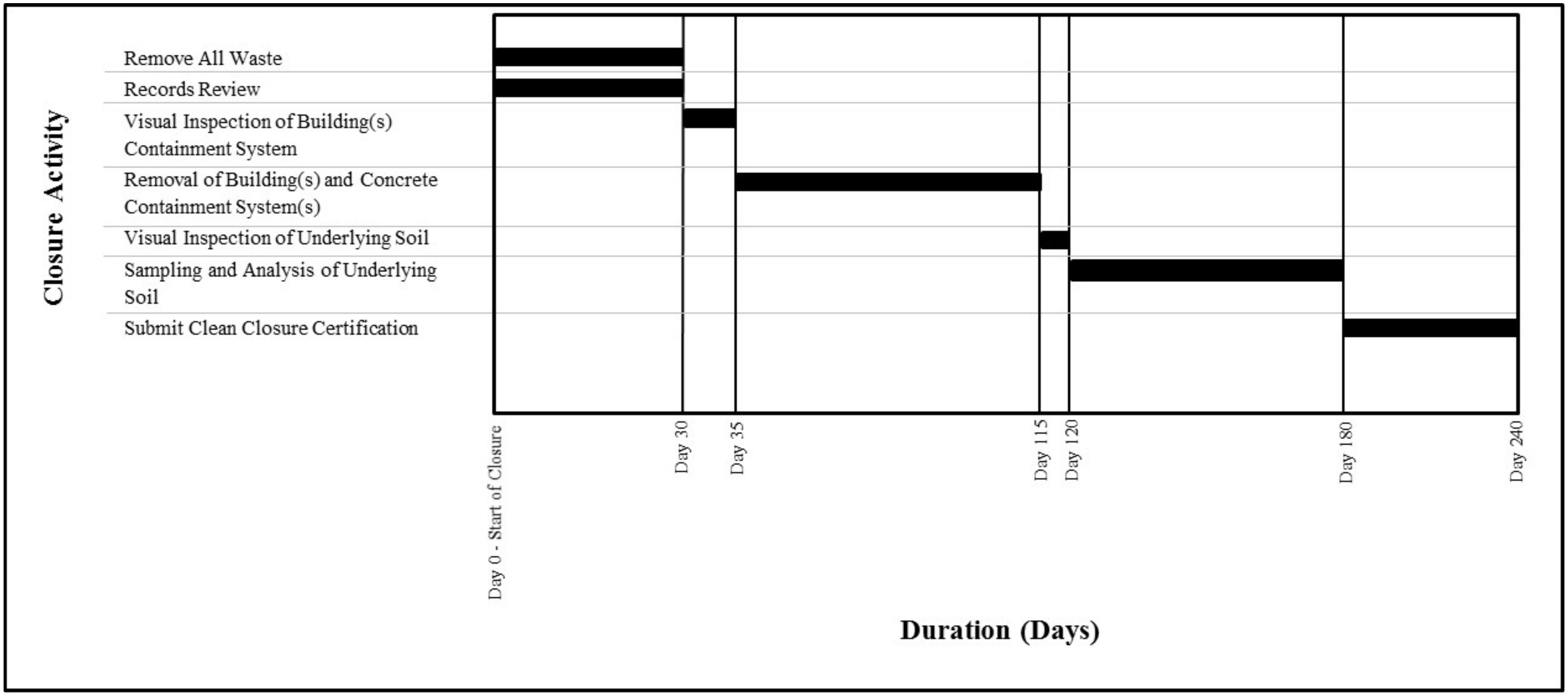

Figure H-C6. T Plant 2706-T and 2706-TA Buildings DWMUs Closure Activities Schedule

Attachment H-C.a

2706-T Building
Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

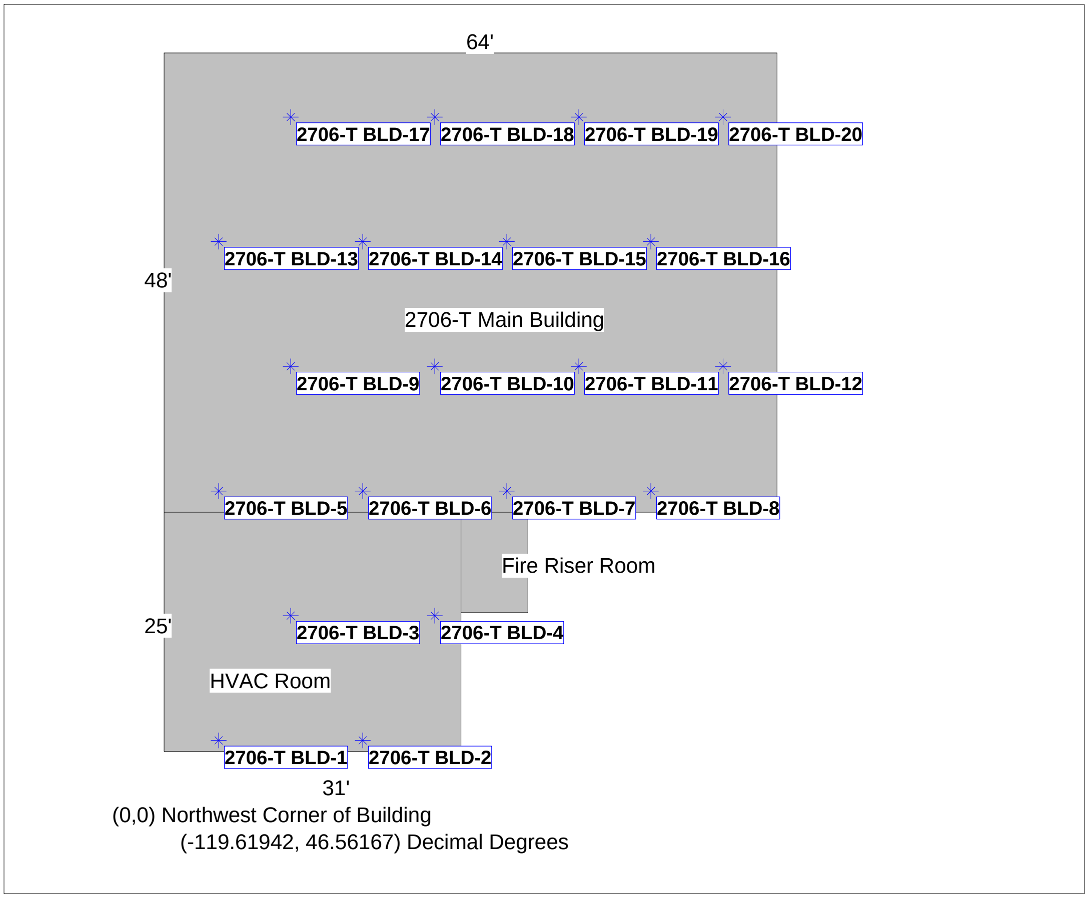
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	20
Number of selected sample areas [b]	1
Specified sampling area [c]	3920.50 ft^2
Size of grid / Area of grid cell [d]	15.0449 feet / 196.025 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 2706-T Building					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
5.7000	1.1534	2706-T BLD-1		Systematic	
20.7449	1.1534	2706-T BLD-2		Systematic	
13.2225	14.1827	2706-T BLD-3		Systematic	
28.2674	14.1827	2706-T BLD-4		Systematic	
5.7000	27.2120	2706-T BLD-5		Systematic	
20.7449	27.2120	2706-T BLD-6		Systematic	
35.7899	27.2120	2706-T BLD-7		Systematic	
50.8348	27.2120	2706-T BLD-8		Systematic	
13.2225	40.2413	2706-T BLD-9		Systematic	
28.2674	40.2413	2706-T BLD-10		Systematic	
43.3124	40.2413	2706-T BLD-11		Systematic	
58.3573	40.2413	2706-T BLD-12		Systematic	
5.7000	53.2706	2706-T BLD-13		Systematic	
20.7449	53.2706	2706-T BLD-14		Systematic	
35.7899	53.2706	2706-T BLD-15		Systematic	
50.8348	53.2706	2706-T BLD-16		Systematic	
13.2225	66.2999	2706-T BLD-17		Systematic	

28.2674	66.2999	2706-T BLD-18		Systematic	
43.3124	66.2999	2706-T BLD-19		Systematic	
58.3573	66.2999	2706-T BLD-20		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty, z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

The values of these inputs that result in the calculated number of sampling locations are:

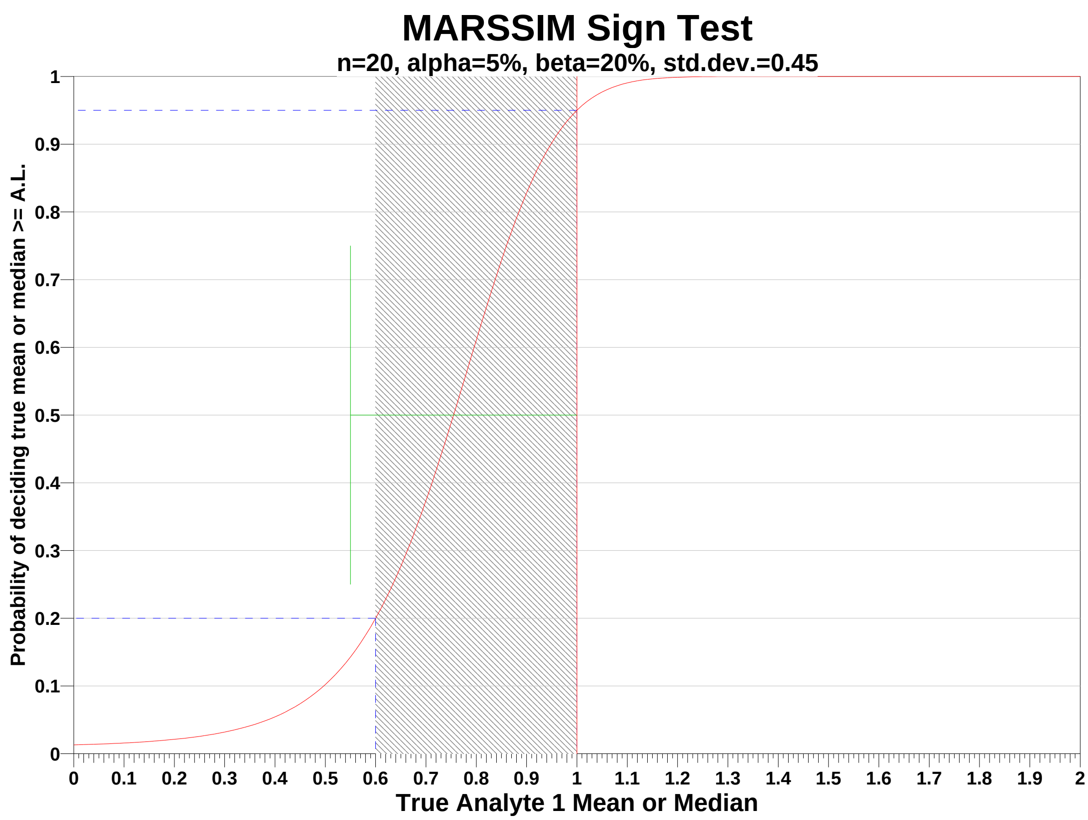
Analyte	n[a]	Parameter

	S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]	
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions
The assumptions associated with the formulas for computing the number of samples are:
1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis
The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%),

probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		**α=5**		**α=10**		**α=15**	
		s=0.9	**s=0.45**	**s=0.9**	**s=0.45**	**s=0.9**	**s=0.45**
LBGR=90	**β=15**	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	**β=15**	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	**β=15**	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**20 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

This report was automatically produced* by Visual Sample Plan (VSP) software version 7.2.

This design was last modified 11/30/2015 8:11:54 AM.

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Attachment H-C.b

2706-TA Building
Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

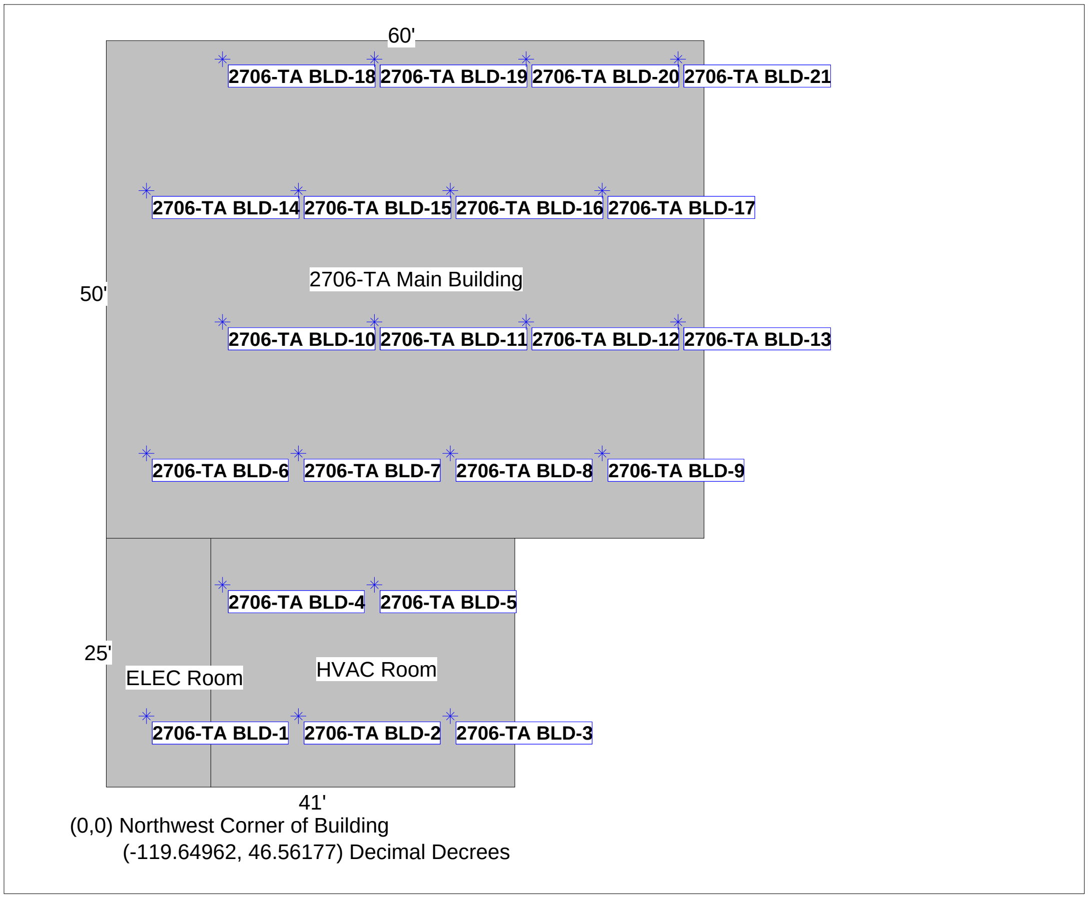
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	21
Number of selected sample areas [b]	1
Specified sampling area [c]	4025.00 ft^2
Size of grid / Area of grid cell [d]	15.2441 feet / 201.25 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 2706-TA Building					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
4.0417	7.1281	2706-TA BLD-1		Systematic	
19.2858	7.1281	2706-TA BLD-2		Systematic	
34.5299	7.1281	2706-TA BLD-3		Systematic	
11.6637	20.3299	2706-TA BLD-4		Systematic	
26.9079	20.3299	2706-TA BLD-5		Systematic	
4.0417	33.5317	2706-TA BLD-6		Systematic	
19.2858	33.5317	2706-TA BLD-7		Systematic	
34.5299	33.5317	2706-TA BLD-8		Systematic	
49.7741	33.5317	2706-TA BLD-9		Systematic	
11.6637	46.7335	2706-TA BLD-10		Systematic	
26.9079	46.7335	2706-TA BLD-11		Systematic	
42.1520	46.7335	2706-TA BLD-12		Systematic	
57.3961	46.7335	2706-TA BLD-13		Systematic	
4.0417	59.9353	2706-TA BLD-14		Systematic	
19.2858	59.9353	2706-TA BLD-15		Systematic	
34.5299	59.9353	2706-TA BLD-16		Systematic	
49.7741	59.9353	2706-TA BLD-17		Systematic	

11.6637	73.1371	2706-TA BLD-18		Systematic	
26.9079	73.1371	2706-TA BLD-19		Systematic	
42.1520	73.1371	2706-TA BLD-20		Systematic	
57.3961	73.1371	2706-TA BLD-21		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

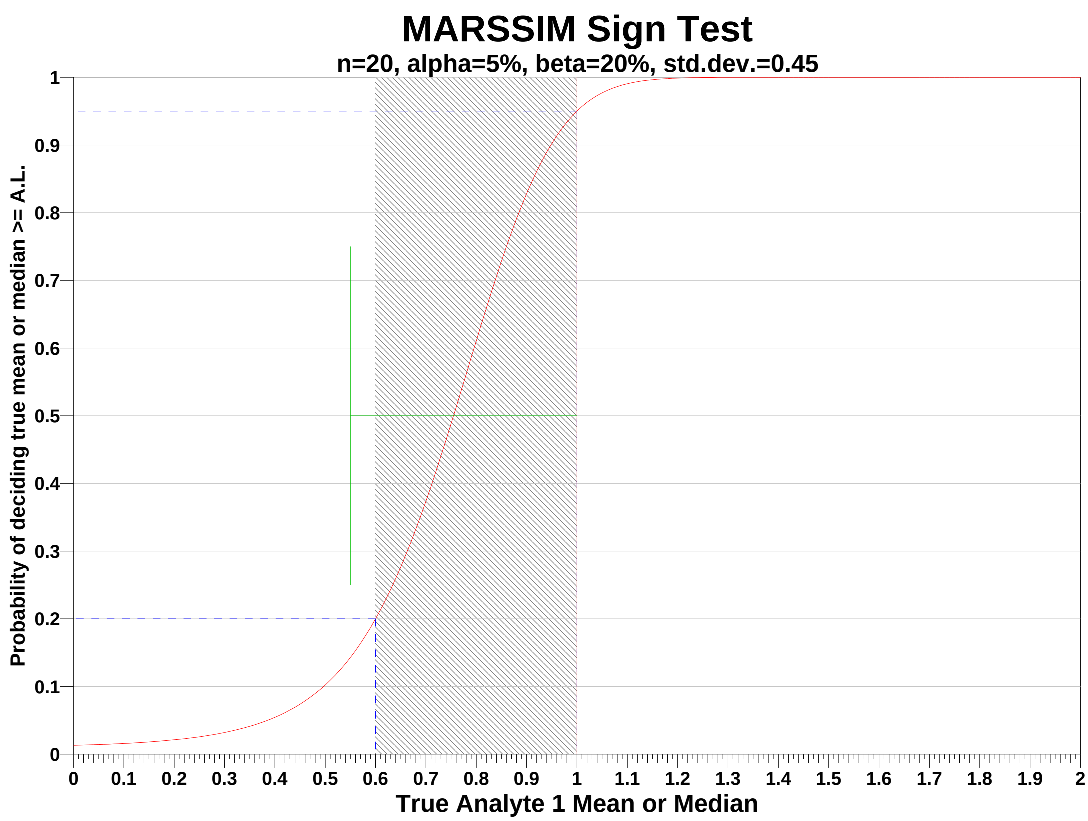
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions
The assumptions associated with the formulas for computing the number of samples are:
1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis
The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of

gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**21 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Appendix H-D

2706-T Asphalt Pad Dangerous Waste Management Unit

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Contents

Attachment

Tables

Figures

H-D1 Introduction

This appendix discusses closure activities for the T Plant Complex Operating Unit Group (OUG) (T Plant) 2706-T Asphalt Pad dangerous waste management unit (DWMU), hereinafter called the 2706-T Asphalt Pad.

This plan describes in detail the closure activities necessary to establish clean closure levels for the 2706-T Asphalt Pad. Such closure activities include removal of all waste, records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste, visual inspection of the asphalt after waste removal to evaluate the likelihood of potential contamination of the underlying soil, demolition of the 2706-T Asphalt Pad, and soil sampling and analysis to confirm that clean closure standards have been achieved.

Please note, the terms “mixed waste” and/or “waste”, when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

Closure of the 2706-T Asphalt Pad will be performed in accordance with the closure schedule provided in Section H-D4. Within 60 days upon completion of closure activities, the Permittees shall provide the Washington State Department of Ecology (Ecology) with a certification of closure in accordance with *Washington Administrative Code* (WAC) 173-303-610(6), “Dangerous Waste Regulations,” “Closure and Post-Closure.” Closure certification will provide supportive evidence that the 2706-T Asphalt Pad has met established clean closure standards.

This closure plan complies with WAC 173-303-610(2) through (6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

H-D1.1 Unit Description

The 2706-T Asphalt Pad is an uncovered asphalt area located northwest of the 2706-TA Building (Figure H-D1 and Figure H-D2) measuring approximately 24 m (80 ft) wide by 45.7 m (150 ft) long, for a total footprint and available waste storage area of approximately 1,100 m^2 (12,000 ft^2). The 2706-T Asphalt Pad is permitted for waste container storage and can store waste containers of various sizes and volumes. Containerized waste may include waste boxes, drums, and casks and come in varying sizes and types (e.g., metal, wood, concrete, and reinforced fiberglass plywood).

The 2706-T Asphalt Pad does not have a constructed secondary containment system. Containers stored in the outside storage area that do not meet the criteria specified in WAC 173-303-630(7)(c) (e.g., waste packages containing free liquids or exhibiting characteristics of ignitability or reactivity) are placed on portable secondary containment systems.

Treatment of waste will not be conducted within this DWMU.

H-D1.1.1 Maximum Waste Inventory

The maximum permitted storage capacity for the 2706-T Asphalt Pad is a total volume of 688.9 m^3 (688,900 L).

H-D2 Closure Performance Standard

Closure performance standards for the 2706-T Asphalt Pad will be based on WAC 173-303-610(2), which requires closure of the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.

- Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, post-closure escape of dangerous waste, dangerous constituents, leachate, contaminated runoff, or waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous waste activity.

These performance standards are addressed in Sections H-D2.1 and H-D3.9 of this closure plan and are furthermore identified in Table H-D4.

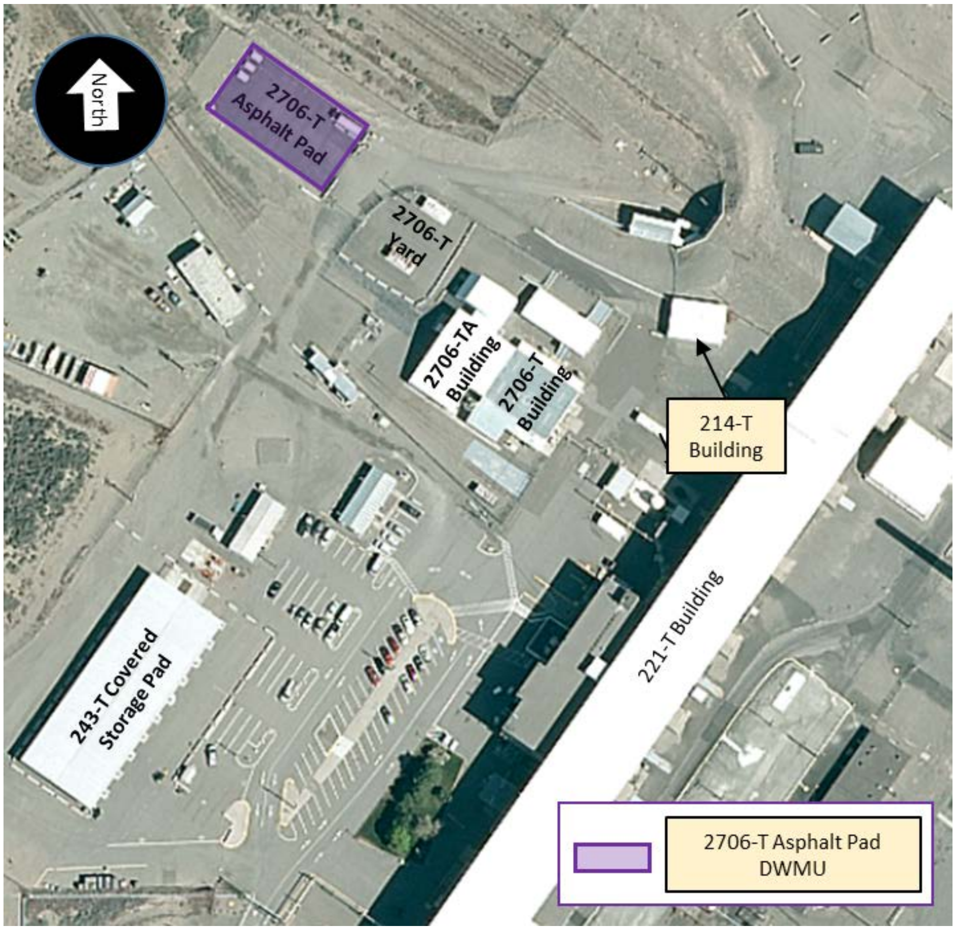

Figure H-D1. T Plant 2706-T Asphalt Pad (Aerial View 2012)

Figure H-D2. T Plant 2706-T Asphalt Pad (February 2013)

H-D2.1 Clean Closure Levels

The 2706-T Asphalt Pad will be clean closed using clean closure levels required for soil. After removal of all waste, the asphalt pad will be visually inspected to identify any waste related staining, major cracks, crevices, seams, and low points. Asphalt will be removed and managed as a newly generated waste stream. Section H-D3.7 details waste generated during closure.

Once the asphalt pad is removed, soil underlying the asphalt pad will be sampled and must meet clean closure levels. In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to WAC 173-340, “Model Toxics Control Act—Cleanup” (MTCA) regulations (WAC 173-340-700, “Overview of Cleanup Standards,” through WAC 173-340-760, “Sediment Cleanup Standards,” excluding WAC 173-340-745, “Soil Cleanup Standards for Industrial Properties”). These numeric cleanup levels have been calculated according to the requirements of WAC 173-303-610(2)(b)(i) using the MTCA (WAC 173-340) Method B closure performance standard for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-D4 provides MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte (Table H-D1).

A null hypothesis is generally assumed to be true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, “Definitions,” for the 2706-T Asphalt Pad is that the soil underlying the asphalt pad is assumed to be above MTCA (WAC 173-340) Method B cleanup levels; therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means that sampling and analysis results of the site indicated soil contamination below MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that the soil meets closure performance standards in accordance with MTCA (WAC 173-340) Method B.

Should sampling and analysis provide a basis that the null hypothesis can be accepted, the soil would be removed, identified as contaminated environmental media, and managed in accordance with Section H-D3.8.

H-D3 Closure Activities

The 2706-T Asphalt Pad will be clean closed under *Resource Conservation and Recovery Act of 1976* (RCRA), and confirmation sampling will be performed to verify that closure performance standards (Table H-D4) are met. As a waste storage unit, clean closure determinations for the 2706-T Asphalt Pad will be based on successfully completing the closure activities in this section. Sampling and analysis activities were developed utilizing the U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection (QA/G-5S)*, and Ecology Publication 94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-D3.10). The objective of the sampling described in this document is to determine if MTCA (WAC 173-340) Method B closure performance standards were met, demonstrating clean closure of the 2706-T Asphalt Pad.

The following closure activities are required to achieve and verify clean closure for soil:

- Remove all waste.
- Review waste container storage, operating, and inspection records for documented spills or releases of waste.
- Perform a visual inspection of the asphalt pad to identify any waste related staining, major cracks, crevices, seams, and low points for purposes of focused sampling.
- Remove asphalt pad.
- Perform waste determination of asphalt pad waste debris.
- Complete and document disposal of the asphalt pad as newly generated waste.
- Perform sampling and analysis of soil under the asphalt pad to confirm that clean closure standards are met.
- If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of any contaminated environmental media present.
- Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been met.
- Transmit closure certification to Ecology.

H-D3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment (PPE). Qualified personnel will be trained in applicable safety and environmental procedures and will have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 of WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter referred to as the Hanford Facility RCRA Permit), describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, "Personnel Training," which provides training requirements for Hanford Facility personnel associated with the 2706-T Asphalt Pad.

Project-specific safety training addressed explicitly to the project and activities for the day will include the following:

- Training provides the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records for each employee are maintained in an electronic training record database. The Permittees training organization maintains the training records system.

H-D3.2 Removal of Wastes and Waste Residues

All waste will be removed from the storage area. Waste will be managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers meeting U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with 49 *Code of Federal Regulations* (CFR), "Transportation" criteria. Waste packaged in non-DOT regulation (large or irregular shaped) containers will be shipped in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily occur utilizing highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet land disposal restriction (LDR) treatment standards specified in WAC 173-303-140, which includes by reference 40 CFR 268, then ultimately disposed of in an appropriate waste disposal facility.

While waste residues are not anticipated, if they are found during clean closure activities, they will be managed in accordance with all applicable requirements of WAC 173-303-170, "Requirements for Generators of Dangerous Waste," through WAC 173-303-230, "Special Conditions." Waste subject to LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-D3.3 Unit Components, Parts, and Ancillary Equipment

The 2706-T Asphalt Pad does not have any unit components, parts, or ancillary equipment.

H-D3.4 Inspection of Units before Decontamination

Although decontamination of the 2706-T Asphalt Pad is not planned, following removal of all waste and waste residues, a visual inspection will be performed to determine the presence of cracks, holes, or other breaches in the asphalt sufficient to reach the underlying soil. These cracks, holes, or other breaches will be documented to determine focused sampling of the underlying soil during confirmation sampling.

During the closure period, the 2706-T Asphalt Pad will be inspected in accordance with WAC 173-303-320(2), "General Inspection," to prevent threats to human health and the environment. Inspections of the 2706-T Asphalt Pad, performed annually until clean closure certification is accepted by Ecology, will verify the following information:

- Posted warning signs at each entrance to T Plant are present, legible, and visible at 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-D3.5 Decontamination

Decontamination of the 2706-T Asphalt Pad is not planned.

H-D3.6 Demolition

Once the asphalt visual inspection is completed, demolition of the asphalt pad can be initiated. Demolition of the pad will include the following primary activities:

- Location of utilities
- Mobilization of equipment
- Removal and disposal of the asphalt pad.

H-D3.6.1 Location of Utilities

Prior to demolition, any in-use utilities will be located to ensure that there are no disruptions to the surrounding activities.

H-D3.6.2 Equipment Mobilization

The resources, equipment, and materials necessary to perform demolition will be staged in designated laydown areas.

H-D3.6.3 Demolition Activities for the 2706-T Asphalt Pad

Demolition of the 2706-T Asphalt Pad will be accomplished utilizing the primary method of rubblizing utilizing large equipment to rubblize the asphalt pad. Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and high efficiency particulate air filtered vacuum cleaners may be used. Additional storm water run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

H-D3.6.3.1 Rubblizing

During rubblizing of the 2706-T Asphalt Pad, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and run-off. Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and asphalt pulverizer jaws or breaker jaws, will be used to perform any rubblizing. Rubble debris from the containment system will be loaded into roll-off boxes for transportation to the approved disposal facility.

H-D3.7 Identifying and Managing Waste Generated During Closure Activities

Closure activities for the 2706-T Asphalt Pad will result in generation of debris in the generation of one known waste stream (debris from demolition) requiring management and disposal. Waste generated during closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. The newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-D3.12).

H-D3.7.1 Debris from Demolition

Debris generated from demolition will be packaged onsite at the 2706-T Asphalt Pad and transported to an appropriate waste disposal facility. Debris includes, but is not limited to, the following types of wastes:

- Asphalt and associated rubblized debris
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)
- Equipment and construction materials.

The preferred management of debris resulting from demolition of the pad is in a bulk form. Bulk waste will be placed into bulk containers, such as roll-off boxes, for disposal. These bulk containers will be stored in a suitable area in proximity to the DWMU or, if debris contains waste, it may be accumulated for up to 90 days in another suitable location. Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

Debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-D3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Soil surrounding the node location, which identified contamination above clean closure levels, will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU. Following removal of contaminated soil, additional confirmatory sampling efforts will be conducted in accordance with the approved closure plan SAP to demonstrate clean closure levels. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. The contaminated soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

Management and disposal of the contaminated environmental media will be documented and included with the clean closure documentation included in Section H-D3.12.

H-D3.9 Confirming Clean Closure

The 2706-T Asphalt Pad will be clean closed. Demonstration of clean closure standards will be accomplished through removal of the asphalt pad and sampling and analysis of the underlying soil.

Once asphalt removal is complete, sampling will be performed in accordance with the SAP (Section H-D3.10) and will consist of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where waste related staining, cracks, or other openings in the asphalt may have allowed release of waste to the underlying soil).

Once removal of the asphalt pad is complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards (MTCA [WAC 173-340-730] Method B) have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-D3.8. Once analytical results confirm clean closure levels of the target analytes, a clean closure certification will be prepared in accordance with Section H-D3.12.

H-D3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarized the sampling design for the 2706-T Asphalt Pad. After the 2706-T Asphalt has been removed, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-D3.10.1 Sampling and Analysis Plan

Sampling and analysis of soil underlying the 2706-T Asphalt Pad will be conducted to confirm that clean closure levels have been achieved. Sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*; the ASTM (formerly the American Society for Testing and Materials) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM standards, EPA approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), at the time of closure. This SAP was also developed using Ecology Publication 94-111, Section 7.0, "Sampling and Analysis for Clean Closure," and EPA/240/R-02/005.

H-D3.10.2 Target Analytes

The 2706-T Asphalt Pad is an active portion of the T Plant OUG; therefore, target analytes at closure may include any or all analytes based on the waste code permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV-Description of Dangerous Wastes). A waste management report, identifying waste codes historically managed at the 2706-T Asphalt Pad, was run to identify existing target analytes. Table H-D1 details the waste codes identified for the waste containers stored at the 2706-T Asphalt Pad and the target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the DWMU upon receipt of the final waste. A permit modification updating the SAP with specific target analytes will be submitted, as necessary, 45 days prior to the DWMU closure in accordance with WAC 173-303-610(3)(b).

Table H-D1. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Endrin (D012)	72-20-8	Lindane (D013)	58-89-9
Benzene (D018) (F005)	71-43-2	Carbon Tetrachloride (D019) (F001)	56-23-5
Chloroform (D022)	67-66-3	*o*-Cresol (D023) (F004)	95-48-7
p-Cresol (D025) (F004)	106-44-5	Cresol (Cresylic Acid) (D026) (F004)[a,d]	1319-77-3
1,4-Dichlorobenzene (D027)	106-46-7	1,2-Dichloroethane (D028)	107-06-2
1,1-Dichloroethylene (D029)	75-35-4	2,4-Dinitrotoluene (D030)	121-14-2
Heptachlor (D031)	76-44-8	Heptachlor Epoxide (D031)	1024-57-3
Hexachlorobenzene (D032)	118-74-1	Hexachlorobutadiene (D033)	87-68-3
Hexachloroethane (D034)	67-72-1	Methyl Ethyl Ketone (D035) (F005)	78-93-3
Nitrobenzene (D036) (F004)	98-95-3	Pentachlorophenol (D037)	87-86-5
Pyridine (D038) (F005)	110-86-1	Tetrachloroethylene (D039) (F001) (F002)	127-18-4
Trichloroethylene (D040) (F001) (F002)	79-01-6	2,4,5-Trichlorophenol (D041)	95-95-4

Table H-D1. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
2,4,6-Trichlorophenol (D042)	88-06-2	Vinyl Chloride (D043)	75-01-4
Methylene Chloride (F001) (F002)	75-09-2	1,1,1-Trichloroethane (F001) (F002)	71-55-6
CFCs (F001) (F002)[g]	Not Applicable	Chlorobenzene (F002)	108-90-7
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-133)(F002)[g]	76-13-1	*Ortho*-dichlorobenzene (F002)	95-50-1
Trichlorofluoromethane (CFC-11) (F002)[g]	75-69-4	1,1,2 Trichloroethane (F002)	79-00-5
Acetone (F003)	67-64-1	*n*-Butyl Alcohol (F003)	71-36-3
Ethyl Ether (F003)	60-29-7	Methyl Isobutyl Ketone (F003)	108-10-1
Xylene (F003)	1330-20-7	Ethyl Acetate (F003)	141-78-6
Ethyl Benzene (F003)	100-41-4	Cyclohexanone (F003)	108-94-1
Methanol (F003)	67-56-1	*m*-Cresol (F004)	108-39-4
Toluene (F005)	108-88-3	Carbon Disulfide (F005)	75-15-0
Isobutanol (F005)	78-83-1	2-Nitropropane (F005)[c,d]	79-46-9
2-Ethoxyethanol (F005)[e]	110-80-5	Copper Cyanide (P029)[b]	544-92-3
Cyanide (P030)	57-12-5	Potassium Cyanide (P098)[b]	151-50-8
Sodium Cyanide (P106)[b]	143-33-9	Vanadium Pentoxide (P120)[f]	1314-62-1
Acetyl Chloride (U006)[d]	75-36-5	Formic Acid (U123)	64-18-6
		Phosphorous Sulfide (U189)[d]	1314-80-3

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol, and *p*-cresol.

b. Analyzed as total cyanide.

c. The closure performance standard for 2-nitropropane was removed in the May 2014 EPA CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

d. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

e. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

f. Vanadium pentoxide will be analyzed as vanadium.

g. A CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

CAS = Chemical Abstracts Service

CFC = chlorinated fluorocarbon

CLARC = Cleanup Levels and Risk Calculations

EPA = U.S. Environmental Protection Agency

H-D3.10.3 2706-T Asphalt Pad SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-D4.

H-D3.10.4 2706-T Asphalt Pad Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

H-D3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-D3.

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned Project Managers responsible for oversight of the 2706-T Asphalt Pad closure.
- **Project Manager:** The Project Manager provides oversight for activities and coordinates with the DOE Richland Operations Office (DOE-RL), EPA, Ecology, and contract management. The Project Manager (or designee) for the 2706-T Asphalt Pad closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that the project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management on all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.
- **Environmental Compliance:** The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.
- **Health and Safety:** The Health and Safety organization is responsible for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.
- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives the analytical data from the laboratories, performs data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.

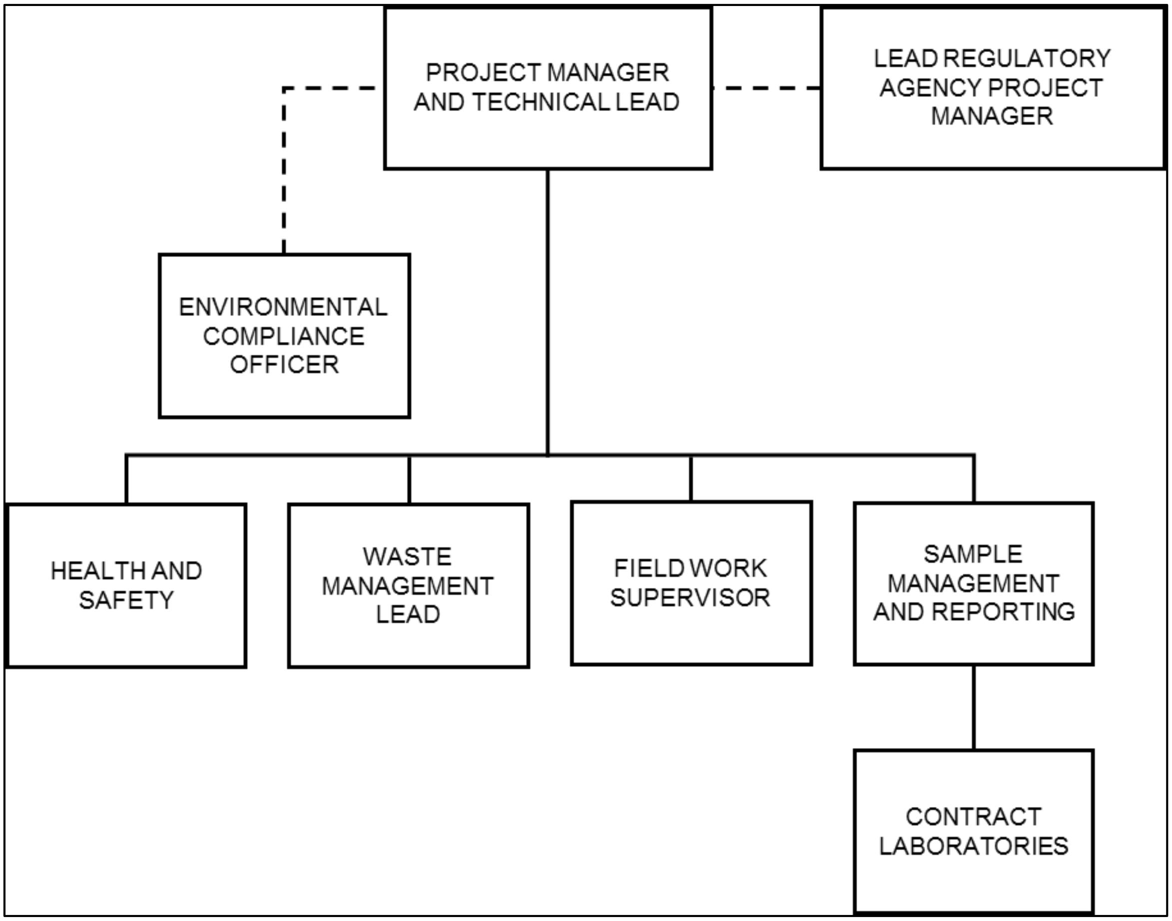

Figure H-D3. 2706-T Asphalt Pad Sampling and Analysis Plan Project Organization

- **Contract Laboratories:** The contract laboratories analyze samples, in accordance with established procedures, and provide necessary sample reports and explanation of results in support of data validation.
- **Waste Management:** The Waste Management organization communicates policies and protocols and ensures project compliance for storage, transportation, disposal, and waste tracking.
- **Field Work Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

H-D3.10.5 Sampling Design

The primary purpose of sampling the 2706-T Asphalt Pad underlying soil is to determine if analytical data values exceed MTCA (WAC 173-340) Method B clean closure performance standards (Table H-D4).

This SAP utilized Ecology Publication #94-111, Section 7.0, to determine the type of sampling design that will be utilized to demonstrate clean closure. When designing the sampling plan, both focused and area wide (grid) sampling methods were considered. Ecology Publication #94-111, Section 7.2.1, identifies that area wide sampling is appropriate when spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication #94-111, Section 7.3, “Sampling to Determine or Confirm

Clean Closure," identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling is further defined below.

Area Wide (Grid) Sampling. Samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication #94-111, is selective sampling of areas where contamination is expected or releases have been documented. Once visual inspections have been performed and any waste related staining, cracks, crevices, seams, and low points have been identified, focused sampling may be deemed necessary and added to the SAP. The location of focused sampling, if any, will be identified and recorded, as required, in Section H-D3.10.12. Judgmental (focused) sampling is further defined in the following paragraphs.

Judgmental (Focused) Sampling. Selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and on professional judgment. Focused sampling is distinguished from probability based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined using the Visual Sample Plan (VSP) software. VSP is a tool, used throughout Washington State and nationally, that statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 2706-T Asphalt Pad, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and utilized for the 2706-T Asphalt Pad input parameters. VSP parameter inputs and the basis for those inputs are detailed in Table H-D2.

The decision rule for demonstrating compliance with the MTCA (WAC 173-340) Method B clean closure level has the following three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-D2, VSP calculated that a minimum of 28 samples is required to reject the null hypotheses with 95 percent confidence and ensure that the 2706-T Asphalt Pad would not be mistakenly released as clean. For the purpose of utilizing VSP software, the null hypothesis is to compare a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Sample locations were determined using the area wide grid with a random start sampling method run in VSP (Figure H-D4). Statistical analysis of systematically collected data is valid if a random start to the grid is used. The 2706-T Asphalt Pad dimensions were entered into VSP to determine locations of the samples. The triangular grid sampling layout was determined to have an even distribution over the entire 2706-T Asphalt Pad, providing the most representative data set including coverage of the middle portion of the sampling area. The 28 samples will be taken from the node locations, indicated by VSP software, and will be assigned sample location identifications and sample numbers using HEIS. The west corner of the 2706-T Asphalt Pad is considered the (0,0) point of the sampling location map in Attachment H-D.a.

The first node location was chosen at random by VSP, and the subsequent 27 sample locations were assigned by VSP using a triangular grid sampling method. Supporting documentation for VSP software sampling designations is provided in Attachment H-D.a.

H-D3.10.6 Sampling Methods and Handling

A grab sample matrix will consist of soil samples collected in precleaned sample containers taken at a depth of no more than approximately 0 to 15 cm (0 to 6.0 in.) below ground surface and within an approximate 0.6 m (2 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer once the asphalt pad has been removed. Subsurface sampling (samples collected at depths greater than approximately 15 cm [6.0 in. below ground surface) will be evaluated, based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-D3.10.14.

Once the soil is sampled, sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter, which allows for a larger surface area to volume ratio, therefore increasing the likelihood of identifying any potential contamination in the sample. Soil samples will be collected directly into containers at the chosen sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation
- Field walkdown of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Table H-D2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value exceeds the threshold (WAC 173-340 "Model Toxics Control Act-Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

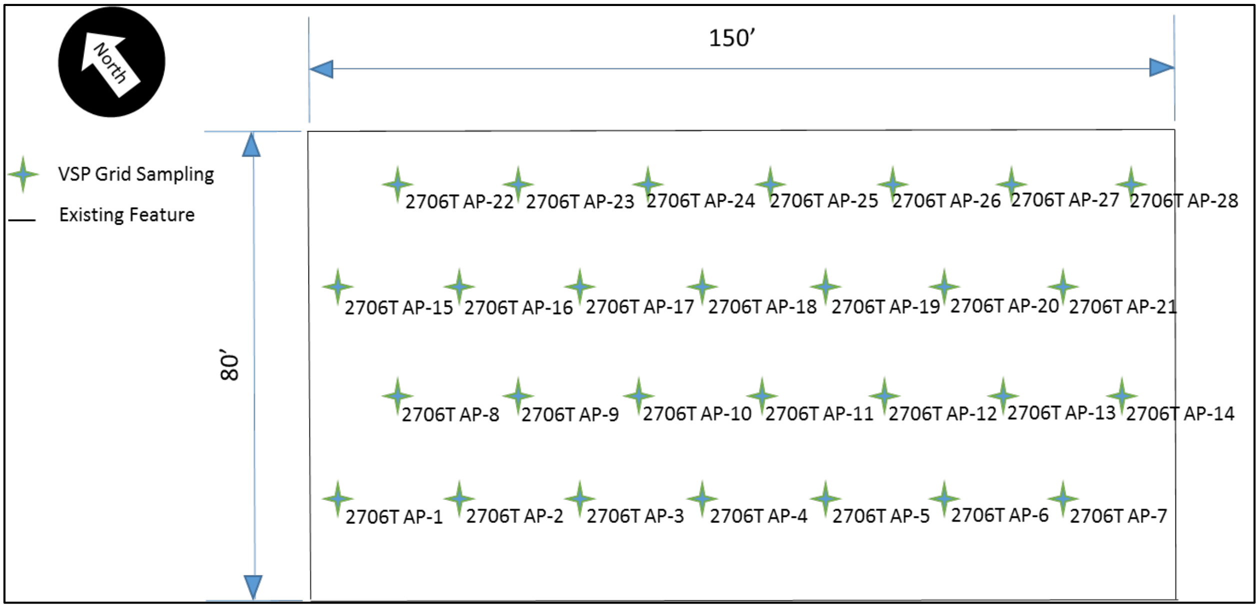

Figure H-D4. VSP Sample Locations for the 2706-T Asphalt Pad

Table H-D3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction; 24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE lined lid	250 g
EPA 9012	Cyanide	Cool ≤4°C	14 days	G/P/PTFE	15 g
EPA 9056	Anions	Cool ≤6°C	28 days prior to extraction; 48 days after extraction	G/P	250 g

AG = amber glass
EPA = Environmental Protection Agency
G = glass
MS = mass spectrometry
OES = optical emission spectrometry
P = plastic

Table H-D3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size

GC = gas chromatography
ICP = inductively coupled plasma
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

Sample container, preservation, and holding time requirements are specified in Table H-D3 for soil samples. These requirements are in accordance with the analytical method specified. Final container types and volumes will be identified on the Sampling Authorization Form and chain-of-custody form.

To prevent potential sample contamination, decontaminated equipment will be used for each sampling activity.

EPA Level 1 precleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory specific volumes/requirements for meeting analytical quantitation limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or the sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- SAF and corresponding number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable).

Sample records must also include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste generated by sampling activities subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-D3.10.7 Analytical Methods

All analyses and testing will be performed consistent with laboratory agreements, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Table H-D4 outlines analytical methods and performance requirements associated with the target analytes.

H-D3.10.8 Quality Control

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

Laboratory QC samples estimate the precision and bias of analytical data. Field and laboratory QC samples are summarized in Table H-D5. A data quality assessment (DQA) will be performed utilizing the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide (QA/G-9R)*, and implementing the specific requirements in Sections H-D3.10.8 through H-D3.10.10.

Data verification, data validation, and DQA will include both primary samples and QC samples.

H-D3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

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

H-D3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to the validators, and only additions to be made, not changes to the raw data, are allowed.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

Table H-D4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
72-20-8	Endrin	SW-846 Method 8270	--	2.40E+01	3.30E-03	±30	≤30
58-89-9	Lindane	SW-846 Method 8270	9.09E-01	2.40E+01	1.65E-03	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30

Table H-D4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
106-46-7	1,4-Dichlorobenzene	SW-846 Method 8270	1.85E+02	5.60E+03	3.30E-01	±30	≤30
107-06-2	1,2-Dichloroethane	SW-846 Method 8260	1.10E+01	4.80E+02	5.00E-03	±30	≤30
75-35-4	1,1-Dichloroethylene	SW-846 Method 8260	--	4.00E+03	1.00E-02	±30	≤30
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30
76-44-8	Heptachlor	SW-846 Method 8270	2.22E-01	4.00E+01	1.65E-03	±30	≤30
1024-57-3	Heptachlor Epoxide	SW-846 Method 8270	1.10E-01	1.04E+00	1.65E-03	±30	≤30
118-74-1	Hexachlorobenzene	SW-846 Method 8270	6.25E-01	6.40E+01	3.30E-01	±30	≤30
87-68-3	Hexachlorobutadiene	SW-846 Method 8270	1.28E+01	8.00E+01	3.30E-01	±30	≤30
67-72-1	Hexachloroethane	SW-846 Method 8270	2.50E+01	5.60E+01	5.00E-03	±30	≤30

Table H-D4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30
87-86-5	Pentachlorophenol	SW-846 Method 8270	2.50E+00	4.00E+02	3.30E-01	±30	≤30
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
95-95-4	2,4,5-Trichlorophenol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
88-06-2	2,4,6-Trichlorophenol	SW-846 Method 8270	9.09E+01	8.00E+01	3.30E-01	±30	≤30
75-01-4	Vinyl Chloride	SW-846 Method 8260	1.75E+02	2.40E+02	1.00E-02	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30

Table H-D4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+03	1.00E-02	±30	≤30
1330-20-7	Xylene	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30

Table H-D4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30
57-12-5	Cyanide	SW-846 Method 9012	--	4.80E+01	1.00E+00	±30	≤30
7440-62-2	Vanadium	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
64-18-6	Formic Acid	SW-846 Method 9056	--	7.20E+04	2.00E+00	±30	≤30

Table H-D4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			

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

Note: Due to the quantity and nature of waste stored in the 2706-T Asphalt Pad not presenting a threat to groundwater, and not having soil or the presence of plants within the DWMU, no groundwater or ecological indicator MTCA cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equation 740-1 and Equation 740-2 from WAC 173-340-740(3)(b) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon

DWMU = dangerous waste management unit

MTCA = "Model Toxics Control Act—Cleanup"

Req't = requirement

WAC = Washington Administrative Code

Table H-D5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance, and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The Laboratory control sample measures the accuracy of the analytical method.

Table H-D5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

H-D3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP software uses the analytical data to determine if the user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software will calculate the true standard deviation and if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-D2.1)

H-D3.10.12 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook, and only authorized persons may make entries in logbooks. Logbooks will be signed by the FWS, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following items will be included in the project file, as appropriate:

- All field logbooks or operational records
- Data forms
- Global positioning system data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports

- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports.

The laboratory is responsible for maintaining, and having available upon request, the following items:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-D3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

In the event that sample results based on the MTCA Method B (WAC 173-340) three-part test (Section H-D3.10.5) indicate contamination above clean closure levels, the contaminated soil will be removed in accordance with Section H-D3.8. Following removal of contaminated soil, additional samples will be taken at the same grid location as identified in Attachment H-D.a. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-D3.10.12, and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-D4, with accompanying QC samples as discussed in Section H-D3.10.8 to confirm that MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-D3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to the SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, “Permit Changes.”

