Appendix D

Conceptual Site Models

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Contents

Figures

Landfill Plates

Please see accompanying compact disk, part of Appendix A, for the following landfill plates:

- West Inner Area and east Inner Area (shows proposed characterization for all landfills in 200-SW-2)
- 218-C-9
- 218-E-1
- 218-E-2, E-2A, E-4, E-5, E-5A, and E-9
- 218-E-8
- 218-E-10
- 218-E-12A
- 218-E-12B
- 218-W-1
- 218-W-1A
- 218-W-2
- 218-W-2A
- 218-W-3
- 218-W-3A
- 218-W-3AE
- 218-W-4A
- 218-W-4B
- 218-W-4C
- 218-W-5
- 218-W-11

Terms

bgs	below ground surface
COC	contaminant of concern
CPS	counts per second
CSM	conceptual site model
DOE	U.S. Department of Energy
EMFLUX	passive soil gas sampling device
EMI	electromagnetic induction (geophysical method for locating metallic anomalies in landfill)
ERT	electrical resistivity tomography (geophysical method for locating fluid data)
FY	fiscal year
GPR	ground-penetrating radar (geophysical method for delineating trench boundaries and locating metallic anomalies)
IC	institutional control
LLW	low-level waste
MASW	multi-channel analysis of surface waves (geophysical method for locating preferential flow paths)
MFP	mixed fission products
OU	operable unit
PFP	Plutonium Finishing Plant
PUREX	Plutonium-Uranium Extraction (Plant or process)
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation (Plant)
RI/FS	remedial investigation/feasibility study
RSW	retrievably stored waste
SAP	sampling and analysis plan
STS	surface-to-surface (electrical resistivity; geophysical method for location of fluid data)
SVE	soil vapor extraction
SWITS	Solid Waste Information and Tracking System
TDEM	time domain electromagnetics

TMF	total magnetic field
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
UPR	unplanned release
USG	unsegregated waste
VOC	volatile organic compound
WIDS	Waste Information Data System

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Glossary

Burial ground: At the Hanford Site, a burial ground is synonymous with the term landfill. Many of the Inner Area landfills that are part of the 200-SW-2 Operable Unit (OU) used the term burial ground as part of the formal name (e.g., equipment burial ground 2; also called 218-E-2). A 200-SW-2 burial ground typically had defined disposal trenches used for disposal of solid waste. Trench dimensions varied, based on the type of waste being disposed.

Caissons: Engineered metal and concrete structures embedded in the landfills. They served as an additional disposal container for wastes that required unusual shielding because of high radioactivity.

Curie content: The quantity of beta gamma curies decayed to 2015 compared to the other landfills. "Low" means the curie quantity is one of the lowest amongst the landfills. "Moderate" means the curie quantity is in the middle. "High" means the curie quantity is one of the highest compared to the other landfills.

Disposal pond: Liquid disposal site for liquid effluent from past Hanford production facilities.

Episodic water: Water that has accumulated on a solid disposal waste site due to weather conditions (flooding due to rapid snowmelt) or due to a breach in a nearby liquid waste disposal site.

Green Islands: Landfill locations containing dangerous waste regulated under the *Resource Conservation and Recovery Act of 1976*. The Green Island phrase originates from the fact that the locations of dangerous waste are marked with green spots on the maps of the landfills.

Landfill: As defined in WAC 173-303-040, "Dangerous Waste Regulations," "Definitions,"[1] a disposal facility, or part of a facility, where dangerous waste is placed in or on land and which is not a pile, a land treatment facility, a surface impoundment, or an underground injection well; a salt dome formation, a salt bed formation, an underground mine, a cave, or a corrective action management unit. The performance standards for disposal facilities under DOE O 435.1, *Radioactive Waste Management*, are functionally equivalent to the *Washington Administrative Code* requirements for landfills.

Hydraulic driving force: A landfill is considered to have been subjected to a hydraulic driving force if any portion of it was covered with water due to a weather-related flood or because of proximity/collocation with a liquid disposal site. The water may have covered the area before or after emplacement of solid waste. Large volumes of water have the potential to drive contamination deeper into the vadose zone than in sites that have remained dry.

N/A: Not available. Designation is used for "soil gas detection" when no soil gas sampling was performed for a specific landfill.

Rank: A categorization of each landfill that indicates how a landfill compares with others with respect to a particular parameter. For example, a landfill ranked number one for plutonium content has the most plutonium of all the landfills.

Record quality: The relative amount of landfill disposal records compared to other landfills. "Poor" records mean relatively few records are available. "Moderate" means there is some missing information but available records provide a decent amount of data. "Good" means there is a good written history of the contents of the landfills.

[1] WAC 173-303-040, "Dangerous Waste Regulations," "Definitions," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-303-040.

Retrievably stored waste: Waste packaged and stored in a manner that allows retrieval at a future time. TRU waste was not retrievably stored until May 1970. The term distinguishes between retrievably stored TRU waste (post-1970) and pre-1970 transuranic-contaminated material.

Subsidence: A downward movement within the ground due to disturbed soil, burial box collapse, or other landfill conditions.

Transuranic (TRU) waste: Radioactive waste (generated since 1970) containing more than 100 nCi (3,700 Bq) of alpha-emitting transuranic isotopes per gram of waste; contributing isotopes have half-lives greater than 20 years.

Treatment, storage, and/or disposal landfill: A landfill where dangerous waste is placed in or on the land, as defined in WAC 173-303.

D1 Introduction

This appendix contains conceptual site models (CSMs) for each of the 24 landfills within the 200-SW-2 Operable Unit (OU). The CSMs contain supplemental information (such as characterization data, summary of previous investigations, inventory, operational history, and data needs) to the *Resource Conservation and Recovery Act of 1976* facility investigation/corrective measures study/remedial investigation/feasibility study work plan and should be reviewed in conjunction with the main document. The CSMs summarize data gaps for individual landfills and thus provide a basis for investigations described in the work plan.

Each landfill was historically designated for disposal of the following waste types: treatment, storage, and disposal unit waste, dry waste, industrial waste, construction waste, dry waste alpha, and caissons. Figure D-1 gives a geographic overview of the locations of different waste types in the west and east Inner Areas. Figure D-2 provides detailed information for each type of landfill. Figures D-3 through D-26 present CSMs for each individual landfill in the 200-SW-2 OU. Each CSM provides a ranking compared to other landfills for volume of waste, size of the landfill, plutonium mass, uranium mass, and curie content. The trench locations on the site maps included with each CSM are based on Hanford Site ("H-2-" prefix) drawings and may not represent actual trench locations.

Based on historical groundwater sampling results from wells near the 200-SW-2 OU landfills, there is no evidence that contaminants from the landfills have reached the underlying groundwater. The vadose zone is the focus of ongoing investigation. Results of sampling proposed in the sampling and analysis plan (SAP) (Appendix A) will be presented in the remedial investigation.

Historically, liquid process waste that was not sent to the tank farms was discharged to the soil column via ponds, cribs, ditches, and trenches. Due to these readily available means of liquid disposal, coupled with a lack of burial records indicating disposal of large quantities of containerized liquid waste in the 200-SW-2 OU landfills, a significant downward driving force for contaminants due to solid waste burials is not anticipated to be present. However, characterization activities proposed in the SAP (Appendix A) are intended to investigate the vadose zone beneath landfill trenches to determine if contaminants have moved from the trenches toward groundwater.

CSMs should be reviewed, along with the individual landfill plates located on the accompanying compact disk. The plates provide additional soil gas monitoring data and groundwater monitoring well locations.

The work plan contains additional information on the environmental setting, geology, groundwater OUs located beneath the 200-SW-2 landfills, environmental resources, nature and extent of contamination, air monitoring for the Hanford Site, and other relevant information. This appendix is not intended as a stand-alone document nor should it be reviewed as such.

Other appendices included with the work plan are a SAP, landfill records, organic contaminants associated with the 200-SW-2 landfills, summary of the T Ponds and Ditches, and data quality objectives.

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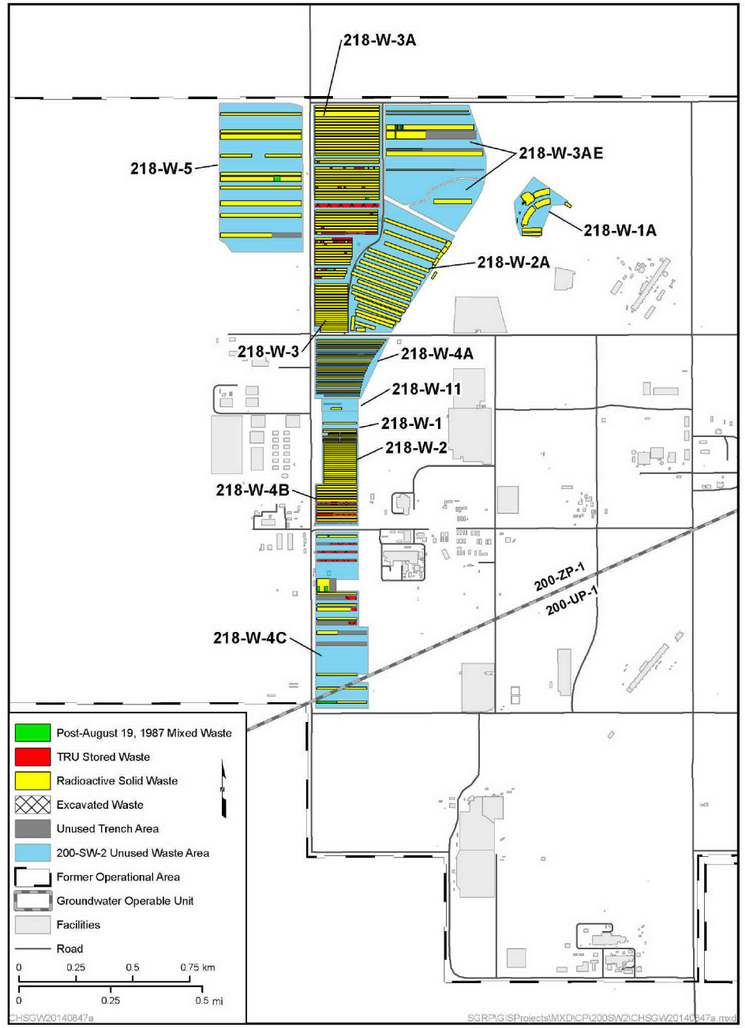
200-SW-2 Operable Unit

Waste Type Area Maps

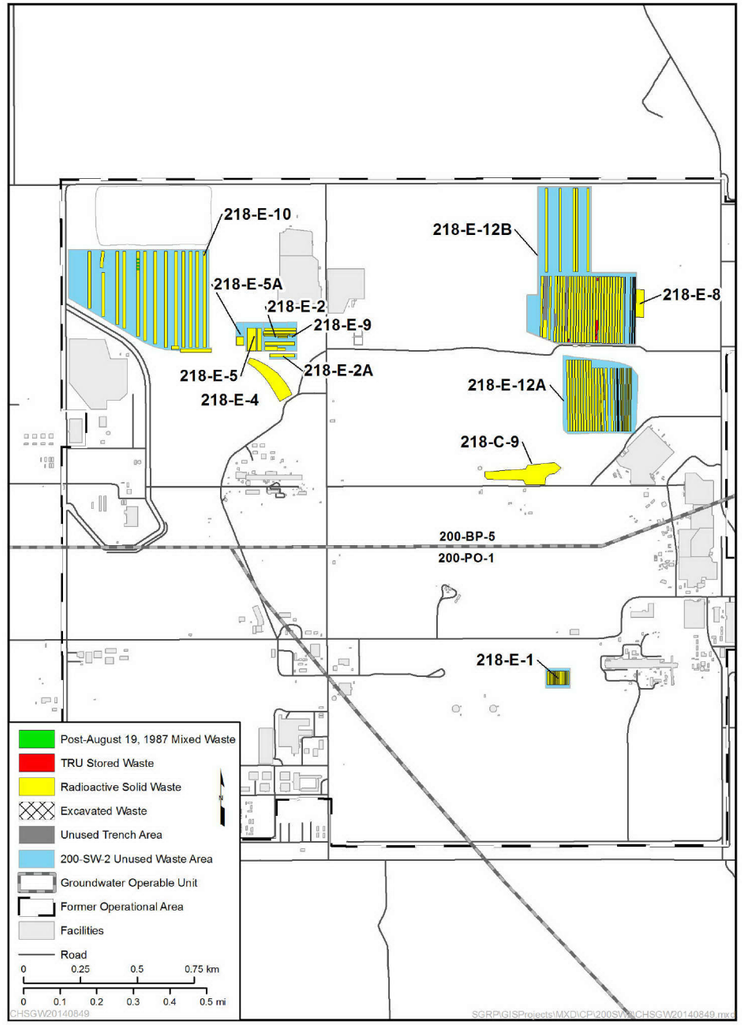
The West Inner Area and East Inner Area Waste Type Area Maps are provided as reference material for the landfill Conceptual Site Models contained in Appendix D.

Site Maps with Waste Type

WEST INNER AREA



EAST INNER AREA



Each landfill trench is color coded based on known waste type. More detailed information on landfill characterization is provided in the Conceptual Site Models for the individual landfills.

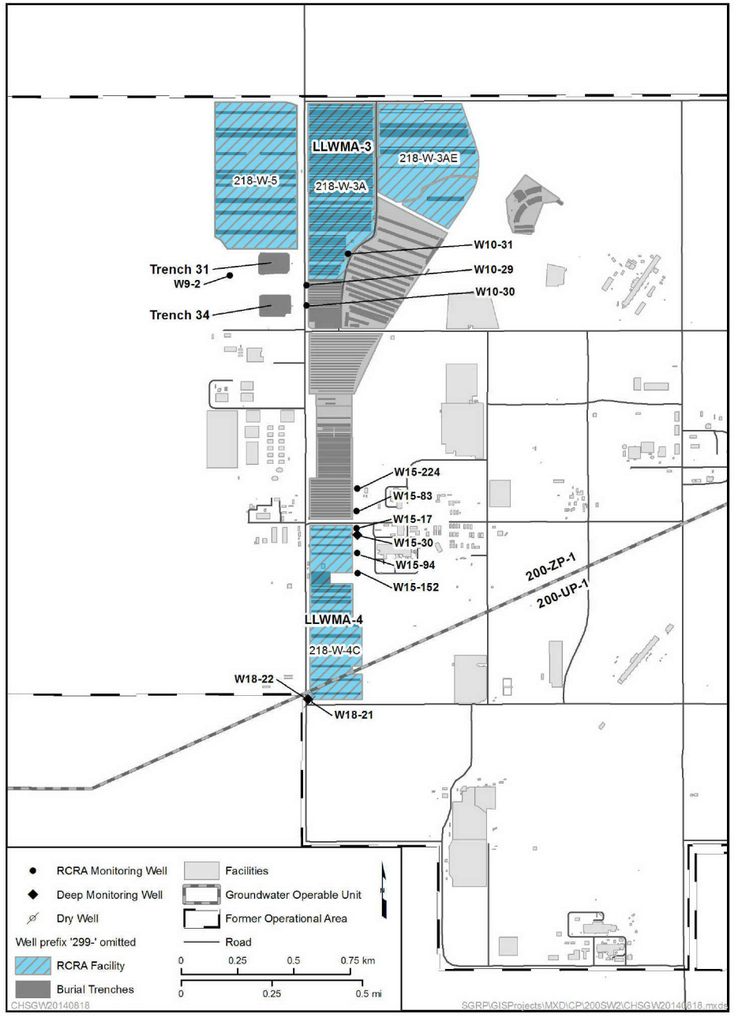
200-SW-2 Operable Unit

LLWMA Boundary Maps

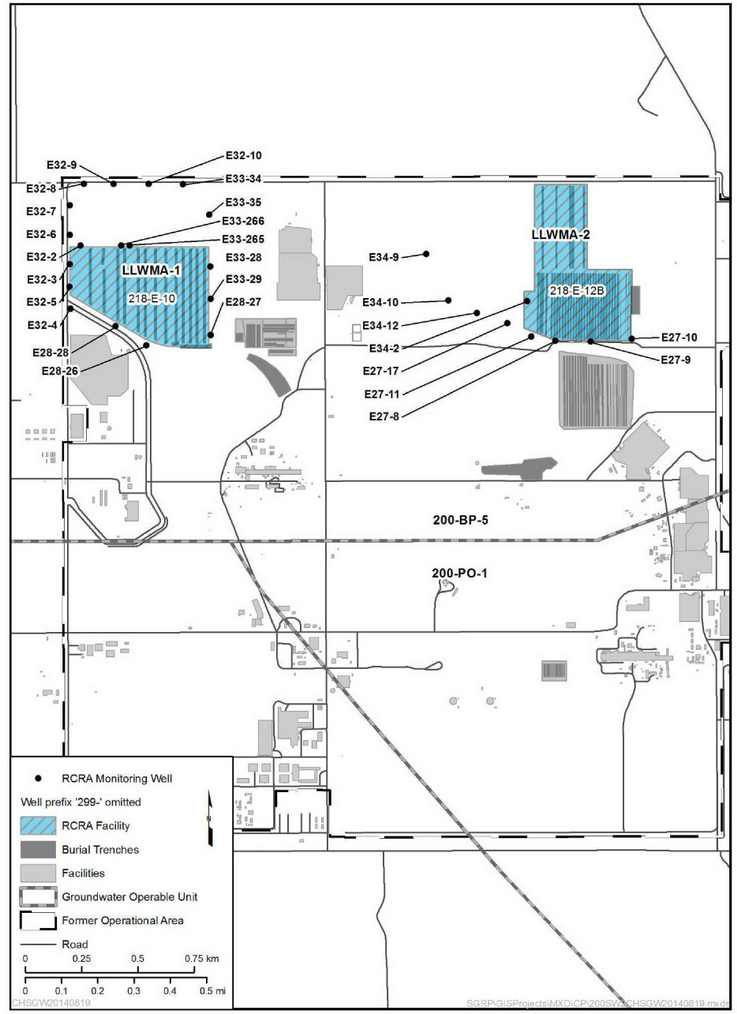
The West Inner Area and East Inner Area LLWMA Boundary Maps are provided as reference material for the landfill Conceptual Site Models contained in Appendix D.

Site Maps with LLWMA Boundaries

WEST INNER AREA



EAST INNER AREA



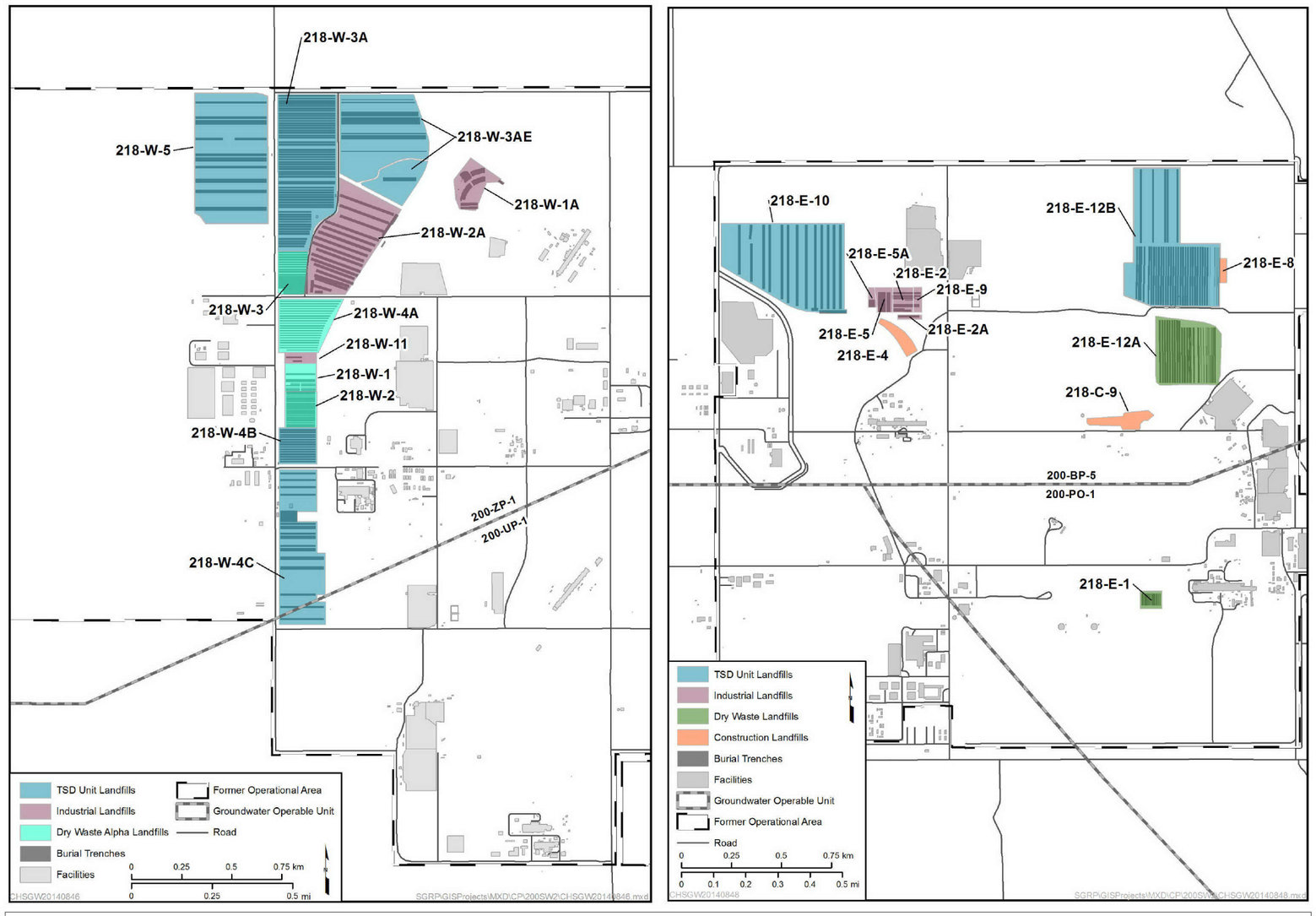
200-SW-2 Landfill Types

Descriptions & Locations

TSD
Industrial
Dry Waste Alpha
Dry Waste
Construction
Caissons*

*218-W-4A and 218-W-4B

Area Maps with Landfill Type



Each landfill is color coded based on type. Descriptions of each type and associated landfills is provided on page D-4. More detailed information on landfill characterization is presented in the Conceptual Site Models for the individual landfills.