H-D3.11 Role of the Independent Qualified Registered Professional Engineer

An Independent, Qualified, Registered Professional Engineer (IQRPE) will be retained to provide certification of the closure and sign the closure certification, as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 2706-T Asphalt Pad. At a minimum, the following field activities would be completed:

- Observation or review of 2706-T Asphalt Pad visual inspection
- Observation or review of demolition
- Observation or review of sampling activities
- Review sampling procedures and results
- Observation or review of contaminated environmental debris removal (as applicable)
- Verification that locations of samples are as specified in the SAP
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-D3.12 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 2706-T Asphalt Pad, a certification that the DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities.
- Description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of any unanticipated contaminated environmental media.
- All laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for all samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.
- Summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.
- Description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-D3.13 Conditions that will be Achieved when Closure is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 2706-T Asphalt Pad will be clean closed. The asphalt pad will be removed, so only bare soil will remain. A permit modification request will be submitted after clean closure has been confirmed to remove the 2706-T Asphalt Pad DWMU from the Hanford Facility RCRA Permit.

H-D4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), closure activities will be completed no more than 180 days after the start of closure (Table H-D6) for the DWMU. Should unexpected circumstances arise and an extension to the 180 day closure activity expiration date be deemed necessary, a permit modification will be submitted to Ecology for approval at least 30 days prior to the 180 day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements and criteria, have been and will continue to be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the 2706-T Asphalt Pad, as outlined in Section H-D3.12 (Figure H-D5).

Table H-D6. 2706-T Asphalt Pad Closure Activity Description

Closure Activity Description		Expected Duration
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 2706-T Asphalt Pad	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 2706-T Asphalt Pad	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste	Package and ship waste to approved facility for treatment, storage, and/or disposal. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all dangerous wastes in accordance with the approved closure plan. Request extension if necessary.	40 Days (Day 40)
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records.	40 Days (Day 40)
Visual Inspection of Asphalt Pad	Identify areas of concern (cracks in asphalt that could potentially reach the soil below the asphalt).	10 Days (Day 50)
	Document visual inspection with photos, locations, and dimensions of staining and cracks.	
Remove Asphalt Pad	Remove asphalt pad with large equipment.	40 Days (Day 90)
	Containerize asphalt waste debris.	
	Perform waste determination on waste debris.	
	Dispose of waste debris in approved disposal facility.	
Sampling and Analysis of Underlying Soil (Following Removal of Asphalt Pad, May be Performed Concurrently with Waste Determination and Disposal of Pad)	See Section H-D3.10 for details of sampling and analysis.	90 Days (Day 180)
	Data validation and verification.	
	If necessary, remove contaminated environmental media (soil), and resample and analyze to confirm that clean closure levels have been achieved.	
Final Closure of the 2706-T Asphalt Pad	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)

Table H-D6. 2706-T Asphalt Pad Closure Activity Description

Closure Activity Description		Expected Duration
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (see Section H-D3.12 for more details on the clean closure certification).	60 Days (Day 240)

H-D5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE and operated by the DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), provisions of WAC 173-303-620, “Financial Requirements,” are not applicable to the Hanford Facility.

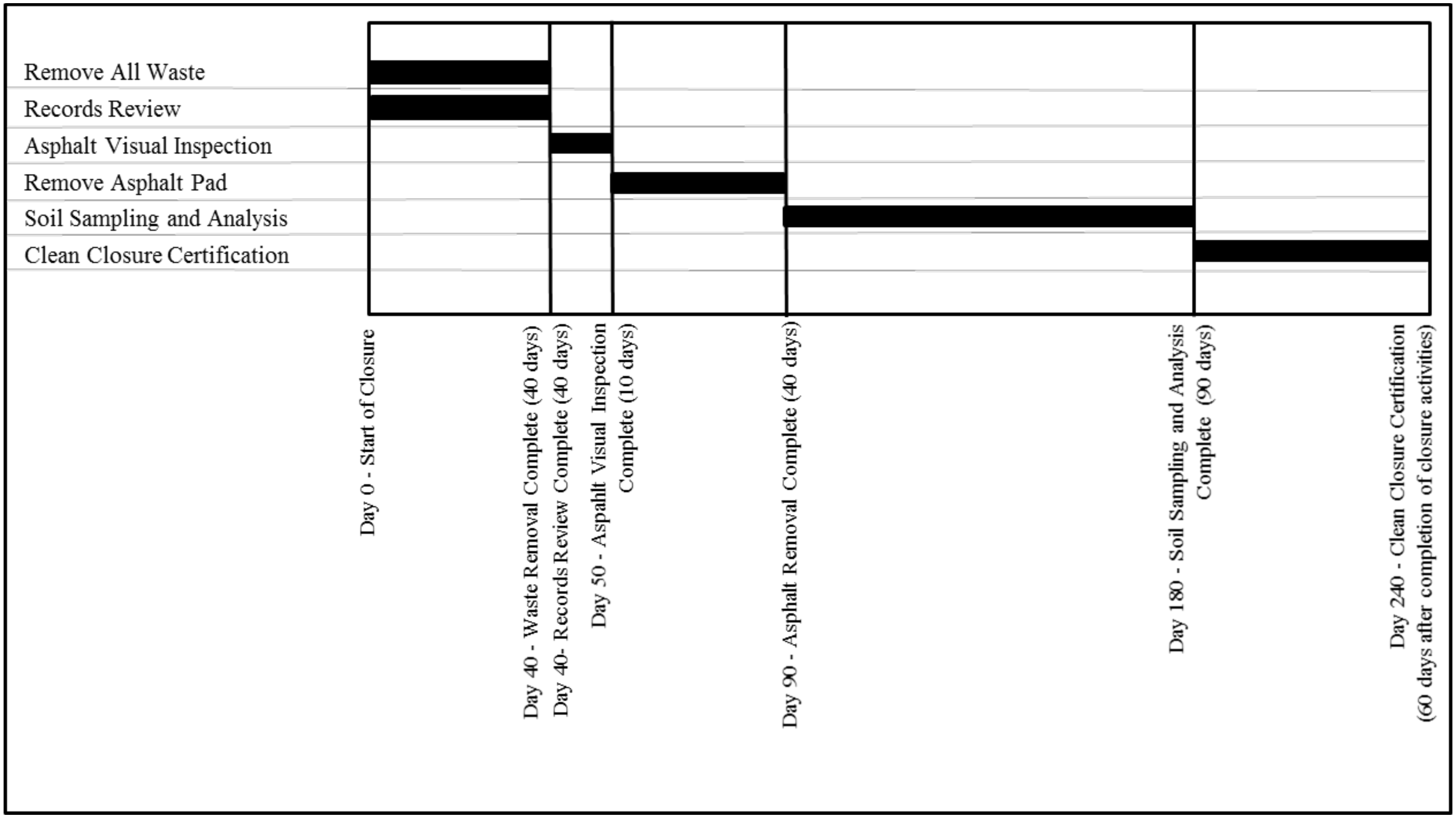

Figure H-D5. 2706-T Asphalt Pad Closure Schedule Activities

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Attachment H-D.a

2706-T Asphalt Pad Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	28
Number of selected sample areas [b]	1
Specified sampling area [c]	11544.00 ft^2
Size of grid / Area of grid cell [d]	20.6532 feet / 369.408 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.

Area: 2706-T Asphalt Pad					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
4.2216	17.0953	2706T AP-1		Systematic	
24.8749	17.0953	2706T AP-2		Systematic	
45.5281	17.0953	2706T AP-3		Systematic	
66.1813	17.0953	2706T AP-4		Systematic	
86.8345	17.0953	2706T AP-5		Systematic	
107.4878	17.0953	2706T AP-6		Systematic	
128.1410	17.0953	2706T AP-7		Systematic	
14.5483	34.9816	2706T AP-8		Systematic	
35.2015	34.9816	2706T AP-9		Systematic	
55.8547	34.9816	2706T AP-10		Systematic	
76.5079	34.9816	2706T AP-11		Systematic	
97.1612	34.9816	2706T AP-12		Systematic	
117.8144	34.9816	2706T AP-13		Systematic	
138.4676	34.9816	2706T AP-14		Systematic	
4.2216	52.8678	2706T AP-15		Systematic	
24.8749	52.8678	2706T AP-16		Systematic	
45.5281	52.8678	2706T AP-17		Systematic	

66.1813	52.8678	2706T AP-18		Systematic	
86.8345	52.8678	2706T AP-19		Systematic	
107.4878	52.8678	2706T AP-20		Systematic	
128.1410	52.8678	2706T AP-21		Systematic	
14.5483	70.7540	2706T AP-22		Systematic	
35.2015	70.7540	2706T AP-23		Systematic	
55.8547	70.7540	2706T AP-24		Systematic	
76.5079	70.7540	2706T AP-25		Systematic	
97.1612	70.7540	2706T AP-26		Systematic	
117.8144	70.7540	2706T AP-27		Systematic	
138.4676	70.7540	2706T AP-28		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,

Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is 1-α,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is 1-β.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

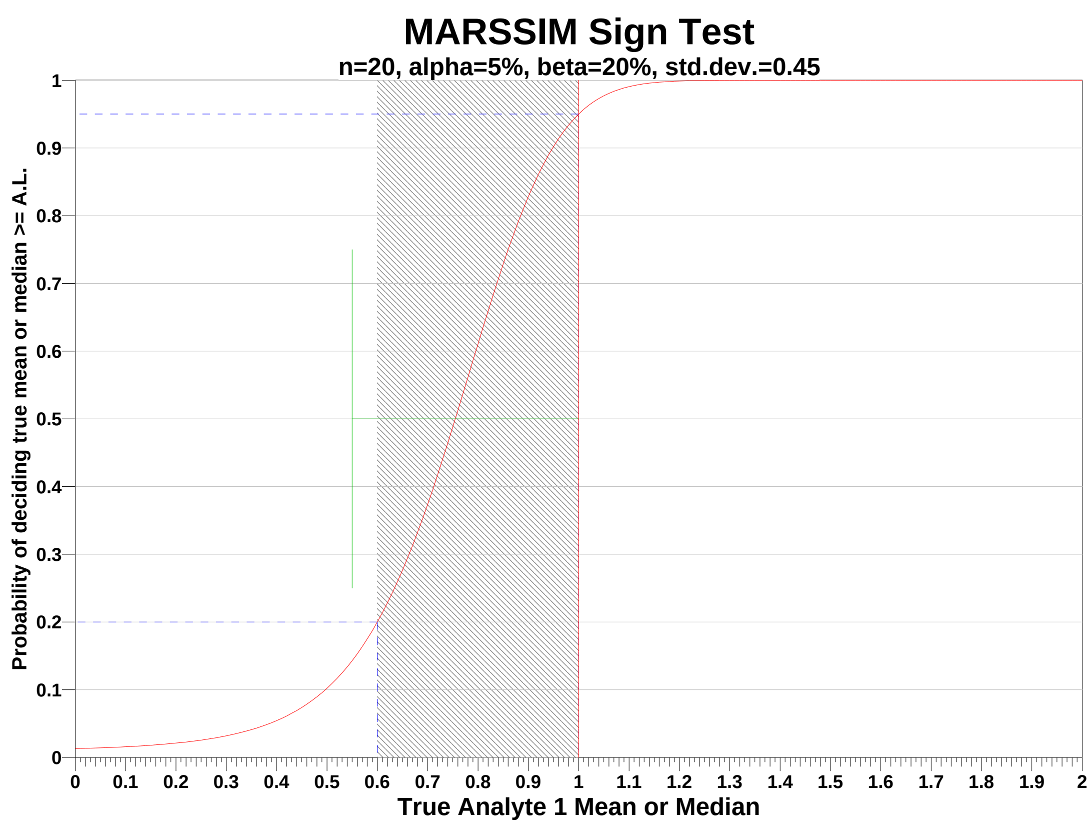
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		**α=5**		**α=10**		**α=15**	
		s=0.9	**s=0.45**	**s=0.9**	**s=0.45**	**s=0.9**	**s=0.45**
LBGR=90	**β=15**	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	**β=15**	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	**β=15**	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling

The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**28 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities

Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Appendix H-E

221-T BY Storage Area Dangerous Waste Management Unit

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Contents

Attachment

Tables

Figures

H-E1 Introduction

This appendix discusses closure activities for the T Plant Complex Operating Unit Group (OUG) (T Plant) 221-T BY Storage Area dangerous waste management unit (DWMU), hereinafter called the 221-T BY Storage Area.

This plan describes in detail the closure activities necessary to establish clean closure levels for the 221-T BY Storage Area. Such closure activities include removal of all waste, records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste, visual inspection of the asphalt after waste removal to evaluate the likelihood of potential contamination of the underlying soil, demolition of the 221-BY Storage Area, and soil sampling and analysis to confirm that clean closure standards have been achieved.

Please note, the terms "mixed waste" and/or "waste", when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

Closure of the 221-T BY Storage Area will be performed in accordance with the closure schedule provided in Section H-E4. Within 60 days upon completion of closure activities, the Permittees shall provide the Washington State Department of Ecology (hereinafter referred to as Ecology) a certification of closure in accordance with *Washington Administrative Code* (WAC) 173-303-610(6), "Dangerous Waste Regulations," "Closure and Post-Closure". Closure certification will provide supportive evidence that the 221-T BY Storage Area has met established clean closure standards.

This closure plan complies with the requirements of WAC 173-303-610(2) through (6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

H-E1.1 Unit Description

The 221-T BY Storage Area measures approximately 37 m (120 ft) wide by 61 m (199 ft) long, for a total footprint and available waste storage area of approximately 2,300 m^2 (24,000 ft^2). It is located northwest of the 221-T Building and is permitted for waste container storage (Figure H-E1). The 221-T BY Storage Area is an uncovered/unenclosed, irregular shaped area constructed of asphalt and gravel (Figure H-E2). The size of the storage area allows for storage of large containers, while providing a separation distance appropriate for higher dose containers.

The 221-T BY Storage Area does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet the criteria specified in WAC 173-303-630(7)(c) (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems. Treatment of waste will not be conducted within this DWMU.

H-E1.1.1 Maximum Waste Inventory

The maximum storage capacity of the 221-T BY Storage Area is a total volume of 1,150 m^3 (1,150,000 liters).

H-E2 Closure Performance Standard

Closure performance standards for the 221-T BY Storage Area will be based on WAC 173-303-610(2), which requires closure of the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.

- Control, minimize, or eliminate, to the extent necessary, to protect human health and the environment, post-closure escape of waste, dangerous constituents, leachate, contaminated runoff, or waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous waste activity.

These performance standards are addressed in Sections H-E2.1 and H-E3.9 of this closure plan and are furthermore identified in Table H-E4.

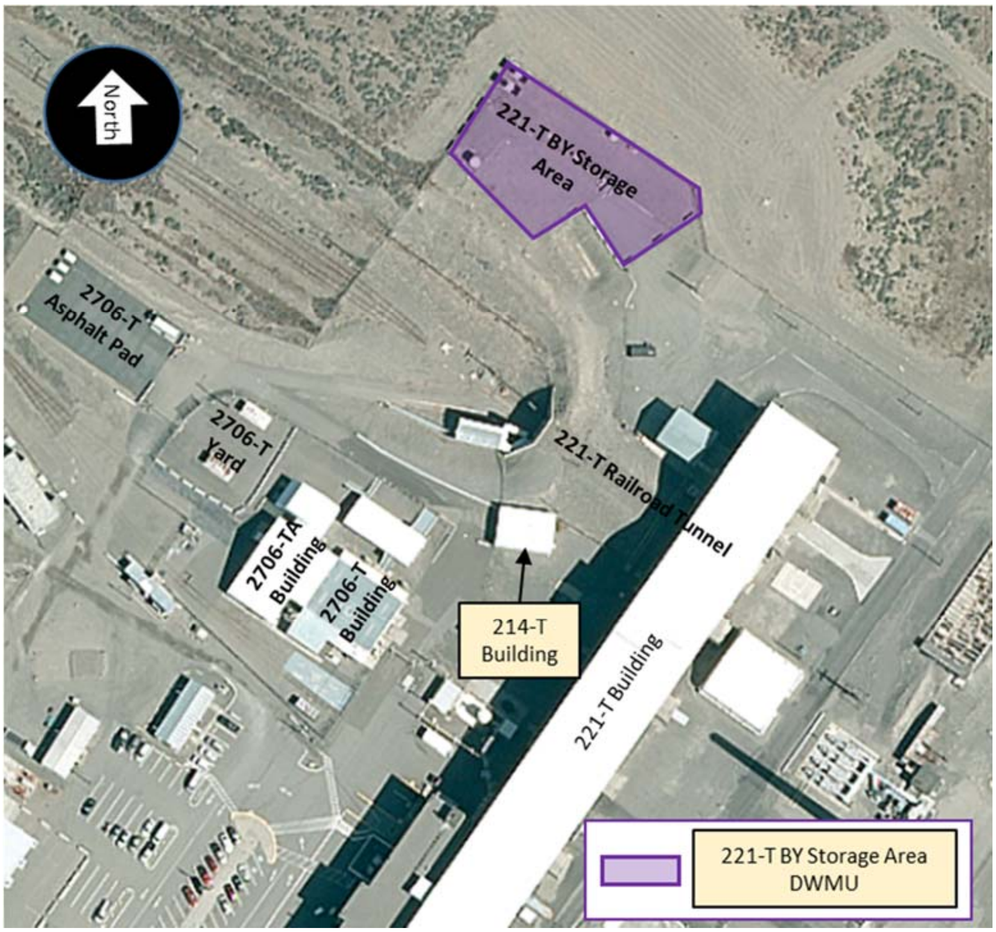

Figure H-E1. T Plant 221-T BY Storage Area (Aerial View 2012)

H-E2.1 Clean Closure Levels

The 221-T BY Storage Area will be clean closed using clean closure levels required for soil. After removal of all waste, the asphalt and gravel pads will be visually inspected to identify any waste related staining, major cracks, crevices, seams, and low points. The asphalt will be removed and managed as a newly generated waste stream. Section H-E3.7 details waste generated during closure.

Figure H-E2. T Plant 221-T BY Storage Area

Once the asphalt pad is removed, soil underlying the gravel and asphalt pads will be sampled and must meet clean closure levels. In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the WAC 173-340, “Model Toxics Control Act—Cleanup,” hereinafter called MTCA, regulations (WAC 173-340-700, “Overview of Cleanup Standards,” through WAC 173-340-760, “Sediment Cleanup Standards,” excluding WAC 173-340-745, “Soil Cleanup Standards for Industrial Properties”). These numeric cleanup levels have been calculated according to the requirements of WAC 173-303-610(2)(b)(i) using the MTCA (WAC 173-340) Method B closure performance standard for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-E4 provides the MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte (Table H-E1).

A null hypothesis is generally assumed true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, “Definitions”, for the 221-T BY Storage Area is that the underlying soil is assumed to be above MTCA (WAC 173-340) Method B cleanup levels. Therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means sampling and analysis results of the site indicated that the soil contains contamination below the MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that the soil meets closure performance standards in accordance with MTCA (WAC 173-340) Method B.

Should sampling and analysis provide a basis that the null hypothesis can be accepted, the gravel/soil would be removed, identified as contaminated environmental media, and managed in accordance with Section H-E3.8.

H-E3 Closure Activities

The 221-T BY Storage Area will be clean closed under *Resource Conservation and Recovery Act of 1976* (RCRA) and confirmation sampling will be performed to verify the closure performance standards (Table H-E4) are met. As a waste storage unit, clean closure determinations for the 221-T BY Storage Area will be based on successfully completing the closure activities in this section. Sampling and analysis activities were developed utilizing the U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection (QA/G-5S)*, and Ecology Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-E3.10). The objective of the sampling described in this document is to determine if the MTCA (WAC 173-340) Method B closure performance standards were met, demonstrating clean closure of the 221-T BY Storage Area.

The following closure activities are required to achieve and verify clean closure for soil:

- Remove all waste storage.
- Review waste container storage, operating, and inspection records for documented spill or releases of waste.
- Perform a visual inspection of the asphalt and gravel pads to identify any waste related staining, major cracks, crevices, seams, and low points for purposes of focused sampling.
- Remove asphalt pad.
- Perform waste determination of asphalt pad waste debris.
- Complete and document disposal of the asphalt pad as newly generated waste.
- Perform sampling and analysis of soil under the gravel and asphalt pads to confirm that clean closure standards are met.
- If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of any contaminated environmental media present.
- Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been met.
- Transmit closure certification to Ecology.

H-E3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment (PPE). Qualified personnel will be trained in applicable safety and environmental procedures and will have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 to the *Hanford Facility Resource Conservation Recovery Act Permit*, identification number WA7890008967 (hereinafter referred to as the Hanford Facility RCRA Permit) describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, "Personnel Training," which provides training requirements for Hanford Facility personnel associated with the 221-T BY Storage Area.

Project-specific safety training addressed explicitly to the project and activities for the day will include the following:

- Training to provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records for each employee are maintained in an electronic database. The Permittee's training organization maintains the training records system.

H-E3.2 Removal of Wastes and Waste Residues

All waste will be removed from the storage area. Waste will be managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers meeting U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with the "Transportation" criteria specified in Title 49 of the *Code of Federal Regulations* (CFR). Waste packaged in non-DOT regulation containers (large or irregular shaped containers) will be shipped in accordance with the DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily utilize highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet the land disposal restriction (LDR) treatment standards specified in WAC 173-303-140, which includes by reference 40 CFR 268, then ultimately disposed of in an appropriate waste disposal facility.

While waste residues are not anticipated, if they are found during clean closure activities, they will be managed in accordance with all applicable requirements of WAC 173-303-170, “Requirements for Generators of Dangerous Waste,” through WAC 173-303-230, “Special Conditions.” Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-E3.3 Unit Components, Parts, and Ancillary Equipment

The 221-T BY Storage Area does not have any unit components, parts, or ancillary equipment.

H-E3.4 Inspection of Units before Decontamination

Although decontamination of the 221-T BY Storage Area is not planned, following the removal of all waste and waste residues, a visual inspection will be performed to determine the presence of cracks, holes, staining, or other breaches in the asphalt and gravel sufficient to reach the underlying soil. These cracks, holes, staining, or other breaches will be documented to determine focused sampling of the underlying soil during confirmation sampling.

During the closure period, to prevent threats to human health and the environment, the 221-T BY Storage Area will be inspected according to WAC 173-303-320(2), “General Inspection.” Inspections of the 221-T BY Storage Area will be performed annually, until clean closure certification is accepted by Ecology, and will verify the following:

- Posted warning signs at each entrance to T Plant are present, legible, and visible at 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-E3.5 Decontamination

Decontamination of the 221-T BY Storage Area is not planned.

H-E3.6 Demolition

Once the asphalt visual inspection is completed, demolition of the asphalt pad can be initiated with the following primary activities included:

- Location of utilities
- Mobilization of equipment
- Removal and disposal of the asphalt pad.

H-E3.6.1 Location of Utilities

Prior to demolition, any in-use utilities will be located to ensure that there are no disruptions to the surrounding activities.

H-E3.6.2 Equipment Mobilization

The resources, equipment, and materials necessary to perform demolition will be staged in designated laydown areas.

H-E3.6.3 Demolition Activities for the 221-T BY Storage Area

Demolition of the 221-T BY Storage Area will be accomplished utilizing the primary method of rubblizing. Demolition of the DWMU will require the use of large equipment to rubblize the asphalt pad. Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the area. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and high efficiency particulate air filtered vacuum cleaners may be used. Additional storm water run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

H-E3.6.3.1 Rubblizing

During rubblizing of the 221-T BY Storage Area, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and run-off. Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and concrete pulverizer jaws or breaker jaws, will be used to perform any rubblizing. Rubble debris from the 221-T BY Storage Area will be loaded into roll-off boxes for transportation to the approved disposal facility.

H-E3.7 Identifying and Managing Waste Generated During Closure Activities

Closure activities for the 221-T BY Storage Area will result in the generation of one known waste stream (debris from demolition) requiring management and disposal. The waste generated during closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. Newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-E3.12).

H-E3.7.1 Debris from Demolition

Debris generated from demolition will be packaged onsite at the 221-T BY Storage Area and transported to an appropriate waste disposal facility. Debris includes, but is not limited to, the following types of wastes:

- Asphalt and associated rubblized debris
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)
- Equipment and construction materials.

The preferred management of debris resulting from demolition of the asphalt is in bulk form. Bulk waste will be placed into bulk containers such as roll-off boxes for disposal. These bulk containers will be stored in a suitable area in proximity to the DWMU or, if debris contains waste, may be accumulated for up to 90 days in another suitable location. Bulk containers of waste will be covered, except when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for blowing materials.

The debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-E3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Gravel/soil surrounding the node location, which identified contamination above clean closure levels, will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated gravel/soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU. Following removal of contaminated gravel/soil, additional confirmatory sampling will be conducted in the location of the original node which identified contamination above the clean closure level in accordance with the approved closure plan SAP. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated gravel/soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated gravel/soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. The contaminated gravel/soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

Management and disposal of the contaminated environmental media will be documented and included with the clean closure documentation included in Section H-E3.12.

H-E3.9 Confirming Clean Closure

The 221-T BY Storage Area will be clean closed. Demonstration of clean closure standards will be accomplished through removal of the asphalt pad and sampling and analysis of soil underlying the gravel and asphalt pads.

Once asphalt removal is complete, sampling will be performed in accordance with the SAP (Section H-E3.10) and will consist of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where waste related staining, cracks, or other openings in the asphalt may have allowed a release of waste to the underlying soil).

Once removal of the asphalt pad is complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards (MTCA [WAC 173-340-730] Method B) have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-E3.8. Once analytical results confirm clean closure levels of the target analytes, clean closure certification will be prepared in accordance with Section H-E3.12.

H-E3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarizes the sampling design for the 221-T BY Storage Area. After the 221-T BY Storage Area has been demolished and removed, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-E3.10.1 Sampling and Analysis Plan

Sampling and analysis of soil underlying the gravel and asphalt pads of the 221-T BY Storage Area will be conducted to confirm that clean closure levels have been achieved. Sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*; ASTM International (formerly the American Society for Testing and Materials) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM standards, EPA approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), at the time of closure. This SAP was also developed using Ecology Publication #94-111, Section 7.0, "Sampling and Analysis for Clean Closure," and EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan (QA/G-5S)*.

H-E3.10.2 Target Analytes

The 221-T BY Storage Area is an active portion of the T Plant OUG; therefore, target analytes at closure may include any or all analytes based on the waste codes permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV-Description of Dangerous Wastes). A waste management report identifying waste codes historically managed at the 221-T BY Storage Area was run to identify the existing target analytes. Table H-E1 details the waste codes identified for the waste containers stored at the 221-T BY Storage Area and the target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the DWMU upon receipt of the final waste. A permit modification updating the SAP with specific target analytes will be submitted, as necessary, 45 days prior to DWMU closure in accordance with WAC 173-303-610(3)(b).

Table H-E1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Carbon Tetrachloride (D019) (F001)	56-23-5	Chloroform (D022)	67-66-3
1,4-Dichlorobenzene (D027)	106-46-7	1,2-Dichloroethane (D028)	107-06-2
1,1-Dichloroethylene (D029)	75-35-4	2,4-Dinitrotoluene (D030)	121-14-2
Hexachloroethane (D034)	67-72-1	Methyl Ethyl Ketone (D035) (F005)	78-93-3
Pentachlorophenol (D037)	87-86-5	Tetrachloroethylene (D039) (F001) (F002)	127-18-4
Vinyl Chloride (D043)	75-01-4	Trichloroethylene (F001) (F002)	79-01-6
Methylene Chloride (F001) (F002)	75-09-2	1,1,1-Trichloroethane (F001) (F002)	71-55-6
CFCs (F001) (F002)[e]	Not Applicable	Chlorobenzene (F002)	108-90-7
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-133) (F002)[e]	76-13-1	*Ortho*-Dichlorobenzene (F002)	95-50-1

Table H-E1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Trichlorofluoromethane (CFC-11) (F002)[e]	75-69-4	1,1,2 Trichloroethane (F002)	79-00-5
Acetone (F003)	67-64-1	*n*-Butyl Alcohol (F003)	71-36-3
Ethyl Ether (F003)	60-29-7	Methyl Isobutyl Ketone (F003)	108-10-1
Xylene (F003)	1330-20-7	Ethyl Acetate (F003)	141-78-6
Ethyl Benzene (F003)	100-41-4	Cyclohexanone (F003)	108-94-1
Methanol (F003)	67-56-1	Cresol (Cresylic Acid) (F004)[a,c]	1319-77-3
m-Cresol (F004)	108-39-4	*o*-Cresol (F004)	95-48-7
p-Cresol (F004)	106-44-5	Nitrobenzene (F004)	98-95-3
Toluene (F005)	108-88-3	Carbon Disulfide (F005)	75-15-0
Isobutanol (F005)	78-83-1	Pyridine (F005)	110-86-1
2-Nitropropane (F005)[b,c]	79-46-9	2-Ethoxyethanol (F005)[d]	110-80-5
		Benzene (F005)	71-43-2

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol, and *p*-cresol.

b. The closure performance standard for 2-nitropropane was removed in the May 2014 EPA CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

c. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

d. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

e. A CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

CFC = chlorinated fluorocarbon

CLARC = Cleanup Levels and Risk Calculations

EPA = U.S. Environmental Protection Agency

H-E3.10.3 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-E4.

H-E3.10.4 Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

H-E3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-E3.

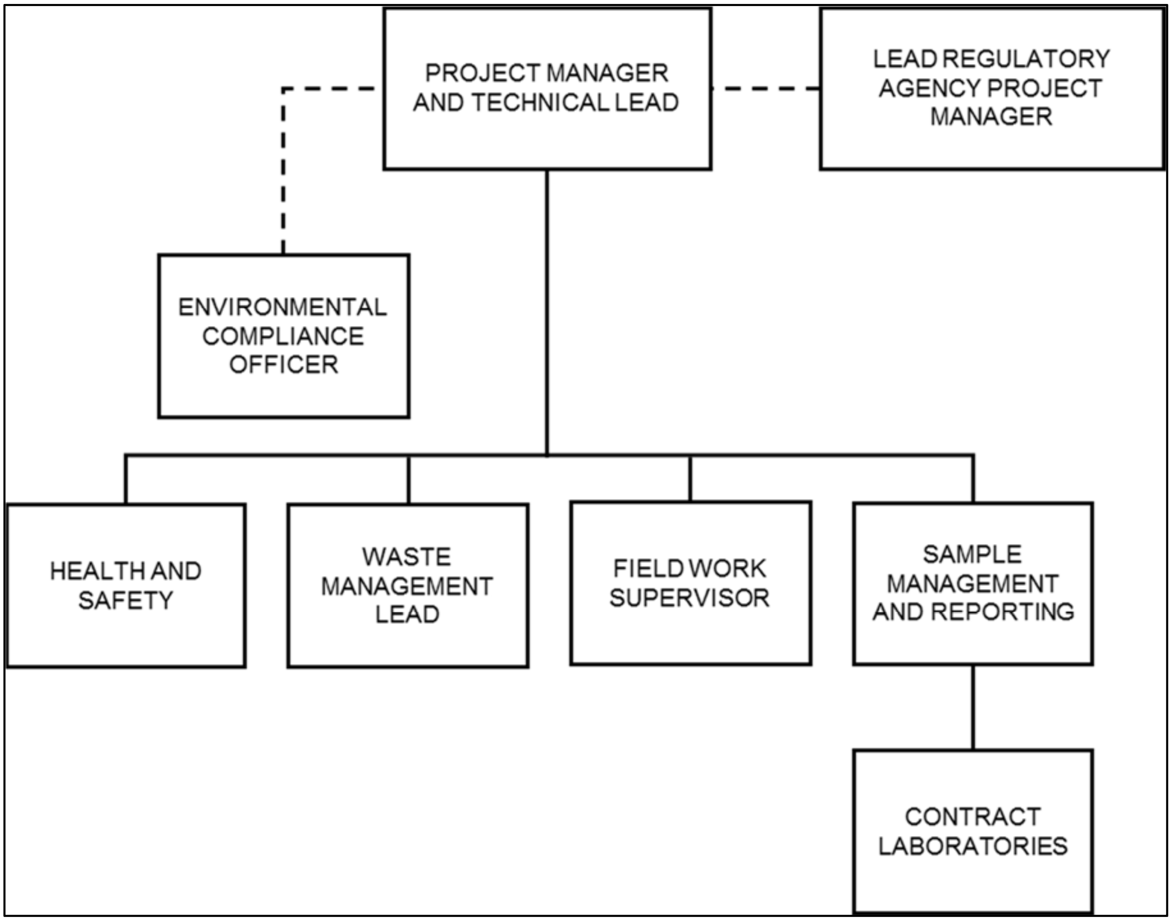

Figure H-E3. 221-T BY Storage Area Sampling and Analysis Plan Project Organization

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned project managers responsible for oversight of the 221-T BY Storage Area closure.
- **Project Manager:** The Project Manager provides oversight for activities and coordinates with the DOE Richland Operations Office (DOE-RL), EPA, Ecology, and contract management. The Project Manager (or designee) for the 221-T BY Storage Area closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management on all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.

- **Environmental Compliance:** The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.
- **Health and Safety:** The Health and Safety organization is responsible for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.
- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives the analytical data from the laboratories, performs the data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.
- **Contract Laboratories:** Contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation.
- **Waste Management:** The Waste Management organization communicates policies and protocols and ensures project compliance for storage, transportation, disposal, and waste tracking.
- **Field Work Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

H-E3.10.5 Sampling Design

The primary purpose of sampling the 221-T BY Storage Area underlying soil is to determine if analytical data values exceed the MTCA (WAC 173-340) Method B clean closure performance standards (Table H-E4).

This SAP utilized Ecology Publication #94-111 (Section 7.0) to determine the type of sampling design that will be utilized to demonstrate clean closure. When designing the sampling plan, both focused and area wide (grid) sampling methods were considered. Ecology Publication #94-111 (Section 7.2.1) identifies that area wide sampling is appropriate when the spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication #94-111 (Section 7.3, "Sampling to Determine or Confirm Clean Closure") identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling is further defined below.

Area Wide (Grid) Sampling. In grid sampling, samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen, at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication #94-111, is selective sampling of areas where contamination is expected or releases have been documented. Once visual inspections have been performed and any waste related staining, cracks, crevices, seams, and low points have been identified, focused sampling may be deemed necessary and added to the SAP. The location of focused samples, if any, will be identified and recorded, as required, in Section H-E3.10.12. Judgmental (focused) sampling is further defined below.

Judgmental (Focused) Sampling. In focused sampling, the selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and on professional judgment. Focused sampling is distinguished from probability based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined using Visual Sample Plan (VSP) software. The VSP tool, used throughout Washington State and nationally, statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 221-T BY Storage Area, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and utilized for the input parameters for 221-T BY Storage Area. VSP parameter inputs and the basis for those inputs are detailed in Table H-E2.

The decision rule for demonstrating compliance with the MTCA (WAC 173-340) Method B clean closure level has the following three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-E2, VSP calculated that at least 21 samples are required to reject the null hypotheses with 95 percent confidence and ensure that 221-T BY Storage Area would not be mistakenly released as clean. For the purpose of utilizing VSP software, the null hypothesis compares a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Table H-E2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value exceeds the threshold (WAC 173-340 "Model Toxics Control Act-Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user-defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

Sample locations were determined using the area wide grid with a random start sampling method run in VSP software (Figure H-E4). Statistical analysis of systematically collected data is valid if a random start to the grid is used. The 221-T BY Storage Area dimensions were entered into VSP to determine the locations of the samples. The triangular grid sampling layout was determined to have an even distribution over the entire 221-T BY Storage Area providing the most representative data set, including coverage of the middle portion of the sampling area. The 21 samples will be taken from the node locations indicated by VSP software, and sample location identifications and sample numbers will be assigned using HEIS. The north corner of the 221-T BY Storage Area is considered the (0,0) point of the sampling location map in Attachment H-E.a.

The first node location was chosen at random by VSP software, and the subsequent 20 sample locations were assigned by VSP software using a triangular grid sampling method. Supporting documentation for VSP software sampling designations is provided in Attachment H-E.a.

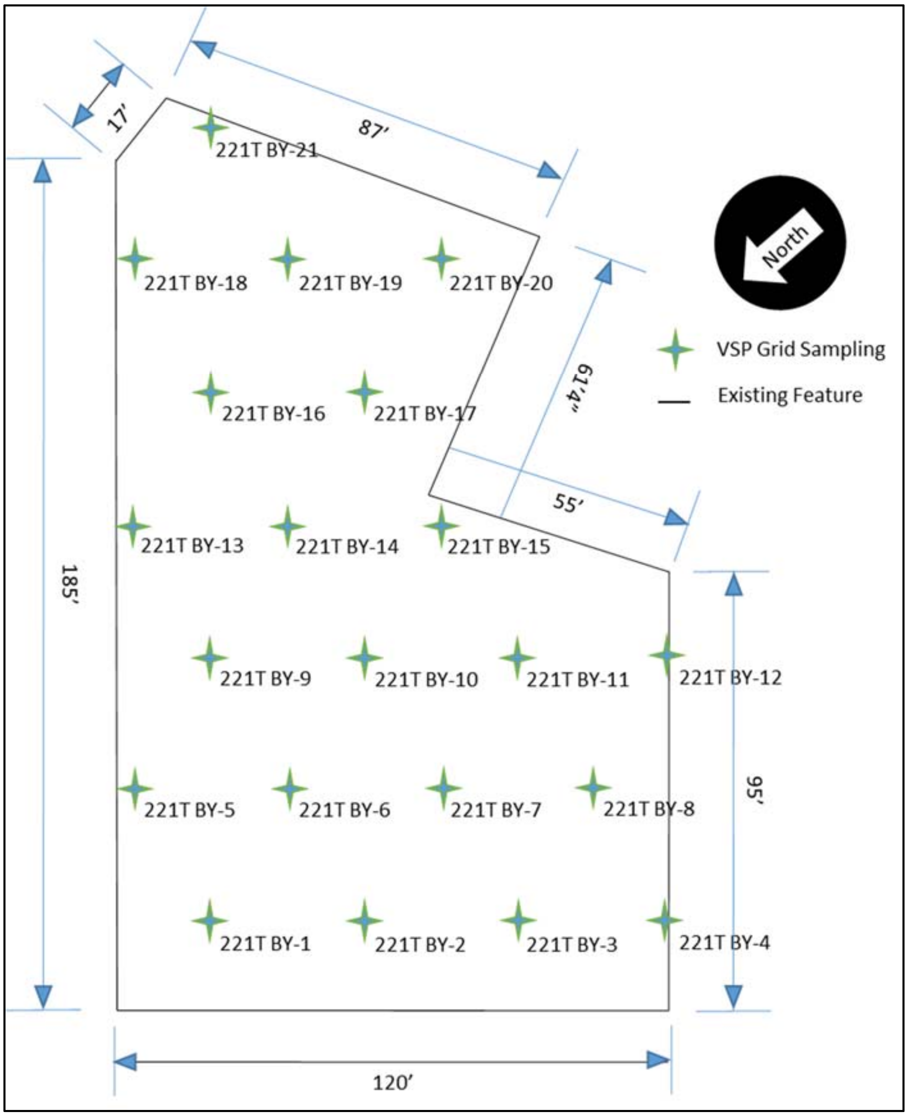

Figure H-E4. VSP Sample Locations for the 221-T BY Storage Area

H-E3.10.6 Sampling Methods and Handling

Grab sample matrix will consist of soil samples collected in precleaned sample containers taken at a depth of approximately 0 to 15 cm (0 to 6 in.) below ground surface and within an approximate 0.6 m (2 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer once loose gravel has been moved aside and the asphalt pad has been removed. Over time, precipitation would have caused any potential contamination from waste storage to migrate down from the loose surface gravel into the surface soil and compacted gravel below. Subsurface sampling (samples collected at depths greater than approximately 15 cm [6.0 in.] below ground surface) will be evaluated, based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-E3.10.14.

Once soil is sampled, the sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter which allows for a larger surface area to volume ratio; therefore, increasing the likelihood of identifying any potential contamination in the sample. Soil samples will be collected directly into containers at the chosen sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation
- Field walk down of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Sample container, preservation, and holding time requirements are specified in Table H-E3 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the sampling authorization form and chain-of-custody form.

Table H-E3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/ Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction;24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE lined lid	250 g

AG = amber glass
EPA = Environmental Protection Agency
MS = mass spectrometry
OES = optical emission spectrometry

Table H-E3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/ Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size

G = glass
GC = gas chromatography
ICP = inductively coupled plasma
P = plastic
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

To prevent potential contamination of samples, decontaminated equipment will be used for each sampling activity.

Level I EPA precleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory-specific volumes/requirements for meeting analytical quantitation limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or the sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- Sampling authorization form and form number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable).

Sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure the maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste generated by sampling activities subject to LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-E3.10.7 Analytical Methods

All analyses and testing will be performed consistent with laboratory agreements, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels.

If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Table H-E4 outlines analytical methods and performance requirements associated with the target analytes.

H-E3.10.8 Quality Control

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

Laboratory QC samples estimate the precision and bias of analytical data. Field and laboratory QC samples are summarized in Table H-E5. A data quality assessment will be performed utilizing the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide (EPA QA/G-9R)*, and implementing the specific requirements in Sections H-E3.10.8 through H-E3.10.10.

Data verification, data validation, and data quality assessment will include both primary samples and QC samples.

H-E3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

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

H-E3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to validators, and only additions to be made, not changes to the raw data, are allowed.

Table H-E4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
106-46-7	1,4-Dichlorobenzene	SW-846 Method 8270	1.85E+02	5.60E+03	3.30E-01	±30	≤30
107-06-2	1,2-Dichloroethane	SW-846 Method 8260	1.10E+01	4.80E+02	5.00E-03	±30	≤30
75-35-4	1,1-Dichloroethylene	SW-846 Method 8260	--	4.00E+03	1.00E-02	±30	≤30
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30
67-72-1	Hexachloroethane	SW-846 Method 8270	2.50E+01	5.60E+01	5.00E-03	±30	≤30
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30
87-86-5	Pentachlorophenol	SW-846 Method 8270	2.50E+00	4.00E+02	3.30E-01	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30

Table H-E4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
75-01-4	Vinyl Chloride	SW-846 Method 8260	1.75E+02	2.40E+02	1.00E-02	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+03	1.00E-02	±30	≤30
1330-20-7	Xylene	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30

Table H-E4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30

Table H-E4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			

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

Note: Due to the quantity and nature of the waste stored in the 221-T BY Storage Area not presenting a threat to groundwater, and not having soil or the presence of plants within the DWMU, no groundwater or ecological indicator MTCA cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equation 740-1 and Equation 740-2 from WAC 173-340-740(3)(b) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon
DWMU = dangerous waste management unit
MTCA = Model Toxics Control Act
Req't = requirement
WAC = Washington Administrative Code

Table H-E5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance, and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The laboratory control sample measures the accuracy of the analytical method.

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

H-E3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP software. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP software uses analytical data to determine if user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software will calculate the true standard deviation and if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-E2.1).

H-E3.10.12 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook and only authorized persons may make entries in logbooks. Logbooks will be signed by the FWS, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following items will be included in the project file, as appropriate:

- All field logbooks or operational records
- Data forms
- Global positioning system data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports.

The laboratory is responsible for maintaining, and having available upon request, the following items:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-E3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Gravel/Soil

In the event that sample results based on the MTCA (WAC 173-340) Method B three-part test (Section H-E3.10.5) indicate contamination above clean closure levels, contaminated gravel/soil will be removed in accordance with Section H-E3.8. Following removal of contaminated gravel/soil, additional samples will be taken at the same grid location as identified in Attachment H-E.a. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-E3.10.12, and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-E4, with accompanying QC samples as discussed in Section H-E3.10.8 to confirm that the MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-E3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to the SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, "Permit Changes."

H-E3.11 Role of the Independent Qualified Registered Professional Engineer

An Independent, Qualified, Registered Professional Engineer (IQRPE) will be retained to provide certification of closure and sign the closure certification, as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 221-T BY Storage Area. At a minimum, the following field activities would be completed:

- Observation or review of 221-T BY Storage Area visual inspection
- Observation or review of demolition
- Observation or review of sampling activities
- Review of sampling procedures and results
- Observation or review of contaminated environmental debris removal (as applicable)
- Verification that locations of samples are as specified in the SAP
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record his or her observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-E3.12 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 221-T BY Storage Area DWMU, a certification that the DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities.
- A description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of any unanticipated contaminated environmental media.
- All laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for all samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.
- A summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.
- A description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-E3.13 Conditions That Will Be Achieved When Closure Is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 221-T BY Storage Area will be clean closed. The asphalt pad will be removed, so only bare soil will remain. A permit modification request will be submitted after clean closure has been confirmed to remove the 221-T BY Storage Area DWMU from the Hanford Facility RCRA Permit.

H-E4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), closure activities will be completed no more than 180 days after the start of closure (Table H-E6). Should unexpected circumstances arise and an extension to the 180 day closure activity expiration date is deemed necessary, a permit modification will be submitted to Ecology for approval at least 30 days prior to the 180 day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements and criteria, have been and will continue to be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the 221-T BY Storage Area, as outlined in Section H-E4 (Figure H-E5).

H-E5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage, and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE and operated by DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), provisions of WAC 173-303-620, "Financial Requirements," are not applicable to the Hanford Facility.

Table H-E6. 221-T BY Storage Area Closure Activity Description

Closure Activity Description		**Expected Duration**
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 221-T BY Storage Area DWMU	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 221-T BY Storage Area DWMU	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste	Package and ship waste to approved facility for treatment, storage, and/or disposal. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all wastes in accordance with the approved closure plan. Request extension if necessary.	40 Days (Day 40)
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records.	40 Days (Day 40)
Visual Inspection of Gravel and Asphalt Pad	Identify areas of concern (cracks in asphalt that could potentially reach the soil below the asphalt or staining of gravel that could indicate seepage).	10 Days (Day 50)
	Document visual inspection with photos, locations, and dimensions of staining and cracks.	
Remove Asphalt Pad	Remove asphalt pad with large equipment.	40 Days (Day 90)
	Containerize asphalt waste debris.	
	Perform waste determination on waste debris.	
	Dispose of waste debris in approved disposal facility.	

Table H-E6. 221-T BY Storage Area Closure Activity Description

Closure Activity Description		Expected Duration
Sampling and Analysis of Underlying Soil (Following Removal of Asphalt Pad; May Be Performed Concurrently with Waste Determination and Disposal of Pad)	See Section H-E3.10 for details of sampling and analysis.	90 Days (Day 180)
	Data validation and verification.	
	If necessary, remove contaminated environmental media (gravel/soil), and resample and analyze to confirm that clean closure levels have been achieved.	
Final Closure of the 221-T BY Storage Area	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (See Section H-E3.12 for more details on the clean closure certification).	60 Days (Day 240)

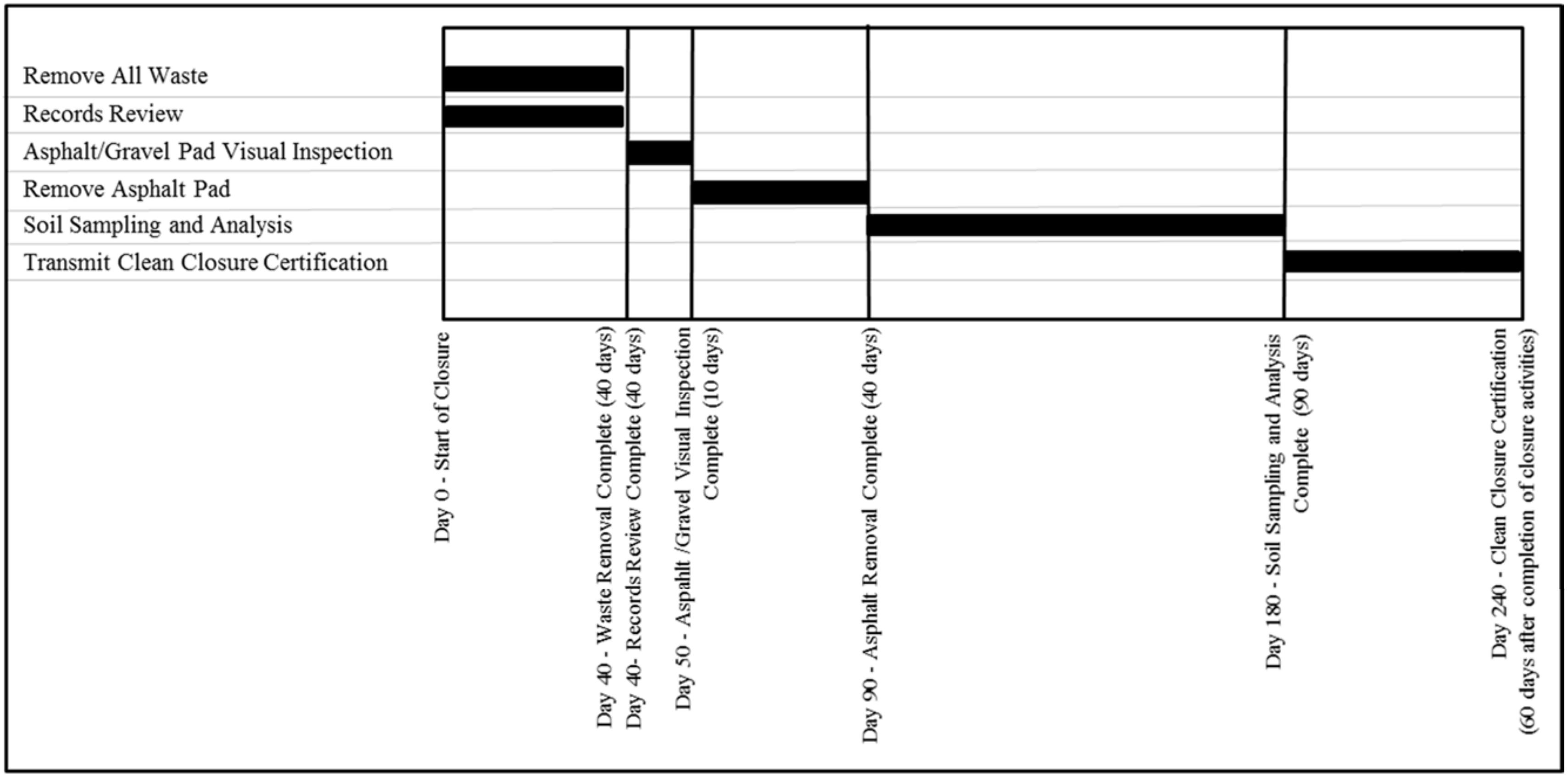

Figure H-E5. 221-T BY Storage Area Closure Schedule Activities

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Attachment H-E.a

221-T BY Storage Area
Visual Sample Plan Supporting Documentation

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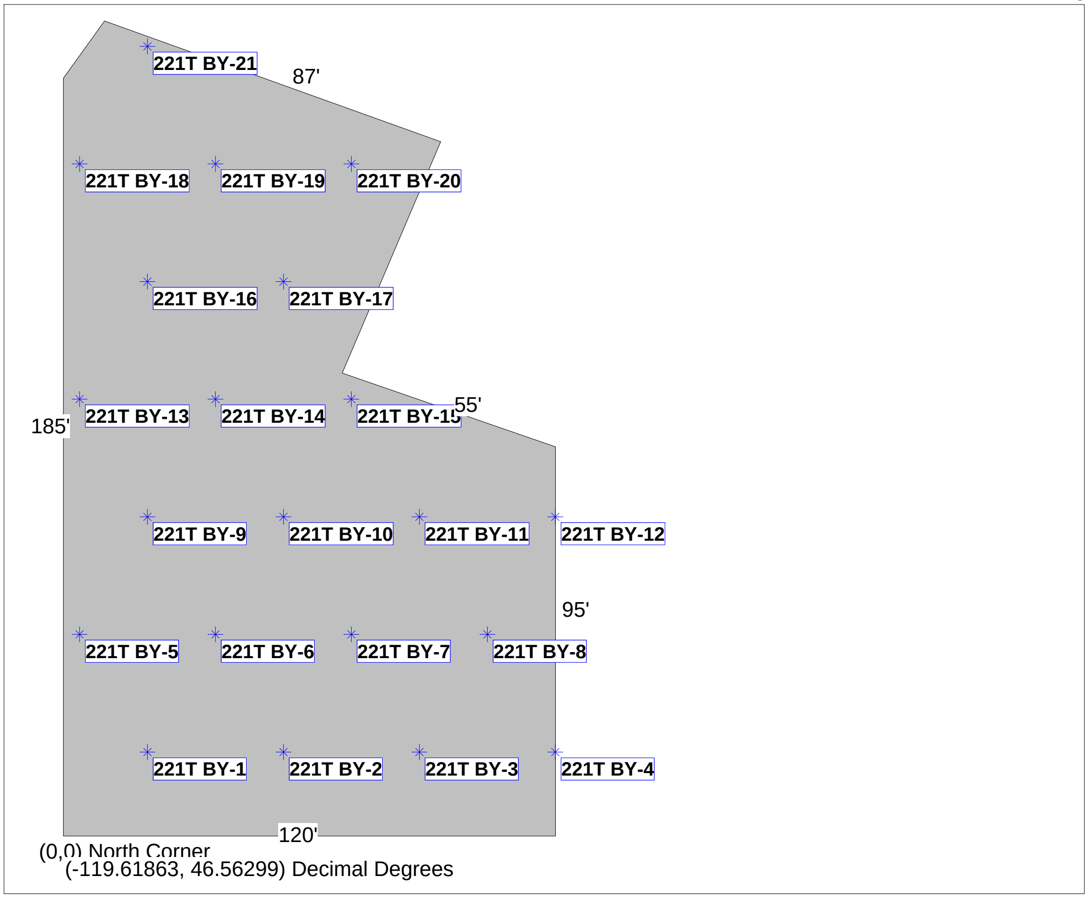
Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

Summary
This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	21
Number of selected sample areas [b]	1
Specified sampling area [c]	19046.50 ft^2
Size of grid / Area of grid cell [d]	33.161 feet / 952.325 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 221-T BY Outside Storage Area					
X Coord	Y Coord	Label	Value	Type	Historical
20.4944	20.4833	221T BY-1		Systematic	
53.6554	20.4833	221T BY-2		Systematic	
86.8164	20.4833	221T BY-3		Systematic	
119.9774	20.4833	221T BY-4		Systematic	
3.9140	49.2016	221T BY-5		Systematic	
37.0749	49.2016	221T BY-6		Systematic	
70.2359	49.2016	221T BY-7		Systematic	
103.3969	49.2016	221T BY-8		Systematic	
20.4944	77.9198	221T BY-9		Systematic	
53.6554	77.9198	221T BY-10		Systematic	
86.8164	77.9198	221T BY-11		Systematic	
119.9774	77.9198	221T BY-12		Systematic	
3.9140	106.6381	221T BY-13		Systematic	
37.0749	106.6381	221T BY-14		Systematic	
70.2359	106.6381	221T BY-15		Systematic	
20.4944	135.3563	221T BY-16		Systematic	
53.6554	135.3563	221T BY-17		Systematic	

3.9140	164.0746	221T BY-18		Systematic	
37.0749	164.0746	221T BY-19		Systematic	
70.2359	164.0746	221T BY-20		Systematic	
20.4944	192.7928	221T BY-21		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty, z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

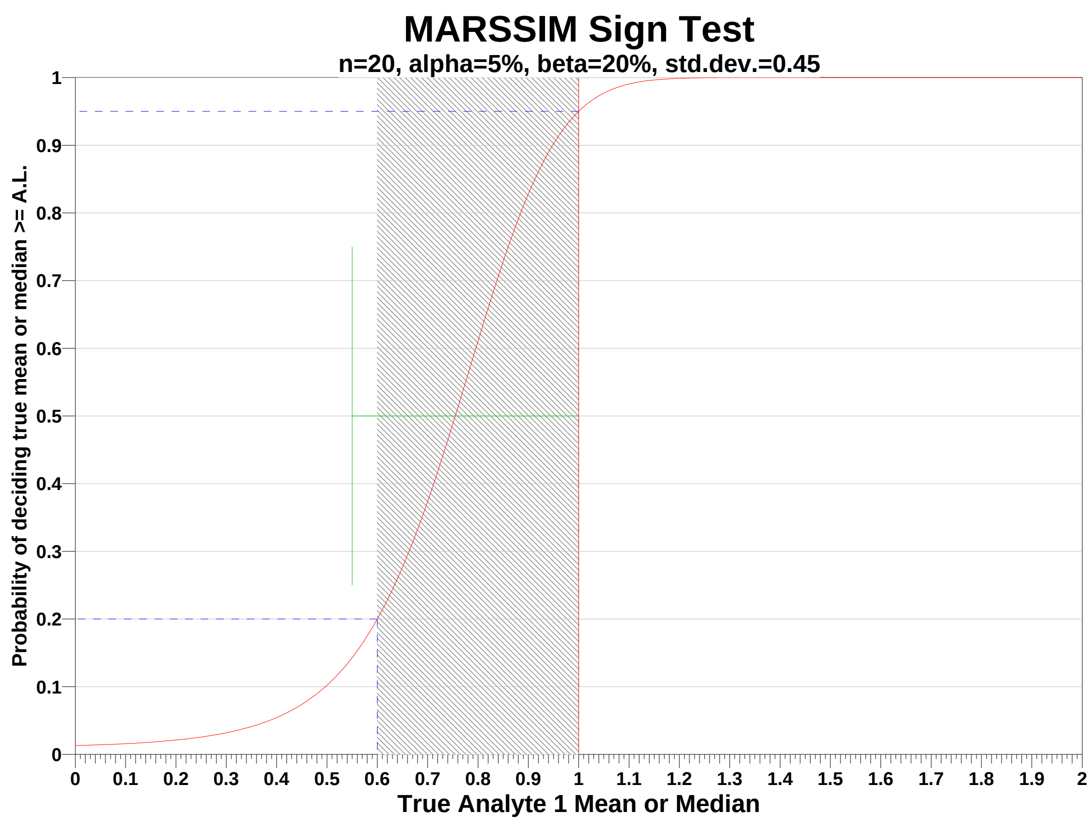
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions
The assumptions associated with the formulas for computing the number of samples are:
1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis
The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of

gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**21 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Appendix H-F

2706-T Yard Dangerous Waste Management Unit

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Contents

Attachment

Tables

Figures

H-F1 Introduction

This appendix discusses closure activities for the T Plant Complex Operating Unit Group (OUG) (T Plant) 2706-T Yard (including HS-030 and HS-032 Storage Modules) dangerous waste management unit (DWMU), hereinafter called the 2706-T Yard.

This plan describes in detail the closure activities which are necessary to establish clean closure levels for the 2706-T Yard. Such closure activities include: removal of all waste; records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste; visual inspection of the asphalt after waste removal to evaluate the likelihood of potential contamination of the underlying soil; demolition of the 2706-T Yard; and soil sampling and analysis to confirm that clean closure standards have been achieved.

Please note, the terms “mixed waste” and/or “waste”, when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

Closure of the 2706-T Yard will be performed in accordance with the closure schedule provided in Section H-F4. Within 60 days upon completion of closure activities, the Permittees shall provide the Washington State Department of Ecology (Ecology) a certification of closure in accordance with the *Washington Administrative Code* (WAC) 173-303-610(6) , "Dangerous Waste Regulations," "Closure and Post-Closure". The closure certification will provide supportive evidence that the 2706-T Yard has met the established clean closure standards.

This closure plan complies with WAC 173-303-610(2) through WAC 173-303-610(6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

H-F1.1 Unit Description

The 2706-T Yard DWMU is an outdoor storage area that is located northwest of the 2706-TA Building and permitted for waste container storage (Figure H-F1 and Figure H-F2). The DWMU is an uncovered fenced area consisting of a storage pad and two associated flammable waste storage modules (HS-030 and HS-032).

The storage pad is constructed of asphalt and measures approximately 28 m (93 ft) wide by 27 m (87 ft) long for a total footprint and available waste storage area of approximately 750 m^2 (8,100 ft^2). The DWMU does not have an engineered secondary containment system. Containers stored in the outside storage area that do not meet the criteria specified in WAC 173-303-630(7)(c) (e.g., waste packages containing free liquids or that exhibit the characteristics of ignitability or reactivity) are placed on portable secondary containment systems.

The modules are pre-engineered covered/enclosed metal structures that each measure approximately 3.50 m (11.5 ft) wide by 7.2 m (24 ft) long by 2.7 m (8.5 ft) high (Figure H-F3 and Figure H-F4). Each module complies with the requirements of NFPA 30, *Flammable and Combustible Liquids Code*, for ignitable and reactive waste and is divided into two separate compartments accessible by separate doors that open onto a loading platform/ramp. Containers are stored on a chemical resistant nonskid fiberglass grate above a steel secondary containment basin that has been sealed with a chemically resistant coating (e.g., epoxy resin). The containment basins provide spill containment and preclude accumulation of liquids. The roofs collect and direct precipitation to the rear of the modules away from the doorways and loading platforms. The modules are anchored to concrete pads.

This storage area provides a place to stage containers, prior to placement inside the 2706-T Building and/or 2706-TA Building for storage and/or treatment, or in preparation for transfer.

Shipping conveyances (e.g., flatbed trailers, van trailers, and casks) can be staged at this location and loaded with waste containers in transit. Treatment of waste will not be conducted within this DWMU.

H-F1.1.1 Maximum Waste Inventory

The maximum storage capacity of the 2706-T Yard is a total volume of 246.3 m^3 (246,300 liters).

H-F2 Closure Performance Standard

Closure performance standards for the 2706-T Yard will be based on requirements found in WAC 173-303-610(2), which require closure of the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.
- Control, minimize or eliminate to the extent necessary to protect human health and the environment, post-closure escape of waste, dangerous constituents, leachate, contaminated runoff, or waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous waste activity.

These performance standards are addressed in Sections H-F2.1 and H-F3.9 of this closure plan, and furthermore identified in Table H-F4.

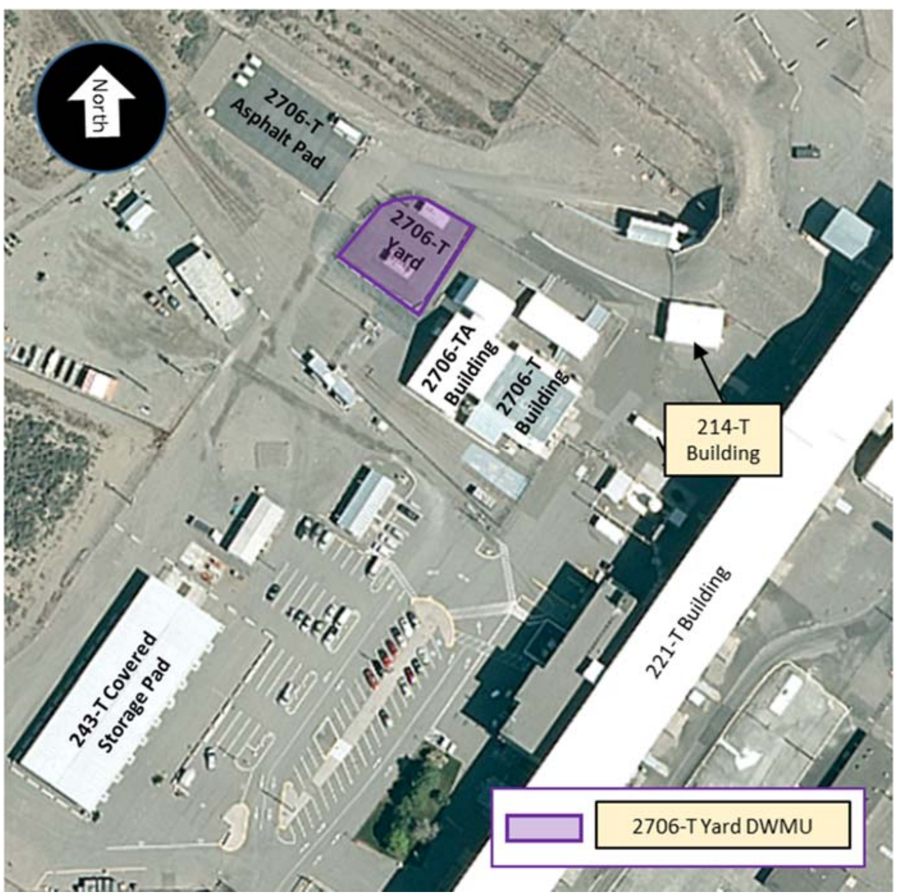

Figure H-F1. T Plant 2706-T Yard (Aerial View 2012)

Figure H-F2. T Plant 2706-T Yard (September 2015)

Figure H-F3. T Plant 2706-T Yard (HS-030) (March 2013)

Figure H-F4. T Plant 2706-T Yard (HS-032) (March 2013)

H-F2.1 Clean Closure Levels

The 2706-T Yard will be clean closed using clean closure levels required for soil. After removal of all waste, the storage modules will be visually inspected for structural integrity, and a decision will be made for repurposing of the modules. Should the modules be deemed inadequate for reuse, they will be designated as a newly generated waste in accordance with WAC 173-303-610(5) and disposed of in an approved disposal facility.

The asphalt will be visually inspected to identify any waste related staining, major cracks, crevices, seams, and low points. The asphalt and fencing will be removed and managed as a newly generated waste stream. Section H-F3.7 details waste generated during closure.

Once the asphalt is removed, the underlying soil will be sampled and must meet clean closure levels. In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the WAC 173-340, “Model Toxics Control Act—Cleanup,” hereinafter called MTCA, regulations (WAC 173-340-700, “Overview of Cleanup Standards,” through -WAC 173-340-760, “Sediment Cleanup Standards,” excluding WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties"). These numeric cleanup levels have been calculated according to the requirements of WAC 173-303-610(2)(b)(i) using the MTCA (WAC 173-340) Method B closure performance standards for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-F4 provides the MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte (Table H-F1).

A null hypothesis is generally assumed true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, “Definitions,” for the 2706-T Yard is that the soil underlying the asphalt is assumed to be above MTCA (WAC 173-340) Method B cleanup levels; therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means sampling and analysis results of the site indicated that soil contains contamination below the MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that the soil meets closure performance standards in accordance with MTCA (WAC 173-340) Method B.

Should sampling and analysis provide a basis that the null hypothesis can be accepted, the soil would be removed, identified as contaminated environmental media, and managed in accordance with Section H-F3.8.

H-F3 Closure Activities

The 2706-T Yard will be clean closed under *Resource Conservation and Recovery Act of 1976* (RCRA) and confirmation sampling will be performed to verify the closure performance standards (Table H-F4) are met. As a waste storage unit, clean closure determinations for the 2706-T Yard will be based on successfully completing the closure activities in this section. Sampling and analysis activities were developed utilizing the U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection (QA/G-5S)*, and the Ecology Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-F3.10). The objective of the sampling described in this document is to determine if the MTCA (WAC 173-340) Method B closure performance standards were met, demonstrating clean closure of the 2706-T Yard.

The following closure activities are required to achieve and verify clean closure for soil:

- Remove all waste.
- Review waste container storage, operating, and inspection records for documented spills or releases of waste.
- Perform visual inspection of the storage modules for cracks, holes, or other types of breaches.
- Remove storage modules for repurposing or disposal.
- Perform a visual inspection of the asphalt to identify any waste related staining, major cracks, crevices, seams, and low points for purposes of focused sampling.
- Remove fencing and asphalt.
- Perform waste determination of fencing and asphalt waste debris.
- Complete and document disposal of fencing and asphalt as newly generated waste.
- Perform sampling and analysis of soil under the asphalt to confirm that clean closure standards are met.
- If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of any contaminated environmental media present.

- Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean-closure levels have been met.
- Transmit closure certification to Ecology.

H-F3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment (PPE). Qualified personnel will be trained in applicable safety and environmental procedures and will have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 to the WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter referred to as the Hanford Facility RCRA Permit), describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, “Personnel Training,” which provides training requirements for Hanford Facility personnel associated with 2706-T Yard.

Project-specific safety training addressed explicitly to the project and activities for the day will include the following:

- Training to provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records for each employee are maintained in an electronic database. The Permittees training organization maintains the training records system.

H-F3.2 Removal of Wastes and Waste Residues

All waste will be removed from the storage area. Waste will be managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers meeting the U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with the "Transportation" criteria specified in Title 49 of the *Code of Federal Regulations* (CFR). Waste packaged in non-DOT regulation containers (large or irregular shaped containers) will be shipped in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily occur utilizing highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet the land disposal restrictions (LDR) treatment standards specified in WAC 173-303-140, which includes by reference 40 CFR 268, then ultimately disposed of in an approved waste disposal facility.

While waste residues are not anticipated, if they are found during clean closure activities, they will be managed in accordance with all applicable requirements of WAC 173-303-170, "Requirements for Generators of Dangerous Waste," through WAC 173-303-230, "Special Conditions". Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-F3.3 Unit Components, Parts, and Ancillary Equipment

The 2706-T Yard contains two low flashpoint storage modules that contain electrical wiring to supply power for lighting and exhaust fans inside the modules. These modules are equipped with a fire alarm circuit and fire heat detectors. If possible, the modules will be repurposed so the electrical wiring will not be removed; however, prior to module removal, external electrical connections running to the storage modules will be disconnected.

H-F3.4 Inspection of Units Before Decontamination

Although decontamination of the 2706-T Yard is not planned, following the removal of all waste and waste residues, a visual inspection will be performed to determine the presence of cracks, holes, or other breaches in the asphalt sufficient to reach the underlying soil. These cracks, holes, or other breaches will be documented to determine focused sampling of the underlying soil during confirmation sampling.

During the closure period, to prevent threats to human health and the environment, the 2706-T Yard will be inspected in accordance with WAC 173-303-320(2), "General Inspection." Inspections of the 2706-T Yard will be performed annually, until the clean-closure certification is accepted by Ecology, and will verify the following:

- Posted warning signs at each entrance to T Plant are present, legible, and visible at 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-F3.5 Decontamination

Decontamination of the 2706-T Yard is not planned.

H-F3.6 Demolition

Once the visual inspection of the asphalt is completed, the demolition of the 2706-T Yard can be initiated with the following primary activities included:

- Location of utilities
- Mobilization of equipment
- Removal and disposal of fencing
- Removal and disposal of asphalt pad (once all the storage modules have been removed and visual inspection of the asphalt pad has been completed).

H-F3.6.1 Location of Utilities

Prior to demolition, any in-use utilities will be located to ensure that there are no disruptions to the surrounding activities.

H-F3.6.2 Equipment Mobilization

The resources, equipment and materials necessary to perform demolition will be staged in designated lay-down areas.

H-F3.6.3 Demolition Activities for the 2706-T Yard

Demolition of the 2706-T Yard will be accomplished utilizing the primary method of shearing and rubblizing. Demolition of the fencing will require the use of heavy equipment (e.g., excavator with various attachments). Other standard industry or conventional demolition practices also may be used (e.g., hydraulic shears with steel shear jaws, concrete pulverizer jaws or breaker jaws). Demolition of the asphalt will primarily be accomplished utilizing large equipment to rubblize the asphalt.

Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and high efficiency particulate air filtered vacuum cleaners may be used. Additional storm water run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

H-F3.6.3.1 Shearing and Rubblizing

During shearing and rubblizing of the 2706-T Yard, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and run-off. The shears will size reduce/cut components of the fence while front end loaders or grapples will load the debris into roll-off containers.

Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and concrete pulverizer jaws or breaker jaws, will be used to perform any rubblizing. The rubble debris from the 2706-T Yard will be loaded into roll-off boxes for transportation to the approved disposal facility.

H-F3.7 Identifying and Managing Waste Generated During Closure Activities

Closure activities for the 2706-T Yard will result in the generation of one known waste stream, debris from demolition, requiring management and disposal. The waste generated during closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. The newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-F3.12).

H-F3.7.1 Debris from Demolition

Debris generated from demolition will be packaged onsite and transported to an appropriate waste disposal facility. Debris includes but is not limited to the following types of wastes:

- Asphalt and associated rubblized debris
- Fencing materials
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)
- Equipment and construction materials.

The preferred management of debris resulting from demolition of the fencing and asphalt is in a bulk form. Bulk waste will be placed into bulk containers such as roll-off boxes for disposal. These bulk containers will be stored in a suitable area in close proximity to the 2706-T Yard or, if debris contains waste, it may be accumulated for up to 90 days in another suitable location. Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

The debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-F3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Soil surrounding the node location which identified contamination above clean closure levels will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU. Following removal of contaminated soil, additional confirmatory sampling will be conducted in the location of the original node which identified contamination above clean closure level in accordance with the approved closure plan SAP. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. The contaminated soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of

WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

Management and disposal of the contaminated environmental media will be documented and included with the clean closure documentation included in Section H-F3.12.

H-F3.9 Confirming Clean Closure

The 2706-T Yard will be clean closed. Demonstration of clean closure standards will be accomplished through removal of the storage modules, fencing and asphalt, and sampling and analysis of the underlying soil.

Once the asphalt removal is complete, sampling will be performed in accordance with the SAP (Section H-F3.10) and will consist of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where cracks or other openings in the asphalt may have allowed a release of waste to the underlying soil).

Once the removal of the 2706-T Yard is complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards [MTCA (WAC 173-340-730) Method B] have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-F3.8. Once analytical results confirm clean closure levels of the target analytes, a clean closure certification will be prepared in accordance with Section H-F3.12.

H-F3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarizes the sampling design for the 2706-T Yard. After the 2706-T Yard has been demolished, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-F3.10.1 Sampling and Analysis Plan

Sampling and analysis of the soil underlying the asphalt of the 2706-T Yard will be conducted to confirm that clean closure levels have been achieved. Sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*; the American Society for Testing and Materials (ASTM) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM standards, EPA approved methods, and DOW/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Documents (HASQARD)* at the time of closure. This SAP was also developed using Ecology Publication #94-111, Section 7.0, “Sampling and Analysis for Clean Closure,” and EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan (QA/G-5S).*

H-F3.10.2 Target Analytes

The 2706-T Yard is an active portion of the T Plant OUG; therefore, target analytes at closure may include any or all analytes based on the waste codes permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV-Description of Dangerous Wastes). A waste management report identifying waste codes historically managed at the 2706-T Yard was run to identify the existing target analytes. Table H-F1 details the waste codes identified for the waste containers stored at the 2706-T

Yard and the target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the DWMU upon receipt of the final waste. A permit modification updating the SAP with specific target analytes will be submitted, as necessary, 45 days prior to DWMU closure in accordance with WAC 173-303-610(3)(b).

Table H-F1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Endrin (D012)	72-20-8	Lindane (D013)	58-89-9
Benzene (D018) (F005)	71-43-2	Carbon Tetrachloride (D019) (F001)	56-23-5
Chlorobenzene (D021) (F002)	108-90-7	Chloroform (D022)	67-66-3
1,4-Dichlorobenzene (D027)	106-46-7	1,2-Dichloroethane (D028)	107-06-2
1,1-Dichloroethylene (D029)	75-35-4	2,4-Dinitrotoluene (D030)	121-14-2
Heptachlor (D031)	76-44-8	Heptachlor Epoxide (D031)	1024-57-3
Hexachloroethane (D034)	67-72-1	Methyl Ethyl Ketone (D035) (F005)	78-93-3
Pentachlorophenol (D037)	87-86-5	Tetrachloroethylene (D039) (F001) (F002)	127-18-4
Trichloroethylene (D040) (F001) (F002)	79-01-6	Vinyl chloride (D043)	75-01-4
Methylene Chloride (F001) (F002)	75-09-2	1,1,1-Trichloroethane (F001) (F002)	71-55-6
CFCs (F001) (F002)[e]	Not Applicable	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133) (F002)[e]	76-13-1
Ortho-Dichlorobenzene (F002)	95-50-1	Trichlorofluoromethane (CFC-11) (F002)[e]	75-69-4
1,1,2 Trichloroethane (F002)	79-00-5	Acetone (F003)	67-64-1
n-Butyl Alcohol (F003)	71-36-3	Ethyl Ether (F003)	60-29-7
Methyl Isobutyl Ketone (F003)	108-10-1	Xylene (F003)	1330-20-7
Ethyl Acetate (F003)	141-78-6	Ethyl Benzene (F003)	100-41-4
Cyclohexanone (F003)	108-94-1	Methanol (F003)	67-56-1
Cresol (Cresylic Acid) (F004)[a,c]	1319-77-3	*m*-Cresol (F004)	108-39-4
o-Cresol (F004)	95-48-7	*p*-Cresol (F004)	106-44-5

Table H-F1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Nitrobenzene (F004)	98-95-3	Toluene (F005)	108-88-3
Carbon Disulfide (F005)	75-15-0	Isobutanol (F005)	78-83-1
Pyridine (F005)	110-86-1	2-Nitropropane (F005)[b,c]	79-46-9
2-Ethoxyethanol (F005)[d]	110-80-5		

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol, and *p*-cresol.

b. The closure performance standard for 2-nitropropane was removed in the May 2014 EPA CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

c. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

d. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

e. A CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

CFC = chlorinated fluorocarbon

CLARC = Cleanup Levels and Risk Calculations

EPA = U.S. Environmental Protection Agency

H-F3.10.3 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-F4.

H-F3.10.4 Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

H-F3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparation, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-F5.

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned project managers responsible for oversight for the 2706-T Yard closure.

- **Project Manager:** The Project Manager provides oversight for activities and coordinates with DOE-Richland Operations Office (RL), EPA, Ecology, and contract management. The Project Manager (or designee) for the 2706-T Yard closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that the project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management on all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.

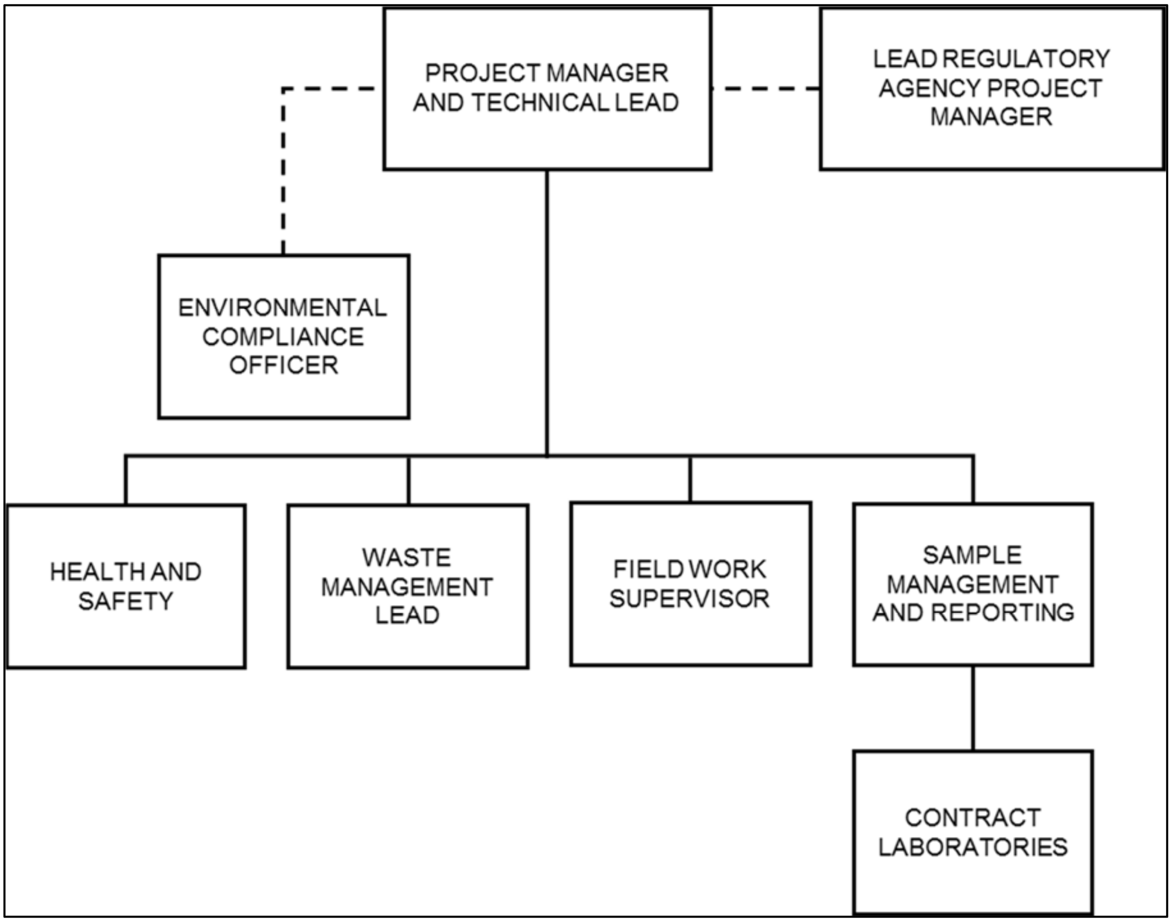

Figure H-F5. 2706-T Yard Sampling and Analysis Plan Project Organization

- **Environmental Compliance:** The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work, and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.
- **Health and Safety:** The Health and Safety organization's responsibility for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.
- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives the analytical data from the laboratories, performs the data entry into the Hanford Environmental Information System (HEIS) database, and arranges for

data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.

- **Contract Laboratories:** The contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation.
- **Waste Management:** The Waste Management organization communicates policies and protocols, and ensures project compliance for storage, transportation, disposal, and waste tracking.
- **Fieldwork Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

H-F3.10.5 Sampling Design

The primary purpose of sampling the 2706-T Yard underlying soil is to determine if analytical data values exceed the MTCA (WAC 173-340) Method B clean closure performance standards (Table H-F4).

This SAP utilized Ecology Publication #94-111, Section 7.0, “Sampling and Analysis for Clean Closure,” to determine the type of sampling design that will be utilized to demonstrate clean closure. When designing the sampling plan, both focused and area wide (grid) sampling methods were considered. Ecology Publication #94-111, Section 7.2.1, identifies that area wide sampling is appropriate when the spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication #94-111, Section 7.3, “Sampling to Determine or Confirm Clean Closure,” identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling is further defined below.

Area Wide (Grid) Sampling. Samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and to infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication #94-111, is selective sampling of areas where contamination is expected or releases have been documented. Once visual inspections have been performed and any waste related staining, cracks, crevices or seams, and low points have been identified, focused sampling may be deemed necessary and added to the SAP. The location of focused samples, if any, will be identified and recorded as required in Section H-F3.10.12. Judgmental (focused) sampling is further defined below.

Judgmental (Focused) Sampling. Selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and on professional judgment. Focused sampling is distinguished from probability-based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined using Visual Sample Plan (VSP) software. The VSP tool, used throughout Washington State and nationally, statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 2706-T Yard, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and utilized for the input parameters for 2706-T Yard. VSP parameter inputs and the basis for those inputs are detailed in Table H-F2.

The decision rule for demonstrating compliance with the MTCA (WAC 173-340) Method B clean closure level has the following three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-F2, VSP calculated that at least 21 samples are required to reject the null hypotheses with 95 percent confidence and ensure that 2706-T Yard would not be mistakenly released as clean. For the purpose of utilizing VSP software, the null hypothesis compares a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Sample locations were determined using the area wide grid with a random start sampling method run in VSP (Figure H-F6). Statistical analysis of systematically collected data is valid if a random start to the grid is used. The 2706-T Yard dimensions were entered into VSP to determine the locations of the samples. The triangular grid sampling layout was determined to have an even distribution over the entire 2706-T Yard providing the most representative data set including coverage of the middle portion of the sampling area. The 21 samples will be taken from the node locations indicated by VSP and will be assigned sample location identifications and sample numbers using HEIS. The southwest corner of the 2706-T Yard is considered the (0,0) point of the sampling location map in Attachment H-F.a.

The first node location was chosen at random by VSP, and the subsequent 20 sample locations were assigned by VSP using a triangular grid sampling method. Supporting documentation for VSP sampling designations is provided in Attachment H-F.a.

Table H-F2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value exceeds the threshold (WAC 173-340 "Model Toxics Control Act-Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user-defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

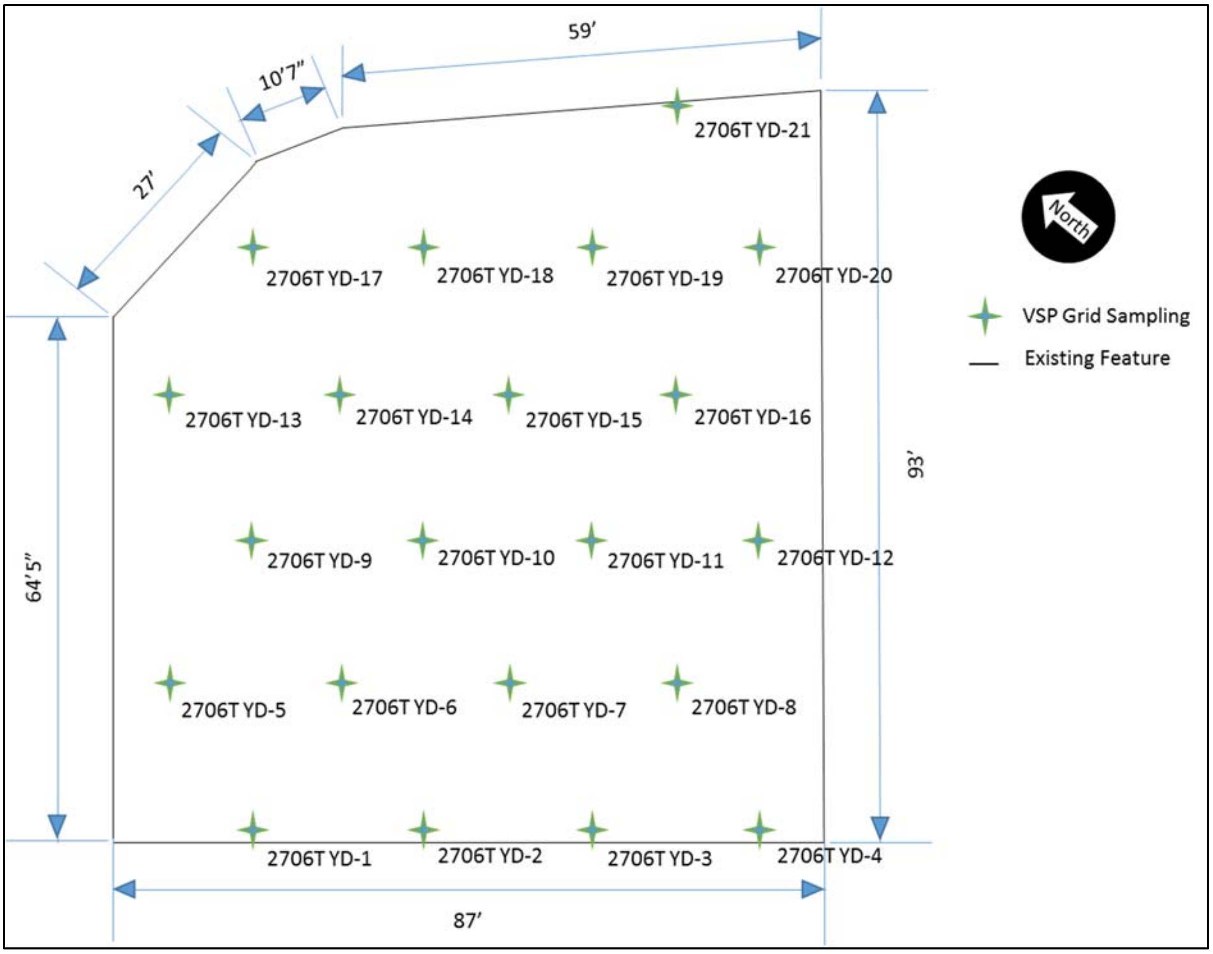

Figure H-F6. VSP Sample Locations for the 2706-T Yard

H-F3.10.6 Sampling Methods and Handling

Grab sample matrix will consist of soil samples collected in pre-cleaned sample containers taken at a depth of no more than approximately 0 to 15 cm (0 to 6.0 in.) below ground surface and within an approximate 0.6 m (2 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer once the asphalt has been removed. Subsurface sampling [samples collected at depths greater than approximately 15 cm (6.0 in) below ground surface] will be evaluated; based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-F3.10.14.

Once soil is sampled, the sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter which allows for a larger surface area to volume ratio; therefore, increasing the likelihood of identifying any potential contamination in the sample. Soil samples will be collected directly into containers at the chosen sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation

- Field walk down of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Sample preservation, container, and holding time requirements are specified in Table H-F3 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the sampling authorization form and chain-of-custody form.

Table H-F3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction; 24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE-lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE-lined lid	250 g

AG = amber glass
EPA = U.S. Environmental Protection Agency
G = glass
GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
OES = optical emission spectrometry
P = plastic
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

To prevent potential contamination of samples, decontaminated equipment will be used for each sampling activity.

EPA Level I pre-cleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory-specific volumes/requirements for meeting analytical quantitation limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or the sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- Sampling authorization form and form number

- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable).

Sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Facility protocols to ensure the maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste generated by sampling activities subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-F3.10.7 Analytical Methods

All analyses and testing will be performed consistent with laboratory agreements, laboratory analytical procedures, and *HASQARD* (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Table H-F4 outlines analytical methods and performance requirements associated with the target analytes.

H-F3.10.8 Quality Control

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

Laboratory QC samples estimate the precision and bias of analytical data. Field and laboratory QC samples are summarized in**Error! Reference source not found.** Table H-F5. A data quality assessment will be performed utilizing the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide (QA/G-09)*, and implementing the specific requirements in Sections H-F3.10.8 through H-F3.10.10.

Data verification, data validation, and data quality assessment will include both primary samples and QC samples.

Table H-F4. Soil Analytical Performance Requirements

Chemical Abstract Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg) Carcinogen	Closure Performance Standard (mg/kg) Non-carcinogen	Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
72-20-8	Endrin	SW-846 Method 8270	--	2.40E+01	3.30E-03	±30	≤30
58-89-9	Lindane	SW-846 Method 8270	9.09E-01	2.40E+01	1.65E-03	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
106-46-7	1,4-Dichlorobenzene	SW-846 Method 8270	1.85E+02	5.60E+03	3.30E-01	±30	≤30
107-06-2	1,2-Dichloroethane	SW-846 Method 8260	1.10E+01	4.80E+02	5.00E-03	±30	≤30
75-35-4	1,1-Dichloroethylene	SW-846 Method 8260	--	4.00E+03	1.00E-02	±30	≤30
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30

Table H-F4. Soil Analytical Performance Requirements

Chemical Abstract Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Non-carcinogen			
76-44-8	Heptachlor	SW-846 Method 8270	2.22E-01	4.00E+01	1.65E-03	±30	≤30
1024-57-3	Heptachlor Epoxide	SW-846 Method 8270	1.10E-01	1.04E+00	1.65E-03	±30	≤30
67-72-1	Hexachloroethane	SW-846 Method 8270	2.50E+01	5.60E+01	5.00E-03	±30	≤30
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30
87-86-5	Pentachlorophenol	SW-846 Method 8270	2.50E+00	4.00E+02	3.30E-01	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
75-01-4	Vinyl Chloride	SW-846 Method 8260	1.75E+02	2.40E+02	1.00E-02	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30

Table H-F4. Soil Analytical Performance Requirements

Chemical Abstract Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Non-carcinogen			
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+03	1.00E-02	±30	≤30
1330-20-7	Xylene	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30

Table H-F4. Soil Analytical Performance Requirements

Chemical Abstract Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Non-carcinogen			

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

Note: Due to the quantity and nature of the waste stored in the 2706-T Yard not presenting a threat to groundwater, and not having soil or the presence of plants within the DWMU, no groundwater or ecological indicator MTCA cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the MTCA (WAC 173-340-740) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equation 740-1 and Equation 740-2 from WAC 173-340-740(3)(b) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon

DWMU = dangerous waste management unit

MTCA = Model Toxics Control Act

Req't = requirement

WAC = Washington Administrative Code

Table H-F5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The laboratory control sample measures the accuracy of the analytical method.

Table H-F5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

H-F3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

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

H-F3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to the validators and only additions to be made, not changes to the raw data, are allowed.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

H-F3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP uses the analytical data to determine if the user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software calculates the true standard deviation and if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-F2.1).

H-F3.10.12 Documents and Records

The Project Manager is responsible for ensuring the current version of the SAP is being used and for providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook and only authorized persons may make entries in logbooks. Logbooks will be signed by the FWS, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following will be included in the project file, as appropriate:

- All field logbooks or operational records
- Data forms
- Global positioning system data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports.

The laboratory is responsible for maintaining, and having available upon request, the following:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hardcopy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989 *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-F3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

In the event that sample results based on the MTCA (WAC 173-340) Method B three-part test (Section H-F3.10.5) indicate contamination above clean closure levels, contaminated soil will be removed in accordance with Section H-F3.8. Following removal of contaminated soil, additional samples will be taken at the same grid location as identified in Attachment H-F.a. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-F3.10.12, and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-F4, with accompanying QC samples as discussed in Section H-F3.10.8 to confirm that the MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-F3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to the SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, "Permit Changes."

H-F3.11 Role of the Independent Qualified Registered Professional Engineer

An Independent, Qualified, Registered Professional Engineer (IQRPE) will be retained to provide certification of the closure, and sign the closure certification as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 2706-T Yard. At a minimum, the following field activities would be completed:

- Observation or review of 2706-T Yard visual inspection
- Observation or review of demolition
- Observation or review of sampling activities
- Review sampling procedures and results
- Observation or review of contaminated environmental debris removal (as applicable)
- Verification that locations of samples are as specified in the SAP
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record his or her observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-F3.12 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 2706-T Yard DWMU, a certification that the DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities.
- A description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of any unanticipated contaminated environmental media.
- All laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for all samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.

- A summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.
- A description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-F3.13 Conditions that will be Achieved when Closure is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 2706-T Yard will be clean closed. The modules, fencing, and asphalt will be removed, so only bare soil will remain. A permit modification request will be submitted after clean closure has been confirmed to remove the 2706-T Yard DWMU from the Hanford Facility RCRA Permit.

H-F4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), the closure activities will be completed no more than 180 days after the start of closure (Table H-F6). Should unexpected circumstances arise and an extension to the 180-day closure activity expiration date be deemed necessary, a permit modification will be submitted to Ecology for approval at least 30-days prior to the 180-day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements and criteria, have been and will continue to be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the 2706-T Yard as outlined in Sections H-F3.12 (Figure H-F7).

Table H-F6. 2706-T Yard DWMU Closure Activities

Closure Activity Description		**Expected Duration**
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 2706-T Yard DWMU	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 2706-T Yard DWMU	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste	Package and ship waste to approved facility for treatment, storage, and/or disposal. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all dangerous wastes in accordance with the approved closure plan. Request extension if necessary.	40 Days (Day 40)

Table H-F6. 2706-T Yard DWMU Closure Activities

Closure Activity Description		**Expected Duration**
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records.	40 Days (Day 40)
Perform Visual Inspection of Storage Modules	Inspect secondary containment areas for breaches in integrity.	5 Days (Day 45)
	Inspect structural integrity (visible aspects only).	
	Reuse or disposal determination.	
Removal of Storage Modules	Disconnect electrical connections.	30 Days (Day 75)
	Secure module for lifting.	
	Transfer module to truck.	
	Ship modules by truck to new location.	
Visual Inspection of Asphalt	Identify areas of concern (cracks in asphalt that could potentially reach the soil below the asphalt).	5 Days (Day 80)
	Document visual inspection with photos, locations and dimensions of staining and cracks.	
Remove Fencing and Asphalt	Remove fencing and asphalt with large equipment.	40 Days (Day 120)
	Containerize fencing and asphalt waste debris.	
	Perform waste determination on waste debris.	
	Dispose of waste debris in approved disposal facility.	
Sampling and Analysis of Underlying Soil (Following Removal of Asphalt, May be Performed Concurrently with Waste Determination and Disposal.)	See Section H-F3.10 for details of sampling and analysis.	60 Days (Day 180)
	Data validation and verification.	
	If necessary, remove contaminated environmental media (soil), and resample and analyze to confirm that clean closure levels have been achieved.	
Final Closure of the 2706-T Yard DWMU	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (See Section H-F3.12 for more details on the clean closure certification).	60 Days (Day 240)

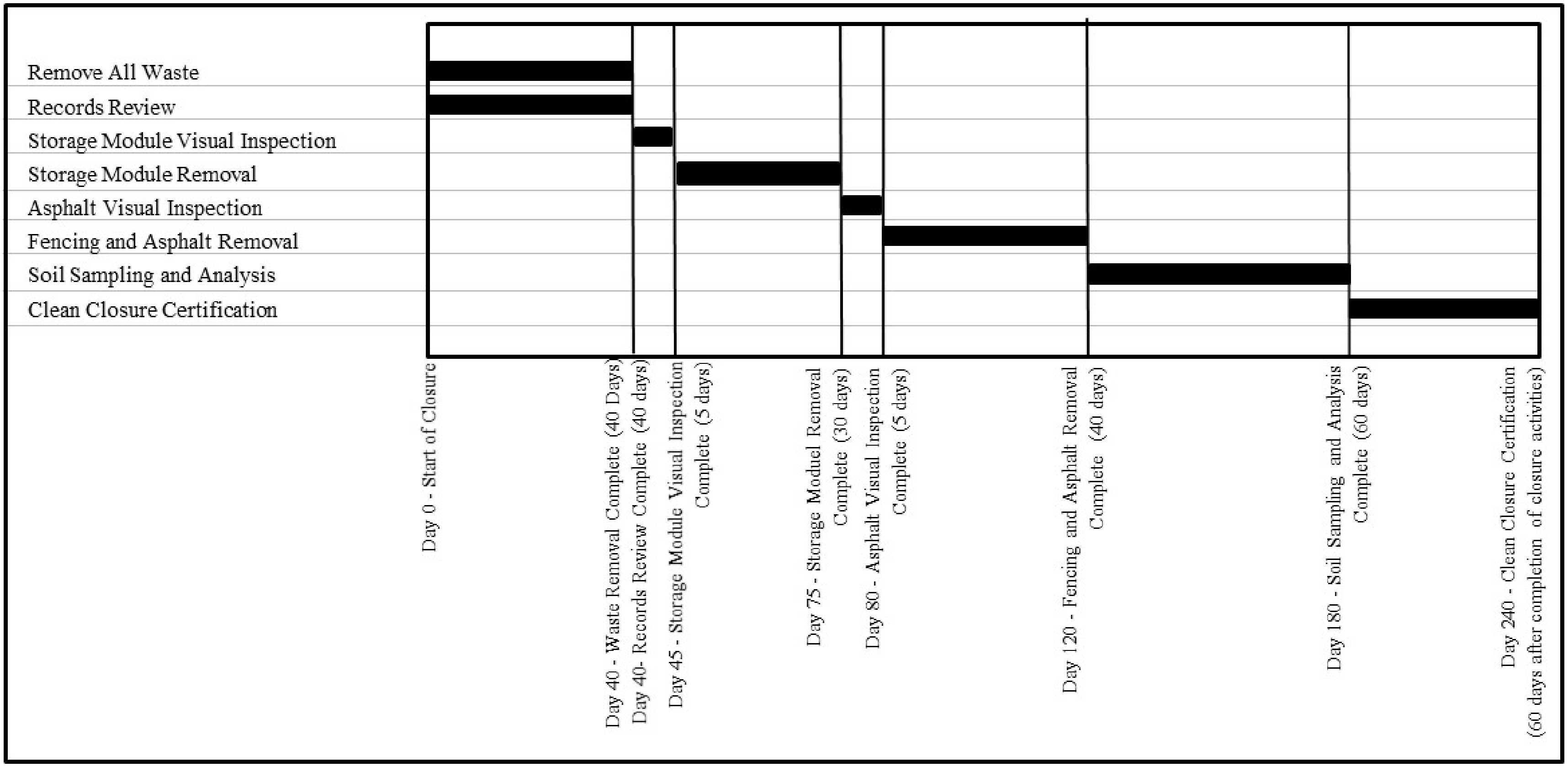

Figure H-F7. 2706-T Yard Closure Schedule Activities

H-F5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage, and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE and operated by the DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), provisions of WAC 173-303-620, "Financial Requirements," are not applicable to the Hanford Facility.

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Attachment H-F.a

2706-T Yard Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

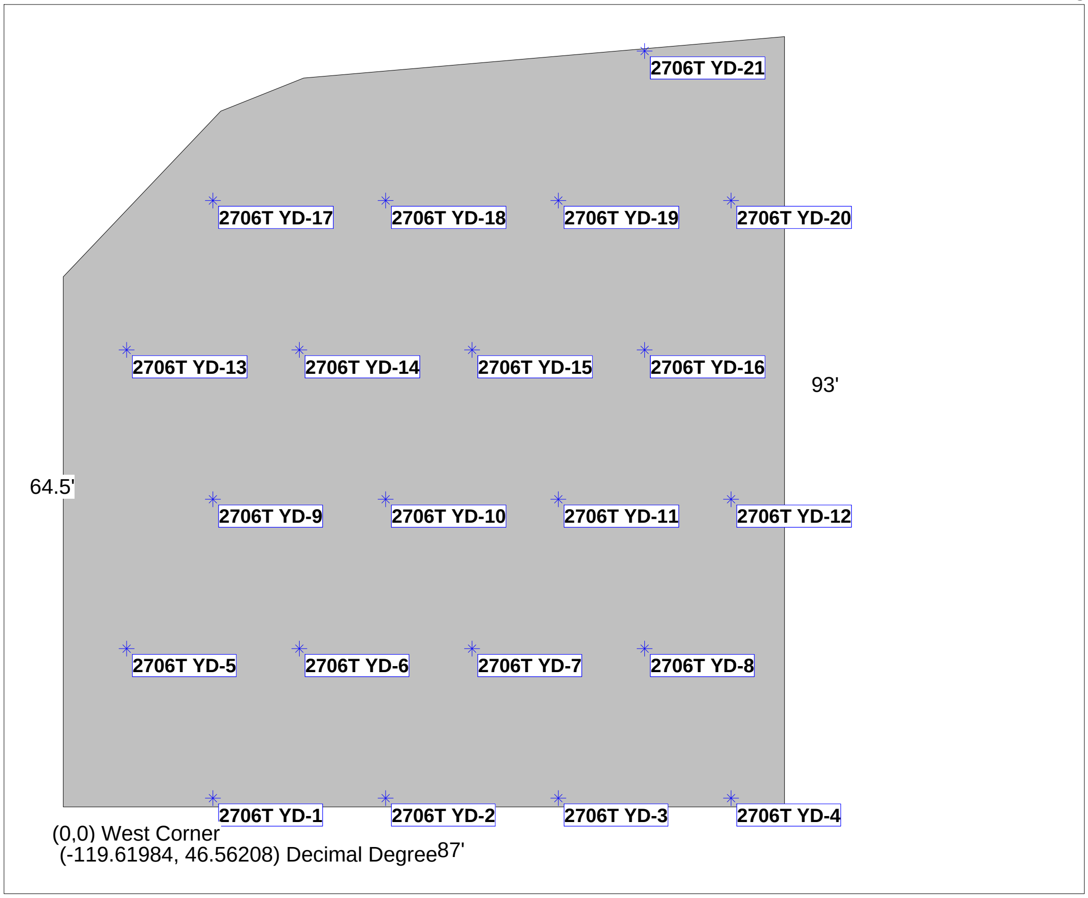
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	21
Number of selected sample areas [b]	1
Specified sampling area [c]	7515.00 ft^2
Size of grid / Area of grid cell [d]	20.8298 feet / 375.75 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 2706-T Yard					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
18.0531	1.0615	2706T YD-1		Systematic	
38.8828	1.0615	2706T YD-2		Systematic	
59.7126	1.0615	2706T YD-3		Systematic	
80.5423	1.0615	2706T YD-4		Systematic	
7.6382	19.1006	2706T YD-5		Systematic	
28.4679	19.1006	2706T YD-6		Systematic	
49.2977	19.1006	2706T YD-7		Systematic	
70.1275	19.1006	2706T YD-8		Systematic	
18.0531	37.1397	2706T YD-9		Systematic	
38.8828	37.1397	2706T YD-10		Systematic	
59.7126	37.1397	2706T YD-11		Systematic	
80.5423	37.1397	2706T YD-12		Systematic	
7.6382	55.1788	2706T YD-13		Systematic	
28.4679	55.1788	2706T YD-14		Systematic	
49.2977	55.1788	2706T YD-15		Systematic	
70.1275	55.1788	2706T YD-16		Systematic	
18.0531	73.2179	2706T YD-17		Systematic	

38.8828	73.2179	2706T YD-18		Systematic	
59.7126	73.2179	2706T YD-19		Systematic	
80.5423	73.2179	2706T YD-20		Systematic	
70.1275	91.2570	2706T YD-21		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

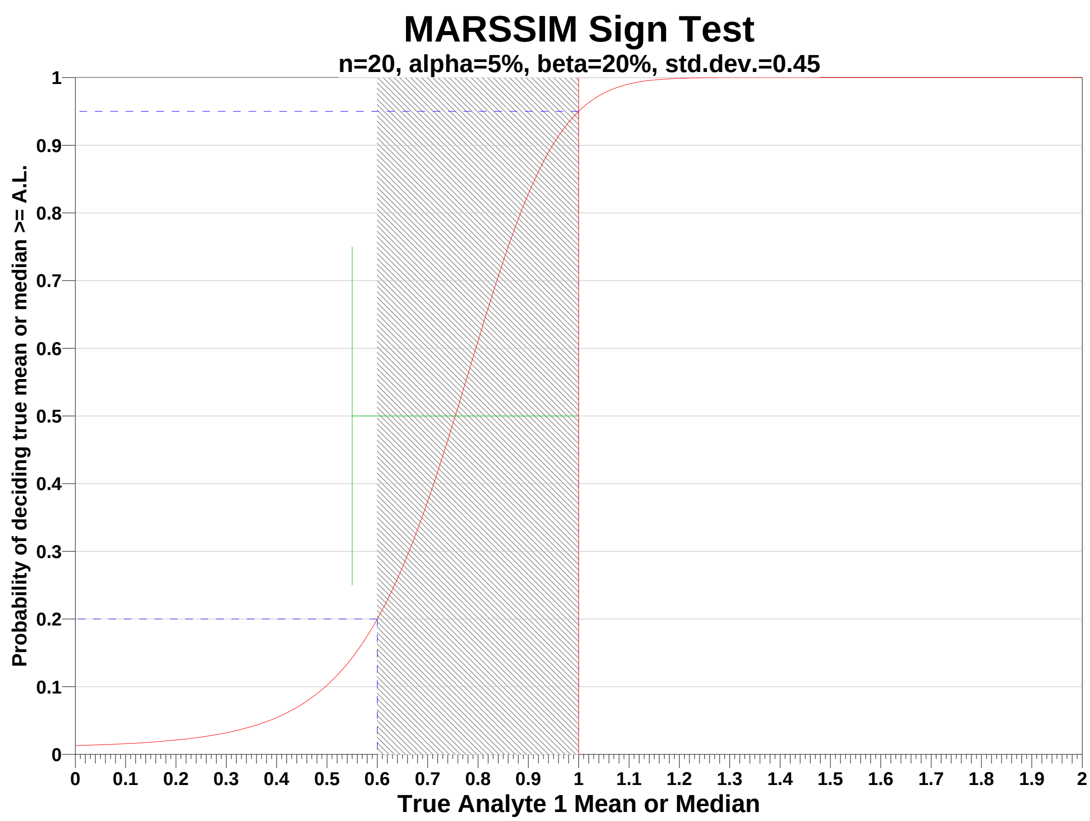
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions
The assumptions associated with the formulas for computing the number of samples are:
1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis
The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of

gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**21 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Appendix H-G

2706-T Outdoor Storage Area & 2706-TA Outdoor Storage Area Dangerous Waste Management Units

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Contents

Attachment

Tables

Figures

H-G1 Introduction

This appendix discusses closure activities for the T Plant Complex Operating Unit Group (OUG) (T Plant) 2706-T Outdoor Storage Area dangerous waste management unit (DWMU) and 2706-TA Outdoor Storage Area DWMU, hereinafter called 2706-T & TA Outdoor Storage Areas. Closure for both DWMUs will be performed in accordance with the included schedule but may be performed independently of each other.