Figure D-2 | **Landfill Types • Descriptions & Locations** *2 of 2*

TSD

- LLBG Dangerous Waste Permit Application - Part A
- Some contain retrievably stored TRU waste: M-91
- Potential for small volume, sorbed, containerized liquids
- Potential for subsidence
- High dose rates
- Include industrial and dry waste types

LANDFILLS

218-E-10 (Page D-27)
218-E-12B (Page D-32)
218-W-3A (Page D-45)
218-W-3AE (Page D-48)
218-W-4B (Page D-55)
218-W-4C (Page D-59)
218-W-5 (Page D-62)

Typical TSD wastes on train in 1989. It is not known where items are disposed.

Industrial

- High internal void volume
- High potential for subsidence
- Disposal of failed/obsolete equipment
- High dose rates
- Waste typically contained in large wooden or concrete boxes

LANDFILLS

218-E-2 (Page D-13)
218-E-2A (Page D-15)
218-E-5 (Page D-19)
218-E-5A (Page D-21)
218-E-9 (Page D-25)
218-W-1A (Page D-36)
218-W-2A (Page D-40)
218-W-11 (Page D-65)

Wooden dragoff box common in Industrial landfills.

Dry Waste Alpha

- Contain at least 90% of the pre-1970 alpha contaminated LLW
- Waste Primarily packaged in fiberboard cartons/boxes/drums
- Low potential for subsidence

LANDFILLS

218-W-1 (Page D-34)
218-W-2 (Page D-38)
218-W-3 (Page D-43)
218-W-4A (Page D-51)

Cardboard boxes, unwrapped, and paper-wrapped items in a Dry Waste Alpha landfill in 1955.

Dry Waste

- Waste primarily packaged in fiberboard cartons/boxes/drums
- Medium dose rate (up to 2,000 mR/hr)
- Low potential for subsidence
- Primarily beta-gamma contaminated waste
- Surface stabilized with fly ash

LANDFILLS

218-E-1 (Page D-11)
218-E-12A (Page D-30)

Dump of miscellaneous scrap common in Dry Waste landfills.

Construction

- Low activity waste (<100 mR/hr)
- Primarily construction/demolition debris and concrete rubble
- Low potential for subsidence

LANDFILLS

218-C-9 (Page D-9)
218-E-4 (Page D-17)
218-E-8 (Page D-23)

Demolition debris from 201-C (semiworks) in the 218-C-9 landfill before backfilling.

Caissons

- High dose rate (up to 10,000 mR/hr)
- Typically remote handled waste
- Small containers (1-5 gallons)
- High beta-gamma radiation
- Potential for small volumes of sorbed organics (lab packs)
- 20 caissons total
- 4 caissons in M-91 project scope
- 4 caissons believed unused

LANDFILLS

218-W-4A (Page D-51)
218-W-4B (Page D-55)

Caisson installation.

218-C-9
Landfill

Construction

Cleanup of the dried 216-C-9 pond is underway in 1985 in preparation for receipt of solid waste in 218-C-9.

Curie Content: Low

Green Islands: No

Hydraulic Driving Force: Yes

Record Quality: Good

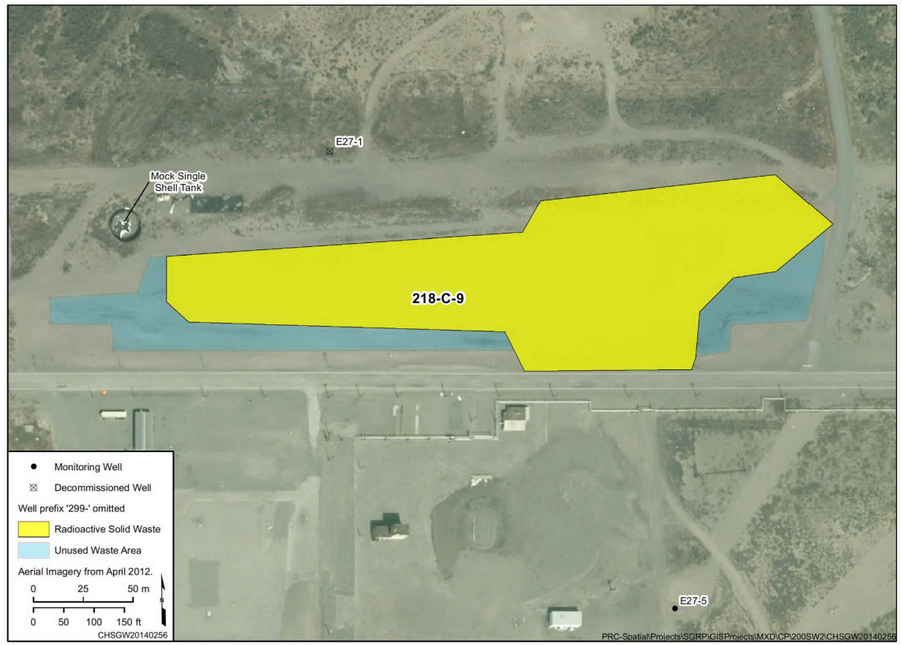
Subsidence: No

Soil gas detection: N/A

Landfill Summary

WIDS Code & Aliases	218-C-9; 218-C-9 Burial Ground; 218EC9; Dry Waste No.0C9
Landfill Type	Construction
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	• Liquid discharges 1953 to 1983 • Solid waste burial 1985 to 1989
Location	North of Hot Semiworks Plant (201C)
General Description	The unit consists of one large burial pit. The burial ground is located inside the excavation of the never-constructed 221-C Building. The burial pit is located at the site of the dried 216-C-9 Pond. SWITS and paper burial records indicate that construction waste was placed in the east end of the landfill; uncontainerized soil and weeds contaminated with radioactive strontium and cesium, including soil from UN-216-E-37 and UN-216-E-39 (both unplanned releases were from a pump removed from 201C that leaked onto the nearby road during transit), were placed in the west end. In August 1986, a fire in the burial pit was caused by torch-cut metal frames placed in the pit before they had cooled; they ignited flammable material. The entire site was backfilled and surface stabilized in 1989 with 284E Powerhouse ash. Debris at the site consists of radiologically contaminated concrete rubble, large equipment, roofing material, metal scrap, and other Hot Semiworks Plant demolition wastes.
Source Facilities Contributing More Than 5% of Waste by Volume	Hot Semiworks (201C)
References	WIDS; SWITS; RHO-CD-673

Site Map



Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	7,600	14
Used Area (hectares)	1.8	15
Plutonium Mass (kg)	7.00E-08	21
Uranium Mass (kg)	0	21
Curies (Ci) decayed to 2015	20	19

WASTE RECORDS

Number Available	Rank	Record Quality
724	9	Good

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	8	No site drawing. Site stabilized/backfilled in 1989 with 200E Powerhouse material.			
Number of Trenches	1	Footprint coincides with former disposal pond 216-C-9 (active 1953-1985)			
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	Y

216-C-9 Pond

Before its use as a landfill, the location was the excavation for the planned plutonium separation building, 221-C, whose construction never was completed. However, the excavation for the 221-C foundation was used as a liquid waste disposal site, designated as the 216-C-9 Pond. For 30 years (1953 to 1983), it received approximately 1 billion L (264 million gal) of mildly radioactive steam condensate liquid discharge from source facilities, the 209-E Critical Mass Laboratory and the Hot Semiworks (201-C). Two years after liquid discharges to the site ceased, solid wastes were disposed to this previously used pond area for a 4 year period (1985 to 1989). A large portion of the 216-C-9 Pond area was assigned the facility designation of “218-C-9” to signify its use as a solid waste landfill. Debris at the landfill consists of potentially contaminated concrete rubble, large equipment, roofing material, metal scrap, and other Hot Semiworks demolition wastes. Contaminated soil from UPR-200-E-37 and UPR-200-E-98 also was placed in the 218-C-9 Landfill. Although the majority of the waste in the 218-C-9 Landfill consists of non-containerized demolition rubble, the landfill also contains approximately 270, 208 L (55 gal) drums of LLW.

Landfill Inventory

Items Known to be Disposed

Absorbent, Air Conditioners, Aluminum, Asbestos, Asbestos-Covered Pipe, Asbestos Piping and Duct, Asphalt, Blacktop, Cardboard, Cardboard, Cement, Chain Link Fence, Cloth, Concrete, Concrete Metal, Contaminated Soil, Cut Pipe, Diatomaceous Earth, Dirt, Drums Soil, Dump Trucks Soil, Electric Motors, Fiberglass, Floor Sweep, Floor Sweeps, Foam, Galvanized Metal Gutters, Glass, Greenhouse, Hay, HEPA Filter, Iron, Kitty Litter, Leather, Lumber, Metal, Metal Brackets, Metal Demolition Debris, Metal Doors, Metal Foam Wood Poles, Metal Pipe, Nylon, Packages of Transite Sheeting Asbestos, Paper, Paper and Plastic in a Steel Box, Pipe, Piping, Plastic, Plastic and Weeds in DOT 55-Gal Drums, Plastic Foam, Plastic Rubber, Plywood, Polyurethane, Pyrofoam, Rags, Rubber, Rubber, Sample Pump, Sand, Sheet Metal Ducts, Soil, Soil and Plastic in a Metal Box, Soil in Drums, Soil Packaged in 1-lb Metal Cans, Stainless Steel, Stainless Steel and Aluminum, Stainless Steel Metal Doors, Stainless Steel Pulsar Columns, Stainless Tanks, Standard Boxes Paper, Steel, Steel Beams and Channel, Straw, Structural Steel Pipe Gallery, Styrofoam, Sweeping Compound, Transite Asbestos, Tumbleweeds, Tumbleweeds Self-Contained, Tumbleweeds Delivered in a Compactor Truck, Tumbleweeds in Plastic Wrap, Vermiculite, Weeds, Weeds in Plastic Wrap, Wood, Wood Demolition Debris, Wood Piles, Wood Poles, Wood Poles with Metal Brackets, Wood Power Poles, Wood Telephone Poles.

Information from photos and logbooks contradicting literature.

None. Photos from 1985-1989 correlate well with the operational history reported in WIDS and SWITS.

CHSGW20140256

Figure D-3 | CSM for the **218-C-9 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-C-9 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Not performed.

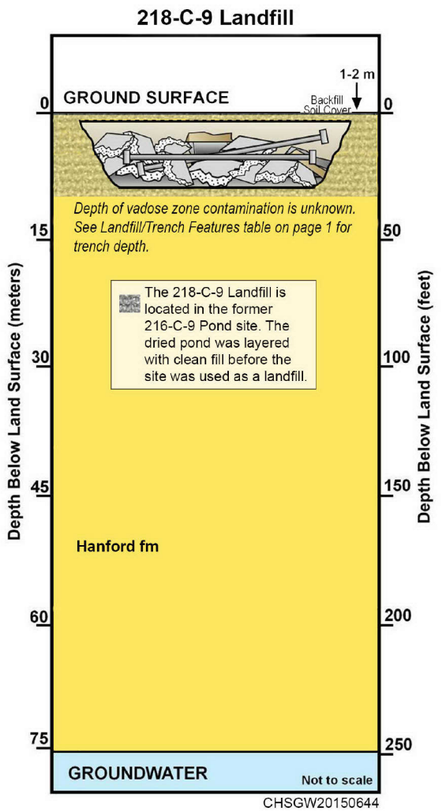
Surface Radiation Surveys

- Based on the 2011 survey, there is a large area in the center of the landfill with counts per second (cps) between 1001 and 1250. The remainder of the landfill generally had a cps between 750 and 1000.

Geophysics Summary

- 2005: The geophysical data indicate this landfill does not appear to contain large, continuous concentrations of buried objects or debris in well-defined trenches or pits. Several large metallic objects or concentrations of smaller metallic debris are buried in several somewhat discrete locations across the landfill, primarily through the center and southwestern portion. No Hanford Site drawing was located for the 218-C-9 Landfill.
- Techniques used: EMI, GPR, TMF

Cross Section



Photographic History

In 1962, 216-C-9 Pond actively received cooling water. It is located in the excavation for the never-built 221-C Building (C-Canyon).

May, 1985. 218-C-9 open excavation before any solid waste has been emplaced.

October, 1986. Some solid waste has been emplaced and covered with a layer of dirt.

August, 1987. Decommisioning rubble from 201-C in the 218-C-9 landfill before backfilling.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Good quality records with no indication of mobile constituents in the waste. Surface radiation survey - one area with between 1001 and 1250 cps.	Need to review existing data. Need EMFLUX to confirm no mobile constituents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	Historical presence of disposal pond suggests earlier release(s) of mobile constituents downward (leaching). Rad surveys indicate that Sr and Cs being brought to surface by vegetation.	Need to identify vadose zone preferential pathways that may control leaching/ downward flow. Need to evaluate bioturbation activity.	Perform MASW to identify preferential pathways. Direct Push for leak detection. Review data on radiation and bioturbation.
Transport Media	Past practice as a disposal pond suggest leachate. Recent rad surveys indicate increasing concentrations of Sr and Cs in surface soils.	Need passive and active soil gas data for risk assessment. Need data on fluid flow.	Perform STS resistivity and ERT for fluid data. Direct Push for soil/fluid samples. Obtain active soil gas samples in area of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Surface/near-surface (e.g., root zone) – soil/veg. Groundwater exposure points – fluids/water.	Need to evaluate vegetation/bioturbation activity at the surface. Need to confirm no impacts to groundwater.	Review/inspect site surface for ecological activity. Review groundwater data for evidence of impacts by 218-C-9 and/or previous pond disposal.
Exposure Route	Ingestion/dermal – contaminated soil/vegetation, fluid/leachate	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

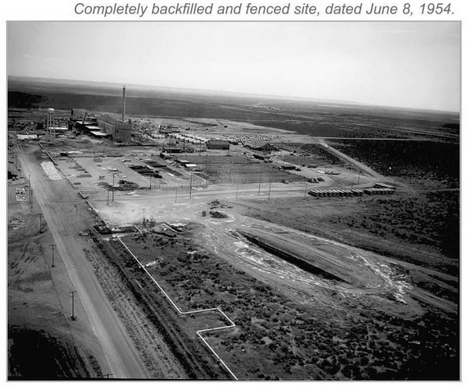
Unplanned Releases Collocated with or Near 218-C-9 Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
216-C-9	216-C-9 Pond	North of 7th Street and north of Hot Semiworks Facility.	1953 to 1983	209-E Critical Mass laboratory Hot Semiworks Facility	1 billion L (264 Mgal) mildly radioactive steam condensate liquid discharge	2.4 m	383 by 70 m (1256 by 230 ft)	The excavation was originally intended to be the foundation for the 221-C Canyon Facility that was never built. It was modified to receive cooling water from the 201-C Hot Semiworks Facility. Over a period of 30 years, the pond received approximately 1 billion liters (264 Mgal) of mildly radioactive steam condensate liquid discharge from the 209-E Critical Mass Laboratory and the Hot Semiworks (201-C)

218-E-1
Landfill

Dry Waste

Completely backfilled and fenced site, dated June 8, 1954.



Curie Content: Low

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: Yes

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-E-1, 200 East Dry Waste No. 001
Landfill Type	Dry Waste
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1945 to 1953
Location	West of PUREX (202A) and southeast of B-Plant (221B)
General Description	The unit received dry waste contaminated with mixed fission products and transuranic elements. Had 1 m (3 ft) of fill before stabilization. In 1974, areas with surface depressions were filled to grade with cinders from the 284 E Powerhouse and topped with gravel. The entire landfill was surface stabilized with 46 cm (18 in.) of clean soil and vegetated with wheat grass.
Source Facilities Contributing More Than 5% of Waste by Volume	B-Plant (221 B)
References	WIDS; WHC-EP-0912; RHO-CD-673; HW-60807; SWITS; HW-41535

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	3,000	19
Used Area (hectares)	1	19
Plutonium Mass (kg)	0.9	12
Uranium Mass (kg)	400	13
Curies (Ci) decayed to 2015	4	21

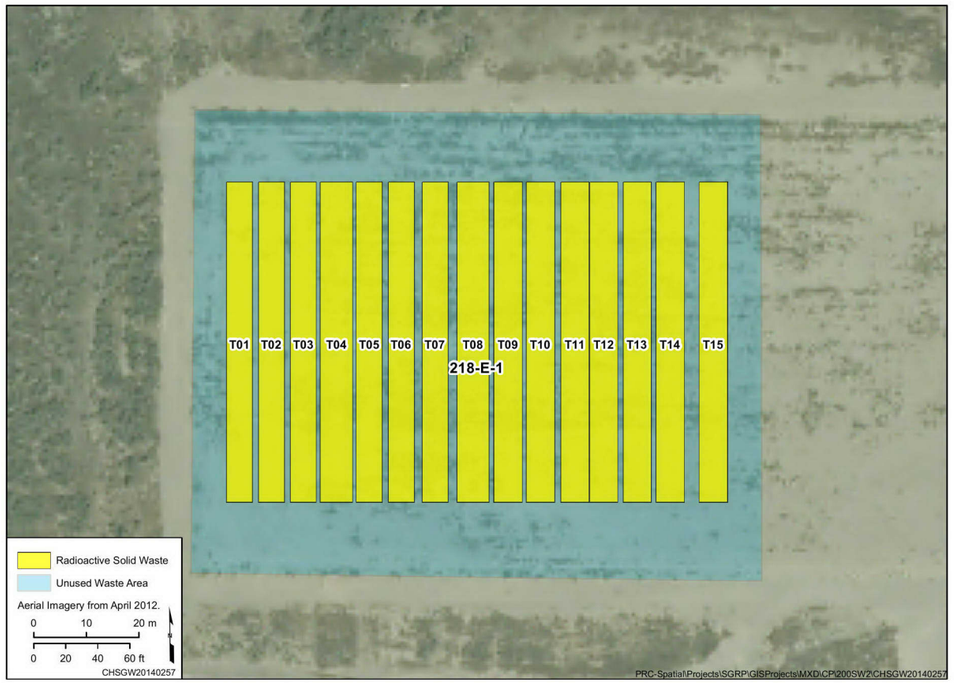
WASTE RECORDS

Number Available	Rank	Record Quality
35	15	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	3	61 m (200 ft) long trenches running north and south, about 6 m (20 ft) wide. It originally was designed for 21 trenches.			
Number of Trenches	15				
Subsidence?	Y	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

154 B Connector, 18-3 tank lid, 7-4 Sampling Assembly, 75-Ton Crane Hook Cable, Decontamination Pot, Dissolver Yoke, GE Tube for Section 14, Precipitator Yoke #63065, Pressure Gauge, Sec. 13 Connector 32, Sec. 18 Connector 2-37, Stainless Steel Pipe, Assault Masks, Dissolver Buckets, Pipe Flanges, Spray Nozzles, Chemox Face Piece, Dissolver Bucket Yokes, Cell Drain Blocks, Sample Stand Pipes, Bucket from Cask Assembly #190.

Information from photos and logbooks contradicting literature.

None. A 1954 photo shows the landfill completely backfilled and fenced.

Figure D-4 | CSM for the **218-E-1 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-1 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — 2009: Sampled at five locations. Detection of methyl ethyl ketone at a concentration of 11 ng/sample in one location.

PHASE 1-A DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Methyl ethyl ketone	1	--	--	--	--	11

Surface Radiation Surveys

- Based on the 2011 survey, there were no areas with high cps recorded.