This plan describes in detail the closure activities which are necessary to establish clean closure levels for the 2706-T & TA Outdoor Storage Areas. Such closure activities include: removal of all mixed waste; records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste; visual inspection of the asphalt and concrete pad after waste removal to evaluate the likelihood of potential contamination of the underlying soil; demolition of the 2706-T & TA Outdoor Storage Areas; and soil sampling and analysis to confirm that clean closure standards have been achieved.

Please note, the terms “mixed waste” and/or “waste”, when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

Closure of the 2706-T & TA Outdoor Storage Areas will be performed in accordance with the closure schedule provided in Section H-G4. Within 60 days upon completion of closure activities, the Permittees shall provide the Washington State Department of Ecology (Ecology) a certification of closure in accordance with the *Washington Administrative Code* (WAC) 173-303-610(6), “Dangerous Waste Regulations,” “Closure and Post-Closure”. The closure certification will provide supportive evidence that the 2706-T & TA Outdoor Storage Areas have met the established clean closure standards.

This closure plan complies with WAC 173-303-610(2) through 173-303-610(6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

H-G1.1 Unit Description

The 2706-T Outdoor Storage Area, located at the southwest side of the 2706-T Building (Figure H-G1 and Figure H-G2), is an irregular shaped uncovered fenced storage area that measures approximately 21 m (70 ft) wide by 23 m (76 ft) long. The DWMU is constructed of asphalt with a concrete storage pad and is permitted for waste container storage. The concrete storage pad is approximately 5.2 m (17 ft) wide by 18 m (60 ft) long for a total footprint and available waste storage area of approximately 94 m^2 (1,020 ft^2). Out-of-service railroad tracks run through the 2706-T Outdoor Storage Area.

The 2706-TA Outdoor Storage Area, located at the northwest side of the 2706-TA Building (Figure H-G1 and Figure H-G3), is an irregular shaped uncovered fenced storage area consisting of multiple measurements ranging from approximately 7.3 m (24 ft) up to 53.3 m (175 ft), and has a total footprint and available waste storage area of approximately 870 m^2 (9,300 ft^2). The storage pad is constructed of asphalt and is permitted for waste container storage. Out-of-service railroad tracks run through the 2706-TA Outdoor Storage Area.

The 2706-T & TA Outdoor Storage Areas provide a place to stage containers prior to placement inside the 2706-T Building and/or 2706-TA Building. The DWMUs do not have an engineered secondary containment system. Any waste containers stored in the outside storage areas that do not meet the criteria specified in WAC 173-303-630(7)(c) (e.g., waste packages containing free liquids or that exhibit the characteristics of ignitability or reactivity) are placed on portable secondary containment systems. Treatment of waste will not be conducted within these DWMUs.

H-G1.1.1 Maximum Waste Inventory

The maximum storage capacity of the 2706-T Outdoor Storage Area and 2706-TA Outdoor Storage Areas is a total volume of 64.9 m^3 (64,900 liters) and 279.5 m^3 (279,500 liters),respectively.

H-G2 Closure Performance Standard

Closure performance standards for the 2706-T &TA Outdoor Storage Areas will be based on WAC 173-303-610(2), which requires closure of the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.
- Control, minimize or eliminate to the extent necessary to protect human health and the environment, post-closure escape of waste, dangerous constituents, leachate, contaminated runoff, or waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas to the degree possible given the nature of the previous waste activity.

These performance standards are addressed in Sections H-G2.1**Error! Reference source not found.**, and H-G3.9 of this closure plan, and furthermore identified in Table H-G4.

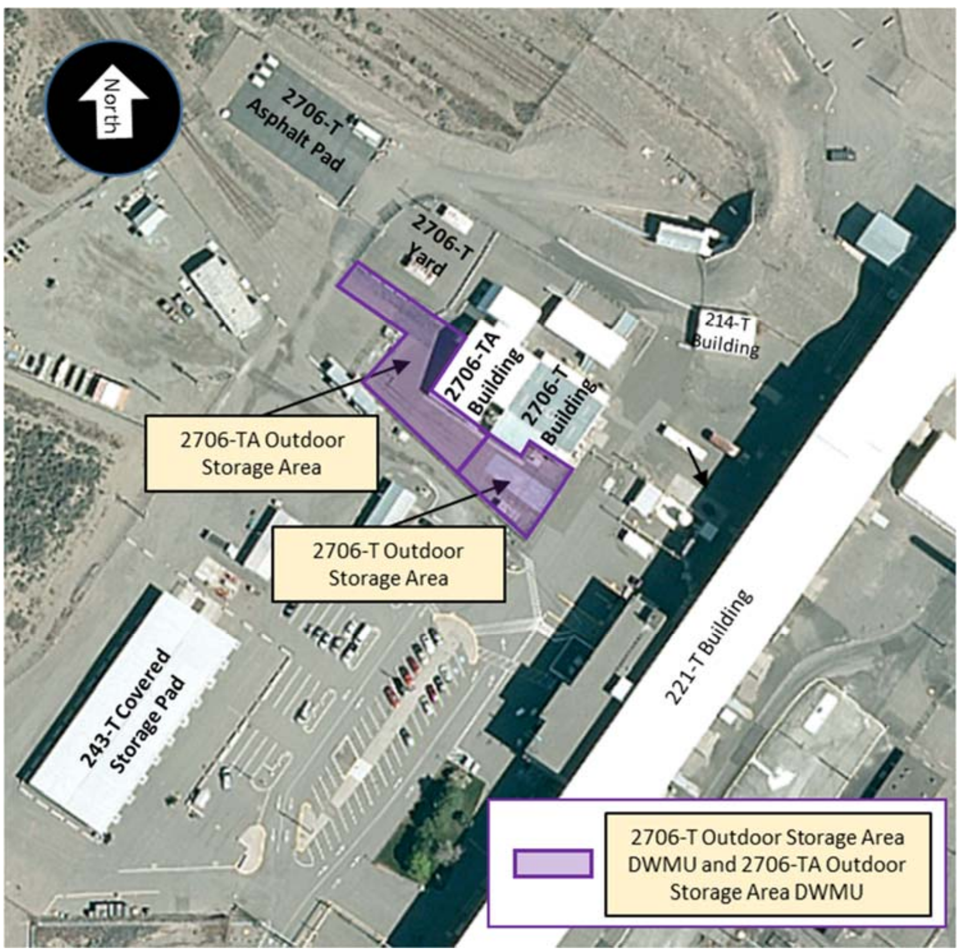

Figure H-G1. T Plant 2706 T & TA Outdoor Storage Areas (Aerial View 2012)

Figure H-G2. 2706-T Outdoor Storage Area (March 2013)

Figure H-G3. 2706-TA Building Exterior and Outdoor Storage Area (March 2013)

H-G2.1 Clean Closure Levels

The 2706-T & TA Outdoor Storage Areas will be clean closed using clean closure levels required for soil. After removal of all waste, the asphalt and concrete pads will be visually inspected to identify any waste related staining, major cracks, crevices, seams and low points. The fencing, railroad tracks, asphalt and concrete pads will be removed and managed as a newly generated waste stream. Section H-G3.7 details waste generated during closure.

Once the asphalt and concrete are removed, the underlying soil will be sampled and must meet clean closure levels. In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the WAC 173-340, “Model Toxics Control Act—Cleanup,” hereinafter called MTCA, regulations (WAC 173-340-700, “Overview of Cleanup Standards,” through -WAC 173-340-760, “Sediment Cleanup Standards,” excluding WAC 173-340-745, “Soil Cleanup Standards for Industrial Properties”). These numeric cleanup levels have been calculated according to the requirements of WAC 173-303-610(2)(b)(i) using the MTCA (WAC 173-340) Method B closure performance standard for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-G4 provides the MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte (Table H-G1).

A null hypothesis is generally assumed true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, “Definitions”, for the 2706-T & TA Outdoor Storage Areas is that the underlying soil is assumed to be above MTCA (WAC 173-340) Method B cleanup levels; therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means sampling and analysis results of the site indicated that soil contains contamination below the MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that the soil meets closure performance standards in accordance with MTCA (WAC 173-340) Method B.

Should sampling and analysis provide a basis that the null hypothesis can be accepted, the soil would be removed, identified as contaminated environmental media, and managed in accordance with Section H-G3.8.

H-G3 Closure Activities

The 2706-T & TA Outdoor Storage Areas will be clean closed under *Resource Conservation and Recovery Act of 1976* (RCRA) and confirmation sampling will be performed to verify the closure performance standards (Table H-G4) are met. As waste storage units, clean closure determinations for the 2706-T & TA Outdoor Storage Areas will be based on successfully completing the closure activities in this section. Sampling and analysis activities were developed utilizing the U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection (QA/G-5S)*, and the Ecology Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-G3.10). The objective of the sampling described in this document is to determine if the MTCA (WAC 173-340) Method B closure performance standards were met, demonstrating clean closure of the 2706-T & TA Outdoor Storage Areas.

The following closure activities are required to achieve and verify clean closure for soil:

- Remove all waste.

- Review waste container storage, operating, and inspection records for documented spills or releases of waste.
- Perform a visual inspection of the asphalt and concrete pads to identify any waste related staining, major cracks, crevices, seams, and low points for purposes of focused sampling.
- Remove fencing, railroad tracks, and asphalt and concrete pads.
- Perform waste determination of the fencing, railroad tracks, and asphalt and concrete pads waste debris.
- Complete and document disposal of the fencing, railroad tracks, and asphalt and concrete pads as newly generated waste.
- Perform sampling and analysis of soil underlying the asphalt and concrete pads to confirm that clean closure standards are met.
- If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of any contaminated environmental media present.
- Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been met.
- Transmit closure certification to Ecology.

H-G3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment (PPE). Qualified personnel will be trained in applicable safety and environmental procedures and will have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 to WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter referred to as the Hanford Facility RCRA Permit), describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, “Personnel Training,” which provides training requirements for Hanford Facility personnel associated with 2706-T & TA Outdoor Storage Areas.

Project-specific safety training addressed explicitly to the project and activities for the day will include the following:

- Training to provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records for each employee are maintained in an electronic database. The Permittees training organization maintains the training records system.

H-G3.2 Removal of Wastes and Waste Residues

All waste will be removed from the storage areas and will be managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers meeting U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with the “Transportation” criteria specified in Title 49 of the *Code of Federal Regulations* (CFR). Waste packaged in non-DOT regulation containers (large or irregular shaped containers) will be shipped in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily occur utilizing highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet the land disposal restriction (LDR) treatment standards specified in WAC 173-303-140, which includes by reference 40 CFR 268, then ultimately disposed of in an appropriate waste disposal facility.

While waste residues are not anticipated, if they are found during clean closure activities, they will be managed in accordance with all applicable requirements of WAC 173-303-170, “Requirements for Generators of Dangerous Waste,” through WAC 173-303-230, “Special Conditions”. Waste subject to the LDR treatment standards specified in WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-G3.3 Unit Components, Parts, and Ancillary Equipment

The 2706-T & TA Outdoor Storage Areas do not have any component, parts, or ancillary equipment.

H-G3.4 Inspection of Units Before Decontamination

Although decontamination of the 2706-T & TA Outdoor Storage Areas is not planned, following the removal of all waste and waste residues, a visual inspection will be performed to determine the presence of cracks, holes, or other breaches in the asphalt and concrete pads sufficient enough to reach the underlying soil. These cracks, holes, or other breaches will be documented to determine focused sampling of the underlying soil during confirmation sampling.

During the closure period, to prevent threats to human health and the environment, the 2706-T & TA Outdoor Storage Areas will be inspected in accordance with WAC 173-303-320(2), "General Inspection." Inspections of the 2706-T Outdoor Storage Areas will be performed annually, until the clean closure certification is accepted by Ecology, and will verify the following:

- Posted warning signs at each entrance to T Plant are present, legible, and visible at 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-G3.5 Decontamination

Decontamination of the 2706-T & TA Outdoor Storage Areas is not planned.

H-G3.6 Demolition

Once the visual inspection of the asphalt and concrete pads is complete, demolition of the 2706-T & TA Outdoor Storage Areas can be initiated. Demolition of the 2706-T & TA Outdoor Storage Areas can be done independently of each other but will both follow the same demolition activities. The primary activities required to complete the demolition include:

- Location of utilities
- Mobilization of equipment
- Removal and disposal of fencing and railroad tracks
- Removal and disposal of the asphalt and concrete pads.

H-G3.6.1 Location of Utilities

Prior to demolition, any in-use utilities will be located to ensure that there are no disruptions to the surrounding activities.

H-G3.6.2 Equipment Mobilization

The resources, equipment and materials necessary to perform demolition will be staged in designated lay-down areas.

H-G3.6.3 Demolition Activities for the 2706-T & TA Outdoor Storage Areas

Demolition of the 2706-T & TA Outdoor Storage Areas will be accomplished utilizing the primary method of shearing and rubblizing. Demolition of the DWMUs will require the use of heavy equipment (e.g., excavator with various attachments) to remove and demolish the fencing and railroad tracks. Other standard industry or conventional demolition practices also may be used (e.g., hydraulic shears with steel shear jaws, asphalt and concrete pulverizer jaws or breaker jaws). Demolition of the asphalt and concrete pads will primarily be accomplished utilizing large equipment to rubblize the asphalt and concrete.

Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and high efficiency particulate air-filtered vacuum cleaners may be used. Additional storm water run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

H-G3.6.3.1 Shearing and Rubblizing

During shearing and rubblizing of the DWMUs, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and run-off. The shears will size reduce/cut components of the 2706-T & TA Outdoor Storage Areas, while front end loaders or grapples will load the debris into roll-off containers.

Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and asphalt and concrete pulverizer jaws or breaker jaws, will be used to perform any rubblizing. The rubble debris from the DWMUs will be loaded into roll-off boxes for transportation to an approved disposal facility.

H-G3.7 Identifying and Managing Waste Generated During Closure Activities

Closure activities for the 2706-T & TA Outdoor Storage Areas will result in the generation of one known waste stream, debris from demolition, requiring management and disposal. The waste generated during the closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. The newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-G3.12).

H-G3.7.1 Debris from Demolition

Debris generated from demolition will be packaged onsite at the 2706-T & TA Outdoor Storage Areas and transported to an appropriate waste disposal facility. Debris includes, but is not limited to, the following types of wastes:

- Asphalt and associated rubblized debris
- Concrete and associated rubblized debris
- Fencing materials
- Railroad materials
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)
- Equipment and construction materials.

The preferred management of debris resulting from demolition of the DWMUs is in a bulk form. Bulk waste will be placed into bulk containers such as roll-off boxes for disposal. These bulk containers will be stored in a suitable area in close proximity to the 2706-T & TA Outdoor Storage Areas or may be accumulated for up to 90-days in another suitable location. Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

The debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-G3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) are identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Soil surrounding the node location, which identified contamination above clean closure levels will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU. Following removal of contaminated soil, additional confirmatory sampling will be conducted in the location of the original node which identified contamination above the clean closure level in accordance with the approved closure plan SAP. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. The contaminated soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

Management and disposal of the contaminated environmental media will be documented and included with the clean closure documentation included in Section H-G3.12.

H-G3.9 Confirming Clean Closure

Both the 2706-T Outdoor Storage Area DWMU and 2706-TA Outdoor Storage Area DWMU will be clean closed. Demonstration of clean closure standards will be accomplished through removal of the fencing, railroad tracks, asphalt and concrete pads, and sampling and analysis of the underlying soil.

Once the removal of the asphalt and concrete is complete, sampling will be performed in accordance with the SAP detailed in Section H-G3.10. The SAP will consist of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where cracks or other openings in the asphalt and concrete may have allowed a release of waste to the underlying soil).

Once the demolition and removal of the 2706-T & TA Outdoor Storage Areas are complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards [MTCA (WAC 173-340-730) Method B] have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-G3.8. Once analytical results confirm clean closure levels of the target analytes, a clean closure certification will be prepared in accordance with Section H-G3.12.

H-G3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarizes the sampling design for the 2706-T & 2706-TA Outdoor Storage Areas. After the 2706-T & 2706-TA Outdoor Storage Areas have been demolished, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-G3.10.1 Sampling and Analysis Plan

Sampling and analysis of the soil underlying the asphalt and concrete pads of the 2706-T & TA Outdoor Storage Areas will be conducted to confirm that clean closure levels have been achieved. Sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*; ASTM International (formerly the American Society for Testing and Materials) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM International standards, EPA approved methods, and DOE/RL-96-68 *Hanford Analytical Services Quality Assurance Requirements Documents (HASQARD)* at the time of closure. This SAP was also developed using Ecology Publication #94-111, Section 7.0, "Sampling and Analysis for Clean Closure," and EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection for Use in Developing a Quality Assurance Project Plan (QA/G-5S).*

H-G3.10.2 Target Analytes

The 2706-T & TA Outdoor Storage Areas are an active portion of the T Plant OUG; therefore, target analytes at closure may include any or all analytes based on the waste codes permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV-Description of Dangerous Wastes). A waste management report identifying waste codes historically managed at the 2706-T & TA Outdoor Storage Areas was run to identify the existing target analytes. Table H-G1 details the waste codes identified for the waste containers stored at the 2706-T & TA Outdoor Storage Areas and the target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the DWMU upon receipt of the final waste. A permit modification updating the SAP with specific target analytes will be submitted, as necessary, 45 days prior to DWMU closure in accordance with WAC 173-303-610(3)(b).

Table H-G1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Endrin (D012)	72-20-8	Lindane (D013)	58-89-9
Benzene (D018) (F005)	71-43-2	Carbon Tetrachloride (D019) (F001)	56-23-5
Chlorobenzene (D021) (F002)	108-90-7	Chloroform (D022)	67-66-3
1,4-Dichlorobenzene (D027)	106-46-7	1,2-Dichloroethane (D028)	107-06-2
1,1-Dichloroethylene (D029)	75-35-4	2,4-Dinitrotoluene (D030)	121-14-2
Heptachlor (D031)	76-44-8	Heptachlor Epoxide (D031)	1024-57-3
Hexachlorobenzene (D032)	118-74-1	Hexachlorobutadiene (D033)	87-68-3
Hexachloroethane (D034)	67-72-1	Methyl Ethyl Ketone (D035) (F005)	78-93-3
Pentachlorophenol (D037)	87-86-5	Tetrachloroethylene (D039) (F001) (F002)	127-18-4
Trichloroethylene (D040) (F001) (F002)	79-01-6	Vinyl Chloride (D043)	75-01-4

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Methylene Chloride (F001) (F002)	75-09-2	1,1,1-Trichloroethane (F001) (F002)	71-55-6
CFCs (F001) (F002)[e]	Not Applicable	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133) (F002)[e]	76-13-1
Ortho-Dichlorobenzene (F002)	95-50-1	Trichlorofluoromethane (CFC-11) (F002)[e]	75-69-4
1,1,2 Trichloroethane (F002)	79-00-5	Acetone (F003)	67-64-1
n-Butyl Alcohol (F003)	71-36-3	Ethyl Ether (F003)	60-29-7
Methyl Isobutyl Ketone (F003)	108-10-1	Xylene (F003)	1330-20-7
Ethyl Acetate (F003)	141-78-6	Ethyl Benzene (F003)	100-41-4
Cyclohexanone (F003)	108-94-1	Methanol (F003)	67-56-1
m-Cresol (F004)	108-39-4	*o*-Cresol (F004)	95-45-7
p-Cresol (F004)	106-44-5	Cresol (Cresylic acid) (F004)[a,c]	1319-77-3
Nitrobenzene (F004)	98-95-3	Toluene (F005)	108-88-3
Carbon Disulfide (F005)	75-15-0	Isobutanol (F005)	78-83-1
Pyridine (F005)	110-86-1	2-Nitropropane (F005)[b,c]	79-46-9
2-Ethoxyethanol (F005)[d]	110-80-5	Polychlorinated Biphenyls (Aroclors) (PCB2)	1336-36-3

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol and *p*-cresol.

b. The closure performance standard for 2-nitropropane was removed in the May 2014 EPA CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

c. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

d. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

e. A CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

CFC = chlorinated fluorocarbon

CLARC = Cleanup Levels and Risk Calculations

EPA = U.S. Environmental Protection Agency

H-G3.10.3 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-G4.

H-G3.10.4 Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

H-G3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-G4.

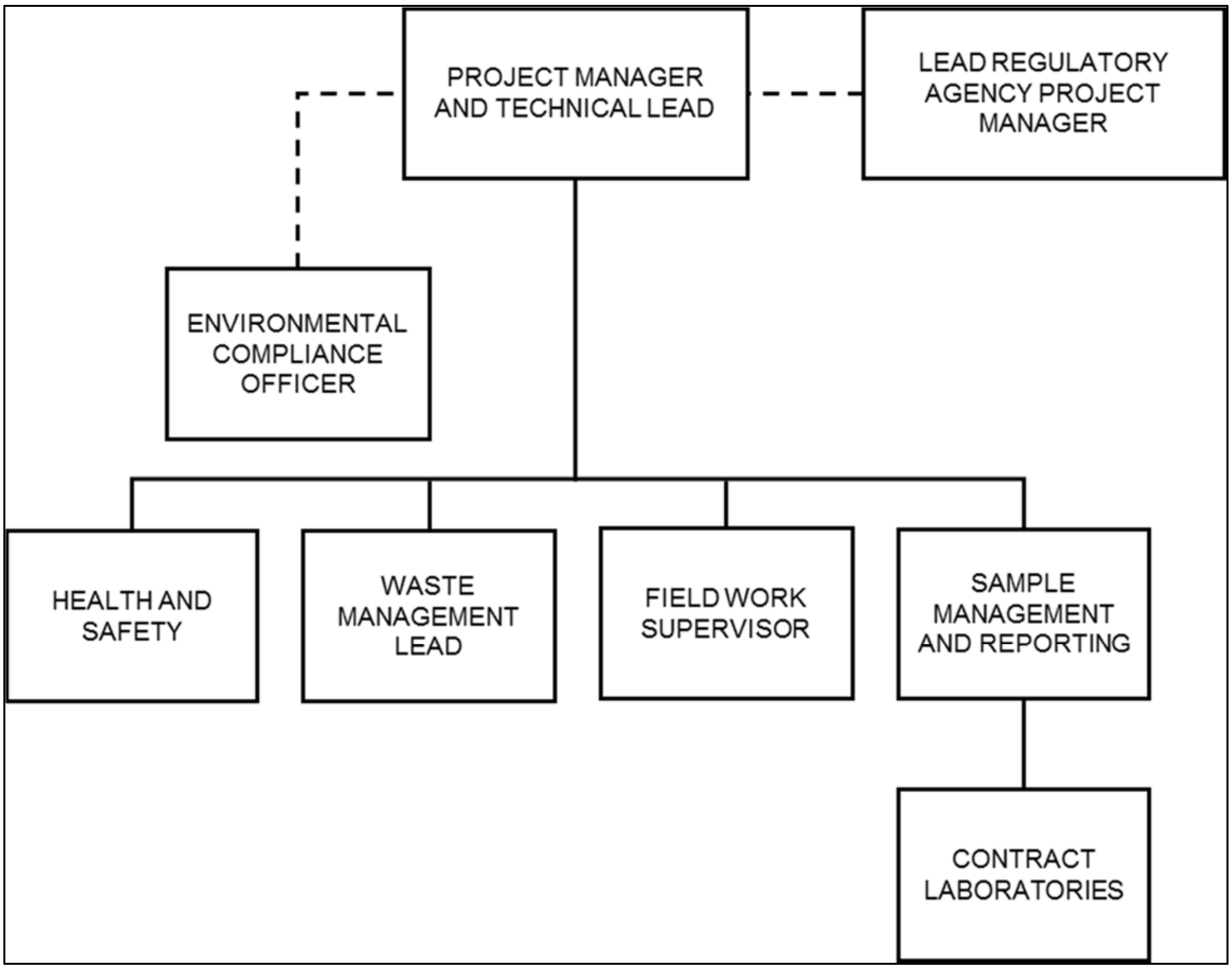

Figure H-G4. 2706-T & TA Outdoor Storage Areas Sampling and Analysis Plan Project Organization

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned project managers responsible for oversight for the 2706-T & TA Outdoor Storage Areas closure.
- **Project Manager**. The Project Manager provides oversight for activities and coordinates with DOE-Richland Office (DOE-RL), EPA, Ecology, and contract management. The Project Manager (or designee) for the 2706-T & TA Outdoor Storage Areas closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that the project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management on

all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.

- **Environmental Compliance**. The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work, and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.
- **Health and Safety:** The Health and Safety organization is responsible for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.
- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives the analytical data from the laboratories, performs the data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.
- **Contract Laboratories:** The contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation.
- **Waste Management:** The Waste Management organization communicates policies and protocols, and ensures project compliance for storage, transportation, disposal, and waste tracking.
- **Field Work Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

H-G3.10.5 Sampling Design

The primary purpose of sampling the 2706-T & TA Outdoor Storage Areas underlying soil is to determine if analytical data values exceed the MTCA (WAC 173-340) Method B clean closure performance standards (Table H-G4).

This SAP utilized Ecology Publication #94-111, Section 7.0, "Sampling and Analysis for Clean Closure," to determine the type of sampling design that will be utilized to demonstrate clean closure. When designing the sampling plan, both focused and area wide (grid) sampling methods were considered. Ecology Publication #94-111, Section 7.2.1, identifies that area wide sampling is appropriate when the spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication #94-111, Section 7.3, "Sampling to Determine or Confirm Clean Closure," identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling is further defined below.

Area Wide (Grid) Sampling: Samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication #94-111, is selective sampling of areas where contamination is expected or releases have been documented. Once the visual inspections have been performed and any waste related staining, cracks, crevices or seams, and low points have been identified, focused sampling may be deemed necessary and added to the SAP. The location of focused samples, if any, will be identified and recorded as required in Section H-G3.10.12. Judgmental (focused) sampling is further defined below.

Judgmental (Focused) Sampling: Selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and on professional judgment. Focused sampling is distinguished from probability-based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined using Visual Sample Plan (VSP) software. The VSP tool, used throughout Washington State and nationally, statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 2706-T & TA Outdoor Storage Areas, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and utilized for the input parameters for 2706-T & TA Outdoor Storage Areas. VSP parameter inputs and the basis for those inputs are detailed in Table H-G2.

The decision rule for demonstrating compliance with the MTCA (WAC 173-340) Method B clean closure level has the following three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-G2, VSP calculated that at least 21 samples are required for 2706-T Outdoor Storage Area and 20 samples for 2706-TA Outdoor Storage Area to reject the null hypotheses with 95 percent confidence and ensure that 2706-T & TA Outdoor Storage Areas would not be mistakenly released as clean. For the purpose of utilizing VSP software, the null hypothesis compares a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Table H-G2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value exceeds the threshold (WAC 173-340 "Model Toxics Control Act-Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user-defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

Sample locations were determined using the area wide grid with a random start sampling method run in VSP (Figure H-G5 and Figure H-G6). Statistical analysis of systematically collected data is valid if a random start to the grid is used. The 2706-T & TA Outdoor Storage Areas dimensions were entered into VSP to determine the locations of the samples. The triangular grid sampling layout was determined to have an even distribution over the entire 2706-T & TA Outdoor Storage Areas providing the most representative data set including coverage of the middle portion of the sampling area. The samples will be taken from the node locations indicated by VSP and will be assigned sample location identifications and sample numbers using HEIS. The south corner of the 2706-T Outdoor Storage Area and 2706-TA Outdoor Storage Area are considered the (0,0) points of the sampling location maps in Attachments H-G.a and H-G.b, respectively.

The first node locations were chosen at random by VSP, and the subsequent sample locations were assigned by VSP using a triangular grid sampling method. Supporting documentation for VSP sampling designations is provided in Attachment H-G.a and Attachment H-G.b.

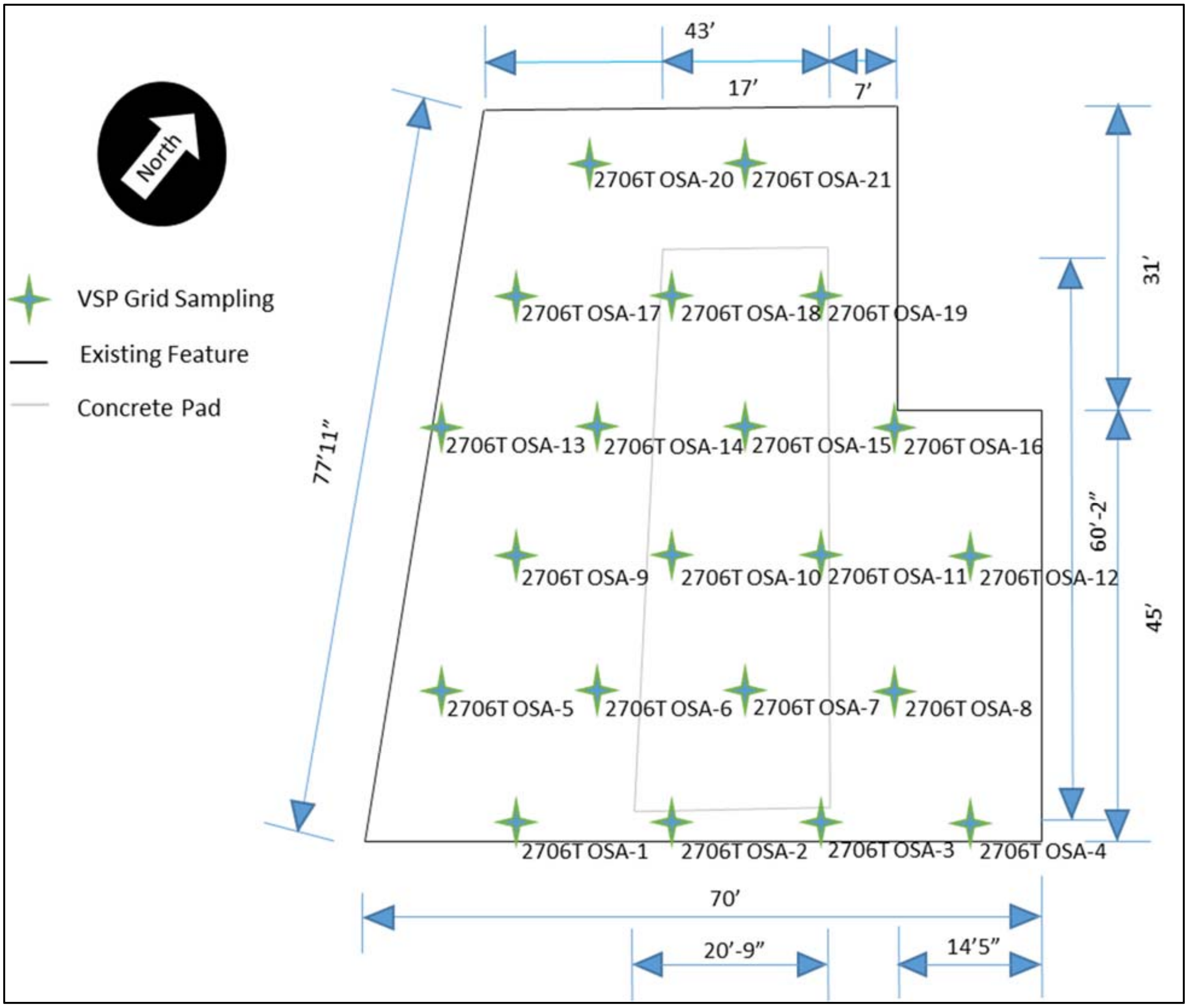

Figure H-G5. VSP Sample Locations for 2706-T Outdoor Storage Area

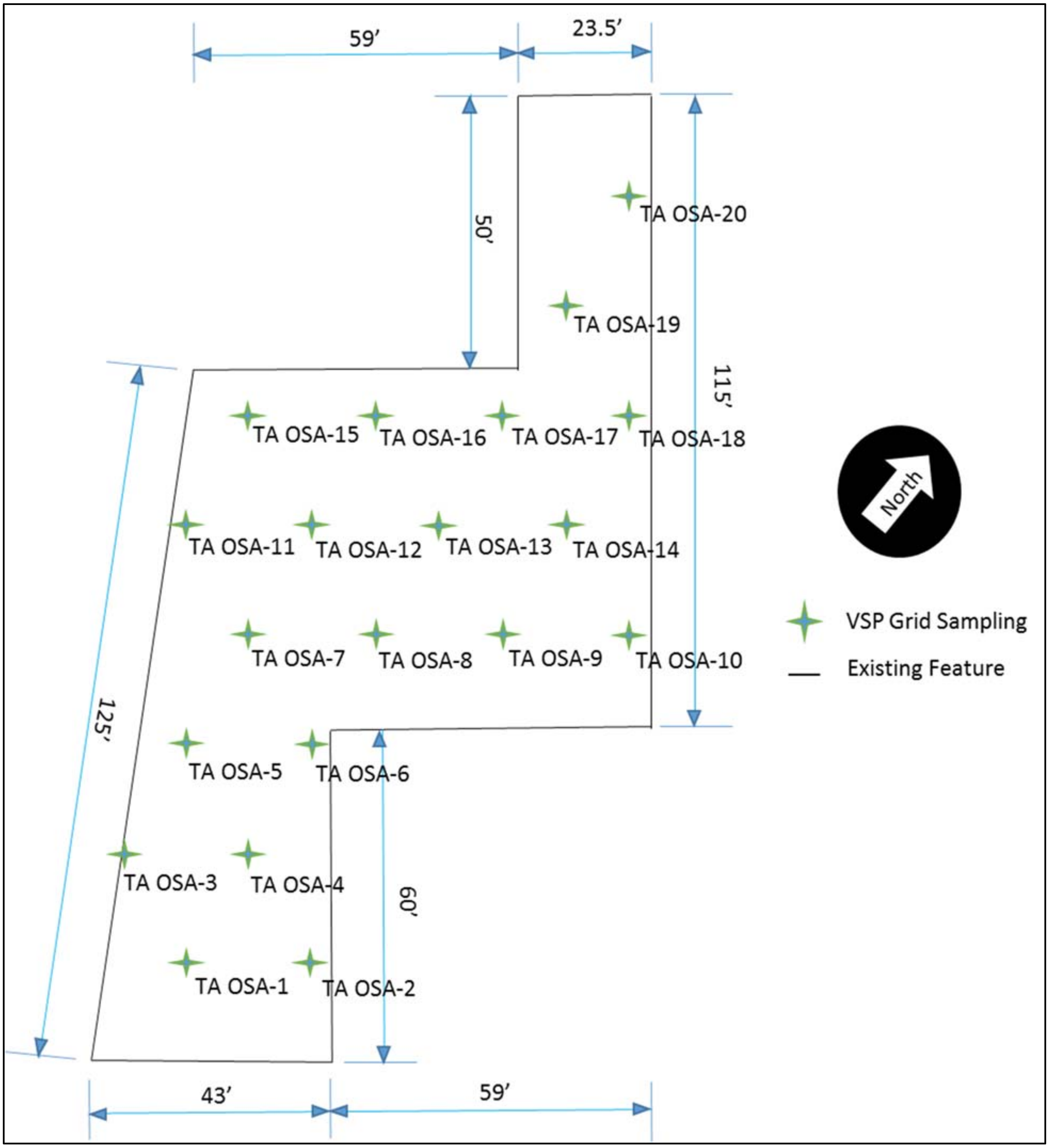

Figure H-G6. VSP Sample Locations for 2706-TA Outdoor Storage Area

H-G3.10.6 Sampling Methods and Handling

Grab sample matrix will consist of soil samples collected in pre-cleaned sample containers taken at a depth of no more than approximately 0 to 15 cm (0 to 6.0 in) below ground surface and within an approximate 0.6 m (2 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer once the asphalt and concrete pads have been removed. Subsurface sampling will be evaluated, based on results of the records review. Subsurface sampling [samples collected at depths greater than approximately 15 cm (6 in.) below ground surface] will be evaluated, based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-G3.10.14.

Once soil is sampled, the sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter which allows for a larger surface area to volume ratio; therefore, increasing the likelihood of identifying any potential contamination in the sample. Soil samples will be collected directly into containers at the chosen sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation
- Field walk down of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Sample preservation, container, and holding time requirements are specified in Table H-G3 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the sampling authorization form and chain-of-custody form.

Table H-G3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction; 24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8082	PCBs by GC	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG w/ PTFE-lined lid	250 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE-lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE-lined lid	250 g

AG = amber glass
EPA = Environmental Protection Agency
G = glass
GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
OES = optical emission spectrometry
P = plastic
PCB = polychlorinated biphenyls
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

To prevent potential contamination of samples, decontaminated equipment will be used for each sampling activity.

EPA Level I pre-cleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory-specific volumes/requirements for meeting analytical quantitation limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or the sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- Sampling authorization form and form number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable).

Sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Facility protocols to ensure the maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste generated by sampling activities subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-G3.10.7 Analytical Methods

All analyses and testing will be performed consistent with laboratory agreements, laboratory analytical procedures, and *HASQARD* (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Table H-G4 outlines analytical methods and performance requirements associated with the target analytes (Table H-G1).

H-G3.10.8 Quality Control

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

Laboratory QC samples estimate the precision and bias of the analytical data. Field and laboratory QC samples are summarized in Table H-G5. A data quality assessment will be performed utilizing the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide (QA/G-9R)*, and implementing the specific requirements in Sections H-G3.10.8 through H-G3.10.10.

Data verification, data validation, and data quality assessment will include both primary samples and QC samples.

H-G3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

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

H-G3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to the validators and only additions to be made, not changes to the raw data, are allowed.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

H-G3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP software uses the analytical data to determine if the user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software will calculate the true standard deviation and if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-G2.1)

Table H-G4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Non-carcinogen			
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
72-20-8	Endrin	SW-846 Method 8270	--	2.40E+01	3.30E-03	±30	≤30
58-89-9	Lindane	SW-846 Method 8270	9.09E-01	2.40E+01	1.65E-03	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
106-46-7	1,4-Dichlorobenzene	SW-846 Method 8270	1.85E+02	5.60E+03	3.30E-01	±30	≤30
107-06-2	1,2-Dichloroethane	SW-846 Method 8260	1.10E+01	4.80E+02	5.00E-03	±30	≤30
75-35-4	1,1-Dichloroethylene	SW-846 Method 8260	--	4.00E+03	1.00E-02	±30	≤30

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Non-carcinogen			
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30
76-44-8	Heptachlor	SW-846 Method 8270	2.22E-01	4.00E+01	1.65E-03	±30	≤30
1024-57-3	Heptachlor Epoxide	SW-846 Method 8270	1.10E-01	1.04E+00	1.65E-03	±30	≤30
118-74-1	Hexachlorobenzene	SW-846 Method 8270	6.25E-01	6.40E+01	3.30E-01	±30	≤30
87-68-3	Hexachlorobutadiene	SW-846 Method 8270	1.28E+01	8.00E+01	3.30E-01	±30	≤30
67-72-1	Hexachloroethane	SW-846 Method 8270	2.50E+01	5.60E+01	5.00E-03	±30	≤30
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30
87-86-5	Pentachlorophenol	SW-846 Method 8270	2.50E+00	4.00E+02	3.30E-01	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
75-01-4	Vinyl Chloride	SW-846 Method 8260	1.75E+02	2.40E+02	1.00E-02	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Non-carcinogen			
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+03	1.00E-02	±30	≤30
1330-20-7	Xylene	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Non-carcinogen			
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30
1336-36-3	Polychlorinated Biphenyls	SW-846 Method 8082	5.00E-01	--	8.00E-03	±30	≤30

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

Note: Due to the quantity and nature of the waste stored in the 2706-T & TA Outdoor Storage Areas not presenting a threat to groundwater, and not having soil or the presence of plants within the DWMUs, no groundwater or ecological indicator MTCA cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equation 740-1 and Equation 740-2 from WAC 173-340-740(3)(b) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon

DWMU = dangerous waste management unit

MTCA = Model Toxics Control Act

Req't = requirement

WAC = Washington Administrative Code

Table H-G5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The laboratory control sample measures the accuracy of the analytical method.

Table H-G5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

H-G3.10.12 Documents and Records

The Project Manager is responsible for ensuring the current version of the SAP is being used and for providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook and only authorized persons may make entries in logbooks. Logbooks will be signed by the FWS, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following will be included in the project file, as appropriate:

- All field logbooks or operational records
- Data forms
- Global positioning system data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports.

The laboratory is responsible for maintaining, and having available upon request, the following:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hardcopy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989 *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-G3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

In the event that sample results based on the MTCA (WAC 173-340) Method B three-part test (Section H-G3.10.5) indicate contamination above clean closure levels, contaminated soil will be removed in accordance with Section H-G3.8. Following removal of contaminated soil, additional samples will be taken at the same grid location as identified in Attachment H-G.a and/or Attachment H-G.b. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-G3.10.12, and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-G4, with accompanying QC samples as discussed in Section H-G3.10.8, to confirm that the MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-G3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to the SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, “Permit Changes.”

H-G3.11 Role of the Independent Qualified Registered Professional Engineer

An Independent, Qualified, Registered Professional Engineer (IQRPE) will be retained to provide certification of the closure, and sign the closure certification as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 2706-T & TA Outdoor Storage Areas. At a minimum, the following field activities would be completed:

- Observation or review of visual inspections.
- Observation or review of demolition.
- Observation or review of sampling activities.
- Review sampling procedures and results.
- Observation or review of contaminated environmental debris removal (as applicable).
- Verification that locations of samples are as specified in the SAP.
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record his or her observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-G3.12 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 2706-T & TA Outdoor Storage Areas, a certification that the DWMUs have been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities.
- A description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of any unanticipated contaminated environmental media.
- All laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for all samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.
- A summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.
- A description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-G3.13 Conditions that will be Achieved when Closure is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 2706-T & TA Outdoor Storage Areas will be clean closed. The asphalt and concrete pads will be removed, so only bare soil will remain. A permit modification request will be submitted after clean closure has been confirmed to remove the 2706-T Outdoor Storage Area DWMU and 2706-TA Outdoor Storage Area DWMU from the Hanford Facility RCRA Permit.

H-G4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), the closure activities will be completed no more than 180 days after the start of closure (Table H-G6). Should unexpected circumstances arise and an extension to the 180-day closure activity expiration date be deemed necessary, a permit modification will be submitted to Ecology for approval at least 30 days prior to the 180-day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements and criteria, have been and will continue to be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the 2706-T & TA Outdoor Storage Areas as outlined in Section H-G4 (Figure H-G7).

H-G5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage, and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE, and operated by the DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), the provisions of WAC 173-303-620, “Financial Requirements,” are not applicable to the Hanford Facility.

Table H-G6. 2706-T & TA Outdoor Storage Areas Closure Activity Description

Closure Activity Description		Expected Duration
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 2706-T & TA Outdoor Storage Area DWMUs	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 2706-T & TA Outdoor Storage Area DWMUs	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste	Package and ship waste to approved facility for treatment, storage, and/or disposal In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all wastes in accordance with the approved closure plan. Request extension if necessary	40 Days (Day 40)
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records	40 Days (Day 40)
Visual Inspection of Asphalt and Concrete Pad	Identify asphalt and concrete pad for areas of concern (cracks in asphalt and concrete that could potentially reach the soil below)	10 Days (Day 50)
	Document visual inspection with photos, locations and dimensions of staining and cracks	
Removal of Fencing, Railroad Tracks, Asphalt and Concrete	Remove fencing, railroad tracks, asphalt and concrete	70 Days (Day 120)
	Containerize fencing, railroad tracks, asphalt and concrete waste debris	
	Perform waste determination on waste debris	
	Dispose of waste debris in approved facility	
Sampling and Analysis of Underlying Soil (Following Removal of Asphalt and Concrete, May be Performed Concurrently with Waste Determination and Disposal of Pad.)	See Section H-G3.10 for details of sampling and analysis	60 Days (Day 180)
	Data validation and verification	
	If necessary, remove contaminated environmental media (soil), and resample and analyze to confirm that clean closure levels have been achieved.	
Final Closure of the 2706-T & TA Outdoor Storage Area DWMUs	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)

Table H-G6. 2706-T & TA Outdoor Storage Areas Closure Activity Description

Closure Activity Description		Expected Duration
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (See Section H-G3.12 for more details on the clean closure certification)	60 Days (Day 240)

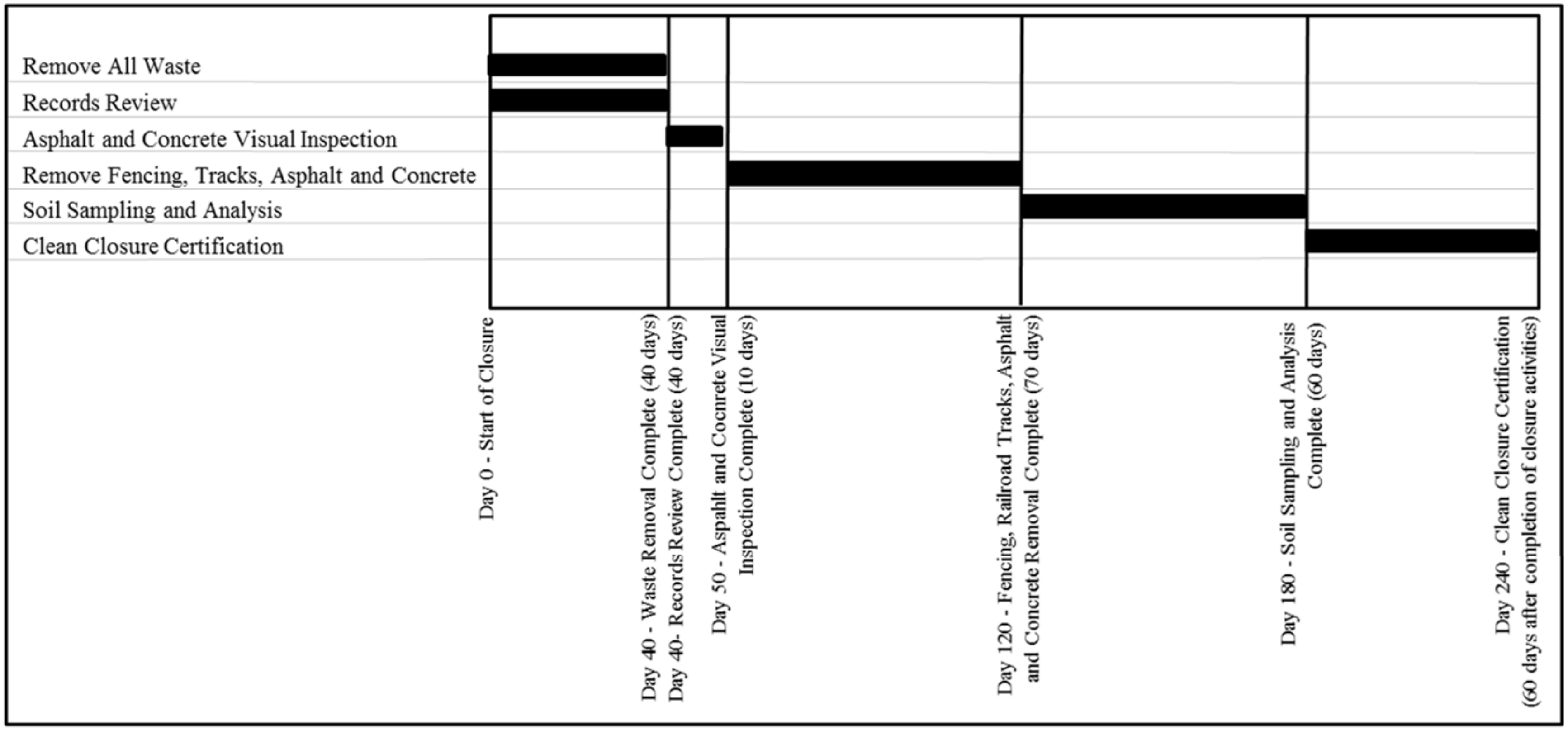

Figure H-G7. 2706-T & TA Outdoor Storage Areas Closure Schedule Activities

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Attachment H-G.a.

2706-T Outdoor Storage Area
Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

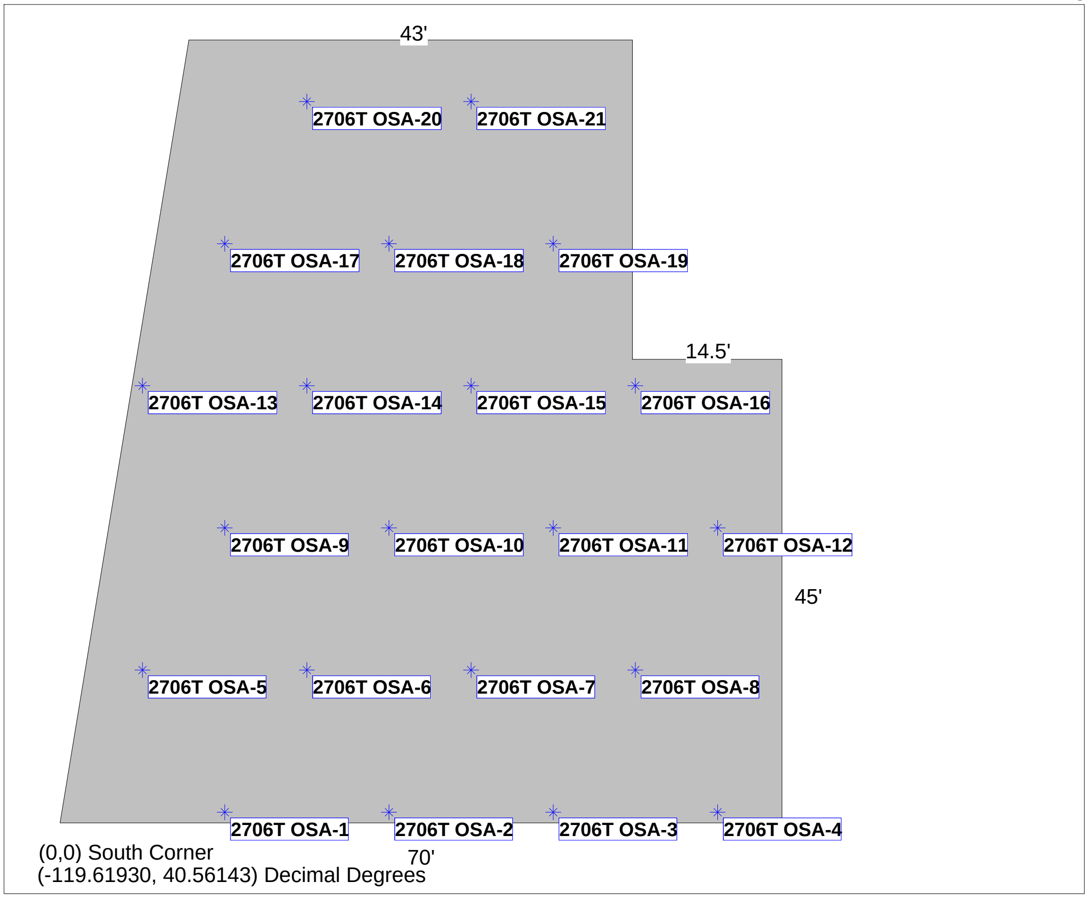
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	21
Number of selected sample areas [b]	1
Specified sampling area [c]	4395.50 ft^2
Size of grid / Area of grid cell [d]	15.9303 feet / 219.775 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 2706-T OSA					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
15.9621	1.0448	2706T OSA-1		Systematic	
31.8924	1.0448	2706T OSA-2		Systematic	
47.8227	1.0448	2706T OSA-3		Systematic	
63.7530	1.0448	2706T OSA-4		Systematic	
7.9970	14.8408	2706T OSA-5		Systematic	
23.9273	14.8408	2706T OSA-6		Systematic	
39.8576	14.8408	2706T OSA-7		Systematic	
55.7879	14.8408	2706T OSA-8		Systematic	
15.9621	28.6369	2706T OSA-9		Systematic	
31.8924	28.6369	2706T OSA-10		Systematic	
47.8227	28.6369	2706T OSA-11		Systematic	
63.7530	28.6369	2706T OSA-12		Systematic	
7.9970	42.4329	2706T OSA-13		Systematic	
23.9273	42.4329	2706T OSA-14		Systematic	
39.8576	42.4329	2706T OSA-15		Systematic	
55.7879	42.4329	2706T OSA-16		Systematic	
15.9621	56.2289	2706T OSA-17		Systematic	

31.8924	56.2289	2706T OSA-18		Systematic	
47.8227	56.2289	2706T OSA-19		Systematic	
23.9273	70.0250	2706T OSA-20		Systematic	
39.8576	70.0250	2706T OSA-21		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

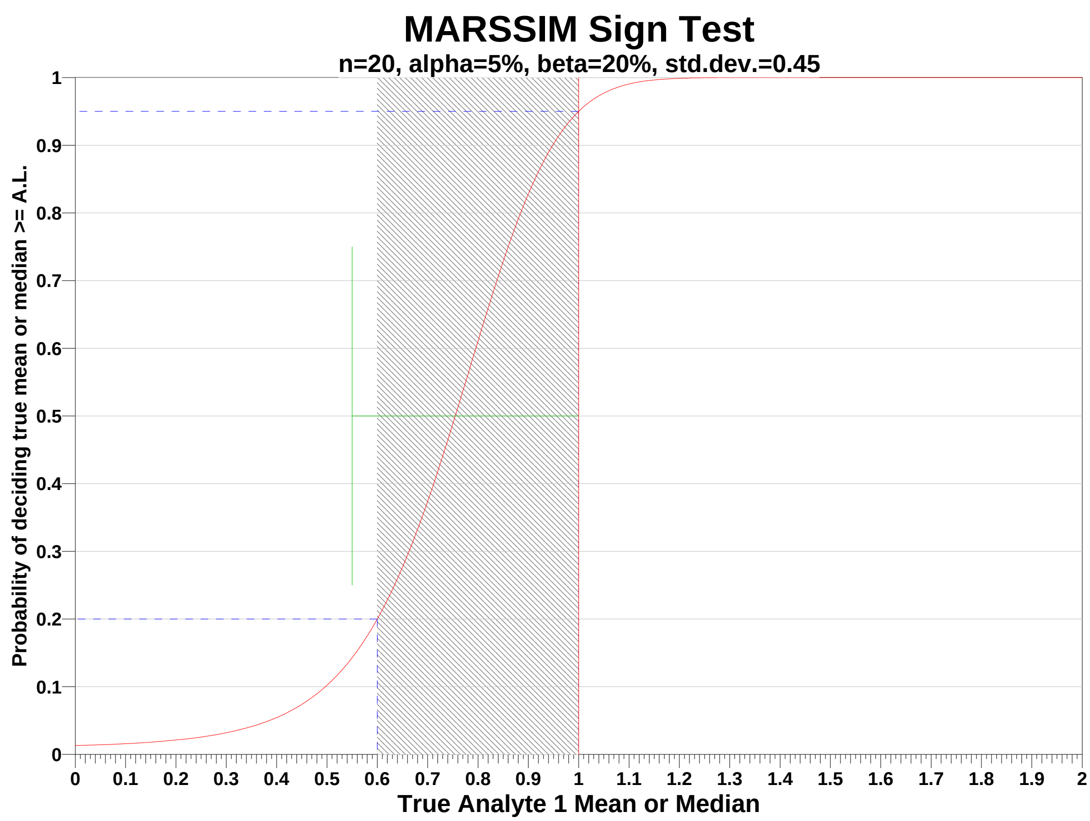
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions
The assumptions associated with the formulas for computing the number of samples are:
1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis
The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of

gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is \$0.00, which averages out to a per sample cost of \$0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**21 Samples**
Field collection costs		\$0.00	\$0.00
Analytical costs	\$0.00	\$0.00	\$0.00
Sum of Field & Analytical costs		**\$0.00**	**\$0.00**
Fixed planning and validation costs			\$0.00
Total cost			**\$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Attachment H-G.b.

2706-TA Outdoor Storage Area
Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

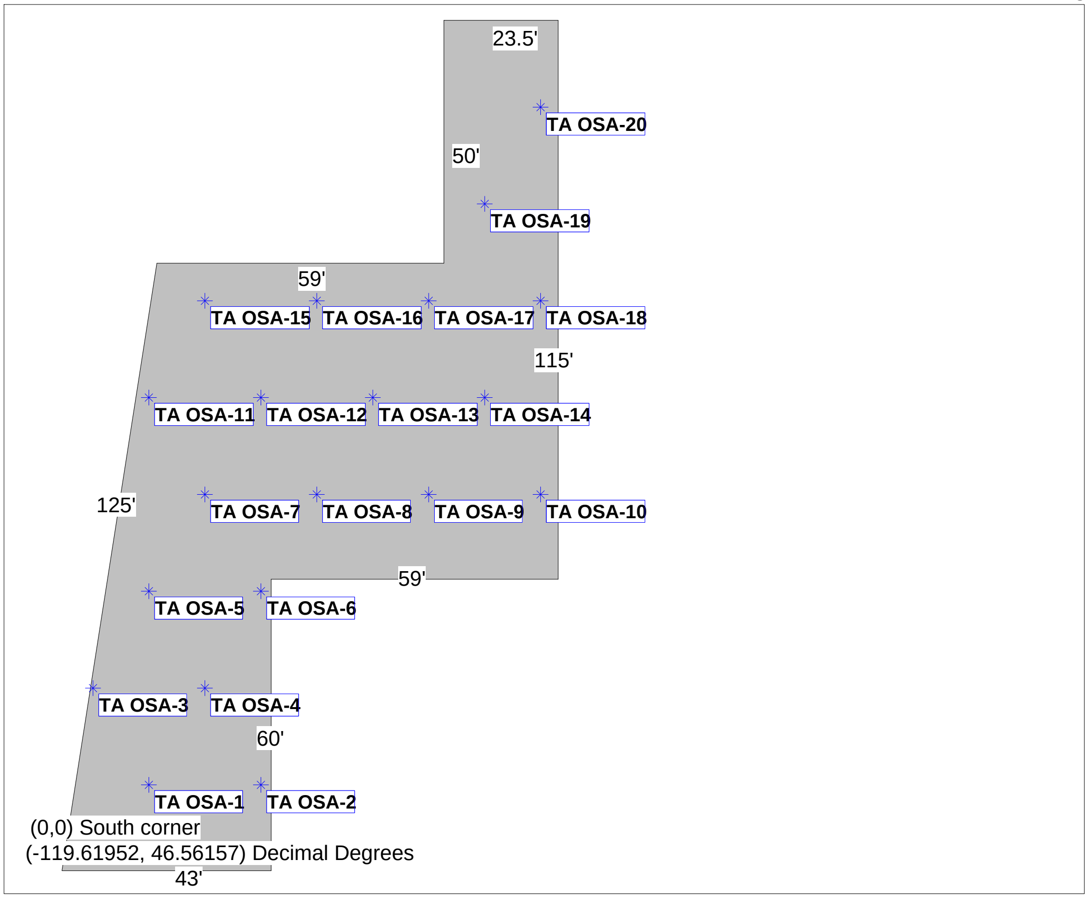
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	20
Number of selected sample areas [b]	1
Specified sampling area [c]	9166.25 ft^2
Size of grid / Area of grid cell [d]	23.0046 feet / 458.312 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 2706TA OSA					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
17.8737	17.6757	TA OSA-1		Systematic	
40.8784	17.6757	TA OSA-2		Systematic	
6.3714	37.5983	TA OSA-3		Systematic	
29.3760	37.5983	TA OSA-4		Systematic	
17.8737	57.5209	TA OSA-5		Systematic	
40.8784	57.5209	TA OSA-6		Systematic	
29.3760	77.4435	TA OSA-7		Systematic	
52.3807	77.4435	TA OSA-8		Systematic	
75.3853	77.4435	TA OSA-9		Systematic	
98.3900	77.4435	TA OSA-10		Systematic	
17.8737	97.3661	TA OSA-11		Systematic	
40.8784	97.3661	TA OSA-12		Systematic	
63.8830	97.3661	TA OSA-13		Systematic	
86.8877	97.3661	TA OSA-14		Systematic	
29.3760	117.2887	TA OSA-15		Systematic	
52.3807	117.2887	TA OSA-16		Systematic	
75.3853	117.2887	TA OSA-17		Systematic	

98.3900	117.2887	TA OSA-18		Systematic	
86.8877	137.2113	TA OSA-19		Systematic	
98.3900	157.1339	TA OSA-20		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

The values of these inputs that result in the calculated number of sampling locations are:

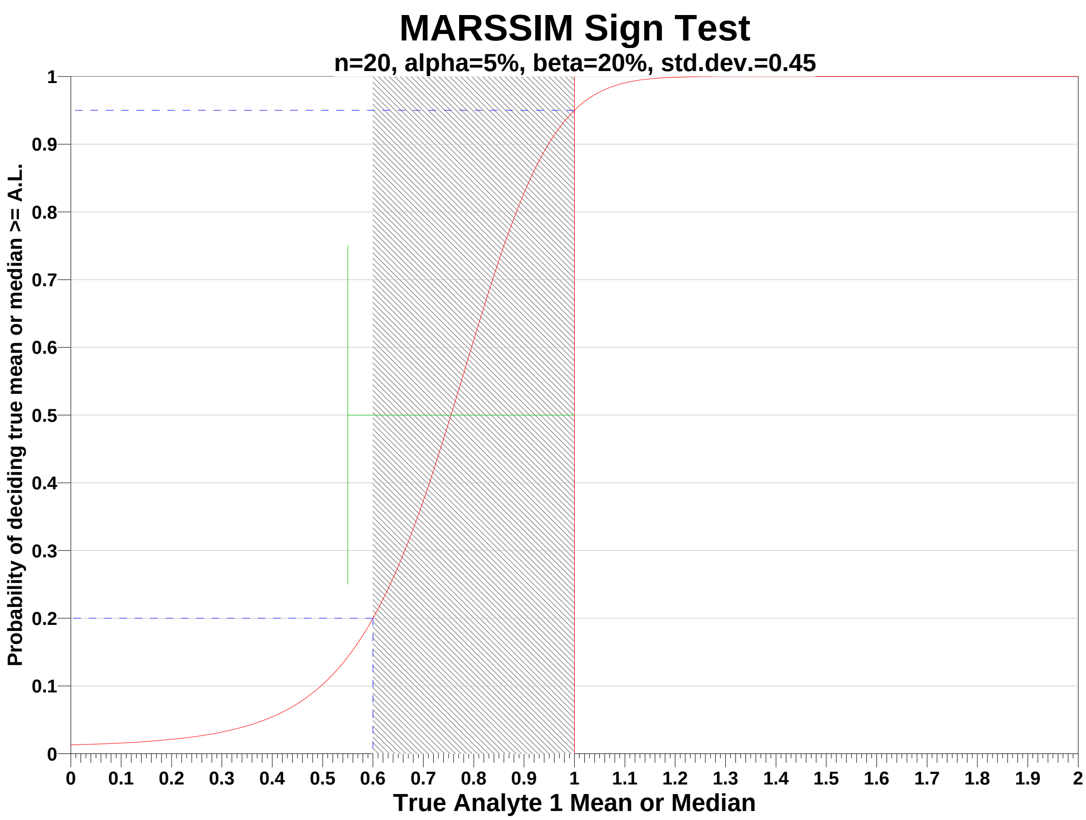
Analyte	n[a]	Parameter

	S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]	
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions
The assumptions associated with the formulas for computing the number of samples are:
1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis
The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%),

probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**20 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Appendix H-H

211-T Cage Dangerous Waste Management Unit

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Contents

Attachment

Tables

Figures

H-H1 Introduction

This appendix discusses closure activities for the T Plant Complex Operating Unit Group (OUG) (T Plant) 211-T Cage dangerous waste management unit (DWMU), hereinafter called 211-T Cage.

This plan describes in detail the closure activities necessary to establish clean closure levels for the 211-T Cage. Such closure activities include removal of all waste, records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste, visual inspection of the concrete after waste removal to evaluate the likelihood of potential contamination of the underlying soil, demolition of the 211-T Cage DWMU, and soil sampling and analysis to confirm that clean closure standards have been achieved.

Please note, the terms “mixed waste” and/or “waste”, when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

Closure of the 211-T Cage will be performed in accordance with the closure schedule provided in Section H-H4. Within 60 days upon completion of closure activities, the Permittees shall provide the Washington State Department of Ecology (Ecology) with a certification of closure in accordance with the *Washington Administrative Code* (WAC) 173-303-610(6), “Dangerous Waste Regulations,” “Closure and Post-Closure.” Closure certification will provide supportive evidence that the 211-T Cage has met established clean closure standards.

This closure plan complies with WAC 173-303-610(2) through WAC 173-303-610(6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

H-H1.1 Unit Description

The 211-T Cage, located between the 2706-T Building and 221-T Building, measures approximately 4.9 m (16 ft) wide by 7.6 m (25 ft) long, for a total footprint and available waste storage area of approximately 40 m^2 (400 ft^2) (Figure H-H1 and Figure H-H2). The 211-T Cage is a covered outdoor storage area with a locking gate and is permitted for waste container storage. The floor is constructed of concrete sealed with an epoxy coating and is split into two sections separated by a concrete berm and surrounded by an approximate 15 cm (6.0 in.) curb. The DWMU has an engineered secondary containment system and collection sump that is not connected to any piping system.

Storing containerized waste for the purpose of segregating incompatible wastes is one use of this storage area. Treatment of waste will not be conducted within this DWMU.

H-H1.1.1 Maximum Waste Inventory

The maximum storage capacity of the 211-T Cage is a total volume of 20 m^3 (20,000 L).

H-H2 Closure Performance Standard

Closure performance standards for the 211-T Cage will be based on WAC 173-303-610(2), which requires closure of the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.
- Control, minimize, or eliminate, to the extent necessary, to protect human health and the environment, post-closure escape of waste, dangerous constituents, leachate, contaminated runoff, or waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous waste activity.

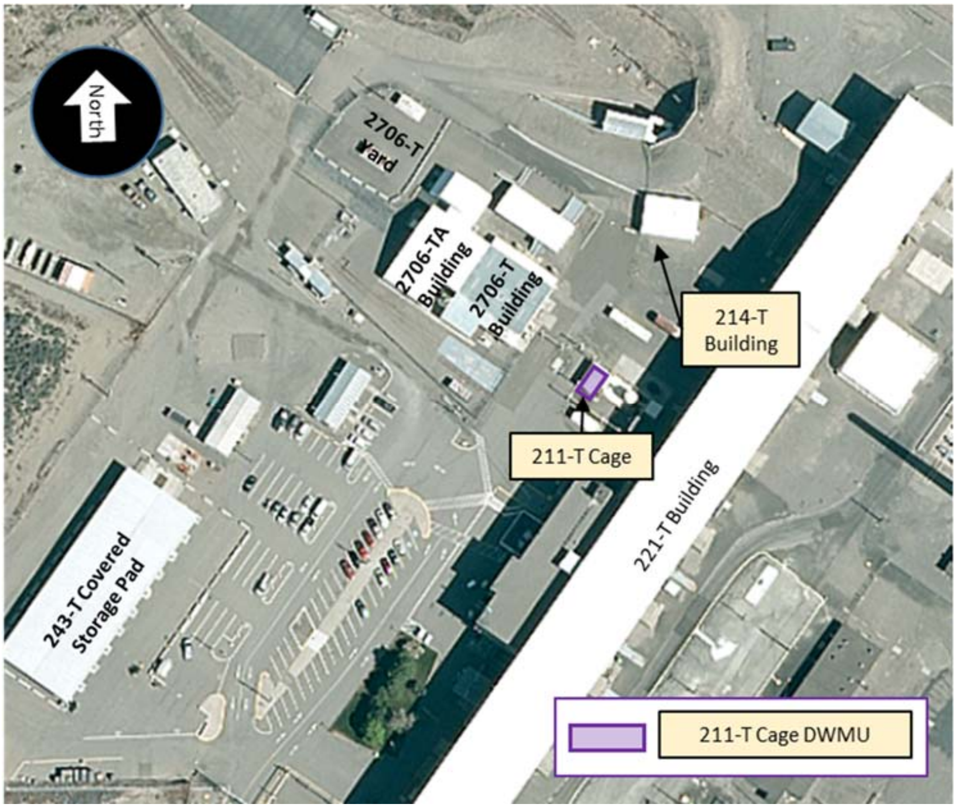

Figure H-H1. T Plant 211-T Cage (Aerial View 2012)

Figure H-H2. T Plant 211-T Cage (March 2013)

These performance standards are addressed in Sections H-H2.1 and H-H3.9 of this closure plan and furthermore identified in Table H-H4.

H-H2.1 Clean Closure Levels

The 211-T Cage will be clean closed using clean closure levels required for soil. After removal of all waste, the concrete will be visually inspected to identify any waste related staining, major cracks, crevices, seams, and low points. The steel frame, roof, fencing, and concrete will be removed and managed as a newly generated waste stream. Section H-H3.7 details waste generated during closure.

Once the concrete is removed, soil underlying the concrete will be sampled and must meet clean closure levels. In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to WAC 173-340, "Model Toxics Control Act—Cleanup," hereinafter called MTCA, cleanup regulations (WAC 173-340-700, "Overview of Cleanup Standards," through WAC 173-340-760, "Sediment Cleanup Standards," excluding WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties"). These numeric cleanup levels have been calculated according to the requirements of WAC 173-303-610(2)(b)(i), using MTCA (WAC 173-340) Method B closure performance standards for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-H4 provides MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte (Table H-H1).

A null hypothesis is generally assumed to be true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, "Definitions," for the 211-T Cage, is that the underlying soil is assumed to be above MTCA (WAC 173-340) Method B cleanup levels. Therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means that sampling and analysis results of the site indicate soil contamination below MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that the soil meets closure performance standards in accordance with MTCA (WAC 173-340) Method B.

Should sampling and analysis provide a basis that the null hypothesis can be accepted, the soil would be removed, identified as contaminated environmental media, and managed in accordance with Section H-H3.8.

H-H3 Closure Activities

The 211-T Cage will be clean closed under *Resource Conservation and Recovery Act of 1976* (RCRA), and confirmation sampling will be performed to verify that closure performance standards (Table H-H4) are met. As a waste storage unit, clean closure determinations for the 211-T Cage will be based on successfully completing the closure activities in this section. Sampling and analysis activities were developed utilizing the U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection* (QA/G-5S), and Ecology Publication 94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-H3.10.1). The objective of sampling described in this document is to determine if MTCA (WAC 173-340) Method B closure performance standards were met, demonstrating clean closure of the 211-T Cage.

The following closure activities are required to achieve and verify clean closure for soil:

- Remove all waste.

- Review waste container storage, operating, and inspection records for documented spills or releases of waste.
- Perform a visual inspection of the concrete to identify any waste related staining, major cracks, crevices, seams, and low points for purposes of focused sampling.
- Remove steel frame, roof, fencing, and concrete.
- Perform waste determination of frame, roof, fencing, and concrete waste debris.
- Complete and document disposal of the frame, roof, fencing, and concrete as newly generated waste.
- Perform sampling and analysis of soil under the concrete to confirm that clean closure standards are met.
- If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of any contaminated environmental media present.
- Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been met.
- Transmit closure certification to Ecology.

H-H3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment (PPE). Qualified personnel will be trained in applicable safety and environmental procedures and have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 to WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter referred to as the Hanford Facility RCRA Permit), describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, "Personnel Training," which provides training requirements for Hanford Facility personnel associated with the 211-T Cage.

Project-specific safety training addressed explicitly to the project and activity for the day will include the following:

- Training will provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities

- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records are maintained for each employee in an electronic training record database. The Permittees training organization maintains the training records system.

H-H3.2 Removal of Wastes and Waste Residues

All waste will be removed from the storage area. Waste will be managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal.

Waste containers meeting U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with 49 *Code of Federal Regulations* (CFR), "Transportation" criteria. Waste packaged in non-DOT regulation (large or irregular shaped) containers will be shipped in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily occur utilizing highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet the land disposal restriction (LDR) treatment standards specified in WAC 173-303-140, "Land Disposal Restrictions," which includes by reference 40 CFR 268, "Land Disposal Restrictions," then ultimately disposed of in an appropriate waste disposal facility.

While waste residues are not anticipated, if they are found during clean closure activities, they will be managed in accordance with all applicable requirements of WAC 173-303-170, "Requirements for Generators of Dangerous Waste," through WAC 173-303-230, "Special Conditions." Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-H3.3 Unit Components, Parts, and Ancillary Equipment

The 211-T Cage does not have any unit components, parts, or ancillary equipment.

H-H3.4 Inspection of Units before Decontamination

Although decontamination of the 211-T Cage is not planned, following the removal of all waste and waste residues, a visual inspection will be performed to determine the presence of cracks, holes, or other breaches in the concrete and asphalt sufficient to reach the underlying soil. These cracks, holes, or other breaches will be documented to determine focused sampling of the underlying soil during confirmation sampling.

During the closure period, the 211-T Cage will be inspected in accordance with WAC 173-303-320(2), "General Inspection," to prevent threats to human health and the environment. Inspections of the 211-T

Cage will be performed annually, until clean closure certification is accepted by Ecology, and will verify the following:

- Posted warning signs at each entrance to T Plant are present, legible, and visible at 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-H3.5 Decontamination

Decontamination of the 211-T Cage DWMU is not planned.

H-H3.6 Demolition

Once the concrete visual inspection is completed, demolition of the 211-T Cage can be initiated, which will include the following primary activities:

- Location of utilities
- Mobilization of equipment
- Removal and disposal of steel frame, roof, and fencing
- Removal and disposal of concrete.

H-H3.6.1 Location of Utilities

Prior to demolition, any in-use utilities will be located to ensure that there are no disruptions to the surrounding activities.

H-H3.6.2 Equipment Mobilization

Resources, equipment, and materials necessary to perform demolition will be staged in designated laydown areas.

H-H3.6.3 Demolition Activities for the 211-T Cage

Demolition of the 211-T Cage will be accomplished utilizing the primary method of shearing and rubblizing. Demolition of the frame, roof, and fencing will require the use of heavy equipment (e.g., excavator with various attachments). Other standard industry or conventional demolition practices also may be used (e.g., hydraulic shears with steel shear jaws, concrete pulverizer jaws, or breaker jaws). Demolition of the concrete will primarily be accomplished utilizing large equipment to rubblize the concrete.

Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and high efficiency particulate air filtered vacuum cleaners may be used. Additional storm water run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

H-H3.6.3.1 Shearing and Rubblizing

During shearing and rubblizing of the 211-T Cage, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and runoff. The shears will size reduce/cut components of the cage such as the roof, frame, fencing, and concrete flooring, while front end loaders or grapplers load the debris into roll-off containers.

Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and concrete pulverizer jaws or breaker jaws, will be used to perform any rubblizing. Debris rubble from the concrete flooring will be loaded into roll-off boxes for transportation to an approved disposal facility.

H-H3.7 Identifying and Managing Waste Generated during Closure Activities

Closure activities for the 211-T Cage will result in the generation of one known waste stream (debris from demolition) requiring management and disposal. Waste generated during closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. Newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-H3.12).

H-H3.7.1 Debris from Demolition

Debris generated from demolition will be packaged onsite and transported to an approved waste disposal facility. Debris includes, but is not limited to, the following types of wastes:

- Concrete and associated rubblized debris
- Fencing materials
- Frame and roofing materials
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)
- Equipment and construction materials.

The preferred management of debris resulting from demolition of the 211-T Cage is in a bulk form. Bulk waste will be placed into bulk containers, such as roll-off boxes, for disposal. These bulk containers will be stored in a suitable area in proximity to the DWMU or, if debris contains mixed waste, it may be accumulated for up to 90 days in another suitable location. Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

Debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Debris subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-H3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Soil surrounding the node location, which identified contamination above clean closure levels, will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU. Following removal of contaminated soil, additional confirmatory sampling will be conducted in accordance with the approved closure plan SAP to demonstrate clean closure levels. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. The contaminated soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

Management and disposal of contaminated environmental media will be documented and included with the clean closure documentation in Section H-H3.12.

H-H3.9 Confirming Clean Closure

The 211-T Cage will be clean closed. Demonstration of clean closure standards will be accomplished through removal of the steel frame, roof, fencing, and concrete and sampling and analysis of the underlying soil.

Once removal of the concrete is complete, sampling will be performed in accordance with the SAP (Section H-H3.10.1) and will consist of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where MW related staining, cracks, or other openings in the concrete may have allowed a release of MW to the underlying soil).

Once removal of the 211-T Cage is complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards (MTCA [WAC 173-340-730] Method B) have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-H3.8. Once analytical results confirm clean closure levels of the target analytes, a clean closure certification will be prepared in accordance with Section H-H3.12.

H-H3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarizes the sampling design for the 211-T Cage. After the 211-T Cage has been demolished, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-H3.10.1 Sampling and Analysis Plan

Sampling and analysis of soil underlying the concrete of the 211-T Cage will be conducted to confirm that clean closure levels have been achieved. Sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/ Chemical Methods, Third Edition; Final Update V*; ASTM (formerly the American Society for Testing and Materials) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM standards, EPA approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), at the time of closure. This SAP was also developed using Ecology Publication 94-111, Section 7.0, “Sampling and Analysis for Clean Closure,” and EPA/240/R-02/005.

H-H3.10.2 Target Analytes

The 211-T Cage is an active portion of the T Plant OUG; therefore, target analytes at closure may include any or all analytes, based on the waste codes permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV, "Description of Dangerous Wastes"). A waste management report identifying waste codes historically managed at the 211-T Cage was run to identify existing target analytes. Table H-H1 details the waste codes identified for waste containers stored at the 211-T Cage DWMU and target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the DWMU upon receipt of the final waste. A permit modification updating the SAP with specific target analytes will be submitted, as necessary, in accordance with WAC 173-303-610(3)(b), 45 days prior to the DWMU closure.

Table H-H1. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Benzene (D018) (F005)	71-43-2	Carbon Tetrachloride (D019) (F001)	56-23-5
Chloroform (D022)	67-66-3	2,4-Dinitrotoluene (D030)	121-14-2
Tetrachloroethylene (D039) (F001) (F002)	127-18-4	Trichloroethylene (F001) (F002)	79-01-6
Methylene Chloride (F001) (F002)	75-09-2	1,1,1-Trichloroethane (F001) (F002)	71-55-6
CFCs (F001) (F002)[e]	Not Applicable	1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-133) (F002)[e]	76-13-1
Chlorobenzene (F002)	108-90-7	*Ortho*-dichlorobenzene (F002)	95-50-1
Trichlorofluoromethane (CFC-11) (F002)[e]	75-69-4	1,1,2 Trichloroethane (F002)	79-00-5
Acetone (F003)	67-64-1	*n*-Butyl Alcohol (F003)	71-36-3
Ethyl Ether (F003)	60-29-7	Methyl Isobutyl Ketone (F003)	108-10-1
Xylene (F003)	1330-20-7	Ethyl Acetate (F003)	141-78-6
Ethyl Benzene (F003)	100-41-4	Cyclohexanone (F003)	108-94-1
Methanol (F003)	67-56-1	Cresol (Cresylic Acid) (F004)[a,c]	1319-77-3
m-Cresol (F004)	108-39-4	*o*-Cresol (F004)	95-48-7
p-Cresol (F004)	106-44-5	Nitrobenzene (F004)	98-95-3
Toluene (F005)	108-88-3	Carbon Disulfide (F005)	75-15-0
Isobutanol (F005)	78-83-1	Pyridine (F005)	110-86-1
2-Nitropropane (F005)[b,c]	79-46-9	2-Ethoxyethanol (F005)[d]	110-80-5
		Methyl Ethyl Ketone (F005)	78-93-3

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol, and *p*-cresol.

Table H-H1. Target Analyte List

Target Analyte (Waste Code)	CAS Number	Target Analyte (Waste Code)	CAS Number

b. The closure performance standard for 2-nitropropane was removed in the May 2014 EPA CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

c. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

d. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

e. A CFC is an organic compound that contains only carbon, chlorine, and fluorine produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

CAS = Chemical Abstracts Service

CFC = chlorinated fluorocarbon

CLARC = Cleanup Levels and Risk Calculations

EPA = U.S. Environmental Protection Agency

H-H3.10.3 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-H4.

H-H3.10.4 Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

H-H3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-H3.

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned Project Managers responsible for oversight of the 211-T Cage closure.
- **Project Manager:** The Project Manager provides oversight for activities and coordinates with the DOE Richland Operations Office (DOE-RL), EPA, Ecology, and contract management. The Project Manager (or designee) for 211-T Cage closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management on all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.
- **Environmental Compliance:** The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.

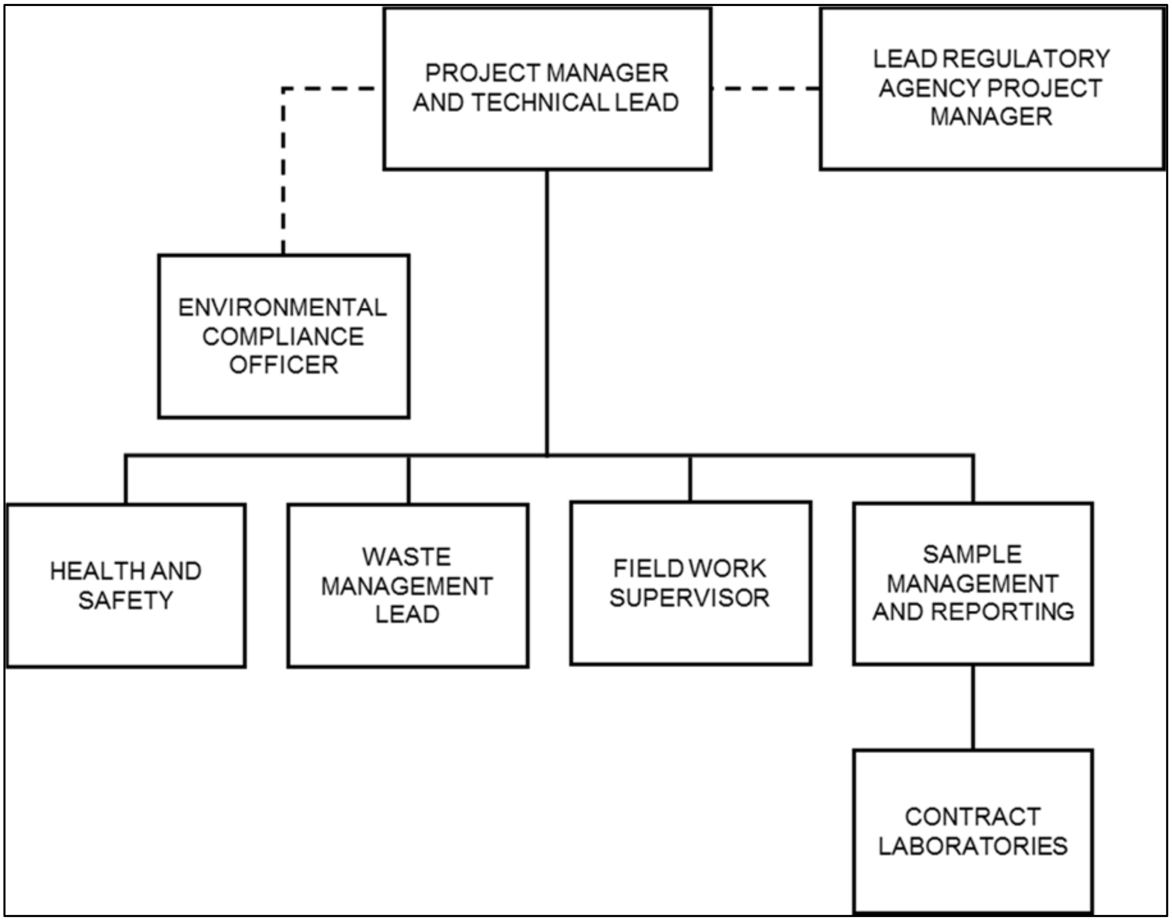

Figure H-H3. 211-T Cage Sampling and Analysis Plan Project Organization

- **Health and Safety:** The Health and Safety organization is responsible for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.
- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives analytical data from the laboratories, performs data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.
- **Contract Laboratories:** Contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation.
- **Waste Management:** The Waste Management organization communicates policies and protocols and ensures project compliance for storage, transportation, disposal, and waste tracking.

- **Field Work Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

H-H3.10.5 Sampling Design

The primary purpose of sampling 211-T Cage soil underlying the concrete is to determine if analytical data values exceed MTCA (WAC 173-340) Method B clean closure performance standards (Table H-H4).

This SAP utilized Ecology Publication 94-111 (Section 7.0) to determine the type of sampling design that will be utilized to demonstrate clean closure. When designing the sampling plan, both focused and area wide (grid) sampling methods were considered. Ecology Publication 94-111 (Section 7.2.1) identifies that area wide sampling is appropriate when the spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication 94-111 (Section 7.3, “Sampling to Determine or Confirm Clean Closure”) identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling is further defined in the following paragraph.

Area Wide (Grid) Sampling: Samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication 94-111, is selective sampling of areas where contamination is expected or releases have been documented. Once the visual inspections have been performed and any waste related staining, cracks, crevices, seams, and low points have been identified, focused sampling may be deemed necessary and added to the SAP. The location of focused samples, if any, will be identified and recorded as required in Section H-H3.12. Judgmental (focused) sampling is further defined in the following paragraph.

Judgmental (Focused) Sampling: Selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and professional judgment. Focused sampling is distinguished from probability based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined using Visual Sample Plan (VSP) software. VSP is a tool, used throughout Washington State and nationally, that statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 211-T Cage, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and utilized for input parameters for the 211-T Cage. VSP parameter inputs and the basis for those inputs, are detailed in Table H-H2.

The decision rule for demonstrating compliance with MTCA (WAC 173-340) Method B clean closure levels has three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-H2Table H-H, VSP calculated that a minimum of 21 samples is required to reject the null hypotheses with 95 percent confidence and ensure that the 211-T Cage would not be mistakenly released as clean. For the purpose of utilizing VSP software, the null hypothesis is to compare a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Sample locations were determined using the area wide grid with a random start sampling method run in VSP (Figure H-H4). Statistical analysis of systematically collected data is valid if a random start to the grid is used. The 211-T Cage dimensions were entered into VSP to determine the locations of the samples. The triangular grid sampling layout was determined to have an even distribution over the entire 211-T Cage, providing the most representative data set including coverage of the middle portion of the sampling area. The 21 samples will be taken from the node locations indicated by VSP and will be assigned sample location identifications and sample numbers using HEIS. The northwest corner of the 211-T Cage is considered the (0,0) point of the sampling location map in Attachment H-H.a.

The first node location was chosen at random by VSP, and the subsequent 20 sample locations were assigned by VSP using a triangular grid sampling method. Supporting VSP software sampling designations are documented in Attachment H-H.a.

As a conservative approach, focused sampling will be performed on the low points in both sumps in the 211-T Cage.

H-H3.10.6 Sampling Methods and Handling

The grab sample matrix will consist of soil samples collected in precleaned sample containers taken at a depth of no more than approximately 0 to 15 cm (0 to 6.0 in.) below ground surface and within an approximate 0.46 m (1.5 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer once the concrete has been removed. Subsurface sampling (samples collected at depths greater than approximately 15 cm [6.0 in.] below ground surface) will be evaluated, based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-H3.10.14.

Table H-H2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value exceeds the threshold (WAC 173-340 "Model Toxics Control Act—Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user-defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

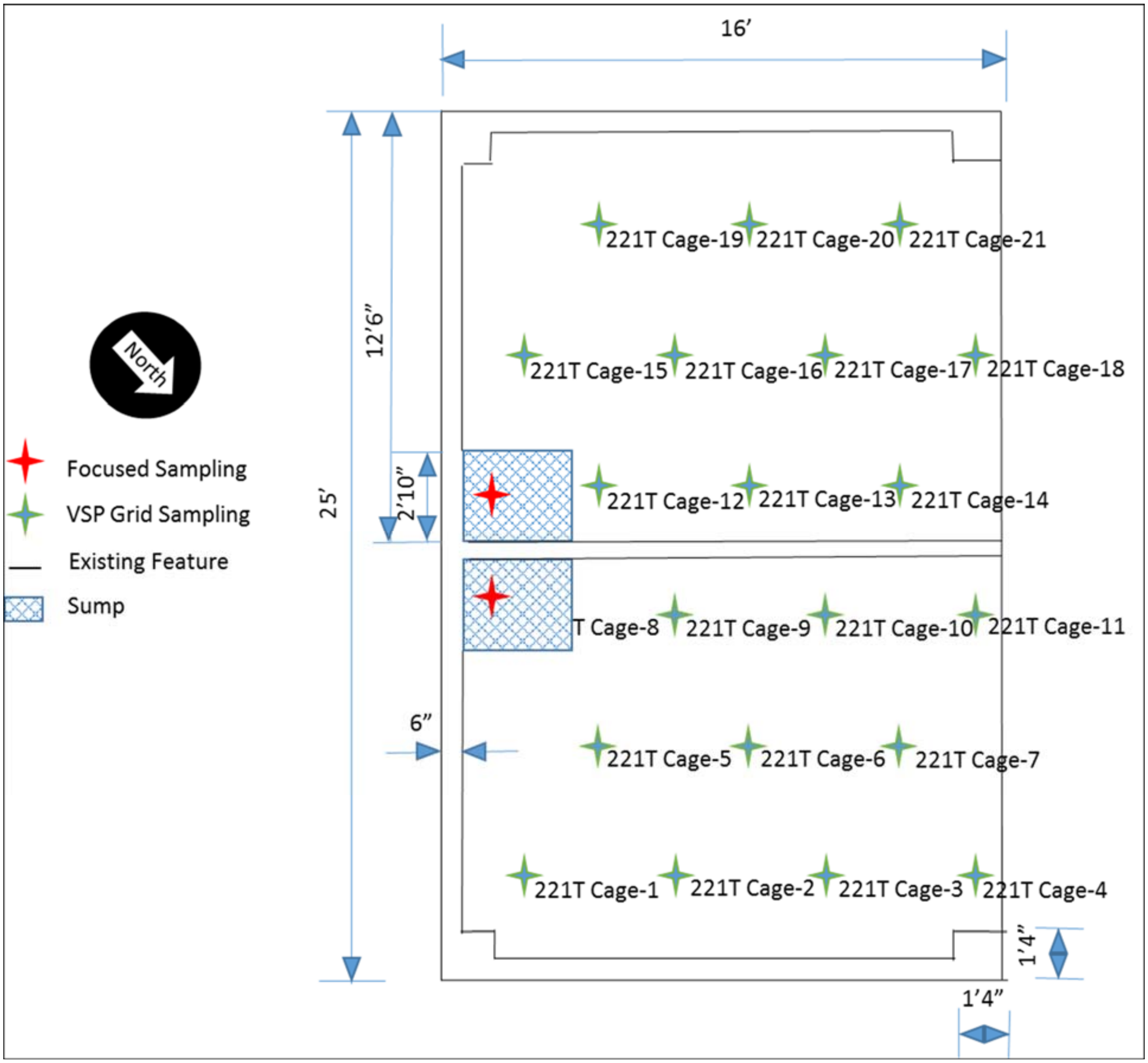

Figure H-H4. VSP Sample Locations for the 211-T Cage

Once the soil is sampled, the sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter which allows for a larger surface area to volume ratio; therefore, increasing the likelihood of identifying any potential contamination in the sample. Soil samples will be collected directly into containers at the chosen sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation
- Field walk down of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Sample container, preservation, and holding time requirements are specified in Table H-H3**Error! Reference source not found.** for soil samples. These requirements are in accordance with the analytical method specified. Final container types and volumes will be identified on the Sampling Authorization Form (SAF) and chain-of-custody form.

Table H-H3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction;24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE lined lid	250 g

AG = amber glass
EPA = U.S. Environmental Protection Agency
G = glass
GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
OES = optical emission spectrometry
P = plastic
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

To prevent potential contamination of the samples, decontaminated equipment will be used for each sampling activity.

EPA Level 1 precleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory specific volumes/requirements for meeting analytical quantitation limits.

Sample locations, depths, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or the sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- SAF and corresponding number
- HEIS number
- Sample collection date and time
- Sampler identification

- Analysis required
- Preservation method (if applicable).

Sample records also must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste generated by sampling activities subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-H3.10.7 Analytical Methods

All analyses and testing will be performed consistent with laboratory agreements, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified, and alternatives will be discussed to demonstrate clean closure levels.

Table H-H4 outlines analytical methods and performance requirements associated with the target analytes.

H-H3.10.8 Quality Control

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

Laboratory QC samples estimate the precision and bias of analytical data. Field and laboratory QC samples are summarized in Table H-H5. A data quality assessment (DQA) will be performed utilizing the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide (QA/G-9R)*, and implementing the specific requirements in Sections H-H3.10.8 through H-H3.10.10.

Data verification, data validation, and data quality assessment will include both primary samples and QC samples.

H-H3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

- Amount of data requested matches the amount of data received (number of samples for requested methods of analytes).
- Correct procedures/methods are used.
- Documentation/deliverables are complete.

- Hard copy and electronic versions of the data are identical.
- Data seem reasonable based on analytical methodologies.

H-H3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to the validators, and only additions are allowed, not changes to the raw data.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

H-H3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP software uses analytical data to determine if user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software will calculate the true standard deviation and if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-H2.1).

H-H3.10.12 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook, and only authorized persons may make entries in logbooks. Logbooks will be signed by the FWS, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

Table H-H4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (Percent Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (Percent Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+04	1.00E-02	±30	≤30
1330-20-7	Xylene	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (Percent Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30

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

Note: Due to the quantity and nature of waste stored in the 211-T Cage not presenting a threat to groundwater, and not having soil or the presence of plants within the DWMU, no groundwater or ecological indicator MTCA cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equation 740-1 and Equation 740-2 from WAC 173-340-740(3)(b) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon

MTCA = "Model Toxics Control Act—Cleanup"

Req't = requirement

WAC = Washington Administrative Code

1

Table H-H5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance, and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The laboratory control sample measures the accuracy of the analytical method.

Table H-H5. Project Quality Control Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following items will be included in the project file, as appropriate:

- All field logbooks or operational records
- Data forms
- Global positioning system data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports.

The laboratory is responsible for maintaining, and having available upon request, the following items:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-H3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

In the event that sample results based on the MTCA Method B (WAC 173-340) three-part test (Section H-H3.10.5) indicate contamination above clean closure levels, the contaminated soil will be removed in accordance with Section H-H3.7. Following removal of contaminated soil, additional samples will be taken at the same grid location identified in Attachment H-H.a. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-H3.10.12, and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-H4, with accompanying QC samples as discussed in Section H-H3.10.7 to confirm that MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-H3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary, due to unexpected events during closure that will affect sampling, a revision to the SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, "Permit Changes."

H-H3.11 Role of the Independent Qualified Registered Professional Engineer

An Independent Qualified Registered Professional Engineer (IQRPE) will be retained to provide and sign the certification of closure, as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of the 211-T Cage. At a minimum, the following field activities would be completed:

- Observation or review of 211-T Cage visual inspection
- Observation or review of demolition
- Observation or review of sampling activities
- Review sampling procedures and results
- Observation or review of contaminated environmental debris removal (as applicable)
- Verification that locations of samples are as specified in the SAP
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record his or her observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-H3.12 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 211-T Cage DWMU, certification that the DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities.
- Description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of any unanticipated contaminated environmental media.
- All laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for all samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.
- Summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.

- Description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-H3.13 Conditions that Will Be Achieved when Closure is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 211-T Cage will be clean closed. The roof, frame, fence, and concrete will be removed, so only bare soil will remain. A permit modification request will be submitted after clean closure has been confirmed to remove the 211-T Cage DWMU from the Hanford Facility RCRA Permit.

H-H4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), closure activities will be completed no more than 180 days after the start of closure (Table H-H6). Should unexpected circumstances arise and an extension to the 180 day closure activity expiration date be deemed necessary, a permit modification will be submitted to Ecology for approval at least 30 days prior to the 180 day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to human health and the environment, including compliance with all applicable permit requirements and criteria, have been and will continue to be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the 211-T Cage, as outlined in Section H-H3.12 (Figure H-H5).

Table H-H6. 211-T Cage Closure Activity Description

Closure Activity Description		
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 211-T Cage	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 211-T Cage	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--
Closure Activities		
Remove All Waste	Package and ship waste to approved treatment, storage, and disposal facility. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all dangerous wastes in accordance with the approved closure plan. Request extension if necessary.	40 Days (Day 40)
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records.	40 Days (Day 40)

Table H-H6. 211-T Cage Closure Activity Description

Closure Activity Description		
Primary Activity	**Secondary Activity**	**Duration**
Visual Inspection of Concrete	Identify areas of concern (cracks in concrete that could potentially reach the soil below the concrete).	10 Days (Day 50)
	Document visual inspection with photos, locations, and dimensions of staining and cracks.	
Remove Steel Frame, Roof, Fencing and Concrete	Remove steel frame, roof, fencing, and concrete.	70 Days (Day 120)
	Containerize steel frame, roof, fencing, and concrete waste debris.	
	Perform waste determination on waste debris.	
	Dispose of waste debris in approved disposal facility.	
Sampling and Analysis of Underlying Soil (Following Removal of Concrete, May be Performed Concurrently with Waste Determination and Disposal of Concrete)	See Section H-H3.10.1 for details of sampling and analysis.	60 Days (Day 180)
	Data validation and verification.	
	If necessary, remove contaminated environmental media (soil), and resample and analyze to confirm that clean closure levels have been achieved.	
Final Closure of the 211-T Cage	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (See Section H-H3.12 for more details on the clean closure certification)	60 Days (Day 240)

H-H5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility treatment, storage and disposal units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE and operated by DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), provisions of WAC 173-303-620, "Financial Requirements," are not applicable to the Hanford Facility.