Geophysics Summary

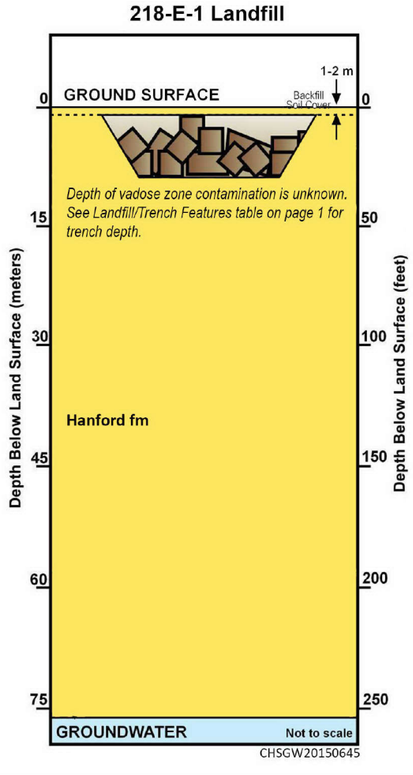
- 2006: Based on Hanford Site Drawing H-2-00124, the original landfill includes fifteen trenches, which correlate with the geophysical data. Geophysical data indicates that this landfill does not appear to contain large, continuous concentrations of buried objects or debris in well-defined trenches or pits.
- Techniques used: EMI, GPR, TMF

Photographic History

1987 photo shows the 218-E-1 landfill. Trench locations are still visible.

No photos of the 218-E-1 trench contents have been found. This photo of the completely backfilled and fenced site, dated June 8, 1954, corroborates the WIDS and SWITS descriptions of operating dates of 1945-1953.

Cross Section



Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Moderate quality records, but no mobile constituent indicated from EMFLUX. See Appendix H for discussion on DNAPL behavior. Relatively high rad concentrations. Surface radiation survey – no areas with high CPS found.	Need to review existing data. Need to understand high surface rad counts. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics. Review rad data to evaluate high surface survey counts. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence. No past history of driving force or constituent mobility via gas or leachate flow.	Need to identify downward flow. Need to understand current erosion/subsidence activity and potential.	Visual inspection/monitoring of surface for erosion and subsidence. Direct Push for leak detection.
Transport Media	Dry waste with no evidence of soil gas or leaching. Potential for direct transport of waste after being uncovered by erosion/ subsidence.	Need data about fluid flow. Need to review site history to assess if waste has been directly transported (e.g., blown about by wind, exposed by storms).	Direct Push for soil/fluid samples. Analyze directly exposed or transported waste, if present.
Exposure Point	Direct exposure to contents.	Need to confirm site conditions and waste containment.	Review/inspect site surface for exposed waste.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-E-1 Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-E-53	UPR-200-E-53, UN-200-E-53, Contamination at 218-E-1	The release occurred at the 218-E-1 Landfill.	1978	N/A	Contaminated soil	N/A	46 by 15 m (150 by 50 ft)	In October 1978, a contamination spread occurred during backfilling operations when a bulldozer uncovered shallow buried contaminated waste in an adjacent trench. Numerous spots of radioactive contamination were detected within the south end of the 218 E 1 Trench. The contaminated soil was reburied, and clean fill was spread over the area. The surface of the landfill was stabilized in 1981. The release is not marked or posted, but the 218 E 1 Landfill is marked and posted. (“Consolidated”)

218-E-2
Landfill

Industrial

A May 1971 photograph shows items stored on the surfaces of colocated landfills 218-E-2, 218-E-2A, 218-E-4, and 218-E-9.

Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Poor

Subsidence: Yes

Soil gas detection: N/A

Landfill Summary

WIDS Code & Aliases	218-E-2; Equipment Burial Ground #2; 200 East Industrial Waste No. 002
Landfill Type	Industrial
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1945 to 1953
Location	North of B-Plant (221B); 218-E-2/2A/4/5/5A/9 are colocated.
General Description	Burial Grounds 218-E-2, 5, 5A and 9 were surface stabilized as a single unit in 1979 with 0.3 meter (1 foot) of clean backfill and vegetated with wheat grass. In 2005, biobarrier material and gravel were placed on portions of the site where reoccurring contamination had been found.
Source Facilities Contributing More Than 5% of Waste by Volume	East Inner Area
References	WIDS; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	9,000	12
Used Area (hectares)	1.3	16
Plutonium Mass (kg)	0.8	13
Uranium Mass (kg)	300	15
Curies (Ci) decayed to 2015	450	10

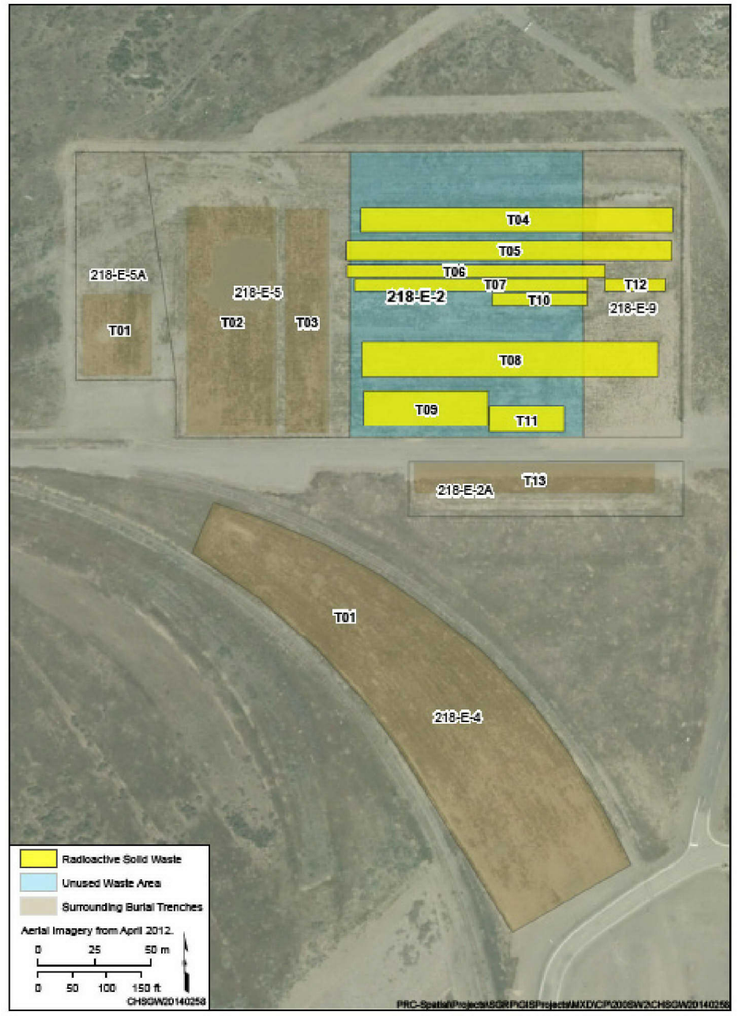
WASTE RECORDS

Number Available	Rank	Record Quality
5	20	Poor

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	Trenches run east to west. Individual trench lengths vary from 27 m (90 ft) to 142 m (465 ft). Site area overlaps with trenches in 218-E-9.			
Number of Trenches	9				
Subsidence?	Y	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

No landfill inventory records available for this landfill. Landfill inventory was estimated from SWITS. SWITS contains radiological inventory.

Figure D-5 | CSM for the **218-E-2 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-2 & 9 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Not performed.

Surface Radiation Surveys

- In September 2006 radiological soil measurements at the 218-E-2 and 218-E-5 Landfills were performed in support of the 200-SW-2 OU non-intrusive characterization effort. Eight survey locations (hot-spots) were selected for further radiological soil measurements in and around the two landfills, based on previously collected MSCM data.
- Cesium contamination appears to be close to the surface and probably not directly related to the landfill.

Geophysics Summary

- 218-E-2 and 218-E-9 Landfills (2009): These two collocated landfills consist of nine trenches oriented east-west. Three primary zones of anomalies were identified, and each zone has characteristics that are usually associated with trenches containing buried debris. The northern most zone of anomalies correlates with the documented locations of Trenches 4, 5, 6, 7, 10, and 12. The middle concentration of anomalies correlates with Trench 8, and the southernmost zone correlates with Trenches 9 and 11. The average depth to the top of the debris is generally 1 to 2 m (3.3 to 6.6 ft). The trenches are comprised primarily of metallic and non-metallic debris. See table below.
- Techniques used: EMI, GPR, TMF

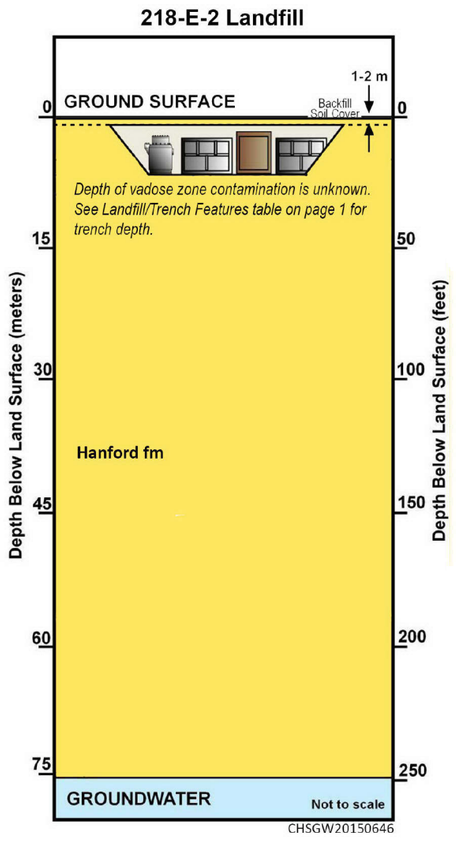
GEOPHYSICAL TRENCH DATA

Trenches 4, 5, 6, 7, 10, and 12	Drawing H-2-55534 shows six trenches oriented east-west within an area approximately 145 m by 45 m (476 ft by 148 ft). There is evidence of multiple trenches in the geophysical data; however, there is not a clear delineation between trenches. The average depth to the top of the debris from the ground surface is generally 1 to 2 m (3.3 to 6.6 ft). The trenches contain significant amounts of metallic debris, but anomalous features were not detected in several areas within the interpreted trench boundaries.
Trench 8	The extent of the geophysical anomalies in this area is consistent with the Trench 8 boundaries depicted in drawing H-2-55534. The excavation boundaries for a significant portion of the trench were detected with the GPR data. Trench 8 anomalies are comprised primarily of concentrations of metallic and non-metallic debris, with an average depth of 1 to 2 m (3.3 to 6.6 ft) below ground surface (bgs).
Trenches 9 and 11	The most notable features in this area are two distinct concentrations of anomalies that correlate fairly well with Trenches 9 and 11 (shown on drawing H-2-55534). The concentrations of anomalies appear to include both metallic and non-metallic debris, with an average depth of 0.5 to 2 m (1.6 to 6.6 ft) bgs. The northern excavation boundary is fairly distinct in the GPR data. The southern excavation boundary is not as clear and appears to be just beyond the area of GPR coverage in some areas.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Poor quality records with no information on constituent mobility. Surface radiation survey – four areas in 218-E-2/5/5A/9 with greater than 1250 cps, one area greater than 1500 cps.	Obtain additional records, if possible. Need EMFLUX data to infer constituent mobility. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess geophysics and search for new information/ records. Collect EMFLUX data to confirm source knowledge. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence. No past history to suggest leaching.	Need to identify possible downward flow. Need to understand current erosion/subsidence activity and potential.	Perform MASW to identify preferential pathways. Horizontal boring and Direct Push for leak detection. Visual inspection/ monitoring of surface for erosion and subsidence.
Transport Media	Construction waste w/no evidence of waste mobility. Potential for direct transport of waste after being uncovered by erosion/ subsidence.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow. Need to review site history to assess if waste has been directly transported (e.g., blown about by wind, exposed by storms)	Perform STS resistivity and ERT for fluid data. Horizontal boring and Direct Push for soil/fluid samples. Perform Analyze directly exposed or transported waste, if present. Obtain active soil gas samples in area of passive soil gas hits (> 1,000 ng/sample).
Exposure Point	Direct exposure to contents	Need to confirm site conditions and waste containment	Review/inspect site surface for exposed waste
Exposure Route	Dermal/ingestion – direct exposure	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Cross Section



Photographic History

A September 1965 photo shows items stored aboveground on 218-E-2 and 218-E-9.

Unplanned Releases Collocated with or Near 218-E-2 Landfill

None.

Information from photos and logbooks contradicting literature.

Photos from 1965, 1970, and 1976 show waste stored aboveground on 218-E-2, 218-E-4, and 218-E-9. *See CSM for 218-E-2A/4/5/9 for more photos.

218-E-2A
Landfill

Industrial

A May 1971 photograph shows items stored on the surfaces of colocated landfills 218-E-2, 218-E-2A, 218-E-4, and 218-E-9.

Curie Content: Low

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Poor

Subsidence: Yes

Soil gas detection: No

Landfill Summary

WIDS Code & Aliases	218-E-2A; Burial Trench; Regulated Equipment Storage Site No. 02A
Landfill Type	Industrial
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1945 to 1950
Location	North of B-Plant (221B); 218-E-2/2A/4/5/5A/9 are colocated.
General Description	No burial records. Site was used as an above ground equipment storage site. Subsidence seen at the site during a 1978 inspection suggest that some waste was buried. The site was surface stabilized with 0.3 m (1 ft) of soil and revegetated in 1980-1981. The above ground equipment was buried in 218-E-10.
Source Facilities Contributing More Than 5% of Waste by Volume	No records of burials.
References	WIDS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	--	23
Used Area (hectares)	0.3	24
Plutonium Mass (kg)	0	22
Uranium Mass (kg)	0	21
Curies (Ci) decayed to 2015	100	17

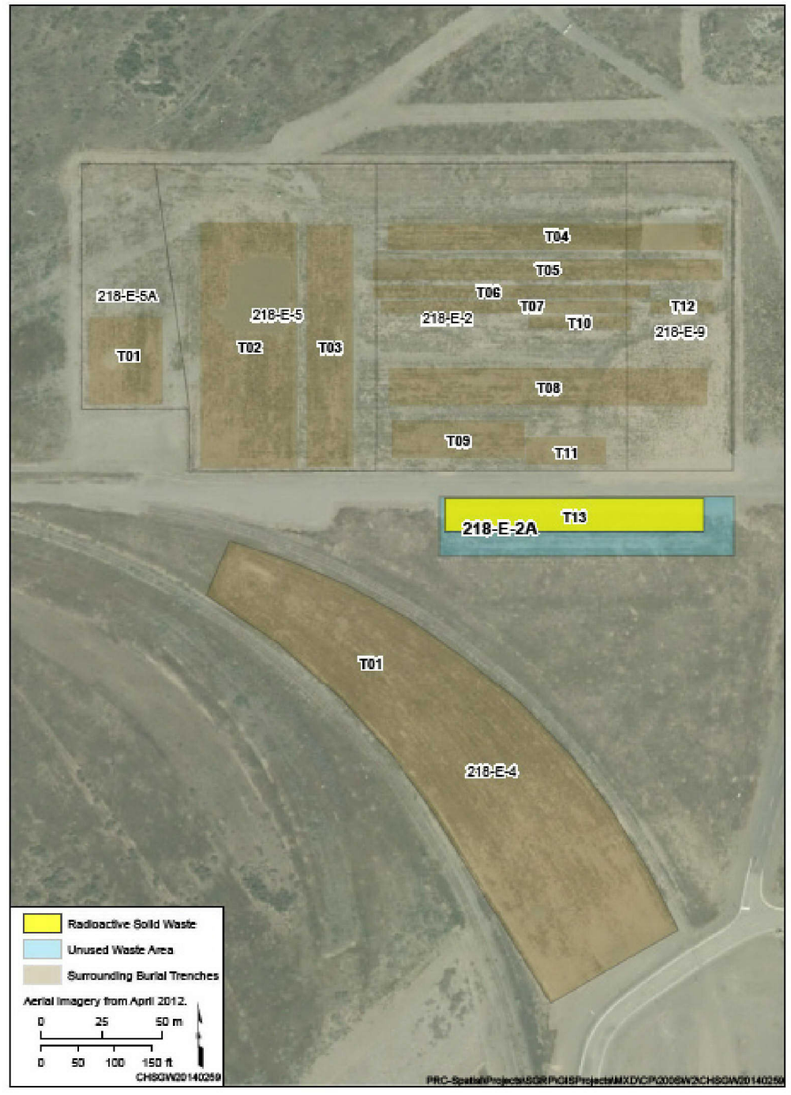
WASTE RECORDS

Number Available	Rank	Record Quality
1	23	Poor

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	Although some literature sources indicate this site was used only for above ground storage, observations in 1980 suggest that 218-E-2A consists of a single east to west trench approximately 110 m (357 ft) long and 14 m (46 ft) wide. Geophysical data collected in 2005 confirm the presence of a trench.			
Number of Trenches	1				
Subsidence?	Y	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed
No landfill inventory records available for this landfill. (SWITS)

Figure D-6 | CSM for the **218-E-2A Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-2 through 9 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — 2009: This landfill was sampled at one location. There were no detections of any constituent.

Surface Radiation Surveys

- Based on the 2011 survey, there were three areas in the northern half of the landfill having a cps greater than 1500. There were numerous areas along the northern boundary that had cps in the range of 1001 to 1250.

Geophysics Summary

- 2005, 2006: The geophysical data from 2005 indicate there is a single trench at this landfill with a series of isolated objects and/ or a number of groups of smaller objects with relatively clean fill in between. GPR data were not successful at detecting all of the buried debris/objects whose presence is interpreted from the EMI and magnetic data. The 2006 data show no anomalies of signific ance west of the western boundary of the landfill, which had been suggested by the 2005 data. The 2006 data indicate a large buried object located just inside the landfill boundary, which is the likely cause of the 2005 anomalies suggesting buried objects beyond the western edge of the landfill.
- Techniques used: EMI, GPR, TMF

Information from photos and logbooks contradicting literature.

None. *See CSM for 218-E-2/4/5/9 for more photos.

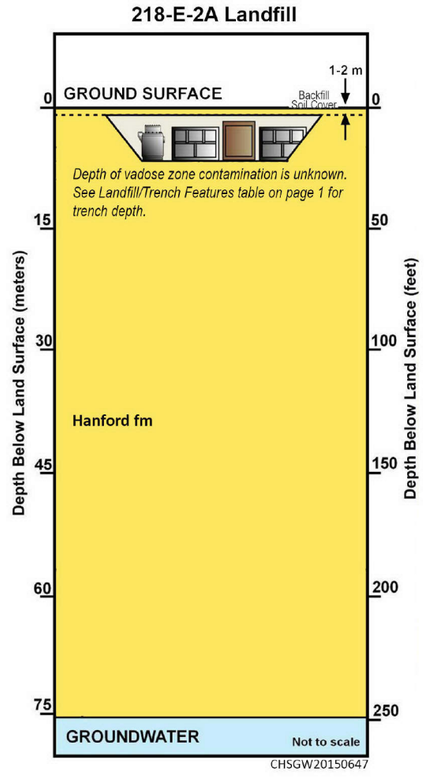
Photographic History

A June 1976 photo shows the 218-E-2/2A/4/9 landfills with items stored aboveground.

Unplanned Releases Collocated with or Near 218-E-2A Landfill

None.

Cross Section



Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Poor records; however, no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – three areas with greater than 1500 cps, numerous areas between 1001 and 1250 cps.	Need additional records and information, if possible. Need EMFLUX data to infer constituent mobility. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and search for new information/records on contents. Collect EMFLUX data to confirm source knowledge. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to identify possible downward flow. Need to understand potential for direct exposure.	Perform MASW to identify preferential pathways. Horizontal boring and Direct Push for soil/fluid samples. Visual inspection/monitoring of surface for erosion and subsidence.
Transport Media	Industrial waste with no evidence of soil gas. No transport likely.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Horizontal boring and Direct Push for soil/fluid samples. Obtain active soil gas samples in area of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

218-E-4
Landfill

Construction

A May 1971 photograph shows items stored on the surfaces of colocated landfills 218-E-2, 218-E-2A, 218-E-4, and 218-E-9.