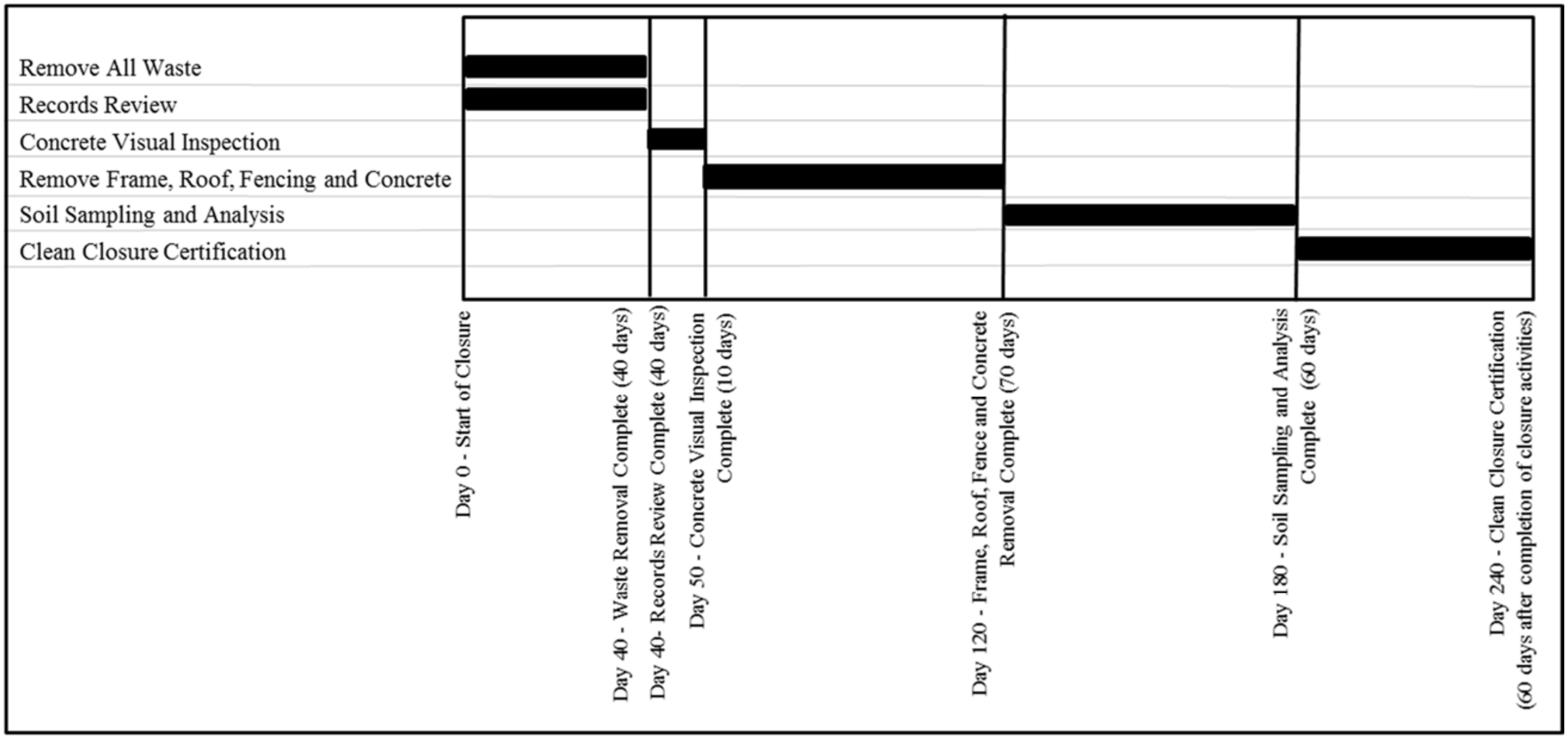

Figure H-H5. 211-T Cage Closure Schedule Activities

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Appendix H-H.a

211-T Cage Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

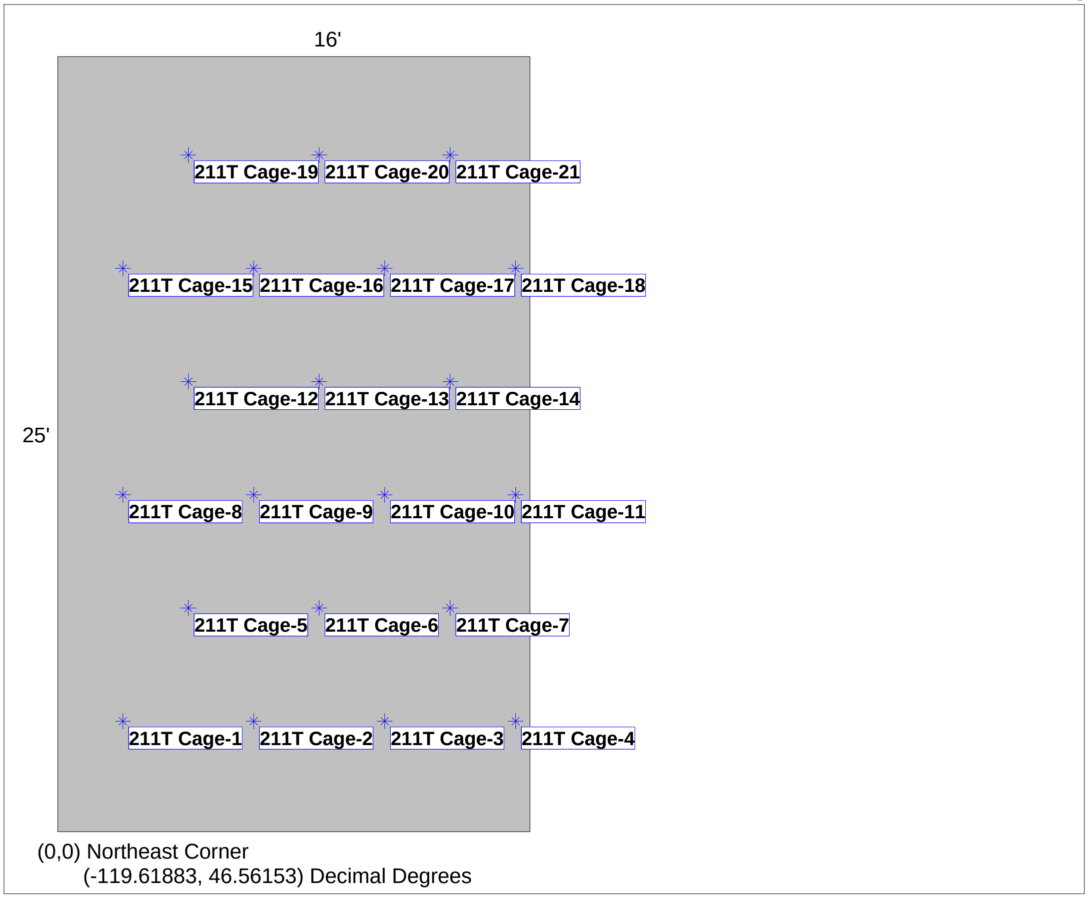
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	21
Number of selected sample areas [b]	1
Specified sampling area [c]	322.00 ft^2
Size of grid / Area of grid cell [d]	3.88052 feet / 13.041 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 211-T Cage					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
1.9303	3.2761	211T Cage-1		Systematic	
5.8108	3.2761	211T Cage-2		Systematic	
9.6914	3.2761	211T Cage-3		Systematic	
13.5719	3.2761	211T Cage-4		Systematic	
3.8706	6.6368	211T Cage-5		Systematic	
7.7511	6.6368	211T Cage-6		Systematic	
11.6316	6.6368	211T Cage-7		Systematic	
1.9303	9.9974	211T Cage-8		Systematic	
5.8108	9.9974	211T Cage-9		Systematic	
9.6914	9.9974	211T Cage-10		Systematic	
13.5719	9.9974	211T Cage-11		Systematic	
3.8706	13.3580	211T Cage-12		Systematic	
7.7511	13.3580	211T Cage-13		Systematic	
11.6316	13.3580	211T Cage-14		Systematic	
1.9303	16.7187	211T Cage-15		Systematic	
5.8108	16.7187	211T Cage-16		Systematic	
9.6914	16.7187	211T Cage-17		Systematic	

13.5719	16.7187	211T Cage-18		Systematic	
3.8706	20.0793	211T Cage-19		Systematic	
7.7511	20.0793	211T Cage-20		Systematic	
11.6316	20.0793	211T Cage-21		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty, z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

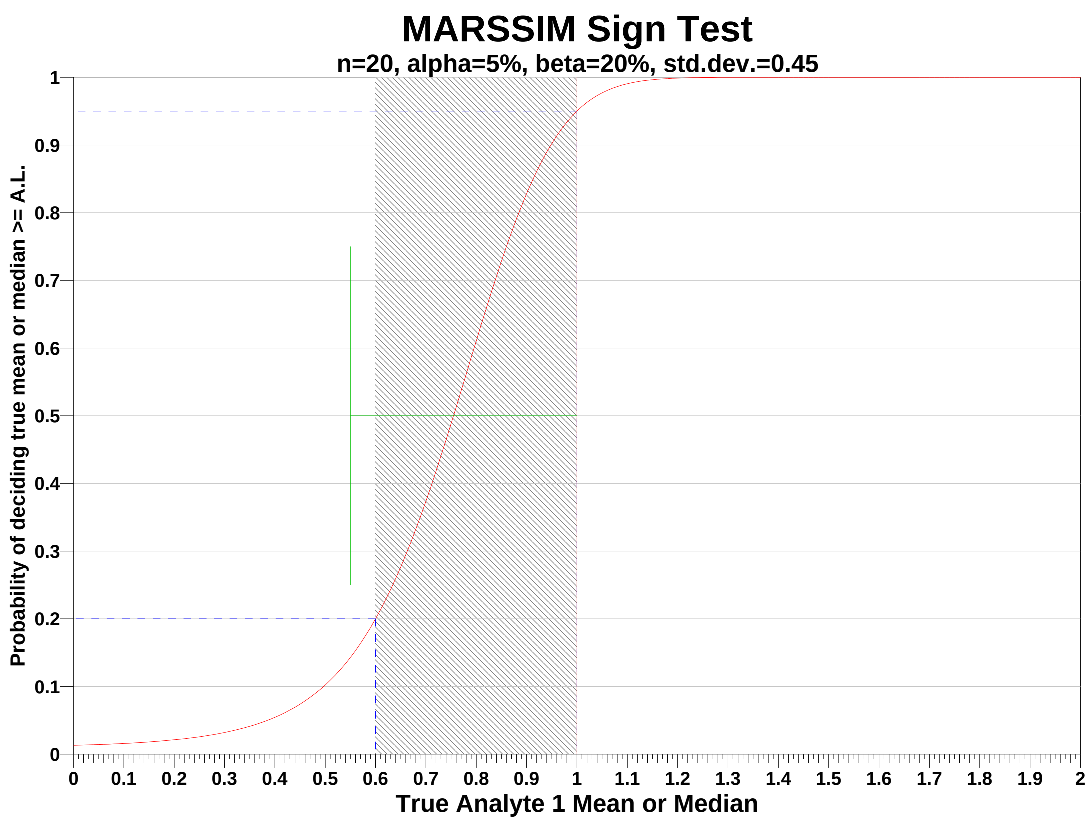
The values of these inputs that result in the calculated number of sampling locations are:

Analyte	n[a]	Parameter					
		S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of

gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%), probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**21 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Appendix H-I

243-T Covered Storage Pad Dangerous Waste Management Unit

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Contents

Attachment

Tables

Figures

H-I1 Introduction

This appendix discusses closure activities for the T Plant Complex Operating Unit Group (OUG) (T Plant) 243-T Covered Storage Pad dangerous waste management unit (DWMU), hereinafter called the 243-T Covered Storage Pad.

This plan describes in detail the closure activities necessary to establish clean closure levels for the 243-T Covered Storage Pad. Such closure activities include removal of all waste, records review (i.e., container storage, operating, and inspection records) for documented spills or releases of waste, visual inspection of the concrete and asphalt pads after waste removal to evaluate the likelihood of potential contamination of the underlying soil, demolition of the 243-T Covered Storage Pad, and soil sampling and analysis to confirm that clean closure standards have been achieved.

Please note, the terms “mixed waste” and/or “waste,” when seen in this document, refer to dangerous waste or hazardous waste, as applicable.

Closure of the 243-T Covered Storage Pad will be performed in accordance with the closure schedule provided in Section H-I4. Within 60 days upon completion of closure activities, the Permittees’ shall provide the Washington State Department of Ecology (Ecology) with a certification of closure in accordance with *Washington Administrative Code* (WAC) 173-303-610(6), “Dangerous Waste Regulations,” ”Closure and Post-Closure.” Closure certification will provide supportive evidence that the 243-T Covered Storage Pad has met established clean closure standards.

This closure plan complies with WAC 173-303-610(2) through (6). Amendments to this closure plan will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

H-I1.1 Unit Description

The 243-T Covered Storage Pad is an irregular shaped area located west of the 221-T Building and consists of multiple measurements ranging from approximately 7.3 m (22 ft) up to 94.3 m (283 ft) for a total footprint and available waste storage area of approximately 3,100 m^2 (34,000 ft^2) (Figure H-I1 and Figure H-I2). The 243-T Covered Storage Pad consists of a covered/unenclosed outdoor storage pad and an associated uncovered storage area and is permitted for waste container storage. The pre-engineered cover is constructed with a steel frame and sheet metal roof, while the storage pad is constructed of concrete and asphalt.

The 243-T Covered Storage Pad does not have a constructed secondary containment system. Containers stored in the outside storage area that do not meet the criteria specified in WAC 173-303-630(7)(c), “Use and Management of Containers,” (e.g., waste packages that contain free liquids or exhibit characteristics of ignitability or reactivity) are placed on portable secondary containment systems. Treatment of waste will not be conducted within this DWMU.

H-I1.1.1 Maximum Waste Inventory

The maximum storage capacity of the 243-T Covered Storage Pad is a total volume of 2,063 m^3 (2,063,000 L).

H-I2 Closure Performance Standard

Closure performance standards for the 243-T Covered Storage Pad will be based on WAC 173-303-610(2), which requires closure of the facility in a manner that accomplishes the following objectives:

- Minimize the need for further maintenance.

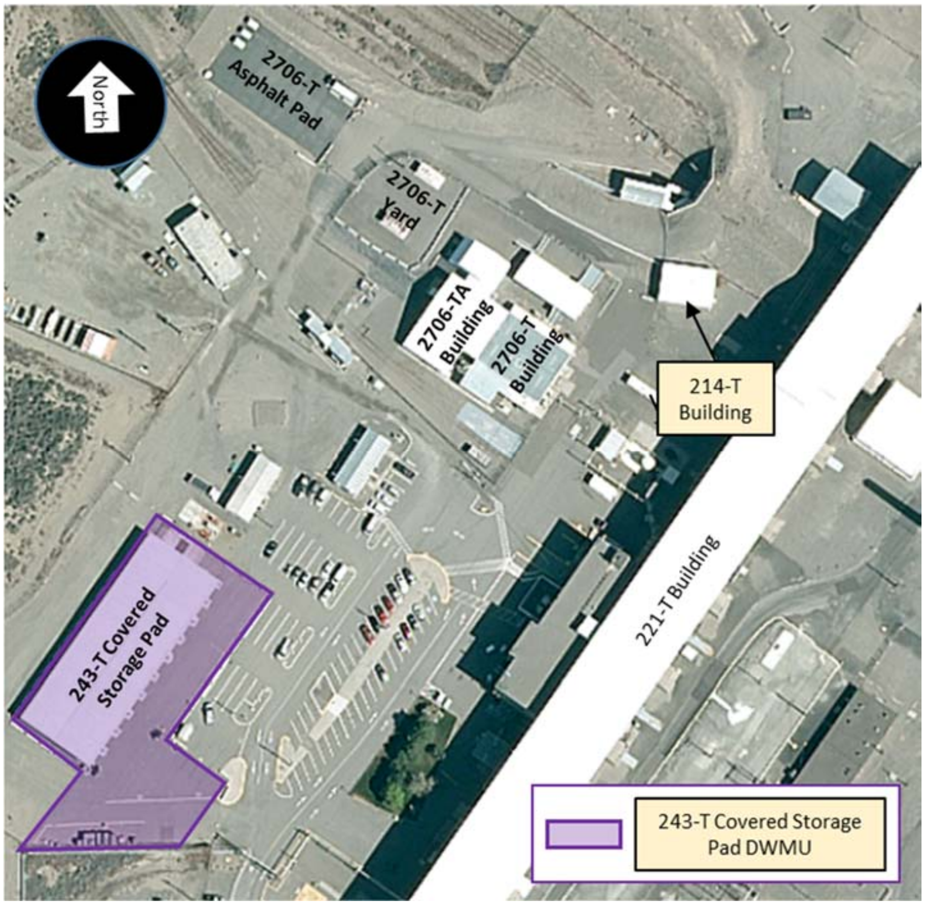

Figure H-I1. T Plant 243-T Covered Storage Pad (Aerial View 2012)

Figure H-I2. T Plant 243-T Covered Storage Pad (February 2013)

- Control, minimize, or eliminate, to the extent necessary, to protect human health and the environment (HHE), post-closure escape of waste, dangerous constituents, leachate, contaminated runoff, or waste decomposition products to the ground, surface water, groundwater, or atmosphere.
- Return the land to the appearance and use of surrounding land areas, to the degree possible, given the nature of the previous waste activity.

These performance standards are addressed in Sections H-I2.1 and H-I3.9 of this closure plan and are furthermore identified in Table H-I4.

H-I2.1 Clean Closure Levels

The 243-T Covered Storage Pad will be clean closed using clean closure levels required for soil. After removal of all waste, the concrete and asphalt pads will be visually inspected to identify any waste related staining, major cracks, crevices, seams, and low points. The steel frame, sheet metal roof, and concrete and asphalt pads will be removed and designated as a newly generated waste in accordance with WAC 173-303-610(5). Section H-I3.7 details waste generated during closure.

Once the concrete and asphalt pads are removed, soil underlying the concrete and asphalt will be sampled and must meet clean closure levels. In accordance with WAC 173-303-610(2)(b)(i), clean closure levels for soil are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to the WAC 173-340, "Model Toxics Control Act—Cleanup," hereinafter called MTCA, regulations (WAC 173-340-700, "Overview of Cleanup Standards," through WAC 173-340-760, "Sediment Cleanup Standards," excluding WAC 173-340-745, "Soil Cleanup Standards for Industrial Properties"). These numeric cleanup levels have been calculated, according to the requirements of WAC 173-303-610(2)(b)(i), using MTCA (WAC 173-340) Method B closure performance standards for soil. These cleanup levels consider carcinogens, noncarcinogens, groundwater protection, and ecological indicator values. Table H-I4 provides the MTCA (WAC 173-340) Method B closure performance standards for unrestricted use exposure assumptions for soil for each individual target analyte (Table H-I1).

A null hypothesis is generally assumed true until evidence indicates otherwise. The null hypothesis, as defined in WAC 173-340-200, "Definitions," for the 243-T Covered Storage Pad is that the soil underlying the concrete and asphalt pads are assumed to be above MTCA (WAC 173-340) Method B cleanup levels. Therefore, the site is presumed to be contaminated. Rejection of the null hypothesis means sampling and analysis results of the site indicated that soil contains contamination below the MTCA (WAC 173-340) Method B cleanup levels. Sampling and analysis will be used to determine whether the null hypothesis can be rejected, thereby confirming that the soil meets closure performance standards in accordance with MTCA (WAC 173-340) Method B.

Should sampling and analysis provide a basis that the null hypothesis can be accepted, the soil would be removed, identified as contaminated environmental media, and managed in accordance with Section H-I3.8.

H-I3 Closure Activities

The 243-T Covered Storage Pad will be clean closed under the *Resource Conservation and Recovery Act of 1976* (RCRA), and confirmation sampling will be performed to verify that closure performance standards (Table H-I4) are met. As a waste storage unit, clean closure determinations for the 243-T Covered Storage Area will be based on successfully completing the closure activities in this section. Sampling and analysis activities were developed utilizing U.S. Environmental Protection Agency (EPA) guidance document EPA/240/R-02/005, *Guidance on Choosing a Sampling Design for Environmental Data Collection (QA/G-5S)*, and Ecology Publication #94-111, *Guidance for Clean Closure of Dangerous Waste Units and Facilities*, and will be conducted via a sampling and analysis plan (SAP) (Section H-I3.10.1). The objective of the sampling described in this document is to determine if MTCA (WAC 173-340) Method B closure performance standards were met, demonstrating clean closure of the 243-T Covered Storage Pad.

The following closure activities are required to achieve and verify clean closure for soil:

- Remove all waste.
- Review waste container storage, operating, and inspection records for periods of documented spills or releases of waste.
- Perform a visual inspection of the concrete and asphalt pads to identify any waste related staining, major cracks, crevices, seams, and low points for purposes of focused sampling.
- Remove steel frame, roof, concrete, and asphalt.
- Perform waste determination of the steel frame, roof, concrete, and asphalt as newly generated waste.
- Complete and document disposal of the steel frame, roof, concrete, and asphalt as newly generated waste.
- Perform sampling and analysis of the underlying soil to confirm that clean closure standards are met.
- If contamination is detected during initial sampling efforts, remove, treat (if necessary), and dispose of any contaminated environmental media present.
- Resample, as necessary, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been met.
- Transmit closure certification to Ecology.

H-I3.1 Health and Safety Requirements

Closure will be performed in a manner to ensure the safety of personnel and the surrounding environment. Qualified personnel will perform any necessary closure activities in compliance with established safety and environmental procedures. Personnel will be equipped with appropriate personal protective equipment (PPE). Qualified personnel will be trained in applicable safety and environmental procedures and will have appropriate training and experience in sampling activities. Field operations will be performed in accordance with applicable health and safety requirements.

The Permittees have instituted training or qualification programs to meet training requirements imposed by regulations, U.S. Department of Energy (DOE) orders, and national standards such as those published by the American National Standards Institute/American Society of Mechanical Engineers. For example, the environmental, safety, and health training program provides workers with the knowledge and skills necessary to execute assigned duties safely. Attachment 5 to WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter referred to as the Hanford Facility RCRA Permit), describes specific requirements for the Hanford Facility Personnel Training program. The Permittees will comply with the T Plant Training Matrix detailed in T Plant Addendum G, “Personnel Training,” which provides training requirements for Hanford Facility personnel associated with the 243-T Covered Storage Pad.

Project-specific safety training addressed explicitly to the project and activities for the day will include the following:

- Training to provide the knowledge and skills that sampling personnel need to perform work safely and in accordance with quality assurance (QA) requirements.
- Samplers are required to be qualified in the type of sampling being performed in the field.

Pre-job briefings will be performed to evaluate activities and associated hazards by considering the following factors:

- Objective of the activities
- Individual tasks to be performed
- Hazards associated with the planned tasks
- Environment in which the job will be performed
- Facility where the job will be performed
- Equipment and material required
- Safety protocols applicable to the job
- Training requirements for individuals assigned to perform the work
- Level of management control
- Emergency contacts.

Training records for each employee are maintained in an electronic training record database. The Permittees training organization maintains the training records system.

H-I3.2 Removal of Wastes and Waste Residues

All waste will be removed from the storage area. Waste will be managed in accordance with WAC 173-303 and T Plant waste management practices. The waste will be designated (if necessary) and shipped to an approved facility for treatment, storage, and/or disposal (TSD).

Waste containers meeting U.S. Department of Transportation (DOT) requirements will be packaged and shipped in accordance with 49 *Code of Federal Regulations* (CFR), “Transportation,” criteria. Waste packaged in non-DOT regulation (large or irregular shaped) containers will be shipped in accordance with DOE/RL-2001-36, *Hanford Sitewide Transportation Safety Document*. Waste shipments primarily occur utilizing highway transportation but may also include shipping by air or rail.

Waste will be treated (if necessary) to meet the land disposal restriction (LDR) treatment standards specified in WAC 173-303-140, “Land Disposal Restrictions,” which includes by reference 40 CFR 268, “Land Disposal Restrictions,” then ultimately disposed of in an appropriate waste disposal facility.

While waste residues are not anticipated, if they are found during clean closure activities, they will be managed in accordance with all applicable requirements of WAC 173-303-170, “Requirements for Generators of Dangerous Waste,” through WAC 173-303-230, “Special Conditions.” Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-I3.3 Unit Components, Parts, and Ancillary Equipment

The 243-T Covered Storage Pad does not have any unit components, parts, or ancillary equipment.

H-I3.4 Inspection of Units Before Decontamination

Although decontamination of the 243-T Covered Storage Pad is not planned, following the removal of all waste and waste residues, a visual inspection will be performed to determine the presence of cracks, holes, or other breaches in the concrete and asphalt sufficient to reach the underlying soil. These cracks, holes, or other breaches will be documented to determine focused sampling of the underlying soil during confirmation sampling.

During the closure period to prevent threats to HHE, the 243-T Covered Storage Pad will be inspected in accordance with WAC 173-303-320(2), "General Inspection." Inspections of the 243-T Covered Storage Pad will be performed annually, until the clean closure certification is accepted by Ecology, and will verify the following:

- Posted warning signs at each entrance to T Plant are present, legible, and visible at 7.6 m (25 ft).
- No evidence of unusual conditions exists at the closing DWMU site.

H-I3.5 Decontamination

Decontamination of the 243-T Covered Storage Pad is not planned.

H-I3.6 Demolition

Once the concrete and asphalt visual inspection is completed, demolition of the 243-T Covered Storage Pad can be initiated with the following primary activities included:

- Location of utilities
- Mobilization of equipment
- Removal and disposal of steel frame and sheet metal roof
- Removal and disposal of the concrete and asphalt.

H-I3.6.1 Location of Utilities

Prior to demolition, any in-use utilities will be located to ensure that there are no disruptions to the surrounding activities.

H-I3.6.2 Equipment Mobilization

Resources, equipment, and materials necessary to perform demolition will be staged in designated laydown areas.

H-I3.6.3 Demolition Activities for the 243-T Covered Storage Pad

Demolition of the 243-T Covered Storage Pad will be accomplished utilizing the primary method of shearing and rubblizing. Demolition of the steel frame and sheet metal roof will require the use of heavy equipment (e.g., excavator with various attachments) to demolish the structures. Other standard industry or conventional demolition practices also may be used (e.g., hydraulic shears with steel shear jaws, concrete pulverizer jaws, or breaker jaws). Demolition of the concrete and asphalt will primarily be accomplished utilizing large equipment to rubblize the concrete and asphalt.

Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Water may be used to control dust generated from demolition activities. The amount of water used will be minimized to prevent ponding and run-off. While unlikely, other controls such as portable ventilation filter units and high efficiency particulate air filtered vacuum cleaners may be used. Additional storm water run-on and run-off controls may be implemented, as needed.

Crusting agents or fixatives will be applied to any disturbed portion of the demolition area and excavation site when deemed necessary. For example, if wind should arise, fixative will be applied to prevent the spread of dust particulates from the work site.

H-I3.6.3.1 Shearing and Rubblizing

During shearing and rubblizing of the 243-T Covered Storage Pad, fog cannons, fire hoses, and misters may be used to spray mist water for dust suppression. The amount of water used will be minimized to prevent ponding and run-off. The shears will size reduce/cut components of the structure, while front end loaders or grapples will load debris into roll-off containers.

Large equipment, such as an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, and concrete and asphalt pulverizer jaws or breaker jaws, will be used to perform any rubblizing. Rubble debris from the 243-T Covered Storage Pad will be loaded into roll-off boxes for transportation to the approved disposal facility.

H-I3.7 Identifying and Managing Waste Generated During Closure Activities

Closure activities for the 243-T Covered Storage Pad will result in the generation of one known waste stream (debris from demolition) requiring management and disposal. Waste generated during closure activities will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Waste generated during the closure period must be properly disposed. Newly generated waste must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230.

Management and disposal of waste generated during closure will be documented and included as part of the clean closure certification documentation (Section H-I3.12).

H-I3.7.1 Debris from Demolition

Debris generated from demolition will be packaged onsite at the 243-T Covered Storage Pad and transported to an approved waste disposal facility. Debris includes, but is not limited to, the following types of wastes:

- Asphalt and associated rubblized debris
- Concrete and associate rubblized debris
- Frame and roofing materials
- Miscellaneous waste (e.g., rubber, glass, paper, PPE, cloth, plastic, and metal)
- Equipment and construction materials.

The preferred management of debris resulting from demolition of the 243-T Covered Storage Pad is in bulk form. Bulk waste will be placed into bulk containers, such as roll-off boxes, for disposal. These bulk containers will be stored in a suitable area in proximity to the DWMU or, if debris contains mixed waste, may be accumulated for up to 90 days in another suitable location. Bulk containers of waste will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container, to eliminate the potential for materials blowing out of the bulk container.

Debris will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-I3.8 Identifying and Managing Contaminated Environmental Media

If contaminated environmental media (soil) is identified as a result of clean closure verification sampling activities (i.e., samples indicate contamination above clean closure standards), the nature and extent of contamination will be evaluated. Soil surrounding the node location which identified contamination above clean closure levels will be removed up to the diameter distance to the adjacent node locations and approximately 0.9 m (3 ft) below the surface. Contaminated soil will be removed using equipment capable of removing the quantity of material required to complete removal and clean close the DWMU. Following removal of contaminated soil, additional confirmatory sampling will be conducted in the location of the original node, which identified contamination above clean closure level in accordance with the approved closure plan SAP to demonstrate clean closure levels. This process will continue until analytical results of confirmatory soil samples prove that clean closure levels have been achieved.

Contaminated soil will be managed as a newly generated waste stream in accordance with WAC 173-303-610(5). Contaminated soil must be handled in accordance with all applicable requirements of WAC 173-303-170 through WAC 173-303-230. Contaminated soil will be containerized, labeled, and sampled (if necessary) for waste characterization. Waste subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

Management and disposal of the contaminated environmental media will be documented and included with the clean closure documentation included in Section H-I3.12.

H-I3.9 Confirming Clean Closure

The 243-T Covered Storage Pad will be clean closed. Demonstration of clean closure standards will be accomplished through removal of the steel frame, sheet metal roof, concrete, and asphalt and sampling and analysis of the underlying soil.

Once concrete and asphalt removal is complete, sampling will be performed in accordance with the SAP (Section H-I3.10.1) and will consist of random grid sampling with judgmental sampling of areas of concern identified during the visual inspection (i.e., areas where cracks or other openings in the concrete and asphalt may have allowed a release of waste to the underlying soil).

Once removal of the 243-T Covered Storage Pad is complete, confirmation sampling of the underlying soil will be conducted in accordance with the SAP to confirm that soil unrestricted use cleanup standards (MTCA [WAC 173-340-730] Method B) have been achieved. If sample results indicate contamination above clean closure levels, contaminated soil will be removed and managed in accordance with Section H-I3.8. Once analytical results confirm clean closure levels of the target analytes, a clean closure certification will be prepared in accordance with Section H-I3.12.

H-I3.10 Sampling and Analysis and Constituents to Be Analyzed

This SAP summarizes the sampling design of the 243-T Covered Storage Pad. After the 243-T Covered Storage Pad has been demolished, sampling and analysis will be performed on the underlying soil in order to demonstrate that clean closure levels have been achieved. The sampling design includes input parameters used to determine the number and location of samples.

H-I3.10.1 Sampling and Analysis Plan

Sampling and analysis of the soil underlying the concrete and asphalt pads of the 243-T Covered Storage Pad will be conducted to confirm that clean closure levels have been achieved. Sampling and analysis will be performed in accordance with the sampling and quality standards established in this closure SAP. The closure SAP details sampling and analysis procedures in accordance with SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*; ASTM International (formerly the American Society for Testing and Materials) *Annual Book of ASTM Standards*; and applicable EPA guidance. Sampling and analysis activities will meet applicable requirements of SW-846, ASTM International standards, EPA approved methods, and DOE/RL-96-68, *Hanford Analytical Services Quality Assurance Requirements Document* (HASQARD), at the time of closure. This SAP was also developed using Ecology Publication #94-111, Section 7.0, “Sampling and Analysis for Clean Closure,” and EPA/240/R-02/005.

H-I3.10.2 Target Analytes

The 243-T Covered Storage Pad is an active portion of the T Plant OUG; therefore, target analytes at closure may include any or all analytes based on the waste codes permitted in the T Plant Hanford Facility RCRA Permit Part A (Attachment B, Section XIV, “Description of Dangerous Wastes”). A waste management report identifying waste codes historically managed at the 243-T Covered Storage Pad was run to identify the existing target analytes. Table H-I1 details the waste codes identified for the waste containers stored at the 243-T Covered Storage Pad DWMU and the target analytes associated with those waste codes. Additional target analytes may be identified upon review of the waste tracking records for the DWMU upon receipt of the final waste. A permit modification updating the SAP with specific target analytes will be submitted as necessary 45 days prior to DWMU closure in accordance with WAC 173-303-610(3)(b).

Table H-I1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Arsenic (D004)	7440-38-2	Barium (D005)	7440-39-3
Cadmium (D006)	7440-43-9	Chromium (Hexavalent) (D007)	18540-29-9
Lead (D008)	7439-92-1	Mercury (D009)	7439-97-6
Selenium (D010)	7782-49-2	Silver (D011)	7440-22-4
Benzene (D018) (F005)	71-43-2	Carbon Tetrachloride (D019) (F001)	56-23-5
Chlorobenzene (D021) (F002)	108-90-7	Chloroform (D022)	67-66-3
1,4-Dichlorobenzene (D027)	106-46-7	1,2-Dichloroethane (D028)	107-06-2
1,1-Dichloroethylene (D029)	75-35-4	2,4-Dinitrotoluene (D030)	121-14-2
Hexachlorobutadiene (D033)	87-68-3	Hexachloroethane (D034)	67-72-1
Methyl Ethyl Ketone (D035) (F005)	78-93-3	Pentachlorophenol (D037)	87-86-5
Tetrachloroethylene (D039) (F001) (F002)	127-18-4	Trichloroethylene (D040) (F001) (F002)	79-01-6

Table H-I1. Target Analyte List

Target Analyte (Waste Code)	Chemical Abstracts Service Number	Target Analyte (Waste Code)	Chemical Abstracts Service Number
Vinyl Chloride (D043)	75-01-4	Methylene Chloride (F001) (F002)	75-09-2
1,1,1-Trichloroethane (F001) (F002)	71-55-6	CFCs (F001) (F002)[e]	Not Applicable
1,1,2-Trichloro-1,2,2-trifluoroethane (CFC-133) (F002)[e]	76-13-1	*Ortho*-Dichlorobenzene (F002)	95-50-1
Trichlorofluoromethane (CFC-11) (F002)[e]	75-69-4	1,1,2 Trichloroethane (F002)	79-00-5
Acetone (F003)	67-64-1	*n*-Butyl Alcohol (F003)	71-36-3
Ethyl Ether (F003)	60-29-7	Methyl Isobutyl Ketone (F003)	108-10-1
Xylene (F003)	1330-20-7	Ethyl Acetate (F003)	141-78-6
Ethyl Benzene (F003)	100-41-4	Cyclohexanone (F003)	108-94-1
Methanol (F003)	67-56-1	Cresol (Cresylic Acid) (F004)[a,c]	1319-77-3
m-Cresol (F004)	108-39-4	*o*-Cresol (F004)	95-48-7
p-Cresol (F004)	106-44-5	Nitrobenzene (F004)	98-95-3
Toluene (F005)	108-88-3	Carbon Disulfide (F005)	75-15-0
Isobutanol (F005)	78-83-1	Pyridine (F005)	110-86-1
2-Nitropropane (F005)[b,c]	79-46-9	2-Ethoxyethanol (F005)[d]	110-80-5

a. The closure performance standard for cresol will be achieved through analysis of its three isomeric forms: *o*-cresol, *m*-cresol, and *p*-cresol.

b. The closure performance standard for 2-nitropropane was removed in the May 2014 EPA CLARC table updates; therefore, this analyte will not be analyzed for due to the unavailability of a closure performance standard.

c. This analyte is removed from further consideration because it is not listed in the EPA CLARC tables.

d. Due to the extremely short half-life of 2-ethoxyethanol (between 168 hours and 672 hours), its presence in soil samples is highly unlikely; therefore, samples will not be analyzed for 2-ethoxyethanol.

e. CFC is an organic compound that contains only carbon, chlorine, and fluorine, produced as a volatile derivative of methane, ethane, and propane. Examples of CFCs include 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-133) and trifluoromethane (CFC-11).

CFC = chlorinated fluorocarbon

CLARC = Cleanup Levels and Risk Calculations

EPA = U.S. Environmental Protection Agency

H-I3.10.3 SAP Schedule

Confirmation closure sampling and analysis will be performed in accordance with the closure plan schedule in Section H-I4.

H-I3.10.4 Project Management

The following subsections address project management and ensure that the project has defined goals, participants understand the goals and approaches used, and planned outputs are appropriately documented. Project management roles and responsibilities discussed in this section apply to the major activities covered under the SAP.

H-I3.10.4.1 Project/Task Organization

The Permittee is responsible for planning, coordinating, sampling, preparing, packaging, and shipping samples to the laboratory. The project organization (regarding sampling and characterization) is described in the following subsections and shown graphically in Figure H-I3.

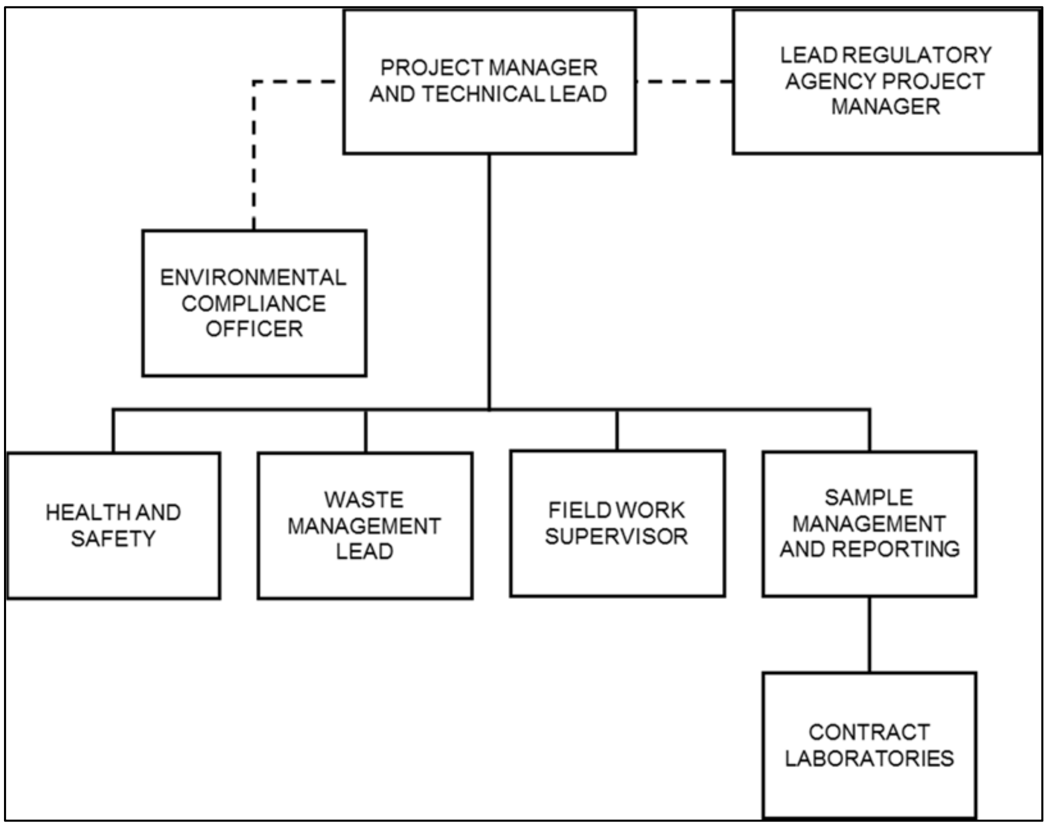

Figure H-I3. 243-T Covered Storage Pad Sampling and Analysis Plan Project Organization

The project has several key positions, including the following:

- **Lead Regulatory Agency Project Manager:** Ecology has assigned Project Managers responsible for oversight for the 243-T Covered Storage Pad closure.
- **Project Manager:** The Project Manager provides oversight for activities and coordinates with the DOE Richland Operations Office (DOE-RL), EPA, Ecology, and contract management. The Project Manager (or designee) for the 243-T Covered Storage Pad closure sampling is responsible for direct management of sampling documents and requirements, field activities, and subcontracted tasks. The Project Manager is responsible for ensuring that the project personnel are working to the current version of the SAP. The Project Manager works closely with Health and Safety and the Field Work Supervisor (FWS) to integrate these and other lead disciplines in planning and implementing the work scope. The Project Manager also coordinates with DOE-RL and the primary contractor management

on all sampling activities. The Project Manager supports DOE-RL in coordinating sampling activities with the regulators.

- **Environmental Compliance:** The Environmental Compliance Officer provides technical oversight, direction, and acceptance of project and subcontracted environmental work and develops appropriate mitigation measures with a goal of minimizing adverse environmental impacts.
- **Health and Safety:** The Health and Safety organization is responsible for coordinating industrial safety and health support within the project, as carried out through health and safety plans, job hazard analyses, and other pertinent safety documents required by federal regulation or by internal primary contractor work requirements.
- **Sample Management and Reporting:** The Permittee's sampling organization coordinates field sampling as well as laboratory analytical work, ensuring that laboratories conform to Hanford Site internal laboratory QA requirements (or their equivalent), as approved by DOE-RL, EPA, and Ecology. The sampling organization receives the analytical data from the laboratories, performs data entry into the Hanford Environmental Information System (HEIS) database, and arranges for data validation. The sampling organization is responsible for informing the Project Manager of any issues reported by the analytical laboratory.
- **Contract Laboratories:** The contract laboratories analyze samples in accordance with established procedures and provide necessary sample reports and explanation of results in support of data validation.
- **Waste Management:** The Waste Management organization communicates policies and protocols and ensures project compliance for storage, transportation, disposal, and waste tracking.
- **Fieldwork Supervisor:** The FWS is responsible for planning and coordinating field sampling resources. The FWS ensures that samplers are appropriately trained and available. Additional related responsibilities include ensuring that the sampling design is understood and can be performed as specified.

H-I3.10.5 Sampling Design

The primary purpose of sampling the 243-T Covered Storage Pad underlying soil is to determine if analytical data values exceed MTCA (WAC 173-340) Method B clean closure performance standards (Table H-I4).

This SAP utilized Ecology Publication #94-111, Section 7.0, to determine the type of sampling design that will be utilized to demonstrate clean closure. When designing the sampling plan, both focused and area wide (grid) sampling methods were considered. Ecology Publication #94-111, Section 7.2.1, identifies that area wide sampling is appropriate when the spatial distribution of contamination at or from the closure unit is uncertain. Ecology Publication #94-111, Section 7.3, "Sampling to Determine or Confirm Clean Closure," identifies the area wide sampling approach as generally appropriate for sampling to determine or confirm that clean closure levels are achieved. Area wide (grid) sampling is further defined in the following paragraph.

Area Wide (Grid) Sampling. Samples are collected at regularly spaced intervals over space or time. An initial location or time is chosen at random, and the remaining sampling locations are defined so that locations are at regular intervals over an area (grid). Grid sampling is used to search for hot spots and to infer means, percentiles, or other parameters. It is useful for estimating spatial patterns or trends over time. This design provides a practical method for designating sample locations and ensures uniform coverage of a site, unit, or process.

Focused sampling, as identified in Section 7.2.2 of Ecology Publication #94-111, is selective sampling of areas where contamination is expected or releases have been documented. Once visual inspections have been performed and any waste related staining, cracks, crevices, seams, and low points have been identified, focused sampling may be deemed necessary and added to the SAP. The location of focused samples, if any, will be identified and recorded as required in Section H-I3.12. Judgmental (focused) sampling is further defined in the following paragraph.

Judgmental (Focused) Sampling. Selection of sampling units (i.e., the number and location and/or timing of collecting samples) is based on knowledge of the feature or condition under investigation and on professional judgment. Focused sampling is distinguished from probability based sampling in that inferences are based on professional judgment, not statistical scientific theory. Therefore, conclusions about the target population are limited and depend entirely on the validity and accuracy of professional judgment. Probabilistic statements about parameters are not possible.

The number and location of area wide samples were determined using Visual Sample Plan (VSP) software. The VSP tool, used throughout Washington State and nationally, statistically determines the quantity of samples required to accept or reject the null hypothesis based on input parameters specific to the DWMU.

Both parametric and nonparametric equations rely on assumptions about the data population. Typically, however, nonparametric equations require fewer assumptions and allow for more uncertainty about the distribution of data. Alternatively, if parametric assumptions are valid, the required number of samples is usually less than if a nonparametric equation was used. For the 243-T Covered Storage Pad, data assumptions were largely based on information obtained from a grouping of similar waste sites with the same type of constituents. Parameters from the 200-MG-1 waste sites were approved by Ecology in the SAP (DOE/RL-2009-60, *Sampling and Analysis Plan for Selected 200-MG-1 Operable Unit Waste Sites*), evaluated, deemed appropriate, and utilized for the input parameters for 243-T Covered Storage Pad. VSP parameter inputs and the basis for those inputs are detailed in Table H-I2.

The decision rule for demonstrating compliance with the MTCA (WAC 173-340) Method B clean closure level has the three parts:

- The 95 percent upper confidence limit on the true data mean must be less than the MTCA (WAC 173-340) Method B clean closure level.
- No sample concentration can be more than twice the cleanup level.
- Less than 10 percent of the samples can exceed the cleanup level.

Using a nonparametric test and the input parameters identified in Table H-I, VSP calculated that at least 20 samples are required to reject the null hypotheses with 95 percent confidence and ensure that 243-T Covered Storage Pad would not be mistakenly released as clean. For the purpose of utilizing VSP software, the null hypothesis compares a site mean to a fixed threshold. Data will be evaluated to ensure that less than 10 percent of the individual values exceed MTCA (WAC 173-340) Method B clean closure performance standards, and no values are more than twice the cleanup level.

Table H-I2. Visual Sample Plan Parameter Inputs

Parameter	Value	Basis
Primary Objective of the Sampling Design	Compare a site mean or median to a fixed threshold	Reject the null hypothesis.
Type of Sampling Design	Nonparametric	Data are not assumed to be normally distributed.
Working Null Hypothesis	The mean value exceeds the threshold (WAC 173-340 "Model Toxics Control Act-Cleanup," Method B closure performance standards)	The null hypothesis assumes that the site is dirty requiring the sampling and analysis to demonstrate through statistical analysis that the site is clean.
Area Wide Grid Sampling Pattern	Triangular	A triangular pattern provided an even distribution of sample locations over the dangerous waste management unit.
Standard Deviation (S)	0.45	This is the assumed standard deviation value relative to a unit action level for the sampling area. The value of 0.45 is conservative, based on consideration of past verification sampling. MARSSIM suggests 0.30 as a starting point; however, 0.45 has been selected to be more conservative. (Number of samples calculated increases with higher standard deviation values relative to a unit action level.)
Delta (Δ)	0.40	This is the width of the gray region. It is a user defined value relative to a unit action level. The value of 0.40 balances unnecessary remediation cost with sampling cost.
Alpha (α)	5%	This is the acceptable error of deciding a dirty site is clean when the true mean is equal to the action level. It is a maximum error rate since dirty sites with a true mean above the action level will be easier to detect. A value of 5% was chosen as a practical balance between health risks and sampling cost.
Beta (β)	20%	This is the acceptable error of deciding a clean site is dirty when the true mean is at the lower bound of the gray region. A value of 20% was chosen during the data quality objectives process as a practical balance between unnecessary remediation cost and sampling cost.
MARSSIM Sampling Overage	20%	MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of *n*.

Reference: EPA 402-R-97-016, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*.

1

Sample locations were determined using the area wide grid with a random start sampling method run in the VSP software (Figure H-I4). Statistical analysis of systematically collected data is valid if a random start to the grid is used. The 243-T Covered Storage Pad dimensions were entered into VSP to determine locations of the samples. The triangular grid sampling layout was determined to have an even distribution over the entire 243-T Covered Storage Pad providing the most representative data set including coverage of the middle portion of the sampling area. The 20 samples will be taken from the node locations indicated by VSP and will be assigned sample location identifications and sample numbers using HEIS. The north corner of the 243-T Covered Storage Pad is considered the (0,0) point of the sampling location map in Attachment H-I.a.

The first node location was chosen at random by VSP, and the subsequent 19 sample locations were assigned by VSP using a triangular grid sampling method. Supporting documentation for VSP software sampling designations is provided in Attachment H-IH-I.a.

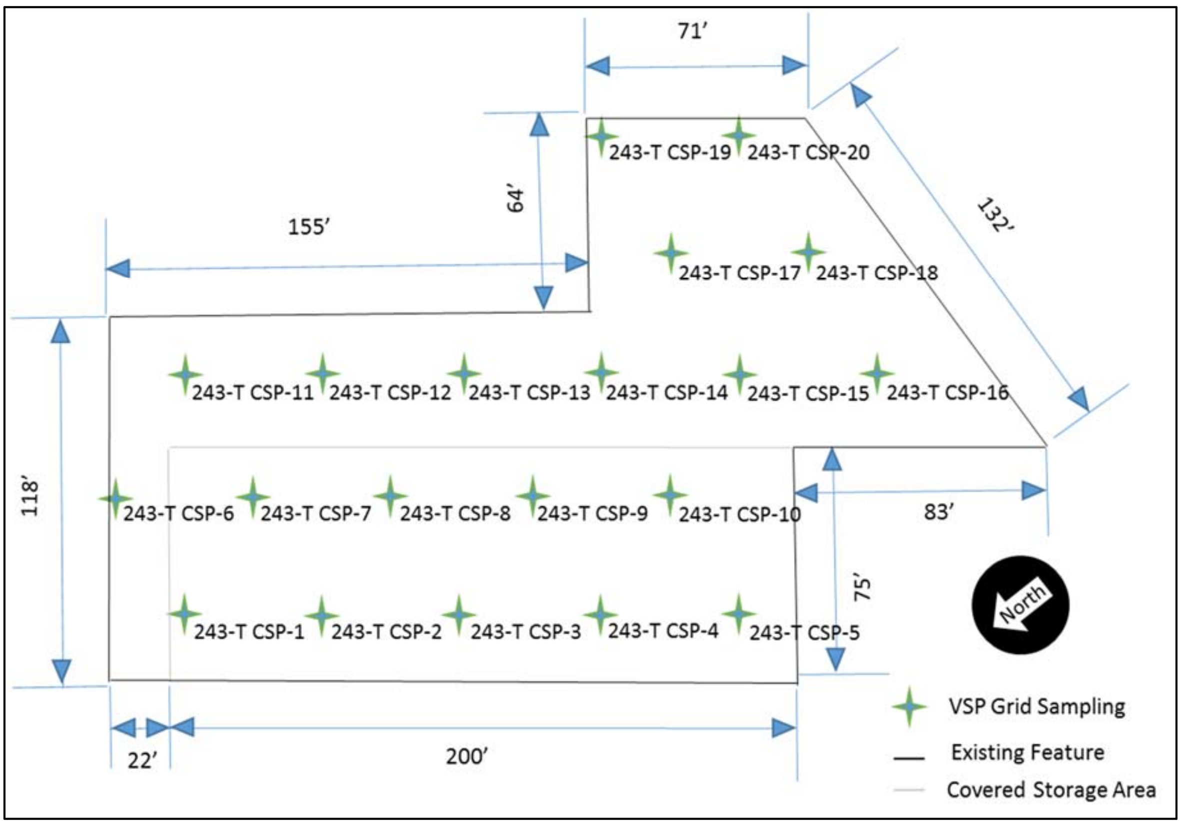

Figure H-I4. VSP Sample Locations for the 243-T Covered Storage Pad

H-I3.10.6 Sampling Methods and Handling

The sample matrix will consist of soil samples collected in precleaned sample containers taken at a depth of no more than approximately 0 to 15 cm (0 to 6.0 in.) below ground surface (bgs) and within an approximate 0.6 m (2 ft) radius surrounding the node location. For the purpose of this SAP, ground surface is defined as the exposed surface layer once the concrete and asphalt pads have been removed. Subsurface sampling (samples collected at depths greater than approximately 15 cm [6.0 in.] bgs) will be evaluated, based on results of the records review. If subsurface sampling is deemed necessary, a permit modification will be submitted in accordance with Section H-I3.10.14.

Once soil is sampled, sampled media will be screened to remove material larger than approximately 2 mm (0.08 in.) in diameter which allows for a larger surface area to volume ratio; therefore, increasing the likelihood of identifying any potential contamination in the sample. Soil samples will be collected directly into containers at the chosen sample locations. To ensure sample and data usability, sampling will be performed in accordance with established sampling practices, procedures, and requirements pertaining to sample collection, collection equipment, and sample handling. Sampling generally includes the following activities:

- Generating a sample request
- Sample container and equipment preparation
- Field walkdown of sample area (includes marking sample locations)
- Sample collection
- Sample packaging, transporting, and shipping.

Container, preservation, and holding time requirements are specified in**Error! Reference source not found.** Table H-I3 for soil samples. These requirements are in accordance with the analytical method specified. The final container type and volumes will be identified on the Sampling Authorization Form (SAF) and chain-of-custody form.

Table H-I3. Preservation, Container, and Holding Time Requirements for Soil Samples

Method	Analysis/Analytes	Preservation Requirement	Holding Time	Container Type	Sample Size
EPA 6010	Metals by ICP-OES	Cool ≤6°C	180 days	G/P/PTFE	20 g
EPA 6020	Metals by ICP-MS	Cool ≤6°C	180 days	G/P	20 g
EPA 7196	Chromium (Hexavalent)	Cool ≤6°C	30 days prior to extraction; 24 hours after extraction	G/P	20 g
EPA 7471	Mercury by Cold Vapor Atomic Absorption	Cool ≤6°C	28 days	G/P/PTFE	15 g
EPA 8260	Volatile Organic Compounds by GC/MS	Cool ≤6°C	14 days	VOA vial with PTFE lined lid	5 × 40 g
EPA 8270	Semivolatile Organic Compounds by GC/MS	Cool ≤6°C	14 days prior to extraction; 40 days after extraction	AG with PTFE lined lid	250 g

AG = amber glass
EPA = U.S. Environmental Protection Agency
G = glass
GC = gas chromatography
ICP = inductively coupled plasma
MS = mass spectrometry
OES = optical emission spectrometry
P = plastic
PTFE = polytetrafluoroethylene
VOA = volatile organic analysis

To prevent potential contamination of samples, decontaminated equipment will be used for each sampling activity.

EPA Level 1 precleaned sample containers will be used for samples collected for chemical analysis. Container sizes may vary, depending on laboratory-specific volumes/requirements for meeting analytical quantitation limits.

The sample location, depth, and corresponding HEIS numbers will be documented in the sampler's field logbook. A custody seal (e.g., evidence tape) will be affixed to each sample container and/or the sample collection package in such a way as to indicate potential tampering.

Each sample container will be labeled with the following information on firmly affixed, water resistant labels:

- SAF and corresponding number
- HEIS number
- Sample collection date and time
- Sampler identification
- Analysis required
- Preservation method (if applicable).

Sample records must include the following information:

- Analysis required
- Sample location
- Matrix (e.g., soil).

Sample custody will be maintained in accordance with existing Hanford Site protocols to ensure the maintenance of sample integrity throughout the analytical process. Chain-of-custody protocols will be followed throughout sample collection, transfer, analysis, and disposal to ensure that sample integrity is maintained.

All waste generated by sampling activities subject to the LDR requirements of WAC 173-303-140, which includes by reference 40 CFR 268, will be characterized, designated, stored, and/or treated, as applicable, prior to disposal in an approved disposal facility.

H-I3.10.7 Analytical Methods

All analyses and testing will be performed consistent with laboratory agreements, laboratory analytical procedures, and HASQARD (DOE/RL-96-68). The approved laboratory must achieve the lowest practical quantitation limits (PQLs) consistent with the selected analytical method to confirm clean closure levels. If a target analyte is detected at or above the clean closure level but less than the PQL of the analytical method, Ecology will be notified and alternatives will be discussed to demonstrate clean closure levels.

Table H-I4 outlines analytical methods and performance requirements associated with the target analytes.