Curie Content: Low

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Poor

Subsidence: No

Soil gas detection: N/A

Landfill Summary

WIDS Code & Aliases	218-E-4, 200 East Minor Construction No. 4, Equipment Burial Ground #4
Landfill Type	Construction
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1955 to 1956
Location	North of B-Plant (221B); 218-E-2/2A/4/5/5A/9 are colocated.
General Description	The site received repair and construction waste from B-Plant modifications. It was also used as an above-ground storage site for contaminated equipment. In June 1960, UPR 200-E-23 contaminated the area to a maximum reading of 1 rad/h. The site was surface stabilized in 1980.
Source Facilities Contributing More Than 5% of Waste by Volume	B-Plant (221 B)
References	WIDS; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	1,600	21
Used Area (hectares)	1.2	17
Plutonium Mass (kg)	0.01	20
Uranium Mass (kg)	1	20
Curies (Ci) decayed to 2015	0.2	22

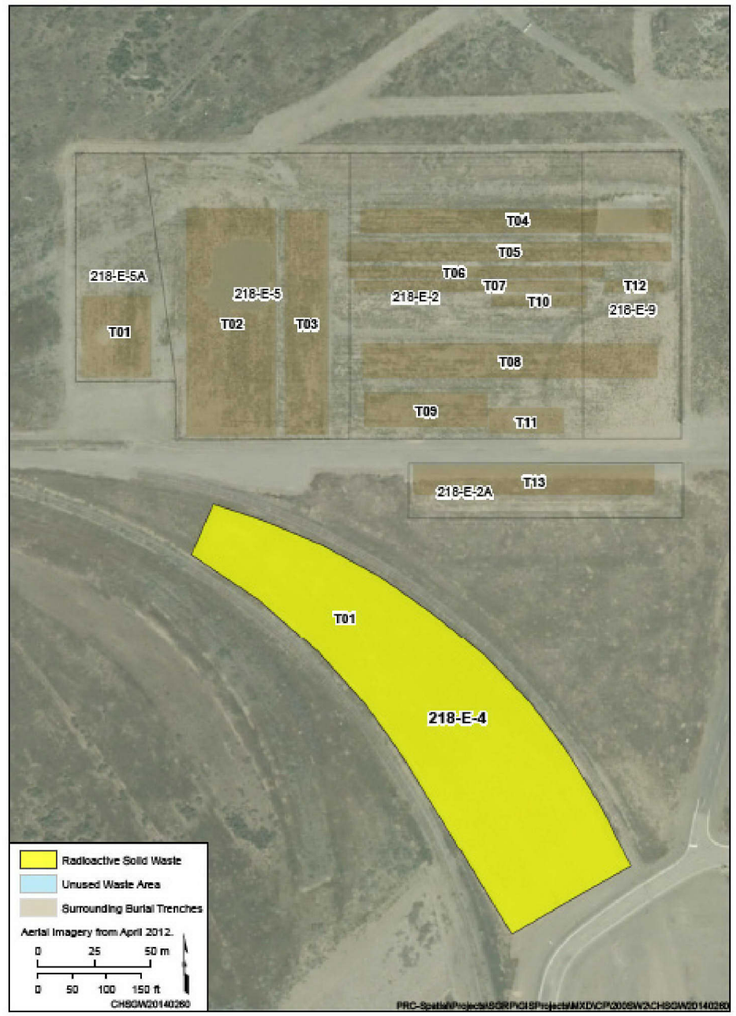
WASTE RECORDS

Number Available	Rank	Record Quality
2	22	Poor

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	The number of trenches and total length is unknown. Literature and photos suggest that the site consists of 2 trenches running parallel to the railroad tracks. Geophysical data collected in 2009 suggest the presence of three trenches.			
Number of Trenches	3				
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed
No landfill inventory records available for this landfill. (SWITS)

CHSGW20140260

Figure D-7 | CSM for the **218-E-4 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-2 through 9 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Not performed.

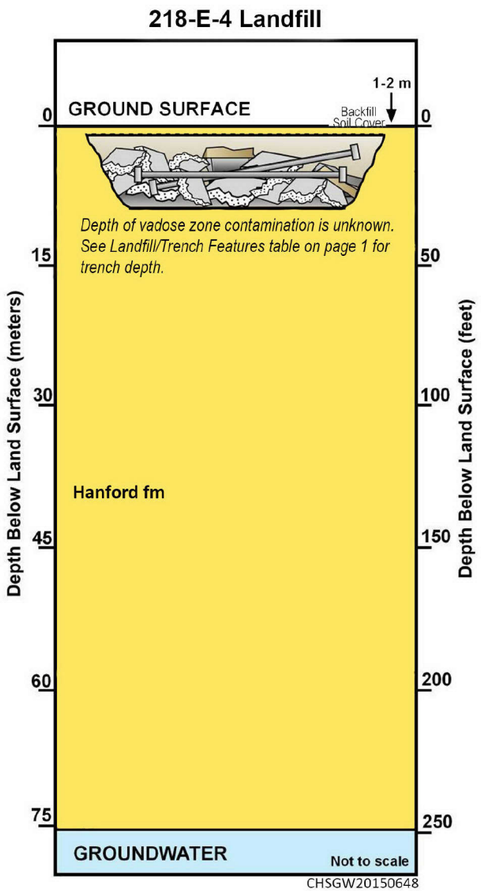
Surface Radiation Surveys

- Not performed.

Geophysical Summary

- 2009: There are no documented trenches shown for 218-E-4 Landfill on drawing H-2-55534. However, the geophysical evidence shows three areas, referred to as trenches, have characteristics typically associated with buried debris. The largest trench is located in the north end and the debris appears to be metallic. Two similar sized, smaller trenches are located in the south and are generally parallel to each other. The westernmost trench is smaller and contains significant amounts of metals while the eastern trench has small areas of metallic debris and significant areas with little or no debris.
- Techniques used: TDEM, EMI, GPR, TMF

Cross Section



Unplanned Releases Collocated with or Near 218-E-4 Landfill

None.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Poor quality records with no information on constituent mobility. Surface radiation survey – not performed.	Obtain additional records, if possible. Need EMFLUX data to infer constituent mobility. Obtain consistent surface radiation data for all landfills.	Review/reprocess geophysics and search for new information/ records. Collect EMFLUX data to confirm source knowledge. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence. No past history to suggest leaching.	Need to identify possible downward flow. Need to understand current erosion/subsidence activity and potential.	Perform MASW to identify preferential pathways. Visual inspection/ monitoring of surface for erosion and subsidence. Direct Push for leak detection.
Transport Media	Construction waste w/no evidence of waste mobility. Potential for direct transport of waste after being uncovered by erosion/ subsidence.	Need soil gas concentration data (active samples) for risk assessment. Need to review site history to assess if waste has been directly transported (e.g., blown about by wind, exposed by storms).	Perform STS resistivity and ERT for fluid data. Analyze directly exposed or transported waste, if present. Obtain active soil gas samples in area of passive soil gas hits. Direct Push for soil/fluid samples.
Exposure Point	Direct exposure to contents.	Need to confirm site conditions and waste containment.	Review/inspect site surface for exposed waste.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Photographic History

A 2007 photo shows the landfills' recent appearance.

Information from photos and logbooks contradicting literature.

Photos from 1965, 1970, and 1976 show waste stored aboveground on 218-E-2, 218-E-4, and 218-E-9. *See CSM for 218-E-2/2A/5/9 for more photos.

218-E-5
Landfill

Industrial

Photo shows the 70 by 100 foot area on the 218-E-5 burial ground that was surface stabilized with 6 inches of clean gravel in May 2010.

Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: Yes

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-E-5; Equipment Burial Ground #5; 200 East Industrial Waste No. 05
Landfill Type	Industrial
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1954 to 1956
Location	North of B-Plant (221B); 218-E-2/2A/4/5/5A/9 are colocated.
General Description	Property disposal records indicate that items such as pumps, ventilation fans, offgas heaters, cell concentrators, and other large PUREX equipment were buried here. In September 1956, railroad boxcars contaminated with uranyl nitrate hexahydrate were buried at the north end of the landfill. The burial areas were stabilized and covered with 0.3 m (1 ft) of clean soil in 1980. The landfill was restabilized with approximately 15 cm clean gravel in 2010.
Source Facilities Contributing More Than 5% of Waste by Volume	PUREX (202-A)
References	WIDS; HW-60807; RHO-CD-673; SWITS; 1960-1966 218-W-4A Logbook

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	3,200	18
Used Area (hectares)	1.1	18
Plutonium Mass (kg)	0.6	15
Uranium Mass (kg)	120	18
Curies (Ci) decayed to 2015	160	13

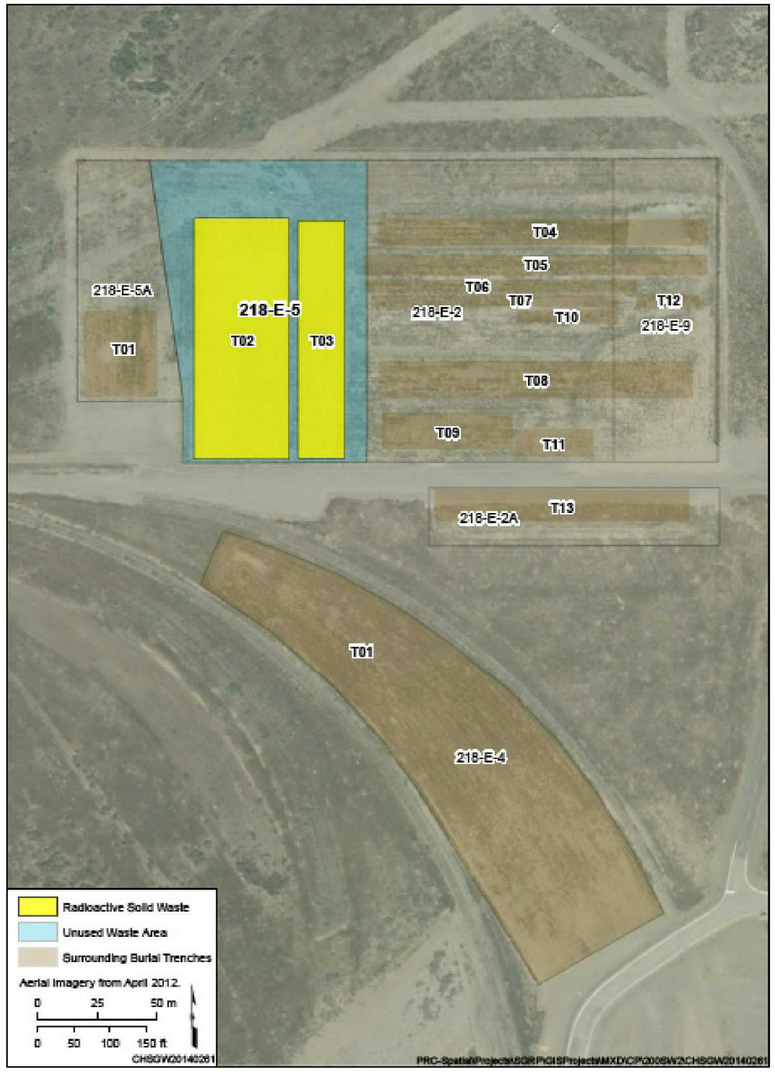
WASTE RECORDS

Number Available	Rank	Record Quality
18	17	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	The site contains two areas of trenches. One area is 104 m (341 ft) long by 40 m (131 ft) wide and contains multiple narrow trenches that received industrial dry waste and small boxes. The second area is a single trench oriented north-south that is 102 m (335 ft) long by 20 m (64 ft) wide.			
Number of Trenches	2				
Subsidence?	Y	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

H-2 Purex Column, Purex FA1 Filter, Purex L Cell Concentrator (Complete), Purex Offgas Heater, Purex Process Solution Pump, J2 Purex Pulse Column, Purex 2-1-A Ventilation Fans of Carbon Steel, Purex Silver Reactors, Purex Waste Concentrator Heat Exchanger Tube Bundles, Misc. Equipment from Tank Farm Recovery Program.

CHSGW20140261

Figure D-8 | CSM for the **218-E-5 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-2 through 9 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive Soil Vapor Sampling
  - — 218-E-5 and 218-E-5A (2009): These landfills were sampled at 12 locations. There were no significant detections of any constituent, only a very low detect of methyl ethyl ketone in 218-E-5 at 14 ng in one location.

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Methyl ethyl ketone	1	--	--	--	--	14

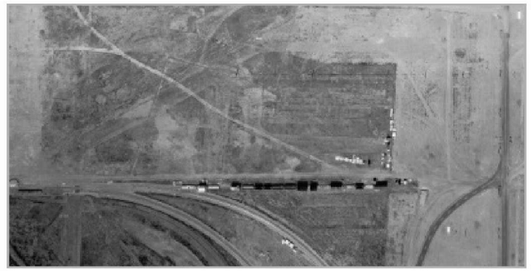
Surface Radiation Surveys

- In September 2006 radiological soil mesurements at the 218-E-2 and 218-E-5 Landfills were performed in support of the 200-SW-2-OU non-intrusive characterization effort. Eight survey locations (hot-spots) were selected for further radiological soil measurments in and around the two landfills, based on previously collected MSCM data. Cesium contamination appears to be close to the surface and probably not directly related to the landfill.

Geophysics Summary

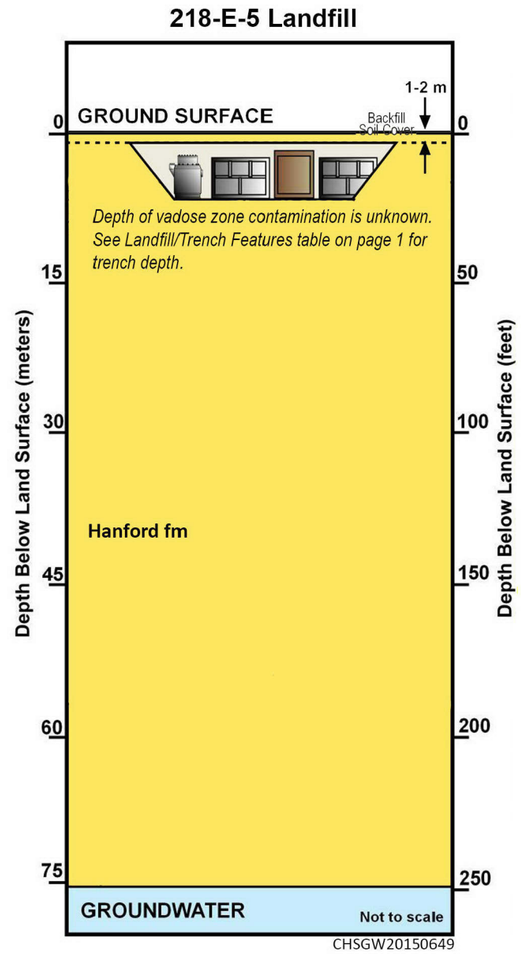
- 218-E-5 and 218-E-5A Landfills (2005): These contiguous landfills were investigated as a single landfill. The data indicate that there are two trenches in 218-E-5 Landfill and one in 218-E-5A Landfill. The geophysical data indicates that the locations of the trenches are generally consistent with Hanford Site Drawing H-2-55534; however, Trench 2 of 218-E-5 Landfill is roughly 20 m (65 ft) to the west of the location shown on the drawing.
- Techniques used: EMI, GPR, TMF

Photographic History



A May 1975 photo shows the 218-E-5 landfills and items stored on the surfaces of colocated landfills 218-E-2, 218-E-2A, 218-E-4, and 218-E-9.

Cross Section



Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Moderate record quality; however, no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – four areas in 218-E-2/5/5A/9 with greater than 1250 cps, one area greater than 1500 cps.	Need additional records and information, if possible. Need EMFLUX data to infer constituent mobility. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and search for new information/ records on contents. Collect EMFLUX data to confirm source knowledge. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to identify possible downward flow. Need to understand potential for direct exposure.	Perform MASW to identify preferential pathways. Visual inspection/monitoring of surface for erosion and subsidence. Direct Push for leak detection.
Transport Media	Industrial waste with no evidence of soil gas. No transport likely.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Direct push to collect soil/fluid samples. Obtain active soil gas samples in area of passive soil gas hits.
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-E-5 Landfill

None.

Information from photos and logbooks contradicting literature.

A logbook indicates that 7 boxes of waste from the 308 building were buried in this landfill in 1965. *See CSM for 218-E-2/2A/4/9 for more photos.

218-E-5A

Landfill

Industrial

In a 1961 photo, worker is backfilling the stabilized and foamed box.

Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: Yes

Soil gas detection: No

Landfill Summary

WIDS Code & Aliases	218-E-5A; Equipment Burial Ground #5A; 200 East Industrial Waste No. 005A
Landfill Type	Industrial
OU & Category	200-SW-2, Past-Practice
Dates of Waste Receipt	1956 to 1958
Location	North of B-Plant (221B); 218-E-2/2A/4/5/5A/9 are colocated.
General Description	Three or four large wooden burial boxes containing PUREX equipment were pulled into a single large excavation in 1958, but were not backfilled with dirt until 1961. Foam was used to control the spread of contamination. The site was stabilized (1979-1980) with 0.3 meters (1 foot) of clean dirt and vegetated with wheat grass.
Source Facilities Contributing More Than 5% of Waste by Volume	PUREX (202-A)
References	WIDS; HW-60807; RHO-CD-673; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	6,200	17
Used Area (hectares)	0.38	23
Plutonium Mass (kg)	1.4	10
Uranium Mass (kg)	120	17
Curies (Ci) decayed to 2015	370	11

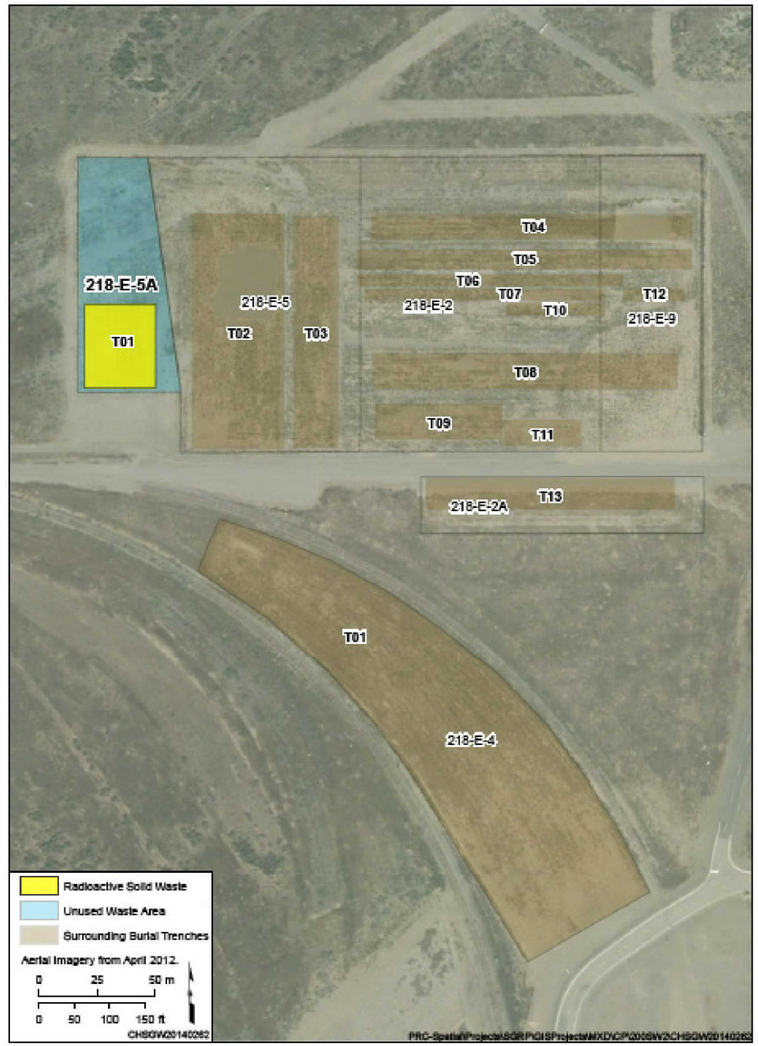
WASTE RECORDS

Number Available	Rank	Record Quality
10	18	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	8	The burial ground probably consists of one burial pit, 31 x 37 m (100 by 120 ft).			
Number of Trenches	1				
Subsidence?	Y	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

Purex J2-Column Package, Purex K2-Column Package, Purex L-Cell Package, Boxes Containing Purex L-Cell Package, K-2 Tower and J-2 Tower, Boxes of Misc. Cell Equipment.

Figure D-9 | CSM for the **218-E-5A Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-2 through 9 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil-vapor sampling
  - — 218-E-5 and 218-E-5A (2009): Sampled at 12 locations. No significant detections. Methyl ethyl ketone was detected in one location at 218-E-5 at 14 ng/sample.

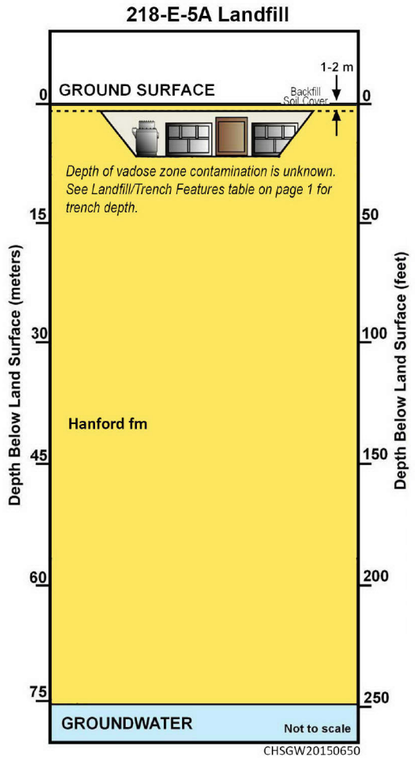
Surface Radiation Surveys

- Not performed.