H-I3.10.8 Quality Control

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

Laboratory QC samples estimate the precision and bias of analytical data. Field and laboratory QC samples are summarized in Table H-I5. A data quality assessment (DQA) will be performed utilizing the guidance in EPA/240/B-06/002, *Data Quality Assessment: A Reviewer's Guide (QA/G-9R)*, and implementing the specific requirements in Sections H-I3.10.8 through H-I3.10.10.

Data verification, data validation, and DQA will include both primary samples and QC samples.

H-I3.10.9 Data Verification

Analytical results will be received from the laboratory, loaded into a database (e.g., HEIS), and verified. Verification includes, but is not limited to, the following activities:

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

H-I3.10.10 Data Validation

Data validation is performed by a third party. The laboratory supplies contract laboratory program equivalent analytical data packages intended to support data validation by the third party. The laboratory submits data packages that are supported by QC test results and raw data.

Controls are in place to preserve the data sent to the validators and allow only additions to be made, not changes to the raw data.

The format and requirements for data validation activities are based upon the most current version of USEPA-540-R-08-01, *National Functional Guidelines for Superfund Organic Methods Data Review* (OSWER 9240.1-48), and USEPA-540-R-10-011, *National Functional Guidelines for Inorganic Superfund Data Review* (OSWER 9240.1-51). As defined by the validation guidelines, 5 percent of the results will undergo Level C validation.

H-I3.10.11 Verification of VSP Input Parameters

Analytical data will be entered back into VSP. If all analytical data for a particular analyte are nondetectable, verification of VSP input parameters is not required for that analyte. VSP software uses the analytical data to determine if the user input parameters were estimated appropriately. Once analytical data are entered into VSP, the software will calculate the true standard deviation and if the null hypothesis can be rejected. If the calculated standard deviation is smaller than the estimated user input standard deviation, no additional sampling will be required. If the calculated standard deviation is larger than the estimated standard deviation, additional sampling may be required. Comparison of the maximum data value for each analyte to the clean closure standards will ensure that all individual analytes are below the action levels. Verification of the null hypothesis through VSP will determine if the mean value of the site analytical data supports rejection of the null hypothesis (Section H-I2.1).

Table H-I4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
7440-38-2	Arsenic	SW-846 Method 6020	6.67E-01	2.40E+01	2.00E-01	±30	≤30
7440-39-3	Barium	SW-846 Method 6010	--	1.60E+04	2.00E+00	±30	≤30
7440-43-9	Cadmium	SW-846 Method 6010	--	8.00E+01	5.00E-01	±30	≤30
18540-29-9	Chromium (Hexavalent)	SW-846 Method 7196	--	2.40E+02	5.00E-01	±30	≤30
7439-92-1	Lead[b]	SW-846 Method 6010	--	2.50E+02	5.00E+00	±30	≤30
7439-97-6	Mercury[d]	SW-846 Method 7471	--	2.40E+01	2.00E-01	±30	≤30
7782-49-2	Selenium	SW-846 Method 6010	--	4.00E+02	1.00E+01	±30	≤30
7440-22-4	Silver	SW-846 Method 6010	--	4.00E+02	1.00E+00	±30	≤30
71-43-2	Benzene	SW-846 Method 8260	1.82E+01	3.20E+02	5.00E-03	±30	≤30
56-23-5	Carbon Tetrachloride	SW-846 Method 8260	1.43E+01	3.20E+02	5.00E-03	±30	≤30
108-90-7	Chlorobenzene	SW-846 Method 8260	--	1.60E+03	5.00E-03	±30	≤30
67-66-3	Chloroform	SW-846 Method 8260	3.23E+01	8.00E+02	5.00E-03	±30	≤30
106-46-7	1,4-Dichlorobenzene	SW-846 Method 8270	1.85E+02	5.60E+03	3.30E-01	±30	≤30
107-06-2	1,2-Dichloroethane	SW-846 Method 8260	1.10E+01	4.80E+02	5.00E-03	±30	≤30
75-35-4	1,1-Dichloroethylene	SW-846 Method 8260	--	4.00E+03	1.00E-02	±30	≤30
121-14-2	2,4-Dinitrotoluene	SW-846 Method 8270	3.23E+00	1.60E+02	3.30E-01	±30	≤30
87-68-3	Hexachlorobutadiene	SW-846 Method 8270	1.28E+01	8.00E+01	3.30E-01	±30	≤30
67-72-1	Hexachloroethane	SW-846 Method 8270	2.50E+01	5.60E+01	5.00E-03	±30	≤30

Table H-I4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
78-93-3	Methyl Ethyl Ketone (2-Butanone)	SW-846 Method 8260	--	4.80E+04	1.00E-02	±30	≤30
87-86-5	Pentachlorophenol	SW-846 Method 8270	2.50E+00	4.00E+02	3.30E-01	±30	≤30
127-18-4	Tetrachloroethylene	SW-846 Method 8260	4.76E+02	4.80E+02	5.00E-03	±30	≤30
79-01-6	Trichloroethylene	SW-846 Method 8260	1.20E+01	4.00E+01	5.00E-03	±30	≤30
75-01-4	Vinyl Chloride	SW-846 Method 8260	1.75E+02	2.40E+02	1.00E-02	±30	≤30
75-09-2	Methylene Chloride	SW-846 Method 8260	5.00E+02	4.80E+02	5.00E-03	±30	≤30
71-55-6	1,1,1-Trichloroethane	SW-846 Method 8260	--	1.60E+05	5.00E-03	±30	≤30
76-13-1	1,1,2-Trichloro-1,2,2-Trifluoroethane (CFC-133)	SW-846 Method 8260	--	2.40E+06	1.00E-02	±30	≤30
95-50-1	*Ortho*-Dichlorobenzene (1,2-Dichlorobenzene)	SW-846 Method 8270	--	7.20E+03	3.30E-01	±30	≤30
75-69-4	Trichlorofluoromethane (CFC-11)	SW-846 Method 8260	--	2.40E+04	1.00E-02	±30	≤30
79-00-5	1,1,2-Trichloroethane	SW-846 Method 8260	1.75E+01	3.20E+02	5.00E-03	±30	≤30
67-64-1	Acetone	SW-846 Method 8260	--	7.20E+04	2.00E-02	±30	≤30
71-36-3	*n*-Butyl Alcohol (*n*-Butanol)	SW-846 Method 8260	--	8.00E+03	1.00E-01	±30	≤30
60-29-7	Ethyl Ether	SW-846 Method 8260	--	1.60E+04	5.00E-03	±30	≤30
108-10-1	Methyl Isobutyl Ketone (4-Methyl-2-Pentanone)	SW-846 Method 8260	--	6.40E+03	1.00E-02	±30	≤30

Table H-I4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			
1330-20-7	Xylene	SW-846 Method 8260	--	1.60E+04	1.00E-02	±30	≤30
141-78-6	Ethyl Acetate	SW-846 Method 8260	--	7.20E+04	5.00E+00	±30	≤30
100-41-4	Ethyl Benzene	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
108-94-1	Cyclohexanone	SW-846 Method 8260	--	4.00E+05	5.00E-02	±30	≤30
67-56-1	Methanol	SW-846 Method 8260	--	1.60E+05	1.00E+00	±30	≤30
108-39-4	*m*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
95-48-7	*o*-Cresol	SW-846 Method 8270	--	4.00E+03	3.30E-01	±30	≤30
106-44-5	*p*-Cresol	SW-846 Method 8270	--	8.00E+03	3.30E-01	±30	≤30
98-95-3	Nitrobenzene	SW-846 Method 8270	--	1.60E+02	3.30E-01	±30	≤30
108-88-3	Toluene	SW-846 Method 8260	--	6.40E+03	5.00E-03	±30	≤30
75-15-0	Carbon Disulfide	SW-846 Method 8260	--	8.00E+03	5.00E-03	±30	≤30
78-83-1	Isobutanol (Isobutyl Alcohol)	SW-846 Method 8260	--	2.40E+04	5.00E-01	±30	≤30
110-86-1	Pyridine	SW-846 Method 8260	--	8.00E+01	5.00E-03	±30	≤30

Table H-I4. Soil Analytical Performance Requirements

Chemical Abstracts Service Number	Analyte[a]	Analytical Method	Closure Performance Standard (mg/kg)		Practical Quantitation Limit (mg/kg)	Accuracy Req't (% Recovery)[c]	Precision Req't (Relative Percent Difference)[c]
			Carcinogen	Noncarcinogen			

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

Note: Due to the quantity and nature of the waste stored in the 243-T Covered Storage Pad not presenting a threat to groundwater, and not having soil or the presence of plants within the DWMU, no groundwater or ecological indicator cleanup standards (WAC 173-340-747, "Deriving Soil Concentrations for Groundwater Protection," and WAC 173-340-7490, "Terrestrial Ecological Evaluation Procedures," through WAC 173-340-7494, "Priority Contaminants of Ecological Concern") are addressed.

a. Unless otherwise noted, closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method B (unrestricted use standards). Where both carcinogen and noncarcinogen performance standards are available, the most conservative value will be used.

b. Closure performance standards are the numeric cleanup levels calculated using unrestricted use exposure assumptions according to MTCA (WAC 173-340-740) Method A (unrestricted use standards). MTCA Method A values were used when MTCA Method B values were not available.

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

d. Equations 740-1 and 740-2 from WAC 173-340-740(3)(b) are used to calculate MTCA Direct Contact Human Health soil cleanup levels. The MTCA human health direct contact soil cleanup level for mercury is calculated to be 24 mg/kg.

CFC = chlorinated fluorocarbon

DWMU = dangerous waste management

MTCA = Model Toxics Control Act—Cleanup"

Table H-I5. Project QC Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated
Field Quality Control		
Trip Blanks	One per 20 samples per media sampled One per cooler for VOCs	Trip blanks are used to assess contamination from sample containers or during transportation and storage procedures.
Field Blanks	One per cooler for VOCs	Field blanks are used to assess contamination from surrounding sources during sample collection.
Equipment Rinsate Blanks	As needed If only disposable equipment is used, then an equipment blank is not required Otherwise, one per 20 samples per analytical method per media sampled, or one per day[a]	Equipment rinsate blanks are used to measure the cleanliness of sampling equipment and effectiveness of equipment decontamination procedures.
Field Duplicates	One per batch[c], 20 samples maximum of each media sampled (soil samples)	Field duplicates are used to assess the precision of the entire data collection activity, including sampling, analysis, and site heterogeneity.
Laboratory Quality Control[b]		
Method Blanks	1 per batch[c]	Measures contamination associated with laboratory sample preparation and analysis.
Lab Duplicates	[b]	Laboratory reproducibility and precision.
Matrix Spikes	One per 20 samples[b]	The spike recovery measures the effects of interferences in the sample matrix and reflects the accuracy of the determination.
Matrix Spike Duplicates	One per 20 samples[b]	The relative percent difference between matrix spike and matrix spike duplicate measures the precision of a given analysis.
Surrogates	[b]	Surrogate standards are added prior to extraction of the sample to evaluate accuracy, method performance, and extraction efficiency.
Laboratory Control Samples	1 per batch[c]	The laboratory control sample measures the accuracy of the analytical method.

Table H-I5. Project QC Sampling Summary

Quality Control Sample Type	Frequency	Characteristics Evaluated

a. Whenever a new type of nondedicated equipment is used, an equipment blank shall be collected every time sampling occurs until it can be shown that less frequent collection of equipment blanks is adequate to monitor the decontamination procedure for the nondedicated equipment.

b. As defined in the analysis procedures.

c. Batching across projects is allowing for similar matrices.

H-I3.10.12 Documents and Records

The Project Manager is responsible for ensuring that the current version of the SAP is being used and providing any updates to field personnel. Version control is maintained by the administrative document control process. Changes to the SAP will be submitted as a permit modification in accordance with WAC 173-303-610(3)(b).

Logbooks are required for field activities. A logbook must be identified with a unique project name and number. The individual(s) responsible for logbooks will be identified in the front of the logbook, and only authorized persons may make entries in logbooks. Logbooks will be signed by the FWS, cognizant scientist/engineer, or other responsible individual. Logbooks will be permanently bound, waterproof, and ruled with sequentially numbered pages. Pages will not be removed from logbooks for any reason. Entries will be made in indelible ink. Corrections will be made by marking through the erroneous data with a single line, entering the correct data, and initialing and dating the changes.

The Project Manager is responsible for ensuring that a project file is properly maintained. The project file will contain the records or references to their storage locations. The following will be included in the project file, as appropriate:

- All field logbooks or operational records
- Data forms
- Global positioning system data
- Chain-of-custody forms
- Sample receipt records
- Inspection or assessment reports and corrective action reports
- Interim progress reports
- Final reports
- Laboratory data packages
- Verification and validation reports.

The laboratory is responsible for maintaining, and having available upon request, the following:

- Analytical logbooks
- Raw data and QC sample records
- Standard reference material and/or proficiency test sample data
- Instrument calibration information.

Records may be stored in either electronic or hard copy format. Documentation and records, regardless of medium or format, are controlled in accordance with internal work requirements and processes to ensure the accuracy and retrievability of stored records. Records required by the Tri-Party Agreement (Ecology et al., 1989, *Hanford Federal Facility Agreement and Consent Order*) will be managed in accordance with the requirements therein.

H-I3.10.13 Sampling and Analysis Requirements to Address Removal of Contaminated Soil

In the event that sample results based on the MTCA (WAC 173-340) Method B three-part test (Section H-I3.10.5) indicate contamination above clean closure levels, contaminated soil will be removed in accordance with Section H-I3.8. Following removal of contaminated soil, additional samples will be taken at the same grid location as identified in Attachment H-1.a. Additional focused sampling may be added in areas where contamination is identified. Additional focused samples will be documented, as required in Section H-I3.10.12 and provided with the closure certification. These samples will be analyzed in accordance with the methods specified in Table H-I4, with accompanying QC samples as discussed in Section H-I3.10.8, to confirm that MTCA (WAC 173-340) Method B clean closure levels have been achieved.

H-I3.10.14 Revisions to the Sampling and Analysis Plan and Constituents to Be Analyzed

If changes to the SAP are necessary due to unexpected events during closure that will affect sampling, a revision to the SAP will be submitted no later than 30 days after the unexpected event as a permit modification as required in WAC 173-303-610(3)(b)(iii) and WAC 173-303-830, "Permit Changes."

H-I3.11 Role of the Independent, Qualified, Registered, Professional Engineer

An Independent, Qualified, Registered, Professional Engineer (IQRPE) will be retained to provide certification of the closure and sign the closure certification as required by WAC 173-303-610(6). The IQRPE will be responsible for observing field activities and reviewing documents associated with closure of 243-T Covered Storage Pad. At a minimum, the following field activities would be completed:

- Observation or review of the 243-T Covered Storage Pad visual inspection
- Observation or review of demolition
- Observation or review of sampling activities
- Review sampling procedures and results
- Observation or review of contaminated environmental debris removal (as applicable)
- Verification that locations of samples are as specified in the SAP
- Verification that closure activities were performed in accordance with this closure plan.

The IQRPE will record his or her observations and reviews in a written report that will be retained in the operating record. The resulting report will be used to develop the clean closure certification, which will then be provided to Ecology.

H-I3.12 Closure Certification

In accordance with WAC 173-303-610(6), within 60 days of completion of closure of the 243-T Covered Storage Pad, a certification that the DWMU has been closed in accordance with the specifications in this closure plan will be submitted to Ecology by registered mail. The certification will be signed by the owner or operator and by an IQRPE.

Upon request by Ecology, the following information will be submitted to support the closure certification:

- All field notes and photographs related to closure activities.
- Description of any minor deviations from the approved closure plan and justification for these deviations.
- Documentation of the removal and final disposition of any unanticipated contaminated environmental media.
- All laboratory and/or field data, including sampling procedures, sampling locations, QA/QC samples, and chain-of-custody procedures for all samples and measurements, including samples and measurements taken to determine background conditions and/or determine or confirm clean closure.
- Summary report that identifies and describes the data reviewed by the IQRPE and tabulates the analytical results of samples taken to determine and confirm clean closure.
- Description of the DWMU area appearance at completion of closure, including what parts of the former unit, if any, will remain after closure.

H-I3.13 Conditions that will be Achieved when Closure is Complete

Upon confirmation of clean closure levels through sampling and analysis, the 243-T Covered Storage Pad will be clean closed. The steel frame, sheet metal roof, concrete, and asphalt will be removed, so only bare soil will remain. A permit modification request will be submitted after clean closure has been confirmed to remove the 243-T Covered Storage Pad DWMU from the Hanford Facility RCRA Permit.

H-I4 Closure Schedule and Time Frame

In accordance with WAC 173-303-610(4)(b), closure activities will be completed no more than 180 days after the start of closure (Table H-I6). Should unexpected circumstances arise and an extension to the 180 day closure activity expiration date be deemed necessary, a permit modification will be submitted to Ecology for approval at least 30 days prior to the 180 day expiration date in accordance with WAC 173-303-610(4)(c) and WAC 173-303-830, Appendix I, Section D.1.b. The extension request would also demonstrate that all steps to prevent threats to HHE, including compliance with all applicable permit requirements and criteria, have been and will continue to be taken. Closure certification will be submitted to Ecology within 60 days following completion of closure activities at the 243-T Covered Storage Pad as outlined in Section H-I3.12 (Figure H-I5).

Table H-I6. 243-T Covered Storage Pad Closure Activity Description

Closure Activity Description		
Primary Activity	**Secondary Activity**	**Duration**
Prior To Closure		
Submit Notification to Ecology of Intent to Close the 243-T Covered Storage Pad DWMU	In accordance with WAC 173-303-610(3)(c)(i), at least 45 days prior to the date on which closure is expected to begin (i.e., no later than 15 days prior to receipt last known volume of final waste).	--
Begin Closure of the 243-T Covered Storage Pad DWMU	In accordance with WAC 173-303-610(3)(c)(ii), within 30 days of receiving the last known volume of final waste.	--

Table H-I6. 243-T Covered Storage Pad Closure Activity Description

Closure Activity Description		
Primary Activity	**Secondary Activity**	**Duration**
Closure Activities		
Remove All Waste	Package and ship waste to approved treatment, storage, and disposal facility. In accordance with WAC 173-303-610(4)(a), within 90 days after the date on which each DWMU has received the last known volume of final waste, the owner/operator must treat, remove, or dispose of all dangerous wastes in accordance with the approved closure plan. Request extension if necessary.	40 Days (Day 40)
Records Review (Performed Concurrently with Waste Removal)	Perform review of daily operating records, inspection records, and spill records.	40 Days (Day 40)
Visual Inspection of Concrete and Asphalt Pads	Identify concrete and asphalt for areas of concern (cracks in concrete and asphalt that could potentially reach the soil below).	10 Days (Day 50)
	Document visual inspection with photos, locations, and dimensions of staining and cracks.	
Removal of Frame, Roof, Concrete and Asphalt	Remove frame, roof, concrete, and asphalt.	70 Days (Day 120)
	Containerize frame, roof, concrete, and asphalt waste debris.	
	Perform waste determination on waste debris.	
	Dispose of waste debris in approved disposal facility.	
Sampling and Analysis of Underlying Soil (Following Removal of Concrete and Asphalt Pads, May Be Performed Concurrently with Waste Determination and Disposal of Pads)	See Section H-I3.10 for details of sampling and analysis.	60 Days (Day 180)
	Data validation and verification.	
	If necessary, remove contaminated environmental media (soil), and resample and analyze to confirm that clean closure levels have been achieved.	
Final Closure of the 243-T Covered Storage Pad DWMU	In accordance with WAC 173-303-610(4)(b), within 180 days after the date on which the last known volume of final waste was received. Request extension if necessary.	0 Days (Day 180)
Closure Activities Complete		
Owner/Operators and IQRPE Submit Clean Closure Certification	In accordance with WAC 173-303-610(6), within 60 days of completion of closure of each DWMU; certification that the DWMU has been closed in accordance with the specifications in the approved closure plan (see Section H-I3.12 for more details on the clean closure certification).	60 Days (Day 240)

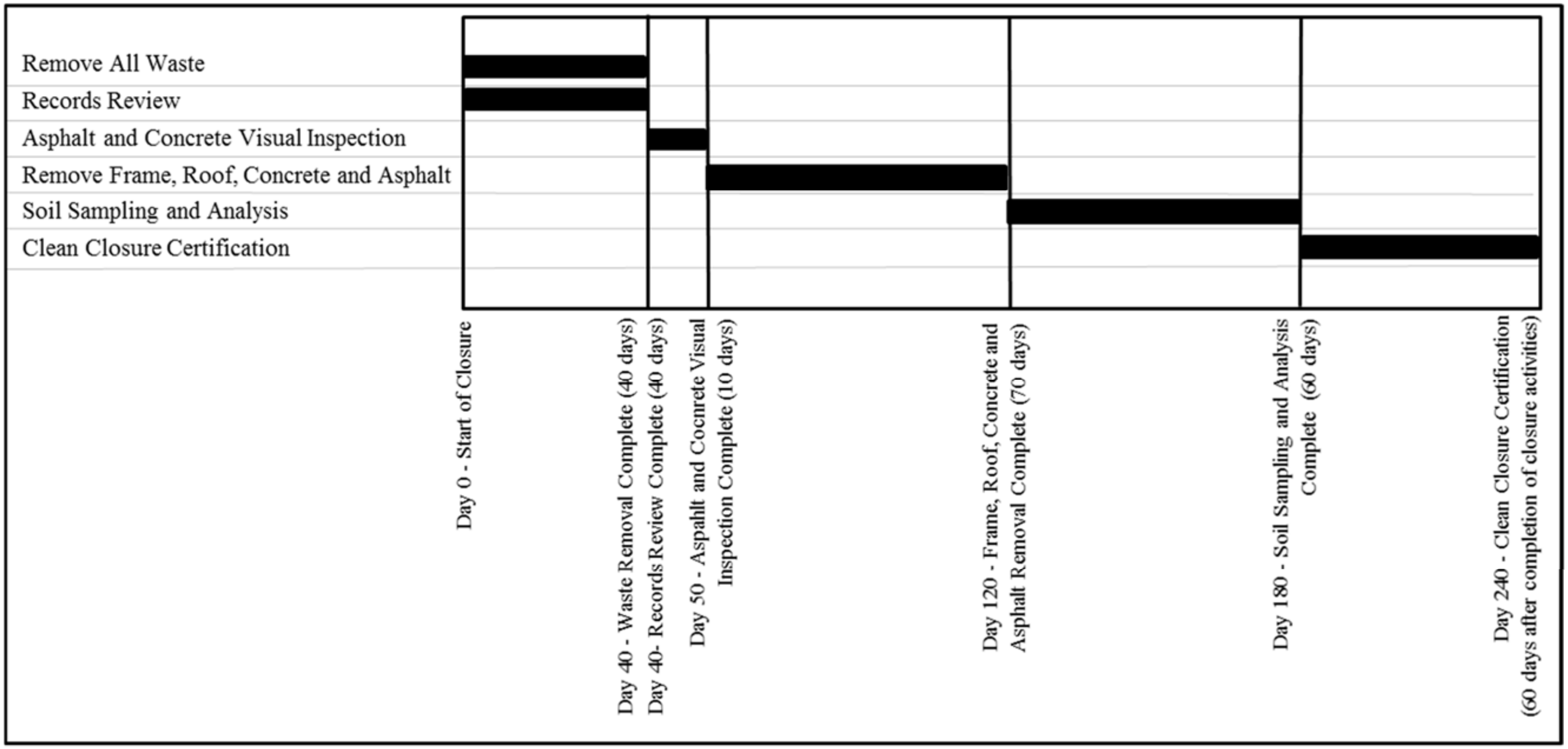

Figure H-I5. 243-T Covered Storage Pad Closure Schedule Activities

H-I5 Closure Costs

An annual report outlining updated projections of anticipated closure costs for the Hanford Facility TSD units having final status is not required per Permit Condition II.H. The Hanford Facility is owned by DOE and operated by DOE and its contractors; therefore, in accordance with WAC 173-303-620(1)(c), provisions of WAC 173-303-620, “Financial Requirements,” are not applicable to the Hanford Facility.

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Attachment H-I.a

243-T Covered Storage Pad Visual Sample Plan Supporting Documentation

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Systematic sampling locations for comparing a median with a fixed threshold (nonparametric - MARSSIM)

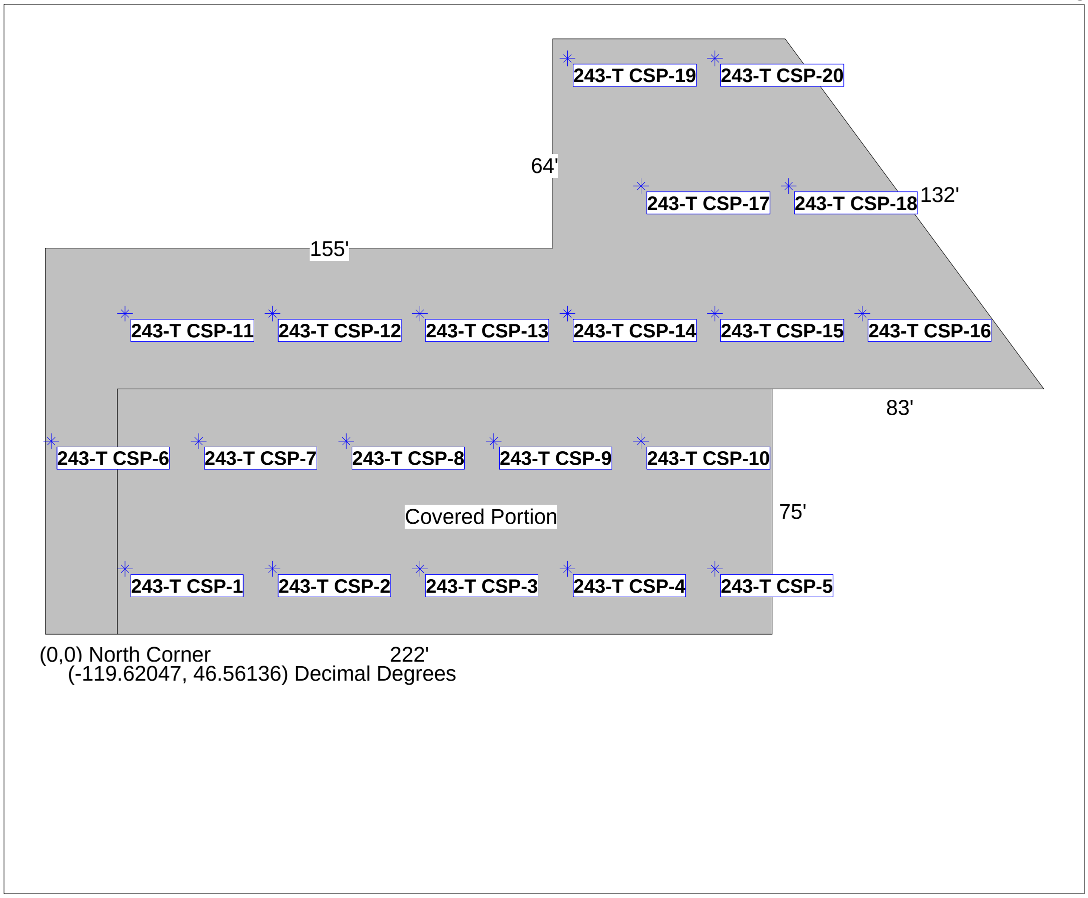
Summary

This report summarizes the sampling design used, associated statistical assumptions, as well as general guidelines for conducting post-sampling data analysis. Sampling plan components presented here include how many sampling locations to choose and where within the sampling area to collect those samples. The type of medium to sample (i.e., soil, groundwater, etc.) and how to analyze the samples (in-situ, fixed laboratory, etc.) are addressed in other sections of the sampling plan.

The following table summarizes the sampling design developed. A figure that shows sampling locations in the field and a table that lists sampling location coordinates are also provided below.

SUMMARY OF SAMPLING DESIGN	
Primary Objective of Design	Compare a site mean or median to a fixed threshold
Type of Sampling Design	Nonparametric
Sample Placement (Location) in the Field	Systematic with a random start location
Working (Null) Hypothesis	The median(mean) value at the site exceeds the threshold
Formula for calculating number of sampling locations	Sign Test - MARSSIM version
Calculated total number of samples	20
Number of samples on map [a]	20
Number of selected sample areas [b]	1
Specified sampling area [c]	35138.50 ft^2
Size of grid / Area of grid cell [d]	45.0413 feet / 1756.92 ft^2
Grid pattern	Triangular
Total cost of sampling [e]	$0.00

[a] This number may differ from the calculated number because of 1) grid edge effects, 2) adding judgment samples, or 3) selecting or unselecting sample areas.
[b] The number of selected sample areas is the number of colored areas on the map of the site. These sample areas contain the locations where samples are collected.
[c] The sampling area is the total surface area of the selected colored sample areas on the map of the site.
[d] Size of grid / Area of grid cell gives the linear and square dimensions of the grid used to systematically place samples.
[e] Including measurement analyses and fixed overhead costs. See the Cost of Sampling section for an explanation of the costs presented here.



Area: 243-T Covered Storage Pad					
X Coord	**Y Coord**	**Label**	**Value**	**Type**	**Historical**
24.3471	19.9973	243-T CSP-1		Systematic	
69.3884	19.9973	243-T CSP-2		Systematic	
114.4297	19.9973	243-T CSP-3		Systematic	
159.4711	19.9973	243-T CSP-4		Systematic	
204.5124	19.9973	243-T CSP-5		Systematic	
1.8264	59.0042	243-T CSP-6		Systematic	
46.8677	59.0042	243-T CSP-7		Systematic	
91.9091	59.0042	243-T CSP-8		Systematic	
136.9504	59.0042	243-T CSP-9		Systematic	
181.9918	59.0042	243-T CSP-10		Systematic	
24.3471	98.0112	243-T CSP-11		Systematic	
69.3884	98.0112	243-T CSP-12		Systematic	
114.4297	98.0112	243-T CSP-13		Systematic	
159.4711	98.0112	243-T CSP-14		Systematic	
204.5124	98.0112	243-T CSP-15		Systematic	
249.5538	98.0112	243-T CSP-16		Systematic	
181.9918	137.0181	243-T CSP-17		Systematic	

227.0331	137.0181	243-T CSP-18		Systematic	
159.4711	176.0250	243-T CSP-19		Systematic	
204.5124	176.0250	243-T CSP-20		Systematic	

Primary Sampling Objective
The primary purpose of sampling at this site is to compare a site median or mean value with a fixed threshold. The working hypothesis (or 'null' hypothesis) is that the median(mean) value at the site is equal to or exceeds the threshold. The alternative hypothesis is that the median(mean) value is less than the threshold. VSP calculates the number of samples required to reject the null hypothesis in favor of the alternative one, given a selected sampling approach and inputs to the associated equation.

Selected Sampling Approach
A nonparametric systematic sampling approach with a random start was used to determine the number of samples and to specify sampling locations. A nonparametric formula was chosen because the conceptual model and historical information (e.g., historical data from this site or a very similar site) indicate that typical parametric assumptions may not be true.

Both parametric and non-parametric equations rely on assumptions about the population. Typically, however, non-parametric equations require fewer assumptions and allow for more uncertainty about the statistical distribution of values at the site. The trade-off is that if the parametric assumptions are valid, the required number of samples is usually less than if a non-parametric equation was used.

Locating the sample points over a systematic grid with a random start ensures spatial coverage of the site. Statistical analyses of systematically collected data are valid if a random start to the grid is used. One disadvantage of systematically collected samples is that spatial variability or patterns may not be discovered if the grid spacing is large relative to the spatial patterns.

Number of Total Samples: Calculation Equation and Inputs
The equation used to calculate the number of samples is based on a Sign test (see PNNL 13450 for discussion). For this site, the null hypothesis is rejected in favor of the alternative one if the median(mean) is sufficiently smaller than the threshold. The number of samples to collect is calculated so that if the inputs to the equation are true, the calculated number of samples will cause the null hypothesis to be rejected.

The formula used to calculate the number of samples is:

$$n = \frac{(Z_{1-\alpha} + Z_{1-\beta})^2}{4(SignP - 0.5)^2}$$

where

$$SignP = \Phi\left(\frac{\Delta}{s_{total}}\right)$$

$\Phi(z)$ is the cumulative standard normal distribution on $(-\infty,z)$ (see PNNL-13450 for details),
n is the number of samples,
S_{total} is the estimated standard deviation of the measured values including analytical error,
Δ is the width of the gray region,
α is the acceptable probability of incorrectly concluding the site median(mean) is less than the threshold,
β is the acceptable probability of incorrectly concluding the site median(mean) exceeds the threshold,
$Z_{1-\alpha}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\alpha}$ is $1-\alpha$,
$Z_{1-\beta}$ is the value of the standard normal distribution such that the proportion of the distribution less than $Z_{1-\beta}$ is $1-\beta$.

Note: MARSSIM suggests that the number of samples should be increased by at least 20% to account for missing or unusable data and uncertainty in the calculated value of n. VSP allows a user-supplied percent overage as discussed in MARSSIM (EPA 2000, p. 5-33).

The values of these inputs that result in the calculated number of sampling locations are:

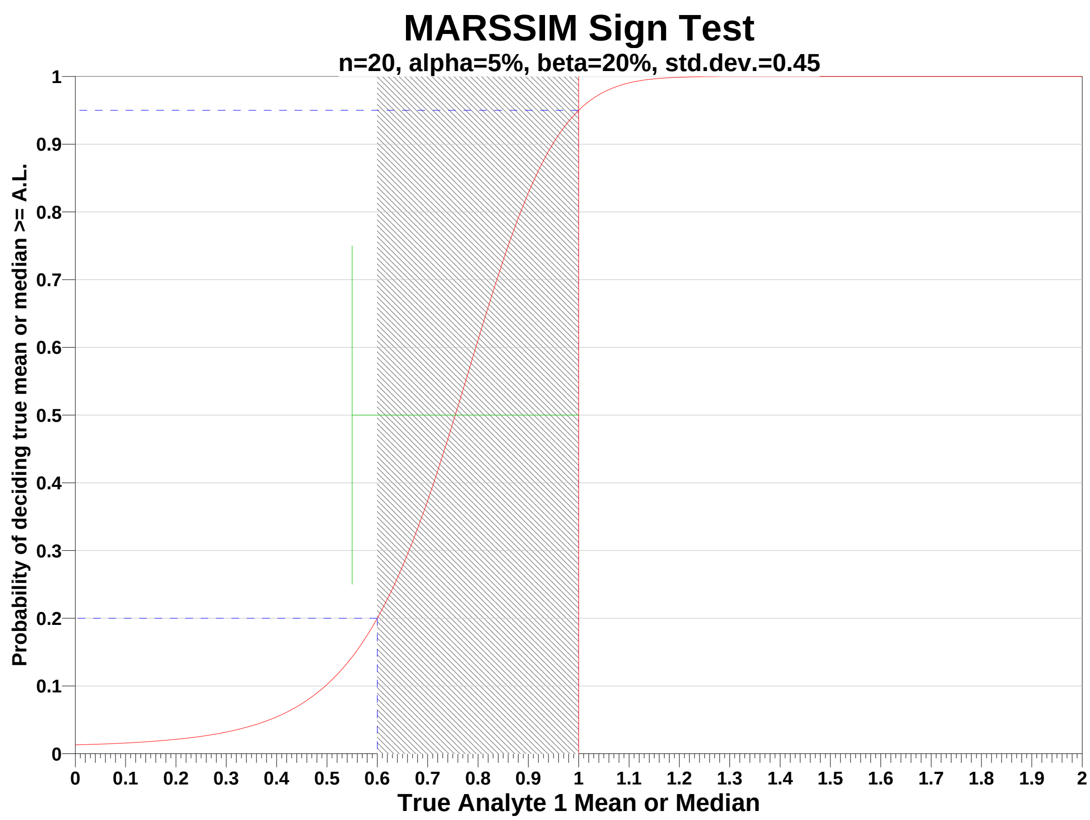
Analyte	n[a]	Parameter

	S	Δ	α	β	$Z_{1-\alpha}$ [b]	$Z_{1-\beta}$ [c]	
Analyte 1	20	0.45	0.4	0.05	0.2	1.64485	0.841621

[a] The final number of samples has been increased by the MARSSIM Overage of 20%.
[b] This value is automatically calculated by VSP based upon the user defined value of α.
[c] This value is automatically calculated by VSP based upon the user defined value of β.

The following figure is a performance goal diagram, described in EPA's QA/G-4 guidance (EPA, 2000). It shows the probability of concluding the sample area is dirty on the vertical axis versus a range of possible true median(mean) values for the site on the horizontal axis. This graph contains all of the inputs to the number of samples equation and pictorially represents the calculation.

The red vertical line is shown at the threshold (action limit) on the horizontal axis. The width of the gray shaded area is equal to Δ; the upper horizontal dashed blue line is positioned at 1-α on the vertical axis; the lower horizontal dashed blue line is positioned at β on the vertical axis. The vertical green line is positioned at one standard deviation below the threshold. The shape of the red curve corresponds to the estimates of variability. The calculated number of samples results in the curve that passes through the lower bound of Δ at β and the upper bound of Δ at 1-α. If any of the inputs change, the number of samples that result in the correct curve changes.



Statistical Assumptions

The assumptions associated with the formulas for computing the number of samples are:

1. the computed sign test statistic is normally distributed,
2. the variance estimate, S^2, is reasonable and representative of the population being sampled,
3. the population values are not spatially or temporally correlated, and
4. the sampling locations will be selected probabilistically.

The first three assumptions will be assessed in a post data collection analysis. The last assumption is valid because the gridded sample locations were selected based on a random start.

Sensitivity Analysis

The sensitivity of the calculation of number of samples was explored by varying the standard deviation, lower bound of gray region (% of action level), beta (%), probability of mistakenly concluding that μ > action level and alpha (%),

probability of mistakenly concluding that μ < action level. The following table shows the results of this analysis.

Number of Samples							
AL=1		α=5		α=10		α=15	
		s=0.9	s=0.45	s=0.9	s=0.45	s=0.9	s=0.45
LBGR=90	β=15	1103	280	825	209	659	167
	β=20	948	240	692	176	542	138
	β=25	826	209	587	149	449	114
LBGR=80	β=15	280	75	209	56	167	45
	β=20	240	64	176	47	138	36
	β=25	209	56	149	40	114	30
LBGR=70	β=15	128	36	95	27	77	22
	β=20	110	32	81	23	63	18
	β=25	95	27	69	20	52	15

s = Standard Deviation
LBGR = Lower Bound of Gray Region (% of Action Level)
β = Beta (%), Probability of mistakenly concluding that μ > action level
α = Alpha (%), Probability of mistakenly concluding that μ < action level
AL = Action Level (Threshold)

Cost of Sampling
The total cost of the completed sampling program depends on several cost inputs, some of which are fixed, and others that are based on the number of samples collected and measured. Based on the numbers of samples determined above, the estimated total cost of sampling and analysis at this site is $0.00, which averages out to a per sample cost of $0.00. The following table summarizes the inputs and resulting cost estimates.

COST INFORMATION			
Cost Details	**Per Analysis**	**Per Sample**	**20 Samples**
Field collection costs		$0.00	$0.00
Analytical costs	$0.00	$0.00	$0.00
Sum of Field & Analytical costs		**$0.00**	**$0.00**
Fixed planning and validation costs			$0.00
Total cost			**$0.00**

Recommended Data Analysis Activities
Post data collection activities generally follow those outlined in EPA's Guidance for Data Quality Assessment (EPA, 2000). The data analysts will become familiar with the context of the problem and goals for data collection and assessment. The data will be verified and validated before being subjected to statistical or other analyses. Graphical and analytical tools will be used to verify to the extent possible the assumptions of any statistical analyses that are performed as well as to achieve a general understanding of the data. The data will be assessed to determine whether they are adequate in both quality and quantity to support the primary objective of sampling.

Because the primary objective for sampling for this site is to compare the site median(mean) value with a threshold value, the data will be assessed in this context. Assuming the data are adequate, at least one statistical test will be done to perform a comparison between the data and the threshold of interest. Results of the exploratory and quantitative assessments of the data will be reported, along with conclusions that may be supported by them.

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Addendum I

Inspection Requirements

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Contents

Table

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I1 Inspection Plan

This addendum[1] describes the method(s) and schedule for inspections of the T Plant Complex (T Plant) Operating Unit Group waste treatment and storage areas. The waste received and processed by T Plant has been generated both on and off the Hanford Site.

Permittees will ensure that inspections at T Plant will meet the requirements for container storage in *Washington Administrative Code* (WAC) 173-303-630(6), "Dangerous Waste Regulations," "Use and Management of Containers," containment buildings in WAC 173-303-695, "Containment Buildings," ignitable and reactive waste in WAC 173-303-395(1)(d), "Other General Requirements," and general inspection requirements of WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter Hanford Facility RCRA Permit) Condition II.O (WAC 173-303-320, "General Inspection"). The purpose of these inspections is to minimize situations that may cause or lead to the release of dangerous waste to the environment or that might pose a threat to human health. Abnormal conditions identified by inspections will be corrected on a schedule that prevents hazards to personnel, the public, and the environment in accordance with the requirements of WAC 173-303-320(3).

Please note, the terms "mixed waste" and/or "waste", when seen in this document, refers to dangerous waste or hazardous waste, as applicable.

I1.1 General Inspection Requirements

Qualified personnel will be trained in accordance with T Plant Addendum G, "Personnel Training," to inspect T Plant waste treatment and storage areas. The content and frequency of inspections are described in the following subsections and in Table I-1.

I1.1.1 Types of Problems

Inspections are conducted to detect any signs of malfunction, deterioration, discharges, or other anomalies. Refer to Table I-1 for the types of problems looked for during an inspection. T Plant Complex inspections include, but are not limited to, the following key components:

- Safety and emergency equipment
- Security equipment
- Storage area/containers
- Containment buildings
- Secondary containment
- Ignitable waste or reactive wastes

I1.1.1.1 Frequency of Inspections

In accordance with WAC 173-303-320, the frequency of inspections for the T Plant Complex is identified in Table I-1. Areas subject to spills, such as loading and unloading areas where containers with known or suspected liquids are handled outside of secondary containment, are inspected daily when in use. Weekly inspections are performed in all areas where dangerous waste is being managed. Emergency response equipment, including spill response kits, eyewashes, safety showers, emergency communication systems, fire extinguishers, and water supplies, have various inspection frequencies based on the rate of possible deterioration of equipment and the probability of an environmental or human health event.

[1] This addendum expressly supersedes Exhibit A, Sections 1.10.2 and 1.10.3 of the Agreed Order and Stipulated Penalty No. DE10156.

I1.1.2 Inspection Log

Inspections, implemented through operating requirements, will be documented on inspection checklists and/or log sheets. Inspection checklists consist of items that will be assessed during each inspection. Any problems or discrepancies identified during the inspection are recorded on the inspection log sheet, reported to the operating organizations, and prioritized and addressed in a timely fashion as described in Section I1.1.3.

When the inspection is completed, the inspector's name is printed, including the date and time, and the inspector signs the inspection checklist and/or log sheet. Permittees will place the required documentation into the Hanford Facility Operating Record, T Plant Complex portion, as required by Hanford Facility RCRA Permit Condition II.I (WAC 173-303-380, "Facility Recordkeeping"). The schedule and inspection records will also be maintained, retained, and stored in accordance with Hanford Facility RCRA Permit Condition II.I.

I1.1.3 Schedule for Remedial Action for Problems Revealed during Inspections

In accordance with Hanford Facility RCRA Permit Condition II.O.2 [WAC 173-303-320(3)], T Plant operating organization will remedy any problems or discrepancies revealed by the inspection on a schedule that prevents hazards to human health and the environment. Where a hazard is imminent or has already occurred, immediate action will be taken, including activation of the "Contingency Plan" (T Plant Addendum J) measures, when required, as defined in Hanford Facility RCRA Permit Condition II.A.

I1.1.4 Specific Process Inspection Requirements

The following subsections detail inspections to be performed at T Plant. As stated in Section I1.1, inspections will be performed by trained and authorized operations personnel. An inspection schedule will be maintained, as identified in this Addendum (Table I-1), and inspections will be documented on inspection checklists and/or log sheets.

I1.1.4.1 General Facility

T Plant will be inspected to ensure that the general facility operating requirements are met in accordance with WAC 173-303-320. Inspection frequencies are detailed in Table I-1 and address security and emergency equipment.

I1.1.4.2 Container Inspection

Upon receipt, each container is inspected by T Plant operations personnel to confirm appropriate documentation and compliance with the requirements in T Plant Addendum B, "Waste Analysis Plan," before the container is placed within T Plant. Any discrepancies are resolved according to the requirements in T Plant Addendum B and documented on the inspection record.

While containers are in storage within T Plant, inspections will take place in accordance with WAC 173-303-630(6) and Table I-1. Inspections of active storage areas and containers are conducted weekly to detect any signs of malfunction, deterioration, discharges, or other anomalies. In accordance with WAC 173-303-320(2)(c), this inspection is repeated daily if waste management operations are being conducted and there is potential for spills to occur from activities, such as moving containers with known or suspected liquid contents outside of secondary containment (e.g., loading and unloading areas).

Waste stored in T Plant storage areas will meet the requirements for containment systems set forth in WAC 173-303-630(7), where applicable. Operational area floors used for containment will be inspected for degradation or damage to floor coatings weekly when waste is present.

I1.1.4.3 Waste Handling Equipment Inspection

Support equipment that is a permanent fixture to the facility and used to handle or contain waste is also inspected to ensure that there is no deterioration or malfunction. Specific items to be evaluated during inspections are listed in Table I-1. If the equipment will be inactive for an extended period of time, it may be shut down and/or isolated until it is returned to service. For situations when equipment is out of service and there is no useful purpose in performing the inspection, then the inspection will be suspended until the equipment is placed back into operation. An initial inspection will be conducted when the system is brought back online, and regularly scheduled inspections will resume.

I1.1.4.4 Containment Building Inspection

The 221-T Canyon Deck, four 221-T Cells (7L, 13R, 16R, and 17R), and the 221-T Railroad Tunnel are permitted as containment buildings for waste storage and treatment. These containment buildings will be inspected to ensure that the requirements are met in accordance with WAC 173-303-320 when dangerous is present. Exterior building surfaces and the area immediately surrounding the building(s) will also be inspected weekly in accordance with WAC 173-303-695. These activities will include checking outside the building(s) for liquid accumulations or ground subsidence and visually surveying for any signs of dangerous waste releases. Specific items to be noted during inspections are listed in Table I-1.

The 221-T Canyon Deck and 221-T Railroad Tunnel may periodically be placed in layup. During layup periods, these areas are inactive and placed in a safe configuration with access points locked and tamper tape placed on the doors. No access is allowed inside the 221-T Canyon Deck or 221-T Railroad Tunnel. The safe configurations of these areas allow inspections and surveillances related to conditions in the canyon to be performed or satisfied without a canyon entry or upon the first re-entry. Surveillance required for the areas placed in layup will be completed by ensuring that the tamper tape is undisturbed and through electronic monitoring.

Electronic monitoring will include inspection of the differential pressure gauges and video surveillance. The 221-T Canyon Deck and 221-T Railroad Tunnel are maintained at a negative differential pressure with respect to the ambient atmosphere. Building differential pressure is monitored to ensure that negative air pressure keeps contamination inside the containment buildings. The 221-T Canyon Deck and 221-T Railroad Tunnel also have video surveillance cameras that will be used for visual remote inspections of the containment building(s) when dangerous waste is present. Electronic monitoring, which includes inspection of the differential pressure gauges as well as visual verification of the containment building(s) and surrounding areas, meets the intent of containment building inspections (57 *Federal Register* 160, “Land Disposal Restrictions for Newly Listed Wastes and Hazardous Debris,” p. 37217, August 18, 1992).

When the 221-T Canyon Deck and 221-T Railroad Tunnel are returned to service, physical inspection of the storage areas containing waste will resume. However, canyon entries will not be performed solely for inspection purposes. If entries are not otherwise planned, inspections will be done via electronic monitoring. Physical inspections of these areas will be conducted only if scheduled entries are made.

I1.1.4.5 Storage of Ignitable or Reactive Wastes

All containers of waste designated as D001 (ignitable) or D003 (reactive) will be placed in storage areas, which will be in compliance with WAC 173-303-630(8).

As required by WAC 173-303-395(1)(d), annual inspection of areas where ignitable or reactive waste is stored will be performed by a professional who is familiar with the International Fire Code or in the presence of a local, state, or federal fire marshal. The inspection record will be submitted in the Hanford Facility Operating Record and will include the date and time of the inspection, the name of the professional inspector or fire marshal, a notation of the observations made, and any remedial actions that were taken as a result of the inspection.

Table I-1. T Plant Complex Inspection Schedule

Requirement Description	Frequency	Inspection
General Facility		
Posted warning signs	Weekly	Signs are present, legible, and visible.
Portable safety shower/eye wash stations	Weekly (when in use)[a,b]	Equipment is present and functional.
Fire extinguishers	Monthly	Equipment is present and in good physical condition, and seal is intact.
First aid kit/emergency medical bag	Monthly	Equipment is present and seal is intact.
Spill kit/emergency response	Monthly	Equipment is present and seal is intact.
Communication equipment (radios and bullhorns)	Monthly	Equipment is present and operating.
Decontamination shower	Weekly	Equipment is present and functional.
Automatic sprinkler system	Monthly	Equipment is in good condition (not leaking) and seals are in place.
Container Storage		
Areas subject to spills (including areas being used where waste is being loaded or unloaded)	Daily[c]	Check for spills; no evidence of spills or leaks, such as moisture on the sides or underneath of containers.
Containers and container storage areas	Weekly[a]	Container integrity is not compromised by punctures, dents, penetrating scratches, loose lids, bulging, excessive corrosion, damage, or deterioration. Containers are closed and stored in a manner that will not rupture the containers or cause them to leak. Aisle spacing between rows of containers is at least approximately 76 cm (30 in). For any portable secondary containment used to meet the requirements of WAC 173-303-630(7), verify no deterioration of secondary containment system caused by corrosion or other factors and no evidence of spills or leaks.
Container labels	Weekly[a]	Container marking/labeling is intact, unobscured, legible, and in good condition. Labels are visible and readable and adequately identify risks.

Table I-1. T Plant Complex Inspection Schedule

Requirement Description	Frequency	Inspection
Curbing, floor, and sumps	Weekly[a]	Containment used to meet the requirements of WAC 173-303-630(7). Verify no deterioration of containment curbing, flooring, and sumps caused by corrosion or other factors; no evidence of spills or leaks.
Waste Handling Equipment		
Canyon crane	Daily (when in use)[b]	Check for proper function and operation.
Compactor	Daily (when in use)[b]	Check for proper function and operation.
Containment Building[d]		
Tamper tape[e]	Weekly	Tamper tape is undisturbed and intact.
Video surveillance[e]	Weekly	Check containment building(s) for liquid accumulations or signs of releases of dangerous waste.
Differential pressure gauge[e]	Weekly	Check if negative pressure is being pulled in the canyon from the ventilation system.
Building exterior surfaces and surrounding area	Weekly[a]	Check for spills; no evidence of spills or leaks. Check outside the containment building(s) for liquid accumulations or signs of releases of dangerous waste.
High-efficiency particulate air (HEPA) filter exhaust system	Daily[f]	Verify that ventilation system maintains a minimum negative differential pressure with respect to the atmosphere.
	Annually	Verify that calibration is current for the differential pressure indicator and transmitter. Verify HEPA filter exhaust system efficiency. Verify normalized differential pressure across HEPA filters. Verify that differential pressure alarms actuate as required.
Stack monitoring system	Annually	Verify no deterioration, and check equipment settings; calibrate, if needed.
Exhaust fans	Annually	Verify fan settings.
Confinement doors	Annually	Verify that non-fire rated automatic door closure mechanisms for confinement boundaries are functional.
Ignitable or Reactive Waste		

Table I-1. T Plant Complex Inspection Schedule

Requirement Description	Frequency	Inspection
Ignitable or reactive waste	Annual	Storage in compliance with WAC 173-303-630(8).

Note: Inspection frequencies: daily- once per calendar day, weekly - once per calendar week, monthly - once per calendar month, and annual - once per calendar year.

a. Weekly inspection logs prepared to meet WAC 173-303-630(6), “Dangerous Waste Regulations,” “Use and Management of Containers,” will be completed when dangerous waste is being managed within T Plant storage areas. If the storage area is empty, “no waste in storage” or equivalent words will be entered on the inspection log.

b. Inspections are applicable only during equipment use. If the facility equipment has been inactive and inspections are suspended, then an initial inspection will be conducted prior to use.

c. To implement WAC 173-303-320(2)(c), “General Inspection,” “daily when in use” is defined as when dangerous waste management activities have potential for spills to occur, such as handling containers with known or suspected liquids, and are moved outside of secondary containment.

d. Containment building(s) will be inspected to ensure that the requirements are met in accordance with WAC 173-303-320 and WAC 173-303-695, “Containment Buildings,” when dangerous waste is present. Physical inspections of these areas will only be conducted if scheduled entries are made into the 221-T Canyon Deck or 221-T Railroad Tunnel. If entries are not otherwise planned, inspections would be done via electronic monitoring.

e. Canyon entries would not be performed solely for inspection purposes. If no entries are planned or the 221-T Canyon Deck and 221-T Railroad Tunnel has been placed in layup, then surveillance required for these areas will be completed by ensuring that the tamper tape is undisturbed and through electronic monitoring.

f. Daily inspections will only be performed during operational days, not on facility closure days.

Addendum J

Contingency Plan

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Contents

Appendix

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J1 Contingency Plan

Washington Administrative Code (WAC) 173-303, “Dangerous Waste Regulations,” requirements for a contingency plan at the T Plant Complex (T Plant) Operating Unit Group (OUG) are satisfied in portions of WA7890008967, *Hanford Facility Resource Conservation and Recovery Act Permit* (hereinafter called Hanford Facility RCRA Permit) Attachment 4 (DOE/RL-94-02, *Hanford Emergency Management Plan*) and this addendum.

The Hanford Facility emergency management program is based on a graded approach for responses to emergency events using OUG specific and/or Hanford Facility level emergency procedures. This addendum contains the building emergency plan for T Plant in Attachment J-A. The plan contains a description of T Plant OUG specific planning and response, which is used in conjunction with Attachment 4 to the Hanford Facility RCRA Permit to meet the requirement for a contingency plan.

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Appendix J-A

Building Emergency Plan for T Plant Complex

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CHPRC ADMINISTRATIVE DOCUMENT PROCESSING AND APPROVAL

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WASTE AND FUELS MANAGEMENT PROJECT Building Emergency Plan for the T Plant Complex

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company
P.O. Box 1600
Richland, Washington 99352

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WASTE AND FUELS MANAGEMENT PROJECT Building Emergency Plan for the T Plant Complex

Project No: T Plant   Document Type: PLAN   Program/Project: WM

P. A. Gray
CH2M HILL Plateau Remediation Company

Date Published
February 2015

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

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WASTE & FUELS MANAGEMENT PROJECT	Document:	HNF-IP-0263-TPC Revision 26
BUILDING EMERGENCY PLAN FOR THE T PLANT COMPLEX	Page:	1 of 34
	Effective Date:	February 17, 2015

This plan covers the following buildings and structures: T Plant Complex, including 211-T, 214-T, 221-T, 221-TA, 243-T, 271-T, 277-T, 291-T, 292-T, 2706-T, 2706-TA, 2706-TB, 2712-T, 211T-52, 2715-T, 2716-T, 210-W, 229-W, 225-WA, M0-433, MO-459, MO-739, MO-892, MO-906, and various conex boxes.

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L C PETERSEN [signature] 2-18-2015
Environmental Compliance Officer — Date

GARELLO, P R [signature] 2-18-15
Facility/Operations Management — Date

Eric Kinnunen [signature] 2-26-15
CHPRC Emergency Preparedness — Date

This document will be reviewed at least annually and updated if necessary by Facility Management unless Hanford Facility RCRA Permit coordination requirements provide otherwise. The Building Emergency Director has the authority to carry out the provisions in this plan.

TABLE OF CONTENTS

1.0 GENERAL INFORMATION

The T Plant Complex is located on the Hanford Site, a 560-square-mile (1,450-square kilometer) U.S. Department of Energy Richland Operations Office (DOE/RL) site in southeastern Washington State. The T Plant Complex is located in the 200 West Area near the center of the Hanford Site. The Hanford Site Emergency Preparedness Program is based on the incident command system that allows a graded approach for response to emergency events. This plan contains a description of facility-specific emergency planning and response and is used in conjunction with Hanford Facility RCRA Permit (Permit) Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02). Response to events is performed using facility-specific and/or Hanford Site-level emergency procedures.

1.1 Facility Name

U.S. Department of Energy
Hanford Site
T Plant Complex

1.2 Facility Location

Benton County, Washington within the 200 West Area.

Buildings/facilities covered by this plan are:

211-T	Waste Storage Area
214-T	Chemical/Waste Storage Facility
221-T	Canyon Facility
221-TA	Ventilation Supply
243-T	Covered Waste Storage Pad
271-T	Office Annex
277-T	Material Storage Facility
291-T	Ventilation Stack Complex (stack, HEPA filter banks, and sand filters)
292-T	Vacant (former Fission Products Release Lab)
2706-T	Building
2706-TA	Building
2706-TB	Waste Storage Tank Building
2712-T	Compressor Building
211T-52	Building
2715-T	Material Storage
2716-T	Tunnel Change Facility
210-W	Storage Shed
229-W	221-T Packaging Supply Storage Area
225-WA	Treated Effluent Disposal Facility (TEDF) Lift Station
MO-433	2706-T Change Facility

MO-459	Women's Change Facility
MO-739	Storage Facility
MO-892	Office and Training Trailer
MO-906	Maintenance Office Facility

The T Plant Complex maintains the following Portable Storage Modules, which store waste, laundry, equipment, chemicals, etc.:

HS-030	Chemical Storage Module
HS-031	Chemical Storage Module
HS-032	Chemical/Waste Storage Module
CC2W0128	Equipment Storage Module
CC2W0135	Storage Module
CC2W0136	Equipment Storage Module
CC2W0137	Equipment Storage Module
CC2W0138	Equipment Storage Module
CC2W0139	Equipment Storage Module
CC2W0140	Laundry/Material Storage Module
CC2W0141	Laundry Storage Module

1.3 Owner

U.S. Department of Energy
Richland Operations Office
825 Jadwin Avenue
Richland, Washington 99352

FACILITY MANAGER:

CH2M Hill Plateau Remediation Company
P.O. Box 1600
Richland, Washington 99352

1.4 Description of the Facility and Operations

The T Plant Complex is a permitted treatment, storage, and disposal (TSD) unit located in the 200 West Area of the Hanford Facility and consists of two main structures, the 221-T Building (221-T) and the 2706-T Complex (2706-T, -TA,-TB). The 221-T Building and 2706-T Complex are used for the storage (tank, container, miscellaneous and containment building) and treatment (tank, container, macro encapsulation, solidification, neutralization, repackaging, and decontamination activities) of mixed, dangerous waste, low-level waste, and Transuranic (TRU) waste. The storage buildings and pads located outside the 2706-T Complex may also be used to store, sample, and treat containerized, mixed, dangerous, low-level, and TRU waste.

A general description of the primary functions of the T Plant Complex follows.

- 221-T Building

The 221-T Building is the largest structure in the T Plant Complex. The 221-T Building, a concrete, canyon-type building, is 260 meters long, 21 meters wide, and 23 meters high. The 221-T canyon deck and cells store contaminated process equipment (including pumps, jumpers, etc.). Cells 3L, 7L, 8R, 9L, 10L, 13L, 13R, 14R, 15L, 16R and 17R, along with the canyon deck and railroad tunnel are also permitted as a containment building for storage of dry-solid RCRA waste. Other cells contain the 221-T RCRA Tank System. This tank system was used to collect liquid waste generated as a result of decontamination activities, rainwater infiltration, or collection of other liquid waste (e.g., sample returns). These tanks have been engineered and administratively isolated to prevent any additions to this tank system. One cell (2R) was converted to store the Pressurized Water Reactor (PWR) Core II spent fuel blanket assemblies. These fuel assemblies have been removed from the spent fuel pool. Four cells (3L, 10L, 13L and 15L) have been converted to store large diameter containers (LDCs).

The 221-T canyon and railroad tunnel are maintained at a negative differential pressure. The main exhaust system (291-T stack) consists of two fans in parallel, one rated at 40,000 cubic feet per minute (cfm) and the other at 36,000 cfm, either of which can pull canyon air past the cell cover blocks down into the cells thorough HEPA filtration and out the 291-T stack. Controls for the two exhaust fans are located on the west side of 291-T.

The railroad tunnel is used for transporting large equipment and material into and out of the 221-T canyon. The railroad tunnel also provides the area for repair, decontamination, loading, treatment, storage, sampling, and repackaging of low-level TRU and mixed waste. Sludge receiving and storage operations will require this area to be accessible.

The 221-T head end is partitioned off from the 221-T Building by a sheet-metal wall. The head end area consists of one large cell, a control room, laboratories, change room, maintenance shops, a high bay work area, and a vehicle access ramp. The head end is used as the primary canyon entrance for personnel and equipment.

- 221-T R-5 Storage Pad

The 221-T R-5 Storage Pad contains both covered and uncovered asphalt storage areas and is located on the northeast side of the 221-T Building. The 221-T R-5 Storage Pad has no secondary containment system with the exception of portable secondary containment systems. The 221-T R-5 Storage Pad stores empty containers and equipment of various sizes and volumes.

- 211-T Cage and 211-T Pad

The 211-T Cage consists of a concrete floor split into two sections separated by a concrete berm. Each floor section slopes to a sump. The cage has a roof, but no walls, and may be used to store waste containers. The 211-T Pad, constructed of concrete, is curbed on three sides and slopes to a sump.

- 214-T Storage Building

The 214-T Storage Building is located on the west side of the 221-T Building near the railroad tunnel. This building is used to store chemicals and waste (e.g., TRU, low-level, mixed and dangerous) in segregated areas. The floor is covered with a chemical-resistant coating and divided by a raised berm. The 214-T Storage Building heat detectors are connected to the 2706-T Building fire alarm.

- 243-T Covered Storage Pad

The 243-T storage pad is a covered concrete area for storage of TRU, mixed and low-level waste. This pad has no secondary containment system with the exception of portable secondary containment systems. This pad can store various sizes of containerized waste and equipment. This pad is located to the southwest of 221-T Building.

- 221-TA Storage Area

The 221-TA storage area is an open storage area at the southeast corner of the 221-T Building. This area does not have a constructed secondary containment system with the exception of portable secondary containment systems. This pad can store various sizes of equipment.

- 221-T Sand Filter Storage Area

The 221-T Sand Filter storage area is an uncovered gravel storage area. This area does not have a constructed secondary containment system with the exception of portable secondary containment systems. The 221-T Sand Filter storage area may be used to store equipment. This pad is located northeast of the 291-T sand filter.

- 2706-T Building

The 2706-T Complex consists of the 2706-T Building, 2706-TA Building, -2706-TB Tank Waste Storage Building, storage pads, and CONEX boxes. A fence surrounds the 2706-T Complex, and the 2706-T yard is paved and used as outdoor waste container storage. The 2706-T Building has openings on the east and west ends fitted with roll-up metal doors. A ten ton overhead crane is available in the 2706-T Building equipment, and travels the length of the building. An exhaust stack on the southwest side has HEPA filtration and confirmatory sampling is provided. The 2706-T and TA Buildings are permitted for venting, decontamination, treatment and storage activities (e.g., removal or reduction of radionuclide's and dangerous waste). The 2706-T and

TA Buildings have been used to decontaminate railroad equipment, buses, trucks, automobiles, cranes, earth moving equipment, and large pieces of plant process equipment by using air, steam, water, chemicals, abrasive blasting, ice blasting, and/or other methods to remove the contamination. Any liquid waste generated in these areas is collected in the railroad sump, or in the 2706-TA sump. Non-dangerous or non-mixed waste liquids collected in the sumps or pumped to portable tanks may be drained into the 225-WA lift station for disposal. Dangerous or mixed waste liquids are not drained into the 225-WA lift station for disposal but follow a different disposal path. The 2706-T and TA Buildings are also used to treat waste (e.g., microencapsulating, solidification, neutralization, absorption, repackaging, puncturing of aerosol cans, venting, etc.), sample, characterize, and repackage waste. Mixed, low-level, or TRU waste generated by treatment and decontamination processes is placed in approved containers for storage until transferred to a permitted TSD unit. The HVAC drains are collected in a sump that is pumped to the 2706-T sump. Floors and rails in 2706-TA are sloped to drain to the 2706-T railroad pit. 2706-TA contains a sump, pumps, and filters for liquid transfers to 2706-TB, as well as recirculation lines and sampling stations for the decontamination waste storage tanks.

The 2706-T Yard is located inside the fenced area west of the 2706-T Complex. The pad is asphalt covered with no secondary containment system with the exception of portable secondary containment systems. This pad can store containerized waste and equipment of various sizes. This pad can store mixed, low-level, and TRU waste.

The 2706-TB Tank Storage Building contains two waste treatment and storage tanks of 56,800 liter and 22,700 liter capacity. Both tanks have installed blind piping flanges that physically prevent the addition of liquid to these tanks. A chemical addition room is on the west side. The 2706-TB contains a secondary containment basin located beneath the floor grating to collect and contain leaks and spills as well as a 20 minute deluge from a sprinkler activation. The basin contains a collection sump with a pump to transfer liquids out of secondary containment.

- 2706-T Asphalt Pad

The 2706-T Asphalt Pad is located west of the 2706-T Complex. The pad is asphalt covered with no secondary containment system with the exception of portable secondary containment systems. This pad can store containerized waste and equipment of various sizes. This pad can store mixed, low-level, and TRU waste.

1.5 Building Evacuation Routing

Figure 1 provides identification of the primary and secondary staging areas and a general layout of the T Plant Complex. Alternate evacuation routes will be used on a case-by case basis, based on meteorological conditions at the time of the event.

2.0 PURPOSE

This plan describes both the facility hazards and the basic responses to upset and/or emergency conditions within the T Plant Complex. These events may include spills or releases caused by processing, fires and explosions, transportation activities, movement of materials, packaging, storage of hazardous materials, and natural and security contingencies. When used in conjunction with Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), this plan meets the requirements for contingency planning as required by WAC 173-303.

3.0 BUILDING EMERGENCY RESPONSE ORGANIZATION

The T Plant Complex maintains a weekly on-call list for technical expert notification. When notified, the on-call person notifies the primary or alternate Building Emergency Director (BED) to respond to the scene in person as necessary. The on-call technical expert maintains contact with the on-scene Incident Commander (IC) until T Plant Complex personnel arrive.

3.1 Building Emergency Director

Emergency response will be directed by the BED until the IC arrives. The Incident Command System (ICS) and staff, with supporting on-call personnel, fulfill the responsibilities of the Emergency Coordinator as discussed in WAC 173-303-360. During events, T Plant Complex personnel perform emergency response duties under the direction of the BED. The Incident Command Post (ICP) is managed by the senior Hanford Fire Department official, unless the event is determined to primarily be a security event, in which case the Hanford Fire Department and Hanford Patrol will operate under a unified command system with Hanford Patrol making all decisions pertaining to security. These individuals are designated as the IC and as such, have the authority to request and obtain any resources necessary for protecting people and the environment.

The BED becomes a member of the ICP and functions under the direction of the IC. In this role, the BED continues to manage and direct T Plant Complex operations.

A listing of BEDs by title, work location, and work telephone number is contained in Section 13.0 of this plan. The BED is on the premises or is available through an "on-call" list 24 hours a day. Names and home telephone numbers of the BEDs are available from the Patrol Operations Center (POC) in accordance with Permit Condition II.A.4.

3.2 Other Members

As a minimum, Facility Management appoints and ensures training is provided to individuals to perform as Personnel Accountability Aides and Staging Area Managers. The Personnel Accountability Aides are responsible for facilitating the implementation of protective actions (evacuation or take cover) and for facilitating the accountability of personnel after the protective actions have been implemented. Staging Area Managers are responsible for coordinating and conducting activities at the staging area. In addition, the BED can identify additional support personnel (radiological control, maintenance, engineering, hazardous material coordinators, etc.) to be part of the Facility/Building Emergency Response Organization.

The complete Facility/Building Emergency Response Organization listing of positions, names, work locations, and telephone numbers for the T Plant Complex is maintained in a separate location in a format determined appropriate by T Plant Complex management. Copies are distributed to appropriate T Plant Complex locations and to Emergency Preparedness.

4.0 IMPLEMENTATION OF THE PLAN

In accordance with WAC 173-303-360(2)(b), the BED ensures that trained personnel identify the character, source, amount and areal extent of the release, fire, or explosion to the extent possible. Identification of waste can be made by activities that can include, but are not limited to, visual inspection of involved containers, sampling activities in the field, reference to inventory records, or by consulting with facility personnel. Samples of materials involved in an emergency might be taken by qualified personnel and analyzed as appropriate. These activities must be performed with a sense of immediacy and shall include available information.

The BED shall use the following guidelines to determine if an event has met the requirements of WAC 173-303-360(2)(d):

1. The event involved an unplanned spill, release, fire, or explosion,

AND

2.a The unplanned spill or release involved a dangerous waste, or the material involved became a dangerous waste as a result of the event (e.g., product that is not recoverable),

OR

2.b The unplanned fire or explosion occurred at the T Plant Complex or transportation activity subject to RCRA contingency planning requirements,

AND

3. Time-urgent response from an emergency services organization was required to mitigate the event, or a threat to human health or the environment exists.

As soon as possible, after stabilizing event conditions, the BED shall determine, in consultation with the site contractor environmental single-point-of-contact, if notification to Washington State Department of Ecology (Ecology) is needed to meet WAC-173-303-360 (2)(d) reporting requirements. If all of the conditions under 1, 2, and 3 are met, notifications are to be made to Ecology. Additional information is found in Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 4.2.

If review of all available information does not yield a definitive assessment of the danger posed by the incident, a worst-case condition will be presumed and appropriate protective actions and notifications will be initiated. The BED is responsible for initiating any protective actions based on their best judgment of the incident.

The BED must assess each incident to determine the response necessary to protect the personnel, facility, and the environment. If assistance from Hanford Patrol, Hanford Fire Department, or ambulance units is required, the Hanford Emergency Response Number (911 from site office phones/373-0911 from cellular phones) must be used to contact the POC and request the desired assistance. To request other resources or assistance from outside the T Plant Complex, the POC business number is used (373-3800).

5.0 FACILITY HAZARDS

5.1 Hazardous Materials

Hazardous materials are stored and used throughout the T Plant Complex. The T Plant Complex maintains a variety of chemicals (greases, lubricants, oils, solvents, detergents, paint products, etc.) used primarily for maintenance and decontamination operations (degreasing agents, caustic and acidic agents). Primary storage areas are located in the 214-T, 221-T, 2706-T Buildings, and 271-T. The primary areas where hazardous materials for decontamination operations are in use are the 221-T and 2706-T Buildings. Maintenance chemicals are used throughout the T Plant Complex.

Hazardous material inventories are maintained at each of the chemical storage areas. A chemical inventory is maintained by the Facility Chemical Custodian. Material Safety Data Sheets are maintained electronically using current Hanford Site databases.

The acidic and caustic solutions stored and used are corrosive and could cause chemical burns. Uncontrolled chemical reactions from reactive materials could lead to fire, explosion, and release of radioactive and dangerous constituents.

Asbestos materials are found in older structures in the T Plant Complex. A release of friable asbestos to the environment or within these older structures would pose a respiratory health hazard.

5.2 Industrial Hazards

Hazards associated with industrial accidents can include injuries from accidents with moving equipment (e.g., forklifts, vehicles, cranes, hoists), falls, and radiological or chemical exposure from spilled waste or chemicals.

5.3 Dangerous/Mixed Waste

T Plant Complex-generated waste includes, but is not limited to, maintenance wastes, paint waste, decontamination waste, excess chemicals, step-off pad waste and project waste. These waste types are managed in storage areas throughout the T Plant Complex. In addition, waste verification, venting, repackaging, and treatment activities for the Hanford Site as well as offsite generators are performed. Liquid waste may be accumulated in the active tank system or designated containers.

5.4 Radioactive Materials

Radioactive materials are removed during the venting, repackaging, or decontamination process of contaminated equipment, and are generated from areas of unconfined or unencapsulated radioactive material.

The equipment to be decontaminated or treated is potentially contaminated with alpha and beta-gamma-emitting radionuclides.

Equipment, waste tanks, and the PWR Pool may contain fissile materials.

5.5 Criticality

The T Plant Complex is classified as a limited control facility. This is defined as a facility that can contain more than one half of a minimum critical mass of fissionable material; however, the form and distribution of the material precludes a criticality accident.

6.0 POTENTIAL EMERGENCY CONDITIONS

Potential emergency conditions, under both WAC 173-303 and the DOE, may include one of three basic categories: (1) operations (process upsets, fires, explosions, loss of utilities, spills, and releases), (2) natural phenomena (e.g., earthquakes), and (3) security contingencies (bomb threat, hostage situation, etc.). The following are conditions that may lead to an emergency at the T Plant Complex.

6.1 Facility Operations Emergencies

6.1.1 Loss of Utilities

Loss of Electricity

A loss of electrical power could include the loss of air balance affecting contamination control and the loss of complex alarms. The associated hazard is exposure to radiation hazards, loss of radiological and other monitoring capabilities, and personnel isolated in areas of darkness.

Loss of Water

Water loss will cause loss of decontamination shower, fire suppression systems and fire hydrants.

Loss of Ventilation

Ventilation loss could result in the loss of contamination control, potentially producing a radiological exposure hazard and contamination spread.

6.1.2 Major Process Disruption/Loss of Plant Control

During waste movements, a partially or completely dropped or immobilized waste container could result in an operational upset condition.

6.1.3 Pressure Release

Pressure hazards include uncontrolled releases of process and compressed air and exposure to hot surfaces.

6.1.4 Fire and/or Explosion

A fire or explosion could result in the release of dangerous and/or radioactive constituents to the air or ground. Fire associated with flammable materials could cause smoke damage to electronic devices and other containment controls, resulting in a release of hazardous materials. Flame impingement could weaken structural components and result in failure of a containment system. Hazards to personnel from smoke or products of combustion from a fire or explosion will obscure visibility which may impede safe egress from the building, and in some instances may be toxic.

6.1.5 Hazardous Material Spill

Hazards associated with a spill include potential exposure to radioactive, corrosive, and toxic material, as well as environmental damage.

6.1.6 Dangerous/Mixed Waste Spill

An outdoor uncontrolled release of stored mixed waste could produce airborne radioactive contamination, as well as pose a risk to human health or the environment.

6.1.7 Transportation and/or Packaging Incidents

Hazardous, low-level, and mixed waste is received and transferred/shipped in various U.S. Department of Transportation-approved containers or other approved containers. Damaged shipping containers could result in chemical and/or radiological releases to the environment and exposure to personnel.

6.1.8 Radioactive Material Release

Gaseous Effluent Discharges (Stack Releases)

Hazards associated with stack releases include personnel and environmental exposure to airborne radioactive contamination, and downwind contamination by surface deposition.

Liquid Effluent Discharges

The 221-T Waste Water System is a liquid collection and transfer system designed to collect waste water generated from floor drains, and the system is operated manually. Collected wastewater is pumped by manual control to a lift station located within the T Plant Complex where the effluent is pumped to the 200 Area Treated Effluent Disposal Facility. The system is made up of two major parts: Electrical Gallery Catch Tanks and Pumps, and the 225-WA Lift Station.

Significant Contamination Spread/Releases

Significant contamination spread or release poses inhalation hazards and could involve hazards including exposure to radioactive, toxic, corrosive, or flammable materials, depending on the nature of the release.

6.1.9 Criticality

A criticality could result in an increased personnel exposure to radiation with a possible release of radionuclides from the T Plant Complex. However, criticality safety evaluations show that a criticality is an incredible event. Criticality safety depends on controlling the form, amount, and distribution of fissionable material and limiting fissionable quantities during process operations.

The physical dimensions of the LDCs and the low total radionuclide inventory from 100K assures sub criticality of the sand in storage.

6.2 Natural Phenomena

Natural phenomena are discussed in the following sections.

6.2.1 Seismic Event

Depending on the magnitude of the event, severe structural damage can occur resulting in serious injuries or fatalities and the release of hazardous materials to the environment. Damaged electrical circuits and wiring could result in the initiation of fires.

6.2.2 Volcanic Eruption/Ash fall

Though not expected to cause structural damage, the ash resulting from a volcanic eruption could cause shorts in electrical equipment and plug ventilation system filters.

6.2.3 High Winds/Tornadoes

High winds or tornadoes may cause structural damage to systems containing hazardous materials, resulting in a release of the materials to the environment.

6.2.4 Flood

Flooding can cause the release of hazardous materials depending on the type of storage containers. Floods can also cause short circuits in electrical wiring located at or below ground level. This may then result in an increased likelihood of fires. However, calculations of the "probable maximum flood" that could occur in the Columbia River Basin indicate that maximum flood conditions would pose no threat to the T Plant Complex.

6.2.5 Range Fire

The hazards associated with a range fire are the same as those associated with a building fire plus potential site access restrictions and travel hazards such as poor visibility.

6.2.6 Aircraft Crash

In addition to the potential for serious injuries or fatalities, an aircraft crash could result in the direct release of hazardous materials to the environment or cause a fire that could lead to the release.

6.3 Security Contingencies

Security contingencies are discussed in the following sections.

6.3.1 Bomb Threat/Explosive Device

A bomb threat may be received by anyone who answers the telephone or receives mail. The major effect on the T Plant Complex is that personnel will need to perform emergency shutdown of the facility before evacuation. If an explosive device detonates, the effects are the same as those discussed under fire and explosion.

6.3.2 Hostage Situation/Armed Intruder

A hostage situation or the entry of an armed hostile intruder(s) can pose an emergency if either of these conditions has the potential to adversely affect facility operations.

6.3.3 Suspicious Object

If a suspicious object is discovered, the major effect on the T Plant Complex is that personnel will need to perform an emergency shutdown of the facility before evacuation.

6.4 Unexpected/Unidentified Odors

Unexpected or unidentified odors have the potential to cause health effects and could be indicative of other events.

7.0 INCIDENT RESPONSE

The initial response to any emergency is to immediately protect the health and safety of persons in the affected area. Identification of released material is essential to determine appropriate protective actions. Containment, treatment, and disposal assessment are secondary responses.

The following sections describe the process for implementing basic protective actions, as well as descriptions of response actions for the events listed in Section 6.0 of this plan. Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 1.3, provides concept of operations for emergency response on the Hanford Site.

This section provides a discussion of protective action responses, response to facility operations emergencies, response to natural phenomena, and response to security contingencies. In addition, a section addressing prevention of secondary release, fires or explosions is provided.

7.1 Protective Action Responses

Protective action responses are discussed in the following sections. The steps identified in the following description of actions do not have to be performed in sequence because of the unanticipated sequence of incident events.

7.1.1 Evacuation

If an evacuation is ordered or the evacuation siren sounds, personnel must leave the building by the nearest exit and proceed to the designated staging area for accountability unless told otherwise.

Locations of the staging areas are identified as follows.

Staging Areas	Area	Location
Designated Staging Area	200 West	West Parking Lot
Secondary Staging Area	200 West	Southeast of 224-T

The order to evacuate is normally passed via the Site Alerting Systems. When possible, the following steps must be conducted concurrently.

AREA EVACUATION PROCESS
Halt any operations or work and place the structures in a safe condition, time permitting. Use emergency shutdown procedures if necessary.
Use whatever means are available (siren, PA System, bullhorns, radios, runners, etc.) to pass the evacuation information to personnel.
Evacuate personnel to the staging area. Assist those needing help (temporary/permanent/ disabled).
Conduct personnel accountability. If unable to account for personnel, report personnel accountability results to the Hanford-Emergency Operations Center (Hanford-EOC).
Inform IC of any potentially affected personnel (e.g., injured, contaminated, exposed, etc.) once the IC arrives at the ICP.
Segregate personnel into four groups: PPE clothing-clad personnel, persons with keys to immediately available private vehicles, persons with keys to government vehicles, and all others.
Relay pertinent evacuation information (routes, destination, etc.) to personnel with vehicle keys.
Dispatch vehicles as soon as the vehicles are loaded, providing safe routes of travel.
Report status to the Hanford-EOC, request additional transportation if required, and report if any personnel remain who are performing late shutdown duties.

7.1.2 Take Cover

When the Take Cover Alarm is activated, personnel take cover in the nearest habitable building or trailer. A message followed by the Take Cover siren is transmitted over the area emergency sirens. The following actions must be taken or considered:

- Shut doors and windows and wait for further instructions.
- Secure unfiltered ventilation.

- Lock up classified documents, follow normal exit procedures from radiological areas (in preparation for a possible evacuation) etc.
- Report your location to the Accountability Aide or the BED.
- Accountability Aides provide accountability status to the Staging Area Manager for facility personnel during an event.
- Inform IC of potentially affected personnel (i.e., injured, contaminated, exposed, etc.) once the IC arrives at the ICP.

7.2 Response to Facility Operations Emergencies

Depending on the severity of the event, the BED reviews the site-wide and T Plant Complex emergency response procedure(s) and, as required, categorizes and/or classifies the event. If necessary, the BED initiates area protective actions and Hanford Site Emergency Response Organization activation. The steps identified in the following description of actions do not have to be performed in sequence because of the unanticipated sequence of incident events. Attachment A provides a list of procedures.

7.2.1 Loss of Utilities

A case-by-case evaluation is required for each event to determine loss of utility impacts. When a BED determines a loss of utility impact, actions are taken to ensure dangerous and/or mixed waste is being properly managed, to the extent possible given event circumstances. As necessary, the BED will stop operations and take appropriate actions until the utility is restored.

7.2.2 Major Process Disruption/Loss of Plant Control

If a waste container is dropped or becomes immobilized during movement, work activities cease, the area is placed in a safe configuration, and recovery activities are initiated.

7.2.3 Pressure Release

Response to a pressure release includes the following:

- Notify personnel to leave the area of the hazard. In the event of any injuries, personnel should immediately call 911 from site office phones/373-0911 from cellular phones for medical response.
- Inform the BED.
- If possible, shut off the affected system's source (e.g., steam decontamination unit by use of valves).

- Evacuate affected areas.
- Determine impacts/risks associated with reentry (e.g., hazardous or radioactive releases, moisture or heat conditions).
- Inform appropriate maintenance personnel for repair.

7.2.4 Fire and/or Explosion

In the event of a fire, the discoverer activates a fire alarm (pull box); calls 911 from site office phones/373-0911 from cellular phones, or verify that the Hanford Emergency Response Number has been called. Automatic initiation of a fire alarm (through smoke detectors, and sprinkler systems) is also possible.

- Unless otherwise instructed, personnel shall evacuate the area/building by the nearest safe exit and proceed to the designated staging area for accountability.
- On actuation of the fire alarm, ONLY if time permits, personnel should shut down equipment and secure waste. The alarm automatically signals the Hanford Fire Department.
- The BED proceeds directly to the ICP, obtains all necessary information pertaining to the incident, and sends a representative to meet the Hanford Fire Department.
- The BED provides a formal turnover to the IC, when the IC arrives at the ICP.
- The BED informs the Hanford Site Emergency Response Organization as to the extent of the emergency (including estimates of dangerous waste and mixed waste quantities released to the environment).
- If operations are stopped in response to the fire, the BED ensures that systems are monitored for leaks, pressure buildup, gas generation, and ruptures.
- Hanford Fire Department firefighters extinguish the fire as necessary.

7.2.5 Hazardous Material, Dangerous and/or Mixed Waste Spill

Spills can result from many sources including process leaks, container spills or leaks, damaged packages or shipments, or personnel error. Spills of mixed waste are complicated by the need to deal with the extra hazards posed by the presence of radioactive materials.

- The discoverer notifies the BED and initiates SWIM response:
  - Stops work
  - Warns others in the vicinity
  - Isolates the area
  - Minimizes exposure to the hazards
  - Requests the BED secure ventilation.
- The BED determines if emergency conditions exist requiring response from the Hanford Fire Department based on classification of the spill and injured personnel, and evaluates the need to perform additional protective actions.
- If the Hanford Fire Department resources are not needed, the spill is mitigated with resources identified in Section 9.0 of this plan and proper notifications are made.
- If the Hanford Fire Department resources are needed, the BED calls 911 from site office phones/373-0911 from cellular phones.
- The BED sends a representative to meet the Hanford Fire Department.
- The BED provides a formal turnover to the IC when the IC arrives at the ICP.
- The BED informs the Hanford Site Emergency Response Organization as to the extent of the emergency (including estimates of dangerous waste and mixed waste quantities released to the environment).
- If operations are stopped in response to the spill, the BED ensures that systems are monitored for leaks, pressure buildup, gas generation, and ruptures.
- Hanford Fire Department stabilizes the spill.

7.2.5.1 Damaged or Unacceptable Shipments

During the course of receiving dangerous and/or mixed waste at T Plant Complex, an unanticipated event could be discovered resulting in a conformance issue concerning the waste. In some cases, the conformance issue will result from receiving an offsite shipment, manifested pursuant to Permit Condition II.P.1 or WAC 173-303-370 that is damaged or otherwise presents a hazard and cannot be transported. Damaged or unacceptable shipments resulting from onsite transfers are not subject to WAC 173-303-370; however conformance issues must be resolved in order to maintain proper records.

Regardless of whether the waste is received as an offsite shipment or onsite transfer, the following actions are taken:

- Operations management is notified of the damaged or unacceptable waste to be received.
- If the conformance issue results in a spill or release, actions described in Section 7.2.5 are taken.
- The generating organization is notified of the conformance issue.
- An operations representative, in conjunction with the generating organization, determines the course of action to resolve the conformance issue.

7.2.6 Radioactive Material Release

Radioactive waste is stored in quantities in the form of liquid and solid waste at the T Plant Complex and spills or releases could result in the spread of significant levels of contamination. Consideration must be given to radiological risks during events involving ventilation loss, electrical loss, and all spills, including the use of clean liquids on contaminated systems or areas.

7.2.6.1 Radioactive Gaseous Effluent Discharge

All potentially contaminated gaseous effluent discharges are sampled to determine radioactivity.

7.2.6.2 Radioactive Liquid Effluent Discharge

Radioactive content of liquid discharges from floor drains have been demonstrated to be below regulatory limits, eliminating the requirement for continuous radioactive monitoring. T Plant Complex management directs personnel to isolate all waste streams that potentially could cause out-of-limit levels in the waste stream. Should the possibility for radioactive contamination become evident, management could re-evaluate and implement additional monitoring.

7.2.6.3 Significant Contamination Spread - Airborne Radioactivity

Significant contamination spreads could be indicated by a Continuous Air Monitor (CAM) alarm. A CAM alarm is characterized by an audible bell and a flashing red beacon.

Response to a CAM:

- Stop work activities, immediately exit the area, and notify management and the BED.
- Warn other personnel to stay out of the area.
- Contact Radiological Control and Operations Management and stand by for survey and contamination status.
- Operations will post the area as an airborne radioactivity area. Radiological Control will investigate the cause and survey, as appropriate, to determine the extent of contamination.

7.2.7 Criticality

Not applicable.

7.3 Prevention of Recurrence or Spread of Fires, Explosions, or Releases

The BED, as part of the ICP, takes the steps necessary to ensure that a secondary release, fire; or explosion does not occur. The BED will take measures, where applicable, to stop processes and operations; collect and contain released wastes and remove or isolate containers. The BED shall also monitor for leaks, pressure buildups, gas generation, or ruptures in valves, pipes or other equipment, whenever this is appropriate.

7.4 Response to Natural Phenomena

Depending on the severity of the event, the BED reviews site-wide and T Plant Complex emergency response procedure(s) and, as required, categorizes and/or classifies the event. If necessary, the BED initiates area protective actions and Hanford Site Emergency Response Organization activation. The steps identified in the following description of actions do not have to be performed in sequence because of the unanticipated sequence of incident events. Attachment A provides a list of procedures.

7.4.1 Seismic Event

The Hanford Site Emergency Response Organization's primary role in a seismic event is coordinating the initial response to injuries, fires, fire hazards and acting to contain or control radioactive and/or hazardous material releases.

Individuals should remain calm and stay away from windows, steam lines, and hazardous material storage locations. Once the shaking has subsided, individuals should evacuate carefully and assist personnel needing help. The location of any trapped individuals should be reported to the BED or is reported to 911 from site office phones/373-0911 from cellular phones.

The BED takes whatever actions are necessary to minimize damage and personnel injuries. Responsibilities include the following:

- Coordinating searches for personnel and potential hazardous conditions (fires, spills, etc.)
- Conducting accountability
- Securing utilities and facility operations
- Arranging rescue efforts and notifying 911 for assistance
- Determining if hazardous materials were released.
- Determining current local meteorological conditions
- Warning other facilities and implementing protective actions if release of hazardous materials poses an immediate danger.
- Providing personnel and resource assistance to other facilities, if required and possible.

7.4.2 Volcanic Eruption/Ash fall

When notified of an impending ash fall, the BED will implement measures to minimize the impact of the ash fall. BED actions include the following:

- Installing filter media over building ventilation intakes or shut down supply ventilation as necessary.
- Installing filter media or protective coverings on outdoors equipment that may be adversely affected by the ash (diesel generators, equipment rooms, etc.).
- Shutting down some or all operations and processes.
- Sealing secondary use exterior doors.

If other emergency conditions arise as a result of the ash fall (e.g., fires due to electrical shorts or lightning), response is as described in other sections of this plan.

7.4.3 High Winds/Tornadoes

Upon notification of impending high winds, the BED takes steps necessary to secure all outdoor waste and hazardous material containers and storage locations. All doors and windows are shut, and personnel are warned to use extreme caution when entering or exiting the building. Ventilation, utilities, and operations will be shut down as appropriate to lessen the severity of the impact.

7.4.4 Flood

Not applicable.

7.4.5 Range Fire

Responses to range fires are handled by preventive measures (e.g., keeping hazardous material and waste accumulation areas free of combustible materials such as weeds and brush). If a range fire breaches the T Plant Complex boundary, the response is as described in Section 7.2.4.

7.4.6 Aircraft Crash

The response to an aircraft crash is the same as that for responding to a fire and/or explosion (Section 7.2.4).

7.5 Security Contingencies

Depending on the severity of the event, the BED reviews the site-wide and T Plant Complex emergency response procedure(s) and, as required, categorizes and/or classifies the event. If necessary, the BED initiates area protective actions and Hanford Site Emergency Response Organization activation. The steps identified in the following description of actions do not have to be performed in sequence because of the unanticipated sequence of incident events. Attachment A provides a list of procedures.

7.5.1 Bomb Threat/Explosive Device

Response to a bomb threat/explosive device is discussed in the following sections.

7.5.1.1 Telephone Threat

Individuals receiving telephoned threats attempt to get as much information as possible from the caller (using the Bomb Threat Checklist if available). Upon conclusion of the call, or during the call if possible, notify the BED and Hanford Patrol by calling 911 (do not use wireless communications devices for reporting a bomb threat/explosive device unless beyond 100 feet from the suspected object).

The BED evacuates the T Plant Complex and questions personnel at the staging area regarding any suspicious objects. When Hanford Patrol personnel arrive, follow their instructions.

7.5.1.2 Written Threat

Receivers of written threats handle the letter as little as possible. Notify the BED and Hanford Patrol by calling 911 (do not use wireless communications devices for reporting a bomb threat/explosive device unless beyond 100 feet from the suspected object). Depending on the content of the letter, the BED might evacuate the affected locations. The letter is turned over to Hanford Patrol and their instructions are followed.

7.5.2 Hostage Situation/Armed Intruder

The discoverer of a hostage situation or armed intruder reports the incident to 911 from site office phones/373-0911 from cellular phones and to the BED if possible. Hanford Patrol will determine the remaining response actions.

7.5.3 Suspicious Object

The discoverer of a suspicious object reports this object to the BED and to 911 (do not use wireless communications devices for reporting a bomb threat/explosive device unless beyond 100 feet from the suspected object), if possible, and ensures that the object is not disturbed.

7.6 Response to Unexpected/Unidentified Odors

Unexpected and unidentified odors should be investigated by the facility or project safety and health personnel. If the odor can be traced to an identifiable source and controlled safely with local resources, it can be resolved at the facility level. Air monitoring may aid in identification of a source and help determine if the odor is indicative of a health threat or is merely a nuisance. If facility or project safety and health personnel concur that the odor may be indicative of a health threat and cannot be safely controlled with local resources or an odor is found to be the result of an action or condition that requires emergency response, the Hanford Fire Department would be notified and respond accordingly.

8.0 TERMINATION OF EVENT, INCIDENT RECOVERY, AND RESTART OF OPERATIONS

Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 9.0, describes actions for event termination, incident recovery, and restart of operations. The extent by which these actions are employed is based on the incident classification of each event. In addition, Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), also contains actions for the management of incompatible wastes that might apply.

8.1 Termination of Event

For events where the Hanford Emergency Operations Center (Hanford-EOC) is activated, the Site Emergency Director (SED) and the Incident Commander (IC) have the authority to declare event termination. Termination occurs after all applicable criteria in this procedure have been met and concurrence among SED and the IC has been obtained. Termination from a security-related event will include the concurrence of the Security Director. For events where the Hanford-EOC is not activated, the ICS and staff will declare event termination.

8.2 Incident Recovery and Restart of Operations

A recovery plan is developed when necessary in accordance with Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 9.2. A recovery plan is needed following an event where further risk could be introduced to personnel, the T Plant Complex, or the environment through recovery action and/or to maximize the preservation of evidence.

If this plan was implemented according to Section 4.0 of this plan, Ecology is notified before operations can resume. Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 5.1, discusses different reports to outside agencies. This notification is in addition to those required reports and must include the following statements.

- There are no incompatibility issues with the waste and released materials from the incident.
- All the equipment has been cleaned, fit for its intended use, and placed back into service.

The notification required by WAC 173-303-360(2)(j) may be made via telephone conference. Additional information that Ecology requests regarding these restart conditions will be included in the required 15-day report identified in Section 11.0 of this plan.

For emergencies not involving activation of the Hanford-EOC, the BED ensures that conditions are restored to normal before operations are resumed. If the Hanford Site Emergency Response Organization was activated and the emergency phase is complete, a special recovery organization could be appointed at the discretion of RL to restore conditions to normal. This process is detailed in RL and contractor emergency procedures. The makeup of this organization depends on the extent of the damage and the effects. The onsite recovery organization will be appointed by the appropriate contractor's management.

8.3 Incompatible Waste

After an event, the BED or the onsite recovery organization ensures that no waste that might be incompatible with the released material is treated, stored, and/or disposed of until cleanup is completed. Clean up actions are taken by T Plant Complex personnel or other assigned personnel. Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 9.2.3, describes actions to be taken.

Waste from cleanup activities is designated and managed as newly generated waste. A field check for compatibility is performed before storage, as necessary. Incompatible wastes are not placed in the same container. Containers of waste are placed in approved storage areas appropriate for their compatibility class.

If incompatibility of waste was a factor in the incident, the BED or the onsite recovery organization ensures that the cause is corrected.

8.4 Post Emergency Equipment Maintenance and Decontamination

All equipment used during an incident is decontaminated (if practicable) or disposed of as spill debris. Decontaminated equipment is checked for proper operation before storage for subsequent use. Consumables and disposed materials are restocked. Fire extinguishers are replaced.

The BED ensures that all equipment is cleaned and fit for its intended use before operations are resumed. Depleted stocks of neutralizing and absorbing materials are replenished; protective clothing is cleaned or disposed of and restocked, etc.

9.0 EMERGENCY EQUIPMENT

Emergency resources and equipment for the T Plant Complex are presented in this section.

9.1 Fixed Emergency Equipment

FIXED EMERGENCY EQUIPMENT		
TYPE	**LOCATION**	**CAPABILITY**
Fire Detection Equipment	Master Fire Alarm Boxes located in 2706-T Electrical Room and 271-T Entry Foyer.	Manual pull station or detector transmits signal to master fire alarm box and then the HFD.
Automatic Sprinkler System	Installed throughout 271-T, 2706-T, portion of the Pipe Gallery in 221-T, and MO-433.	Automatically activates and controls or extinguishes fire.

9.2 Portable Emergency Equipment

PORTABLE EMERGENCY EQUIPMENT		
TYPE	**LOCATION**	**CAPABILITY**
Fire Extinguishers	Throughout the complex	Fire control
Eye Wash	Pipe Gallery for storage, work location for use	Assists in flushing chemical/material from eyes, clothes, and body.
Emergency Monitoring Kit*	MO-892	Use during emergencies for radiation detection equipment, PPE clothing, and respiratory equipment
Emergency Monitoring Kits*	271T	Use for radiological emergency response

* = This equipment is for radiological emergency response purposes only. It is not Ecology's intent to regulate radionuclides. However, it is necessary to maintain an up-to-date complete BEP.

9.3 Communications Equipment/Warning Systems

COMMUNICATIONS EQUIPMENT		
TYPE	**LOCATION**	**CAPABILITY**
PA System	Throughout complex	Public address system used for communication

Note: Site-wide communications and warning systems are identified in Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Table 5.1.

9.4 Personal Protective Equipment

PERSONAL PROTECTIVE EQUIPMENT		
TYPE	**LOCATION**	**CAPABILITY**
Protective Clothing	Section 20, Operating Gallery; Section 20, Pipe Gallery; MO-433; 2716-T, Section 11; Head End	Protect personnel from exposure to hazardous chemicals/materials
Respirators	Mask Station, 271-T	Protect personnel from hazardous atmosphere and airborne particulates

9.5 Spill Control and Containment Supplies

SPILL KITS AND SPILL CONTROL EQUIPMENT		
TYPE	**LOCATION**	**CAPABILITY**
Absorbents, spill pigs and pillows, and gloves	First floor Pipe Gallery Spill Cabinet	Use to clean up most liquid spills and some solids
Magnetic mat	First floor Pipe Gallery Spill Cabinet	Sealing floor drains for spill containment
Non-sparking cleanup tools	First floor Pipe Gallery Spill Cabinet	Opening-closing drums, sweeping/shoveling ignitable
Sampling containers and supplies	First floor Pipe Gallery Spill Cabinet	Sampling most liquids and solids
Emergency response equipment and supplies	Emergency Supply Cage in Pipe Gallery	Use for emergency response

9.6 Incident Command Post

The ICPs can be identified in a fixed location or the IC can determine a location appropriate for the event. Emergency resource materials are stored at each location. The IC could activate the Hanford Fire Department Mobile Command Unit if necessary.

10.0 COORDINATION AGREEMENTS

RL has established a number of coordination agreements or memoranda of understanding (MOU) with various agencies to ensure proper response resource availability for incidents involving the Hanford Site. A description of the agreements is contained in Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 3.0, Table 3-1.

11.0 REQUIRED REPORTS

Post incident written reports are required for certain incidents on the Hanford Site. The reports are described in Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02), Section 5.1.

Facility management must note in the TSD-unit operating record, the time, date and details of any incident that requires implementation of the contingency plan (refer to Section 4.0 of this plan). Within fifteen (15) days after the incident, a written report must be submitted to Ecology. The report must include the elements specified in WAC 173-303-360(2)(k).

12.0 PLAN LOCATION AND AMENDMENTS

Copies of this plan are maintained at the following locations:

- 271-T Room 213
- MO-892

This plan will be reviewed and immediately amended as necessary, in accordance with Permit Attachment 4, *Hanford Emergency Management Plan* (DOE/RL-94-02) Section 14.3.1.1.

13.0 FACILITY/BUILDING EMERGENCY RESPONSE ORGANIZATION

BUILDING EMERGENCY DIRECTOR

T Plant Complex BEDs		
TITLE	**WORK LOCATION**	**WORK PHONE**
Operations Supervision	Various	373-1077

Names and home telephone numbers of the BEDs are available from the POC (373-3800) in accordance with Permit Condition II.A.4.

14.0 REFERENCES

DOE/RL-94-02, *Hanford Emergency Management Plan*

DOE O 231.1A, *Environment, Safety, and Health Reporting*, U.S. Department of Energy, Washington D.C.

DOE M 231.1-2, *Occurrence Reporting and Processing of Operations Information*, U.S. Department of Energy, Washington D.C.

WAC 173-303, "Washington State Dangerous Waste Regulations," *Washington Administrative Code*, Washington State Department of Ecology, Olympia, Washington

Ecology, *Hanford Facility Resource Conservation and Recovery Act Permit for the Treatment, Storage, and Disposal of Dangerous Waste, Permit Number* WA7890008967, Washington State Department of Ecology, Olympia, Washington, as amended.

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BUILDING EMERGENCY PLAN FOR THE T PLANT COMPLEX	Page:	33 of 34
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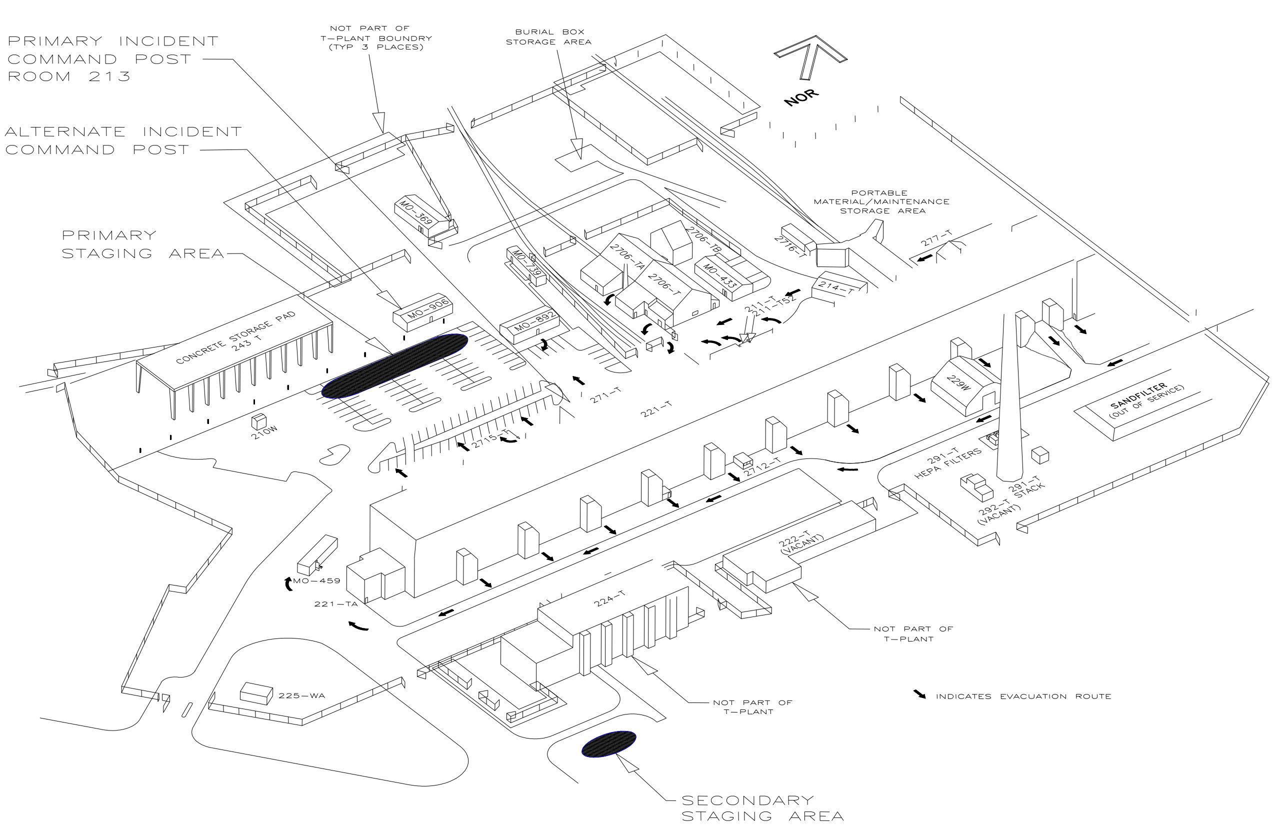
Figure 1. T Plant Complex Evacuation Routes and Staging Areas



ATTACHMENT A

Listing of Procedures and Documents

DOE-0223, *Emergency Plan Implementing Procedures*, RLEP-1.0, "Recognizing and Classifying Emergencies," Appendix 1-2.E

DOE-0223, *Emergency Plan Implementing Procedures*, RLEP-1.1 "Hanford Incident Command System and Event Recognition and Classification"

DOE-0223, *Emergency Plan Implementing Procedures*, RLEP-3.4 "Emergency Termination, Reentry, and Recovery"

Facility-Specific Emergency Response Procedures

DO-ERP-001, "Evacuation"
SWOC-ERP-001, "Response to Off-normal Condition at SWOC"
SWOC-ERP-002, "Respond to Fire or Explosion"
SWOC-ERP-003, "Respond to Spill/Release"
SWOC-ERP-004, "Take Cover"

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