Geophysics Summary

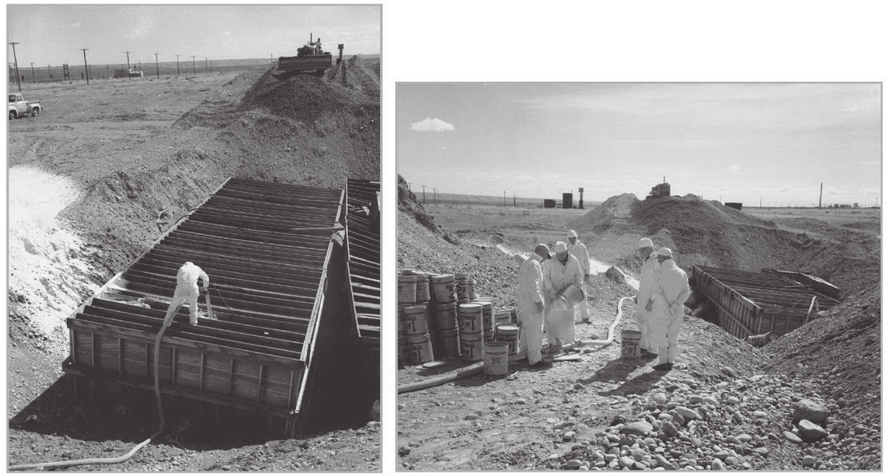
- 218-E-5 and 218-E-5A Landfills (2005): Landfills are adjacent and were investigated as a single landfill. 218-E-5 Landfill has two trenches and 218-E-5A Landfill has one trench. The geophysical data indicates that the locations of the trenches are generally consistent with Hanford Site Drawing H-2-55534; however, Trench 2 of 218-E-5 Landfill is roughly 20 m (65 ft) to the west of the location shown on the drawing.
- Techniques used: EMI, GPR, TMF

Cross Section



Photographic History

In a 1961 photo, worker is backfilling the stabilized and foamed box.



April 19, 1961 photos of 218-E-5A correlate well with the WIDS description of the backfilling operation for deteriorating wooden boxes, which occurred that date and which used foam as contamination control. Operator is foaming pit and interior of box.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Moderate record quality; however, no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – four areas in 218-E-2/5/5A/9 with greater than 1250 cps, one area greater than 1500 cps.	Need additional records and information, if possible. Need EMFLUX data to infer constituent mobility. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and search for new information/ records on contents. Collect EMFLUX data to confirm source knowledge. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to identify possible downward flow. Need to understand potential for direct exposure.	Perform MASW to identify preferential pathways. Direct Push for leak detection. Visual inspection/monitoring of surface for erosion and subsidence.
Transport Media	Industrial waste with no evidence of soil gas. No transport likely.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Direct Push for soil/fluid samples. Obtain active soil gas samples in area of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-E-5A Landfill

None.

Information from photos and logbooks contradicting literature.

Photos and WIDS indicate that waste in this landfill was backfilled in 1961.

218-E-8

Landfill

Construction

June 1969: aerial photo looking southwest shows waste in the 200-E Burn Pit (non-radioactive) adjacent to 218-E-8. The photo suggests some overlap between the locations of the landfill and burn pit. The photo shows open trenches in 218-E-12B (top right), the 216-B-2 ditches (top), the 200-E Burn Pit (center), and the 218-E-8 landfill (upper center).

Curie Content: Low

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Poor

Subsidence: No

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-E-8, 200 East Construction Burial Grounds
Landfill Type	Construction
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1958 to 1959
Location	North of B-Plant (221B); 218-E-2/2A/4/5/5A/9 are colocated.
General Description	The site was used to dispose of equipment from 293-A construction and the temporary PUREX canyon ventilation barricade used for the 1959 crane addition to PUREX. The waste is mainly equipment and construction debris. The number of trenches is not known.
Source Facilities Contributing More Than 5% of Waste by Volume	PUREX (202-A and 293-A)
References	WIDS; HW-60807; BHI-00178; PNL-6456; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	2,300	20
Used Area (hectares)	0.44	22
Plutonium Mass (kg)	0.02	19
Uranium Mass (kg)	2	19
Curies (Ci) decayed to 2015	0.2	22

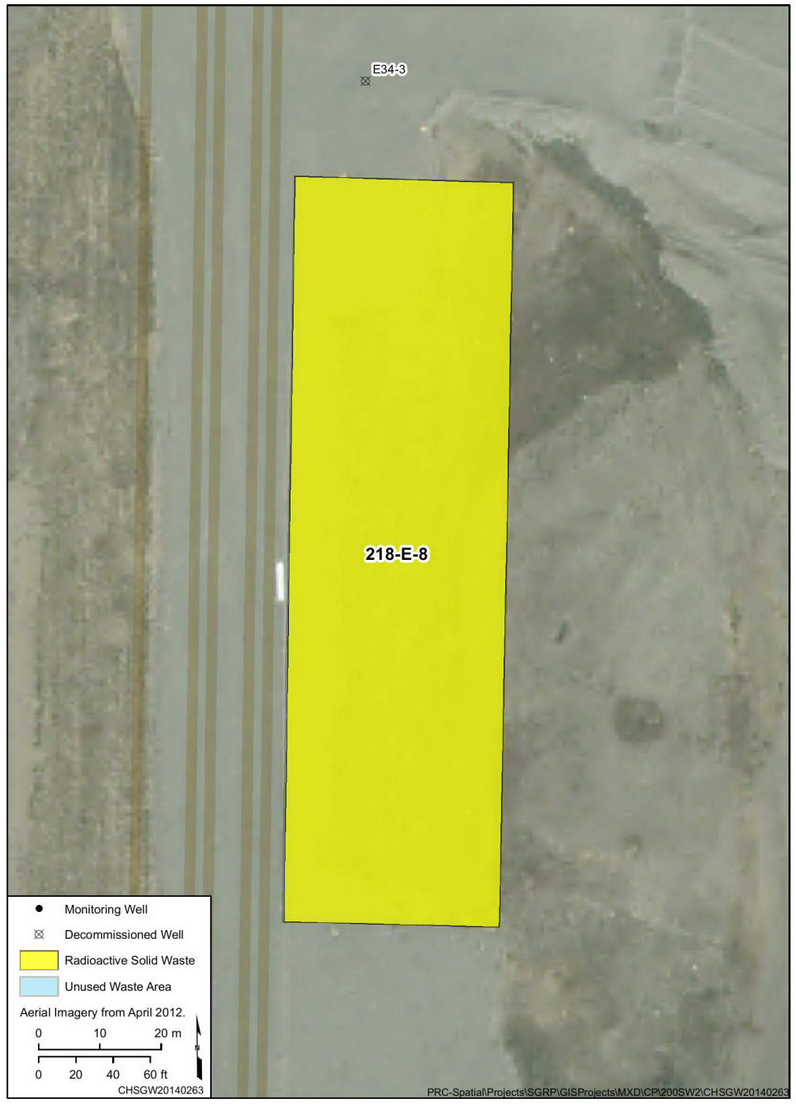
WASTE RECORDS

Number Available	Rank	Record Quality
5	19	Poor

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	8	Literature indicates the site consists of an unknown number of backfilled trenches; photos show one or two large pits.			
Number of Trenches	2				
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed
No landfill inventory records available for this landfill. (SWITS)

CHSGW20140263

Figure D-10 | CSM for the **218-E-8 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-8 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - 2009: This landfill was sampled at two locations. There were no significant detections of any constituent, only one very low detect of chloroform at 23 ng in one location; and a very low detect of methyl ethyl ketone at 11 ng and tetrachloroethene at 22 ng in another location.

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Methyl ethyl ketone	1					11
Chloroform	1					23
Tetrachloroethene	1					22

Surface Radiation Surveys

- Based on the 2011 survey, only one area on the north end had a counts per second (cps) count in the range of 1001 to 1250.

Geophysics Summary

- 2005, 2006: The 2005 geophysical data for this landfill showed no clear indications of any distinct trenches or large concentrations of buried debris. The 2006 geophysical data indicated buried objects and/or debris outside of the marked landfill. Near the landfill boundary is one buried object (or concentration of smaller objects) that may be associated with the landfill. A significant pit of buried debris was located approximately 60 m (197 ft) east of the landfill. In addition, EMI data strongly suggested a buried utility along the northern boundary of the investigation area, although this could not be corroborated by other methods or engineering drawing.
- Techniques used: EMI, GPR, TMF

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Poor records; however, no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – one area with 1001 to 1250 cps.	Need additional records and information, if possible. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and search for new information/records on contents. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to understand potential for direct exposure. Need to identify possible downward flow.	Visual inspection/monitoring of surface for erosion and subsidence. Horizontal boring and Direct Push for leak detection.
Transport Media	Construction waste with no evidence of soil gas. No transport likely.	Need data about fluid flow.	Horizontal drilling and Direct Push for soil/ fluid samples.
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

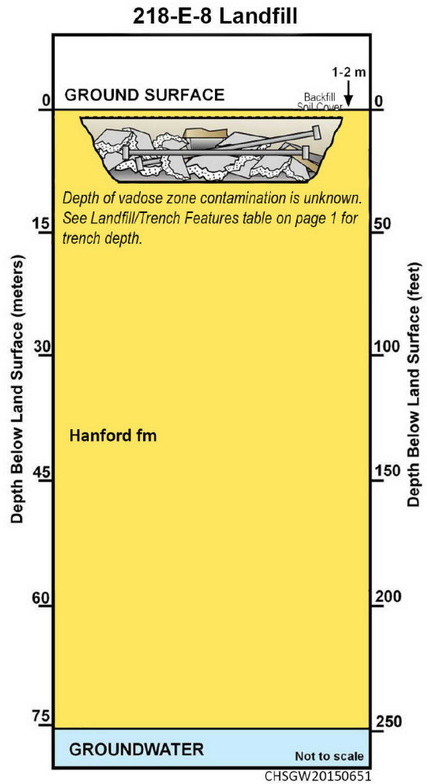
Photographic History

Undated aerial photo, probably about 1970, looking northeast. Shows open trench in 218-E-12B, 200 East Burn Pit, and possibly waste stored on surface of 218-E-8.

1975 photo (top is north) shows backfilled trenches in the 200 East Burn Pit (center) adjacent to the 218-E-8 landfill (left).

1988 photo (top of photo is north) shows waste stored on surface of 200 East Burn Pit adjacent to 218-E-8

Cross Section



Unplanned Releases Collocated with or Near 218-E-8 Landfill

None.

Information from photos and logbooks contradicting literature.

Photos from the late 1960s through late 1980s show the non-radioactive 200 East Burn Pit adjacent to the radioactive 218-E-8 landfill. The burn pit was still in use during that period but the landfill was backfilled. The landfill footprints of the two waste sites appear to overlap in places. Geophysical investigations of 218-E-8 have been difficult to interpret because of the close proximity of the two waste sites.

218-E-9
Landfill

Industrial

May 1971: photograph shows items stored on the surfaces of colocated landfills 218-E-2, 218-E-2A, 218-E-4, and 218-E-9.

Curie Content: Low

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Poor

Subsidence: No

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-E-9, 200 East Regulated Equipment Storage Site No. 009, Burial Vault (HISS)
Landfill Type	Industrial
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1953 to 1958
Location	North of B-Plant (221B); 218-E-2/2A/4/5/5A/9 are colocated.
General Description	No burial records. The site was used as an above ground storage site for fission product equipment that became contaminated in the uranium recovery process operations at tank farms. It is not certain that it ever was used as a landfill. The site was stabilized in 1980 and restabilized in 1991 when contaminated vegetation was found. The boundary between 218-E-2 and 218-E-9 is unknown; therefore, geophysics data for both landfills is provided.
Source Facilities Contributing More Than 5% of Waste by Volume	No records of burials.
References	WIDS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	--	23
Used Area (hectares)	0.56	21
Plutonium Mass (kg)	0	22
Uranium Mass (kg)	0	21
Curies (Ci) decayed to 2015	10	20

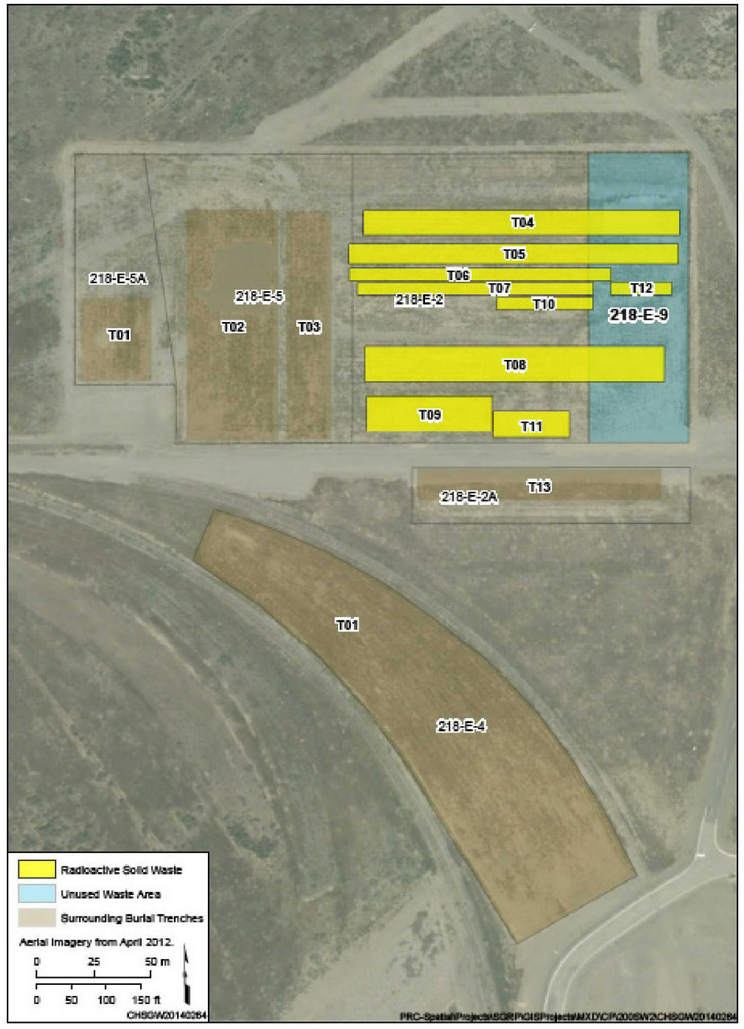
WASTE INFORMATION

Number Available	Rank	Record Quality
0	24	Poor

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	Although some literature sources indicate this site was used only for above ground storage, observations in 1980 suggest that the site consists of one backfilled trench. Site area overlaps with trenches in 218-E-2.			
Number of Trenches	--				
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed
No landfill inventory records available for this landfill. Landfill inventory was estimated from SWITS.

Figure D-11 | CSM for the **218-E-9 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-2 through 9 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Not performed.

Surface Radiation Surveys

- Not peformed.

Geophysics Summary

- 218-E-2 and 218-E-9 Landfills (2009): These two colocated landfills consist of nine trenches oriented east-west. Three primary zones of anomalies were identified, and each zone has characteristics that are usually associated with trenches containing buried debris. The northern most zone of anomalies correlates with the documented locations of Trenches 4, 5, 6, 7, 10, and 12. The middle concentration of anomalies correlates with Trench 8, and the southernmost zone correlates with Trenches 9 and 11.The average depth to the top of the debris is generally 1 to 2 m (3.3 to 6.6 ft). The trenches are comprised primarily of metallic and non-metallic debris.
- Techniques used: TDEM, EMI, GPR, TMF

GEOPHYSICAL TRENCH DATA

Trenches 4, 5, 6, 7, 10, and 12	Drawing H-2-55534 shows six trenches oriented east-west within an area approximately 145 m by 45 m (476 ft by 148 ft). There is evidence of multiple trenches in the geophysical data; however, there is not a clear delineation between trenches. The average depth to the top of the debris from the ground surface is generally 1 to 2 m (3.3 to 6.6 ft). The trenches contain significant amounts of metallic debris, but anomalous features were not detected in several areas within the interpreted trench boundaries.
Trench 8	The extent of the geophysical anomalies in this area is consistent with the Trench 8 boundaries depicted in drawing H-2-55534. The excavation boundaries for a significant portion of the trench were detected with the GPR data. Trench 8 anomalies are comprised primarily of concentrations of metallic and non-metallic debris, with an average depth of 1 to 2 m (3.3 to 6.6 ft) below ground surface (bgs).
Trenches 9 and 11	The most notable features in this area are two distinct concentrations of anomalies that correlate fairly well with Trenches 9 and 11 (shown on drawing H-2-55534). The concentrations of anomalies appear to include both metallic and non-metallic debris, with an average depth of 0.5 to 2 m (1.6 to 6.6 ft) bgs. The northern excavation boundary is fairly distinct in the GPR data. The southern excavation boundary is not as clear and appears to be just beyond the area of GPR coverage in some areas.

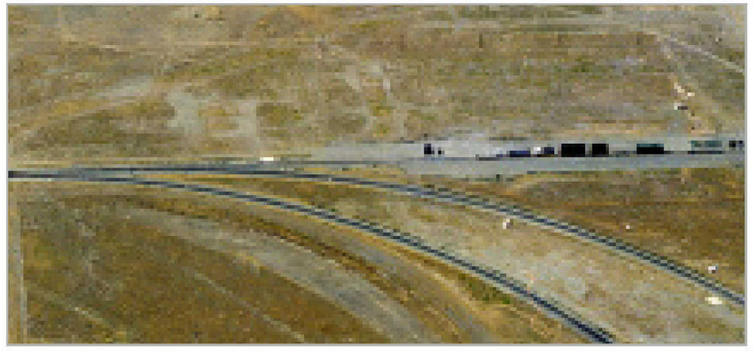
Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	No records and perhaps no waste. No indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – four areas in 218-E-2/5/5A/9 with greater than 1250 cps, one area greater than 1500 cps.	Need additional records and information, if possible. Need EMFLUX data to infer constituent mobility. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and search for new information/records on contents. Collect EMFLUX data to confirm source knowledge. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to identify possible downward flow. Need to understand potential for direct exposure.	Perform MASW to identify preferential pathways. Visual inspection/ monitoring of surface for erosion and subsidence. Horizontal and Direct Push for leak detection.
Transport Media	Industrial waste with no evidence of soil gas. No transport likely.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Horizontal drilling and Direct Push for soil/fluid samples. Obtain active soil gas samples in area of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-E-9 Landfill

None.

Photographic History

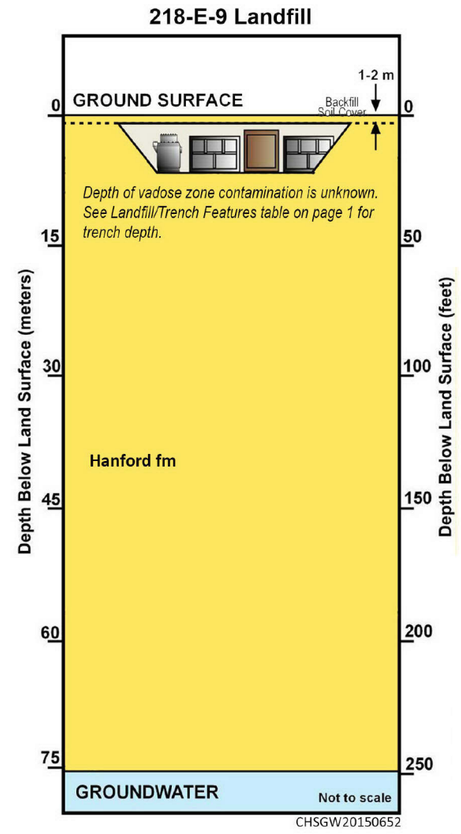


A June 1976 photo shows the 218-E-2/2A/4/9 landfills with items stored aboveground.

Information from photos and logbooks contradicting literature.

Photos from 1965, 1970, and 1976 show waste stored aboveground on 218-E-2, 218-E-4, and 218-E-9. *See CSM for 218-E-2/2A/4/5 for more photos.

Cross Section



218-E-10
Landfill

RCRA TSD

Concrete dragoff box common in TSD landfills – burial records show 178 such boxes in 218-E-10, about 30% of the waste volume of the landfill.

Curie Content: Highest

Green Islands: Yes

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: Yes

Soil gas detection: N/A

Landfill Summary

WIDS Code & Aliases	218-E-10, 200 East Industrial Waste No. 10, Equipment Burial Ground #10
Landfill Type	Industrial TSD Unit
OU & Category	200-SW-2, Treatment, Storage, and Disposal
Dates of Waste Receipt	1960 to 2000
Location	Northwest of B-Plant (221B); northwest of 218-E-2/2A/4/5/5A/9
General Description	The site is located within the LLBG TSD unit. Wastes disposed to the site include cover blocks, tube bundles, jumper vessels, pumps, columns, and filters. In June 1960, a partially covered burial box of PUREX tube bundles caused an airborne contamination spread (UPR 200 E 23). In 1980, Trenches 1 through 5 were backfilled and stabilized. The section was vegetated with grasses.
Source Facilities Contributing More Than 5% of Waste by Volume	100 Area, B Plant (221 B/224-B), Offsite, PUREX (202-A)
References	WIDS; HW-60807; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	26,000	5
Used Area (hectares)	23	2
Plutonium Mass (kg)	4.9	8
Uranium Mass (kg)	840	11
Curies (Ci) decayed to 2015	1,700,000	1

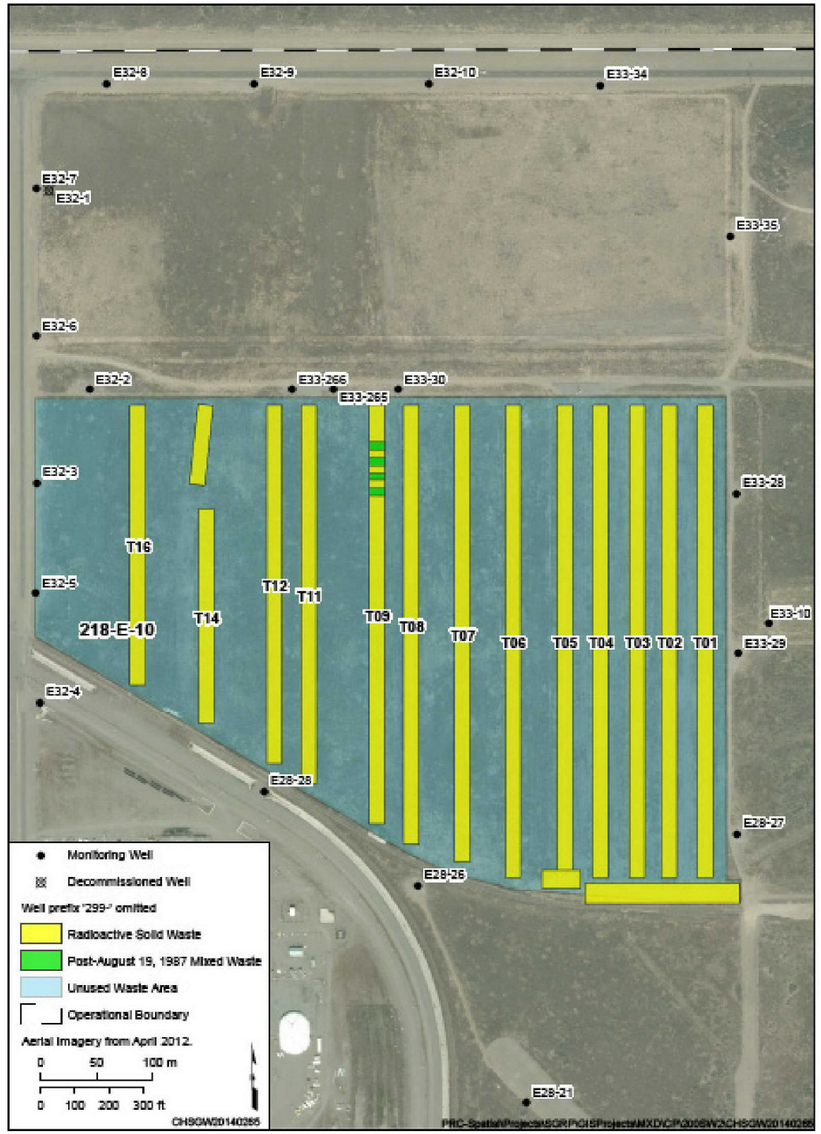
WASTE INFORMATION

Number Available	Rank	Record Quality
592	10	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	There is one unnumbered east-west trench in two sections, and 13 north-south trenches that are numbered from east to west 1-9, 11, 12, 14, 16. Trench 14 is divided in two sections. Trenches are quite varied in length, spacing, and width.			
Number of Trenches	14				
Subsidence?	Y	RSW?	N	Green Islands?	Y
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



*Some of the post-August 19, 1987 mixed waste (green islands) in trench T09 are currently being considered for removal from RCRA. See DOE/RL-2014-43 for more information.

Figure D-12 | CSM for the **218-E-10 Landfill**

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-10 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Not performed.

Surface Radiation Surveys

- Based on the 2010 survey, there were numerous areas in the center of the landfill that had cps greater than 1500. The west and east ends had numerous areas with counts per second (cps) between 750 and 1000.

Geophysics Summary

- Surface geophysical investigations were performed only on the portion of the landfill that was unused (located north of the used portion). The unused portion has been designated with WIDS code 200-E-20.
- Surface geophysical investigations did not identify the presence of any buried materials or trench-like features at the WIDS 200-E-20 site, with the exception of an anomaly that is approximately 10 × 20 m (33 × 65 ft) in area centered about N137700 and E572990. Ground-penetrating radar data indicate that this area likely contains shallow, scattered material from 0.3 to 1.0 m (1 to 3.3 ft) below the surface.

Groundwater Monitoring

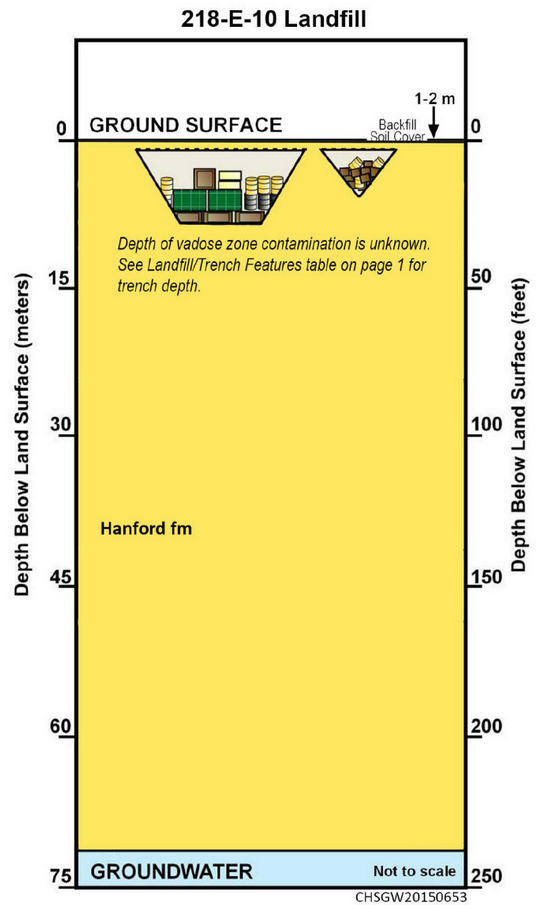
- LLWMA 1 – monitoring wells have been sampled since 1988 for contaminant indicator parameters, groundwater quality parameters, drinking water parameters, and site specific parameters as required by WAC 173-303-400(3). Background monitoring began in 1988, and initial background comparison values for the indicator parameters (e.g., total organic carbon, total organic halides, pH, and specific conductivity) were established in 1989 using data from four quarters from upgradient wells 299-E28-27, 299-E33-28, and 299-E33-29. Several specific conductance exceedances occurred from late 1989 until 2000, but increased sampling frequencies provided evidence that the elevated specific conductance, and associated contaminants, were not associated with 218-E-10, but were from either the liquid waste disposal facilities to the south or the BY Cribs.
- Currently, groundwater monitoring activities at 218-E-10 consist of water-level monitoring and chemical constituent monitoring. The burial ground is sampled semi-annually from a network of 17 wells. Samples are analyzed semi-annually for the indicator parameters, anions, and metals and annually for alkalinity, mercury, lead, and phenols. Sitewide water-level measurements are collected every March. Regional water-level measurements have also been collected monthly since June 2008.
- Based on the general geochemnical conditions and the nonradiological waste constituents reported beneath 218-E-10, significant contaminant migration appears unlikely. Even if large volumes of water may have been applied to fix radiologic contamination (e.g. UPR-200-E-23), gross-gamma logging results from 1987 at proximal wells 299-E28-27 and 299-E33-29 (approximately 87 m and 118 m [285 ft and 387 ft], respectively) showed no elevated sign of gamma. The mobility of lead and cesium is approximately the same (PNNL-11800). Furthermore, asbestos (which is orders of magnitude larger in size than molecular ions associated with porewater) would have even less mobility.

Well 299-E33-265

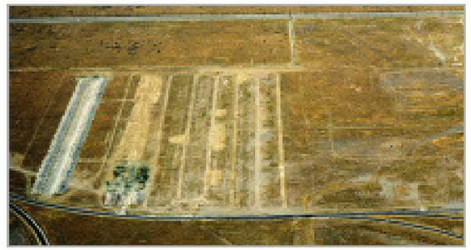
In 2012, TOC was confirmed to exceed the critical mean in downgradient well 299-E33-265. The elevated TOC at this well was coincident with a flow reversal. As a result, a draft of DOE/RL-2012-35, *First Determination RCRA Groundwater Quality Assessment Plan for Low-Level Burial Grounds Low-Level Waste Management Area-1*. was submitted to Ecology in May, 2012. Evaluation of the assessment results were reported in the First Determination RCRA Groundwater Quality Assessment Report for Low-Level Burial Grounds Low-Level Waste Management Area-1, DOE/RL-2013-25, which was submitted to the Administrative Record on May 10, 2013. The conclusion of the report was that no dangerous waste/dangerous waste constituents in groundwater were associated with the 216-E-10 Landfill; however, the TOC values remained elevated at well 299-E33-265. In addition, Washington Department of Ecology took an independent sample of the well on July 30, 2014, and confirmed these results.

The most likely reason for the elevated TOC is an upgradient source of natural organic material near the well. This conclusion stemmed from the non-detect organic results throughout the well network and the low TOC in neighboring wells 299-E33-30 and 299-E33-266, located 58 meters to the east and 37 meters to the west, respectively. Thus, interim detection monitoring was reinstated in 2013 as defined by DOE/RL-2009-75.

Cross Section

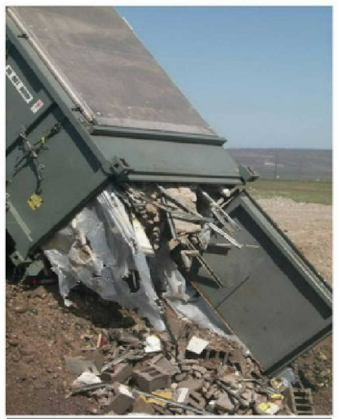


Photographic History



June 1976: 218-E-10 shows trenches in the center of the landfill open for waste receipt. This correlates well with SWITS records, which indicate that Trenches 6 and 8 received waste that year.

Undated aerial photo shows layout of 218-E-10.



Over 300 burials, about one-third of the waste volume in 218-E-10, were directly dumped into the landfill via truck, similar to the depiction in this photo taken in an unknown location. The truck contents are usually described as “waste accumulation”, “concrete”, “soil”, or “tumbleweeds”.

Figure D-12 | CSM for the **218-E-10 Landfill** *3 of 3*

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Medium quality records with no indication of mobile constituents in the waste. Surface radiation survey – numerous areas with greater than 1500 cps and numerous areas with 750 to 1000 cps.	Need baseline geophysics. Need EMFLUX to confirm no mobile constituents. Obtain consistent surface radiation data for all landfills.	Obtain baseline geophysics. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence. No past history of driving force. No evidence of constituent mobility via gas or leachate flow.	Need to understand current erosion/subsidence activity and potential. Need to identify possible downward flow.	Visual inspection/monitoring of surface for erosion and subsidence. Horizontal and Direct Push for leak detection.
Transport Media	No evidence of soil gas or leaching. Potential for direct transport of waste after being uncovered by erosion/ subsidence.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow. Need to review site history to assess if waste has been directly transported (e.g., blown about by wind, exposed by storms).	Horizontal drilling and Direct Push for soil/fluid samples. Analyze directly exposed or transported waste, if present. Obtain active soil gas samples where passive soil gas hits (>1,000 ng/sample).
Exposure Point	Direct exposure to contents.	Need to confirm site conditions and waste containment.	Review/inspect site surface for exposed waste.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-E-10 Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-E-23	UPR-200-E 23, Burial Box Collapse at the 218-E-10 Burial Ground, UPR-200-W-158	Release occurred at 218-E-10 Landfill; the contamination spread east and southeast up to 4.8 km (3 mi) bey¬ond the 200 East Area perimeter fence.	1960	PUREX F-11 and H-4 tube bundles	Particles and contaminated soil	N/A	N/A	The unplanned release (UPR-200-E-23) occurred at the 218-E-10 Landfill when a large box of contaminated PUREX equipment collapsed and spread contamination. The maximum dose rate at the box was 5 rad/h (100 ft) from the box. The box was partially covered with soil. (“Consolidated”)
UPR-200-E-24	UPR-200-E-24, Contamination Plume from the 218-E-10 Burial Ground, UN-200-E-24	Contamination spread from 218-E-10 Landfill to 4.8 km (3 mi) beyond the 200 East Area perimeter fence.	1960	PUREX F-11 and H-4 Tube bundles	Particles and contaminated soil	N/A	N/A	An unplanned release (UPR-200-E-23) occurred at the 218-E-10 Landfill when a large box of PUREX equipment collapsed and spread contamination. This related unplanned release (UPR-200-E-24) also is reported to account for the airborne contamination plume from the broken box. (“Consolidated”)
UPR-200-E-30	UPR-200-E-30, UN-200-E-30	Within the 218-E-10 Landfill.	1961	N/A	Process jumpers and contaminated soil	N/A	Area of 37,161 m2 (400,000 ft2)	A wooden burial box containing 82 highly contaminated process jumpers collapsed as it was covered with soil. This has been assigned to the 218-E-10 Landfill. Maximum contamination of 500 mR/h was spread over a 37,161 m2 (400,000 ft2) area. The landfill has been surface stabilized. (“Consolidated”)

Information from photos and logbooks contradicting literature.

A logbook indicates that this landfill went into service in 1955.

Landfill Inventory

Items Known to be Disposed

Wood Roofing, Wood and Roofing, Wood, WESF Drums, Waste from Trap Pit #5 Reading Over 1000 C/ft^3, Waste from Trap Pit #2, Waste from Membrane Filter Press, Waste from 225-B in Drums Out of Cell 4, Waste Drums from 225-B, Waste Drums, Waste Boxes, Valves, Two Tube Bundles #63 and 68, Two Purex Tube Bundles H4 and F-11, Two Purex Tube Bundles F6 and 11, Two Hood Panels from Z Plant in Std Concrete Burial Box, Tumbleweeds, Tube Bundles, Terra Cotta, T-18-2 Column, Steel Spacers, Steel Roll Door, Steel Overpacks, Steel Low-Boy Trailer with Wooden Box, Stainless Steel, Spacers, Soil, Sieve Plate and Misc. Small Items, Scrubbers, Scrap Metal From 221-T Canyon, Sand and Gravel from A-Farm Complex Fence Line, Sampler, Rudy Cart, Rubble, Rubber, Roofing, Resin TK From 18-2 Tank, Resin Tank and Filter, Railroad Rail with Two Wheel Stops, Radiation Waste Boxes, Purex L-I Column, Purex HC Column, Purex FA-1 Filter, Purex Cover Blocks, Purex Centrifuge Blocks, Pumps F-22-5 Filters, Pumps, Pump-Agitator, PRTR Connecters, PPE, Plywood Boxes, Plastic Liner Inside Concrete Box, Plastic Liner and Absorbent Materials with Plywood Boxes, Plastic Liner, Plastic, Planks, PDR RHO 82-359 2-Concentrator, Parts For 2 Pumps, Paper, P-25-2 Pumps, Old Pr Cans, Non-Containerized Tumbleweeds Collected in Compactor Truck, Misc. Small Tools, Misc. Dry High Dose Rate B-G Contaminated Failed Equipment from the Purex Canyon, Misc. Purex Canyon Waste Including Piping, Misc. Jumpers and Rags from Canyon, Misc. High-Level Waste Consisting of Failed Canyon Jumpers and Metal Items All Dry, Misc. Failed Equipment, Misc. Dry Waste, Misc. Dry High Rate B-G Waste, Misc. Contaminated Equipment, Misc. Canyon Waste, Misc. Canyon Trash, Metal, Mark I Type Wrapped in Plastic and Loose Packed Metal Basin Debris, LLW Soil from 3707D Facility in 300 Area, LLW, Lead Shielding, Laundry Bags, Laundry and Barrels from 225-B (Misc.), Laundry, Lard Cans, L-9 Vessel and Piping, Key Block Off of Cell 39, K-3 Filter B Plant, K-3 Filter Box, Junk Metal, Jumpers, ITS Heaters, Irradiated Steel Spacers, Irradiated Spacers in Burial Box, Irradiated N Reactor Carbon Steel Dummies, Irradiated Fuel Spacers Removed From 105-N #2 Site, Irradiated Fuel Spacers, Irradiated Canisters, Hot Shop Wastes, Hood Panels from L-9, High-Level Equipment, High-Level B-G Contaminated Failed Equipment from Purex Canyon, HEPA Filters, General Purpose Burial Box, Gantry Crane Steel Beam, Gantry Crane Parts, Fuel Spacers and Canisters Inside Plastic-Lined Concrete Box, Fuel Spacers, Fuel Canisters, Filters from 233-S Building, Filters, FB Boxes Waste Rags, Failed Pumps and Agitators, Failed Process Equipment, Failed Motor, Failed Jumpers, Failed Equipment Out of Canyon, Failed Equipment, F-22-5 Filters, F1 Filter, Expansion Joints, Excess Jumpers, Excavation Material from 2706T W 259 Project, Equipment, Electric Cable Hoist with Trolley, E-E-1 Nozzle Plate, E-E-1 Frame, E-5-2 Concentrator, Drums of Waste Laundry, Drums of Waste from 225-B, Drums, Drum of Filters, Disposal of Contaminated Change Trailer, Dewatered Sludge, Cut Up Jumpers, Cover Blocks, Contaminated Laundry, Concrete Waste Burial Box, Concrete Styrofoam, Concrete Slab, Concrete Rubble, Concrete Roofing, Concrete Expansion Joints, Concrete Cell Blocks, Concrete Blocks, Concrete, Concentrator Tube Bundles # 53 and 56, Cloth, Centrifuge Blocks from 221-B, Cell Jumpers, Caster Heads, Caster Assembly, Cask with Nozzle Inside, Case Core 15R/C, Carbon Steel, Canyon Waste, Canyon Trash, Canyon Burial From Purex, Canisters Inside Wood Boxes, Canisters, Bulk Soil, Box Filled with Absorbent Layer, Box Containing Straw, Blanks and A Pump, Bent Jumpers, B-2 Tank, Asphalt, Aluminum Shavings, Agitators, Absorbent Material, 55-Gal Drums, 2A Column, 244 AR-Filter Box, 244-AR Vanet Pump, 125-Hp Electric Motor.

218-E-12A
Landfill

Dry Waste

September 1965: 218-E-12A (looking east) shows open, unfilled trenches near the landfill center with mainly filled trenches to the east and unfilled land to the west. It correlates well with the operations dates of 1953-1967 and the sequence of trench filling from east to west.

Curie Content: Low

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: No

Soil gas detection: No

Landfill Summary

WIDS Code & Aliases	218-E-12A, 200 East Dry Waste No. 12A
Landfill Type	Dry Waste
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1953 to 1967
Location	Northwest of the C Tank Farm and south of 218-E-12B Burial Ground
General Description	The site received cardboard boxes and plastic bags of radioactive waste. Trenches 4 through 11, 15, 16, and 26 through 28 contain acid-soaked material in 2 m (7 ft) deep trenches. A waste inventory logbook documents burials of tank farm dip tubes, an impact wrench, contaminated cable, jumpers, animal carcasses from 108-F, and an off-site shipment of depleted uranium. The trenches were backfilled, and stabilization occurred in 1979 and 1980. Biobarriers installed at the site included polyethylene liners and ureabor (herbicide) to kill vegetation. The site was stabilized again in 1994 with 50-60 cm of clean fill.
Source Facilities Contributing More Than 5% of Waste by Volume	200 East Area
References	WIDS; HW-60807; 218-E-12A Logbook; PNL-6456; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	15,000	9
Used Area (hectares)	10	8
Plutonium Mass (kg)	9	5
Uranium Mass (kg)	990	9
Curies (Ci) decayed to 2015	40	18

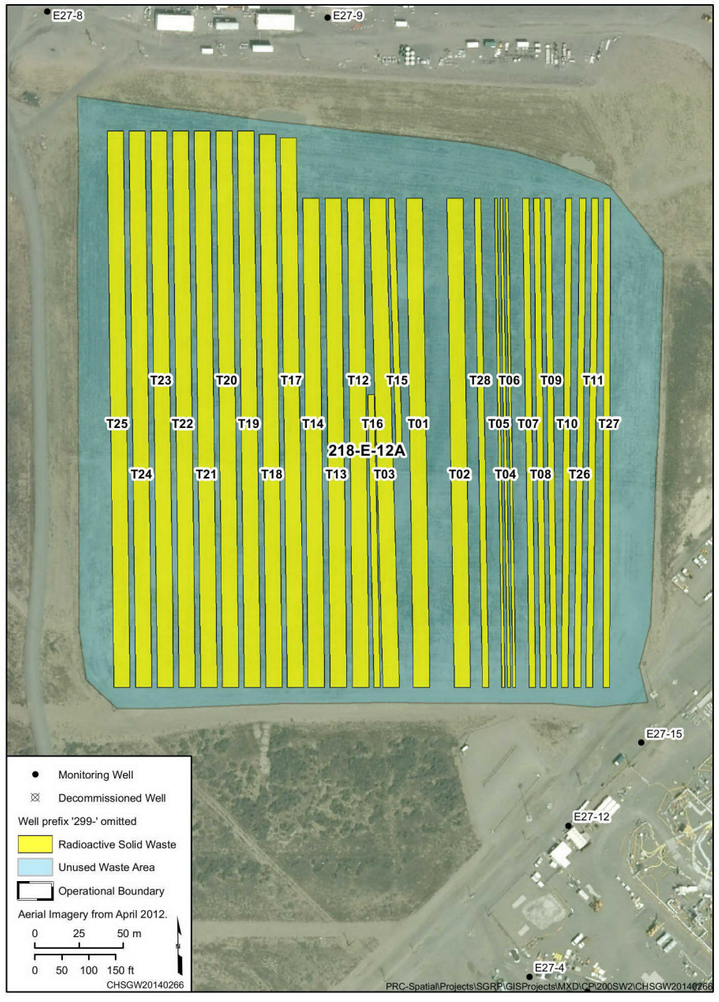
WASTE RECORDS

Number Available	Rank	Record Quality
92	13	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	4	The site contains 28 burial trenches that have been backfilled and surface stabilized. A 1960s era logbook indicates that a trench was dug five feet deep. Visual observations confirmed some waste visible at surface, prior to stabilization efforts.			
Number of Trenches	28				
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

Containers, Drums Depleted Uranium and Contaminated Scrap, 241-A Bumper Log, 90 Linear Feet of Hogwire from B Plant Intersection Diversion Box, 5/8-inch Purex Gantry Crane Cable, Impact Wrench (Redox Type) with Attached T-Bar Encased in Plastic, Animal Carcasses from 100F, Cardboard Cartons, Containers & Pcs Piping, Containers Air Conditioner Pads, Containers Misc. Waste, Containers Offsite Depleted Uranium, Diversion Box Vent Pipe, Jumper from Purex #6 Trap Pit, Metal, Misc. Boxes, Misc. Shelving, Bins, & Scrap Lumber, Pickup Load of Paper, Poles, Preheat Coil Reading, Routine Trench Accumulation From Purex, Several Truck Loads of Tumbleweeds from 275-EA at Purex's Request, Standard Boxes - Misc. Waste, Temp. Construction Shack, 102A Pump from 241-A Tank Farm in Special Plastic-Shrouded Rack, Boxed Waste from Purex Plant Containing Both Pu and Mixed Fission Products, Truck Loads of Contaminated Lumber and Trash from 275 EA, Tubes from 241-CR Encased in Plastic and in Burial Boxes, Used Light Bulbs, Waste Cartons of Filter Media from 2E General Area, Wires, Wood, Wood Box Containing Purex Waste from Trap Pit #2.

Figure D-13 | CSM for the **218-E-12A Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-12A Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — 2009: This landfill was sampled at 10 locations. There was one low detect of 1,1,1-Trichloroethane at 13 ng/sample.

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
1,1,1-Trichloroethane	1	--	--	--	--	13

Note: 10 total sample locations are at the 218-E-12A Landfill.

Surface Radiation Surveys

- Several areas in the south were identified having cps greater than 1500. An area along the northern boundary had numerous areas with cps ranging from 750 and 1250.

Geophysics Summary

- 2006: Fifteen trenches were documented as containing dry waste in Hanford Site Drawing H-2-32095. Pockets of debris and metallic waste were located and mapped in each of the dry-waste trenches. The remaining 13 trenches are documented as containing acid-soaked material and are shown on Hanford Site Drawing H-2-32560. All of the acid-soaked material trenches are documented as being in the eastern half of the landfill, and the geophysical data suggests that most of the debris in these apparently narrow, shallow acid-soaked material trenches is nonmetallic.
- In all of the dry waste trenches, concentrations of metallic waste were identified. Because of the depth of burial of the debris in trenches and the marginally favorable soil conditions, it is assumed that there is more debris in the trenches than was detected in the data.
- All of the acid trenches are documented as being in the eastern half of the landfill where the soil conditions are least favorable to GPR.
- Techniques used: EMI, GPR, TMF

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Moderate quality records. There was one low detect of 1,1,1-Trichloroethane at 13 ng/sample. 1,1,1-Trichloroethane is a dense non-aqueous phase liquid (DNAPL) chemical that can travel in the landfill and vadose zone without the presence of water if sufficient quantities had been released. Due to the very low concentration detected, this chemical is not expected to be present as a mobile liquid in the landfill. See Appendix H for discussion on DNAPL behavior. Surface radiation survey - several areas with greater than 1500 cps, numerous areas with between 750 and 1000 cps.	Need to review existing data, and obtain additional records/ information if possible. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence. No past history of driving force or constituent mobility via gas or leachate flow.	Need to understand current erosion/subsidence activity and potential. Need to identify possible downward flow.	Visual inspection/monitoring of surface for erosion and subsidence. Horizontal boring and Direct Push for leak detection.
Transport Media	Dry waste with no evidence of soil gas or leaching. Potential for direct transport of waste after being uncovered by erosion/subsidence.	Need data about fluid flow. Need to review site history to assess if waste has been directly transported (e.g., blown about by wind, exposed by storms).	Horizontal drilling and Direct Push for soil/fluid samples. Analyze directly exposed or transported waste, if present.
Exposure Point	Direct exposure to contents.	Need to confirm site conditions and waste containment.	Review/inspect site surface for exposed waste.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

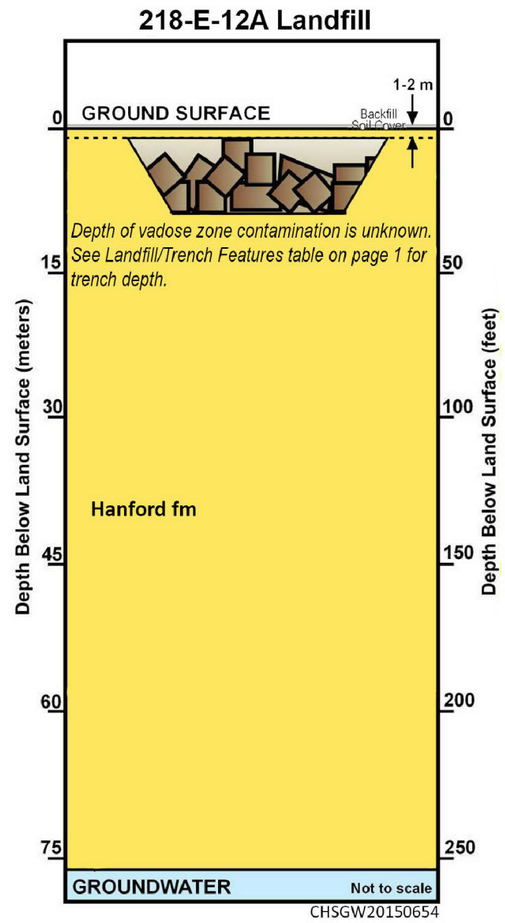
Photographic History

An undated photo, probably from the mid-1960s, shows an open trench in 218-E-12A and waste stored on the surface of the landfill. The 216-B-2 ditches are visible near the top of the photo.

It is not known which landfill is shown in this mid-1950s photograph. The 218-E-12A landfill was operational during this time, and is known to have received waste in the form of miscellaneous scrap and dirt dumped directly into a trench, as depicted.

This 2007 Aerial photo shows 218-E-12A.

Cross Section



Information from photos and logbooks contradicting literature.

None.

218-E-12B

Landfill

RCRA TSD

Undated photo, probably about 1970, depicts one of the unusually narrow trenches on the east side of the 218-E-12B landfill, as well as waste emplaced inside a more typical wider trench.

Curie Content: High

Green Islands: No

Hydraulic Driving Force: Yes

Record Quality: Good

Subsidence: Yes

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-E-12B, 200 East Dry Waste No. 12B
Landfill Type	Dry Waste TSD Unit
OU & Category	200-SW-2, Treatment, Storage, and Disposal
Dates of Waste Receipt	1967 to 2004
Location	North of the C Tank Farm and south of 12th Street
General Description	The southern portion of the site (Trenches 1 through 17) was interim stabilized in 1981 with clean fill.
Source Facilities Contributing More Than 5% of Waste by Volume	200 East Area, B-Plant (221 B), Offsite, PUREX, Tank Farms
References	WIDS; WHC-EP-0912

Retrievably Stored Waste (RSW) TRU Retrieval

*All volumes are estimates based on SWITS 5/4/2016.

Beginning RSW (m^3)	RSW Retrieved (m^3)	RSW Remaining to be Retrieved (m^3)
651	348	303

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	66,000	3
Used Area (hectares)	23	2
Plutonium Mass (kg)	1.4	11
Uranium Mass (kg)	310	14
Curies (Ci) decayed to 2015	49,000	5

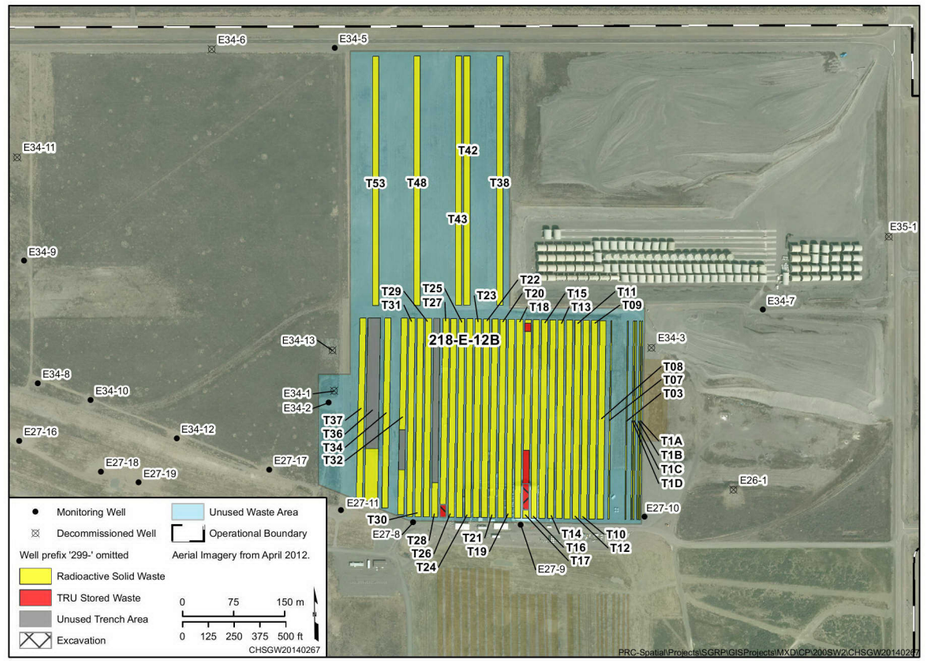
WASTE INFORMATION

Number Available	Rank	Record Quality
21,613	3	Good

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	The unit consists of 39 trenches. It was originally designed to have 29 trenches. The expansion to the north and west was to have enlarged the burial ground to include a total of 138 trenches running north and south, however most of the trenches in the enlarged area never were constructed.			
Number of Trenches	39				
Subsidence?	Y	RSW?	Y	Green Islands?	N
Episodic Water?	Y	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

10 Mil Liner, 303K Building Demolition Rubble - Bulk Waste, 5 Mil Liner, 50 Metal Pallet Bulk Shipment, Absorbed Sludge, Absorbent, Absorbent Pads, Acid, Asbestos, Ashes, Asphalt, Banding, Banding (Steel), Batteries, Blacktop, Bldg A Concrete & Wood, Bldg C & Bldg 'A' Hot Cell, Blocking & Bracing, Blocks Plastic & Wood, Brick, Building A Concrete And Rubble, Building A Rubble Concrete, Building Debris (Asbestos Containing Material), Bulk Asbestos Insulation From 1304N, Bulk Shipment LLSW Insulation From 1304N Emergency Dump Tank, Bulk Waste, Cardboard, Cement, Clay, Cloth, Coal Tar, Coal Tar Creosote, Concrete From A Unit, Concrete, Copper, Cork, Cotton, Cover Blocks, Creosote, D&D Debris From Unit A, D&D of Buildings Parking And Driveway, Dewatered Sludge, Diatomaceous Earth, Dirt, Dried Paint, Driveway, Expansion Joints & Roofing, Feces, Fiberglass, Film Formers (Paints), Filters, Fire Brick, Firebrick, Flange, Flatcar Assembly, Flatcar Wheel Assembly, Floor Sweeps, Floor Tile, Foam, Galvanized, Glass, Glass Small Tools And Parts Incident To The Operation And Maintenance of TFTR Experimental Systems, Gravel, Grout, Grout, Hose, Inert Non-Hazardous Material, Insulation Non-Asbestos, Insulation From 1304N Emergency Dump Tank, Irradiated Non-Regulated Metal (Bulk Waste), Kotex, Lead, Leather, Line Pole 35' Wood, Low-Level Waste, Lucite, Lumber, Metal, Metal Pallets In Bulk Shipment To LLWBGs, Neutron Activated Construction Debris With Radiological Contamination Below Regulatory Limits, Non-Containerized Tumbleweeds Collected In Compactor Truck, Nylon, Oil, Organic Debris, Oxides, Paints, Panel Covers, Paper, Parks Bldg Rubble, Pedestal Racks, Plaster, Plastic, Plastic Piping, Plexiglas, Plywood , Polyurethane, Porcelain, Powders, Pumps, Pyrofoam, Radioactive Tumbleweeds Collected In A Compactor Truck From Various Tank Farm Location, Resins, Richland Landfill Waste, Rocks, Roofing, Rope, Rubber, Sand, Scabble Debris, Sheet, Sheetrock, Sludges, Soil, Solid Non-Haz Components (Non-Specified), Stainless Steel, Steel, Styrofoam, Tape, Tar, Telephone Pole From Area Next To 2715-Z Pad, Transformer(Iron), Tumbleweeds, Valves, Vegetation, Vermiculite, Void Filler, Waste Dunnage Wood And Pallets, Waste From Membrane Filter Press, Waste Generated By D&D of Building Parking & Driveway, Water, Weeds, Wire, Plastic Packaging, Wood.

CHSGW20140267

Figure D-14 | CSM for the **218-E-12B Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-E-12B Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Vent riser soil-vapor sampling
  - Soil-vapor sampling on retrievably stored TRU waste trench segments is required by Tri-Party Agreement Milestone M-091-40, Requirement 2. This waste is not in the scope of this work plan; these results are included for informational purposes only. For more sampling details see Appendix H.
  - Step I Results: The 218-E-12B Landfill received retrievably-stored TRU in trenches T-17 and T-27. No vent risers exist in the 218-E-12B Landfill; therefore passive soil vapor sampling was conducted in the overlying soil. No carbon tetrachloride was detected. Tetrachloroethylene was detected at a maximum concentration of 34 ng. Other compounds and maximum concentrations detected include 1,2,4-trimethylbenzene (30 ng).

Surface Radiation Surveys

- Based on the 2009 survey, numerous areas were identified having a cps greater than 1500. Most of those were located near the center of the landfill. There were also numerous areas with cps between 1001 and 1250 and between 1251 and 1500. These areas were generally distributed across the footprint of the landfill.

Geophysics Summary

- Not performed.

Groundwater Monitoring

- LLWMA-2 monitoring wells have been sampled since 1988 for contaminant indicator parameters, groundwater quality parameters, drinking water parameters, and site specific parameters as required by WAC 173-303-400(3).
- Groundwater monitoring was initiated at 218-E-12B in 1987. The derived background comparison value (i.e., critical mean) for all of the indicator parameters has been exceeded periodically throughout the history of detection monitoring. The downgradient wells that have exceeded the critical mean were explained by laboratory issues or sample collection errors. Upgradient wells (e.g., 299-E34-7) that exceeded the critical mean have been associated with either leaching or infiltration processes within the vadose zone. The source of infiltration has not been determined. The groundwater monitoring activities at LLWMA-2 currently consist of water-level monitoring and chemical constituent monitoring. The LLWMA-2 is sampled semiannually from a network of nine wells. Samples are analyzed semiannually for the indicator parameters, anions, and metals; samples are analyzed annually for alkalinity, mercury, lead, and phenols. Water-level measurements are collected for each sampling event and in March for Hanford Sitewide monitoring. Regional water-level measurements have also been collected monthly since March 2008. Water levels will continue to be collected regionally on a monthly basis for an undetermined time period to resolve the groundwater gradient in the area with respect to high disposal discharges at the 200 Area Treated Effluent Disposal Facility, high Columbia River stages, and times when those influences are not present.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Good quality records with no indication of mobile constituents in the waste. Surface radiation survey – numerous areas with greater than 1500 cps, numerous areas between 1001 and 1250 and 1251 and 1500.	Need baseline geophysics. Need EMFLUX to confirm no mobile constituents. Obtain consistent surface radiation data for all landfills.	Obtain baseline geophysics. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	Historical presence of episodic water suggests potential for release(s) of mobile constituents downward.	Need to identify possible downward flow.	Perform MASW to identify preferential pathways. Horizontal boring and Direct Push for leak detection.
Transport Media	Fluid/water downward.	Need active soil gas data (for risk assessment). Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Horizontal drilling and Direct Push for soil/fluid samples. Obtain active soil gas samples where passive soil gas hits (>1,000 ng/sample).
Exposure Point	Groundwater exposure points – fluids/water.	Need to know if any releases have reached groundwater.	Review groundwater data for evidence of impacts by 218-E-12B.
Exposure Route	Ingestion/dermal – fluid/water.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-E-12B Landfill

None.

Photographic History

This 1996 photo of 218-E-12B shows trenches 36, 37, and 42 open for waste receipt. It correlates well with the SWITS fill dates for these trenches from the late 1980s through the early 2000s.

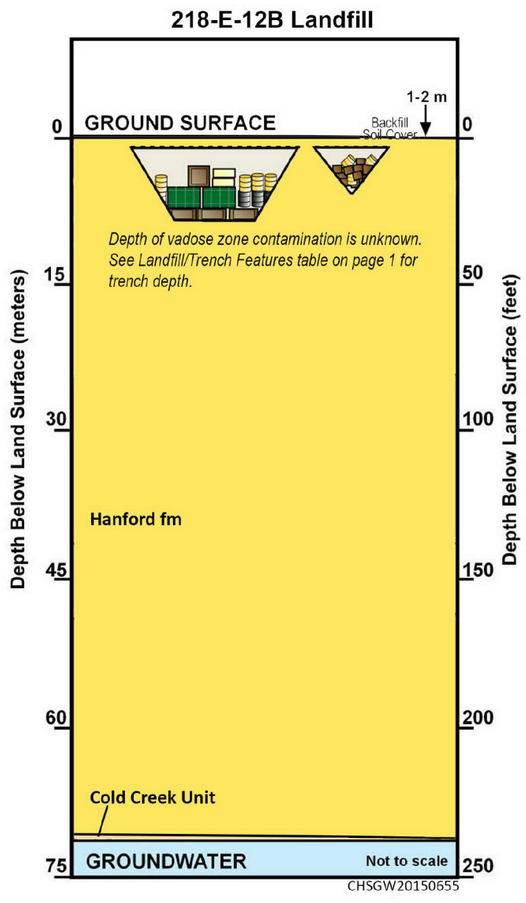
Packages in this era (1974) were placed in the trench within a few feet of the surface before backfilling.

Workers are disposing of typical dry waste of the time period (1974).

Information from photos and logbooks contradicting literature.

None.

Cross Section



218-W-1
Landfill
Dry Waste Alpha

Aerial photo from 1977 shows backfilled trenches in 218-W-1.

Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: No

Soil gas detection: No

Landfill Summary

WIDS Code & Aliases	218-W-1, 200 W Area Dry Waste No. 001, Solid Waste Burial Ground #1
Landfill Type	Dry Waste Alpha
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1944 to 1953
Location	Northwest of the 234-5Z Building, between the 218-W-2 and 218-W-11 Burial Grounds
General Description	"V" trenches typically were used to dispose of small contaminated articles such as paper, filters, and small pieces of equipment. The flat-bottom trenches contain large pieces of contaminated equipment and wooden, metal, and concrete burial boxes. The trenches have been backfilled, and the site was stabilized in 1983. A surface radiological survey is performed annually.
Source Facilities Contributing More Than 5% of Waste by Volume	West Inner Area
References	WIDS; SWITS; DDTS-GENERATED-5634; DDTS- GENERATED-5635; DDTS-GENERATED-5636; DDTS- GENERATED-5637; DDTS-GENERATED-5640; HAN-95462

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	7,200	16
Used Area (hectares)	2.2	14
Plutonium Mass (kg)	94	2
Uranium Mass (kg)	700	12
Curies (Ci) decayed to 2015	160	13

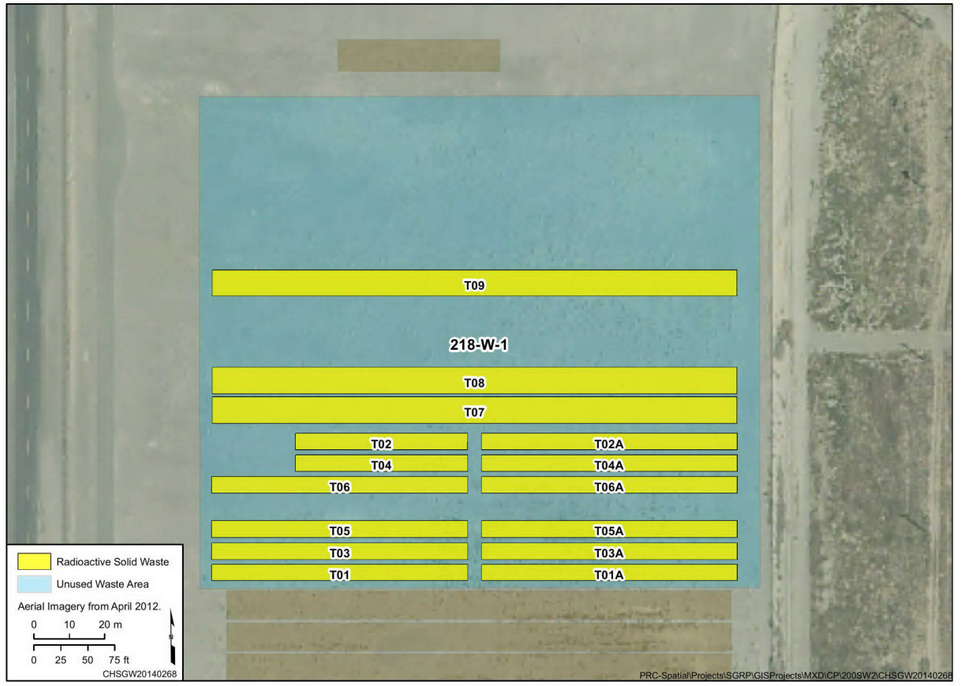
WASTE INFORMATION

Number Available	Rank	Record Quality
80	14	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	3	The unit consists of nine trenches; trenches 1 through 6 are each divided in two sections. Trenches 1 through 6 are "V" shaped, 8 ft deep and 16 ft wide at surface level. Trenches 7 through 9 are flat-bottom trenches 9 ft deep and 24 ft wide at surface.			
Number of Trenches	9				
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

Misc. Piping from Cell 6C, Sample Can Drying Head No. 1, 2-inch Powell Globe Valve, 3-5R to 4-8 Gang Valve, Adapter Plug #173, Adapter Plug Wrench Holder, Case Spray Assembly (3 Pcs) from E-2 Centrifuge, Case Spray Line (2 Pieces), Closure Plug #173, Conductivity Cell, Connector Head, Crescent Wrench, Cylindrical Lead Jacket, Dist. Dip Tube, Filter Box W-75399, Filter Cap Holder, Filter Holder for E-3 Vent Line, Gang Valve, 5-6 To 6-1, HF Dip Tube, Micro-Burette, Misco, Ring Balance Recording Meter, Sample Can #173, Sample Can And Adapter Plug #860, Sample Can Carrier Assembly #1000, Sampler, Sampler Assembly, Sampler Assembly from D-4 Tank, Sampler Dip Tube from D-4 Tank, Still Vacuum Receiver, Testing Plug (Old Style), Wexler Temperature Indicator, Adapter Plugs, Sampler Cups (Minus Air Jet), Miscellaneous Cell Connectors, Brackets and Bolts (Part of Sample Cup Holder), Bulk Samples, Chemox Mask, Connector Heads, Crescent Wrenches, Filter Box 231-Z, Filter Cap Supports, Sample Cup Holder Braces (Part of Sample Cup Holders), Sample Cup Holders, Sample Cup Hooks, U-Shaped Sample Cup Guides, Steam Hose, Connectors, Drainage Trays, Stainless Steel, Air Filters, Impact Wrench, Lubrication Connectors, Vacuum Cleaner, Shipping Plugs For Sample Cans, Beckman Tube.

Information from photos and logbooks contradicting literature.

None.

CHSGW20140268

Figure D-15 | CSM for the **218-W-1 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-1 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive Soil Vapor Sampling
  - — 2009: This landfill was sampled at four locations. There were no detections of any constituent.

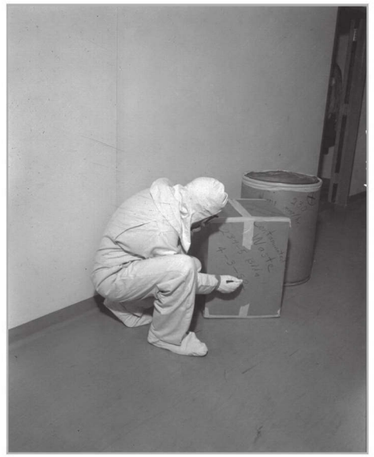
Surface Radiation Surveys

- 218-W-11, 218-W-1 and 218-W-2: Based on the 2010 survey, less than 10 areas were identified having cps greater than 1500. They were evenly distributed amongst the three landfills. There is a large cluster of hits between 1001 and 1250 cps in the former location of UPR-200-W-16, which is in the southern end of 218-W-1.

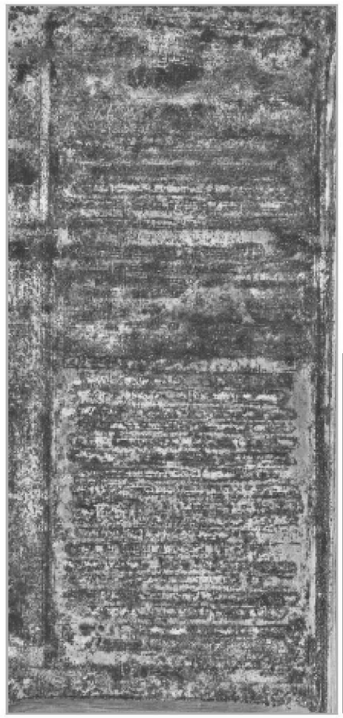
Geophysics Summary

- 2006: The geophysical data for the 218-W-1 Landfill indicates pockets of debris in each of the trenches; with discrete concentrations of metallic waste in most of the trenches. Nonmetallic waste is interpreted to be mixed with the metallic waste. Most of the waste is at least 1 to 2 m deep and occasionally deeper. It is possible that there is more debris in the trenches than was detected in the data and plotted on the interpretation map. Based on Hanford Site Drawing H-2-75149, trench series 1 through 6 all were designed to be about 2.5 m deep with about 1.3 m separation. Given the proximity of the trenches in the 1 through 6 series, it is quite possible that a trench could have been constructed and not be apparent in the geophysical data. Trenches 1 through 6 may have been opened and backfilled with similar soils or never opened. According to the drawing, trenches 7 and 8 are separated by 1 m. Most of the trenches were evident in the data, with the exception of Trenches 1, 1A, 4A, and 6. These four trenches lack even subtle anomalies and, therefore, their existence cannot be confirmed. Three east-west oriented trenches were identified that are not shown on Hanford Site Drawing H-2-75149, Dry Waste Burial Ground 218-W-1. They are north of the northernmost trench shown on the drawing (Trench 9) and south of 218-W-11. They have a character similar to that of the other trenches in the 218-W-1 Landfill. Additionally, two pit-like areas not shown on the drawing were identified in this northern area, with one having significant metallic content.
- Techniques used: EMI, GPR, TMF

Photographic History

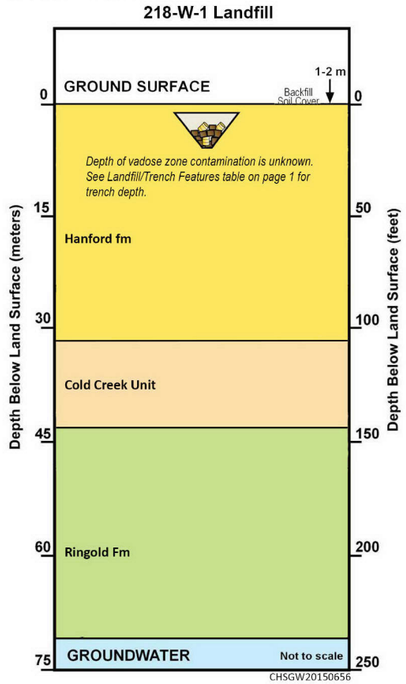


1952 photo of a masked worker preparing a standard cardboard burial box and a cardboard barrel. The containers are marked “4-3-52, contaminated waste, 234-5Z Building” and “230 mr/hr.” The containers are buried in 218-W-1.



February 1980: aerial photo shows 218-W-11 (top/north), 218-W-1 (center) and 218-W-2 (bottom/south). Trench locations are still visible during this era, before interim stabilization in 1983.

Cross Section



Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Moderate records; no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – fewer than 10 areas in 218-W-11, 218-W-1, and 218-W-2 with greater than 1500 cps.	Review Existing records and information. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to understand potential for direct exposure.	Visual inspection/monitoring of surface for erosion and subsidence. Direct Push for leak detection.
Transport Media	Dry waste with no evidence of soil gas. No transport likely.	Need data about fluid flow.	Direct push to confirm transport media, low likelihood of release mechanism.
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-W-1 Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/ Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-11	UPR-200-W-11, Burial Ground Fire, UN-200-W-11, UPR-200-W-16	Within the 218-W-1 Landfill.	1952	N/A	Airborne radioactive contamination including alpha particles	N/A	N/A	This site was a result of a spontaneous fire in the 218-W-1 Landfill. It is a duplicate of UPR-200-W-16. (“Consolidated”)
UPR-200-W-16	UPR-200-W-11, Burial Ground Fire, UN-200-W-11, Fire at 218-W-1 Burial Ground	Within the 218-W-1 Landfill.	1952	N/A	Airborne radioactive contamination including alpha particles	N/A	N/A	The release was a result of a spontaneous fire in the 218-W-1 Landfill. The trench where the fire occurred runs east and west and was roughly in the center of the landfill. A fire in the dry waste spread plutonium contamination near the 231-Z Building. The contaminated soil was bulldozed into the trench. The ground on the north side was stabilized with oil, and roads near the Z Plant were washed down with water. (“Consolidated”)

218-W-1A
Landfill

Industrial

August 1961, equipment being placed in the 218-W-1A industrial landfill.

Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: Yes

Soil gas detection: No

Landfill Summary

WIDS Code & Aliases	218-W-1A, 200 W Area Industrial Waste Burial Ground #1, Equipment Burial Ground #1
Landfill Type	Industrial
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1944 to 1961
Location	Northwest of 221-T, between two railroad spurs
General Description	The site is the first burial ground in the 200 West Area to receive large, contaminated equipment. Most of the equipment was disposed in wooden boxes that eventually rotted and settled, creating sinkholes. The sinkholes were filled in 1975 with 1.8 m (6-ft) thick concrete cell blocks and clean fill. Radiological surveys are performed annually.
Source Facilities Contributing More Than 5% of Waste by Volume	West Inner Area
References	WIDS; WHC-EP-0912; RHO-CD-673; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	14,000	10
Used Area (hectares)	3.4	11
Plutonium Mass (kg)	2	9
Uranium Mass (kg)	900	10
Curies (Ci) decayed to 2015	870	9

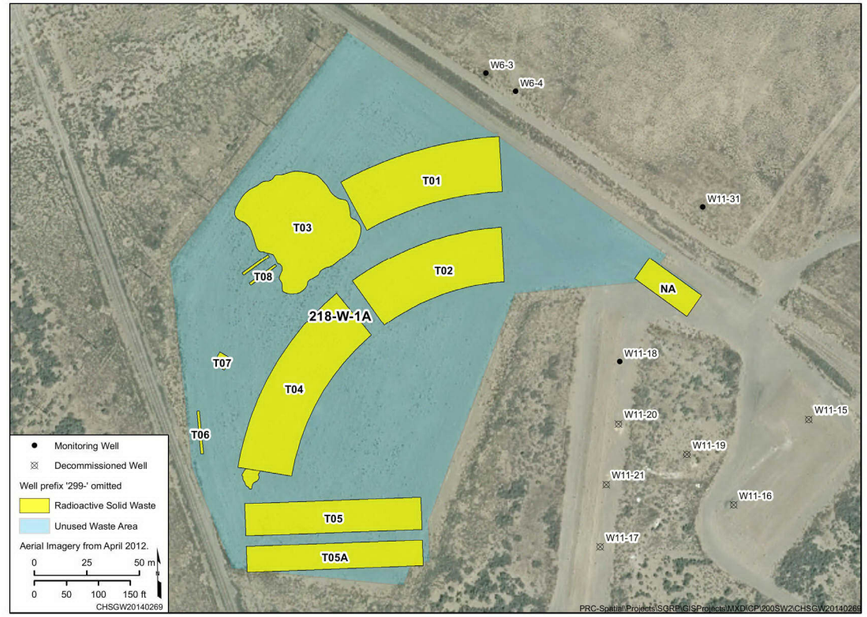
WASTE RECORDS

Number Available	Rank	Record Quality
126	12	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	8	The site contains approximately 10 burial areas. Some are typical trenches but several areas are described as burial holes. The exact locations of the burial holes are not known.			
Number of Trenches	10				
Subsidence?	Y	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

Seal Pots, “A” Jumpers from #152 Diversion Box, (E-1) HF Dip Tubes, (E-1) Thermohms and Wells, (E-3) Thermohm and Well, “A” Jet Assemblies, “B” Jet Assemblies, 1/6 Hp Motor, 1-inch Aloyco 150 Stainless Valve/224-T, 10 GPM Jets/224-T, 291-T No. 2 Fan Assembly Including Steel Inlet and Outlet Duct Work, 3-gpm Jet/224-T, 30 Ft Pipe, Stainless Steel, 500 Ft Water Hose, A-1 Thermohm, Agitator, AT Tank, B-1 Thermowell, Bed Cover Bows, Bottom Section of Scrubber, Bucket from Cask Assembly 190#, Cabinets, Capsule Section of ORNL Waste Storage Tank Sludge Sampler Capsule Type plus the Carrier Lift Yoke - in 10-inch Pipe Container, Centerpole and Superstructure of Clamshell Type ORNL Waste Storage Tank Sludge Sampler in 10-inch Pipe Container, Centrifuge Concrete Block Section 19-R, Centrifuge, Foundation, Clothes Drying Machine, Commander Air Sampler, Condenser, Stainless Steel, Corrosion Sampler, C-R-2 Tank, D-12 Pot Redox, D-12 Waste Concentrator Pot, D 2 To D-3 Overflow Line, D-3 Thermowell, Damper Section of Outlet Duct Over the Electrically Driven Fan / 231-Z, Dip Tube, Distributor B-1, Double Thermohm and Well for B-1 Tank, Drip Catcher from Recycle Line, Drive Fork from E-4 Centrifuge, Electric Muffle Furnace, F-10 Tank No. 224-140, Fan and Ductwork / 291-T, G.E. Ion Chamber, GE Air Sampler, HF Dip Tubes, Idler Wheel, Inlet and Outlet Ducts to Steam Engine Fan / 291-T, Invasion Pipe, Jet Assembly, Jumper Upper 2 to Lower 13 Having Blank Supporting Connector to Upper 7, Jumpers Redox, Lead Cask for Wafers, Metallurgical Cut-Off Box, Model K Skilblower, Overflow Lines from Tanks, Overflow Pipes (25-12 Fabrication)/224-T, Overflow Pots Det. 63730/224-T, Plow from B-2 Centrifuge, Plow from E Centrifuge, Preheater Coils, Reduction Gear, Repair Scaffold, Rubber Floor Mat, Rubber Tires from Lorain Crane, Sample Cans (#134, 150, 180, 272, 374), Sampler Dip Tube, Sampler Dip Tube from E-4 Tank, Sampler Jet and Assembly/224-T, Seal Pots and Overflow Lines, Stainless Steel, Sections Sludge Pipe, Selsyn Motor, Shipping Crates Known as “Bird Cages”, Side Boards, Silver Reactor and A D-3 Condenser Redox, Skimmer from B 2 Centrifuge, Sludge Box, Sparger D-1, Stainless Steel Drum 15 Gallons, Steam Coils - Air Conditioning Units 221-B, Tank Distributor and Tail Pipe (2 Pieces), Tank Sampler Dip Tube, Tank Thermohn Dip Tube, Tank Wt. Ftr. Dip Tube, Tarpaulin Cover, Thermohm, Thermohm Dip Tube from D-1 Tank, Thermom Well, Timer – Model R2d299ll

Sm 60, Top of Glass Lined Tank, Transfer Box and Cover of Capsule Type ORNL Waste Storage Tank Sludge Sampler in Wood Box, Two Silver Reactors Redox - Box Broke During Burial, Variac from Chemical Assay Board, Vari-Speed Stirrer Motor (Without Stand), Vent Pipe from E-4 Tank, Wt. Ftr. Sp Gr Dip Tube Assembly, Wt. Ftr. Sp Gr Dip Tube from D-1 Tank, H-4 Oxidizer Pot Redox, Misc. Canyon Waste Redox, One ORNL Supernatant Waste Sample (Pump Type), One Transfer Box For ORNL Waste Storage Tank Sludge Sample (Clamshell Type), One Carrier Assembly For ORNL Waste Storage Tank Sludge Sample (Capsule Type)

CHSGW20140269

Figure D-16 | CSM for the **218-W-1A Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-1A Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — 2009: This landfill was sampled at 13 locations. There were no significant detections of any constituent (a very low detect of napthalene at 15 ng).

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Max. Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Naphthalene	1	--	--	--	--	15

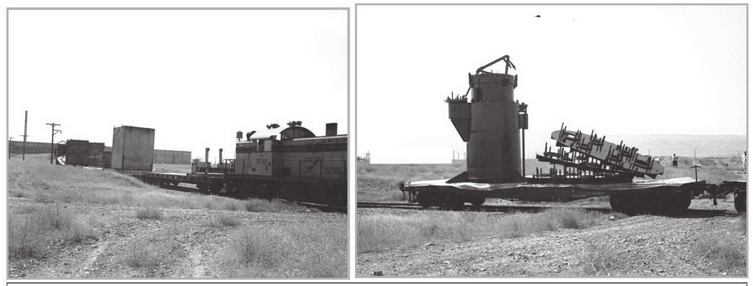
Surface Radiation Surveys

- Based on the 2010 survey, only one area was identified in the middle of the landfill having a cps greater than 1500.

Geophysics Summary

- 2005: No geophysical evidence was detected for one trench (5A). Additional trenches and pits were detected that were not previously documented. The EMI and magnetic data were most useful in detecting anomalies associated with buried debris. Although no distinct trench boundaries were indicated by the geophysical data, the pattern of anomalies in the EMI and magnetic data generally agreed with the locations and orientations of trenches/pits shown on Hanford Site Drawing H-2-2516, Industrial Burial Ground 218-W-1A.
- Techniques used: EMI, GPR, TMF

Photographic History



August 1961, equipment being placed in the 218-W-1A industrial landfill.

A May 1971 aerial photo shows the layout of the 218-W-1A landfill.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Moderate quality records; however, no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – only one area with greater than 1500 cps.	Obtain additional records and information, if possible. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and search for new information/ records on contents. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to understand potential for direct exposure. Need to identify potential of downward flow.	Visual inspection/monitoring of surface for erosion and subsidence. Direct Pushes for leak detection.
Transport Media	Industrial waste with no evidence of soil gas. No transport likely.	Need data about fluid flow.	Direct push to confirm transport media, low likelihood of release mechanism.
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

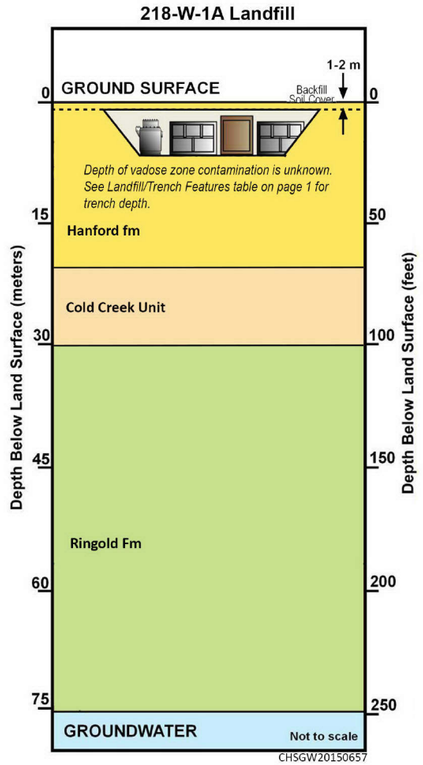
Unplanned Releases Collocated with or Near 218-W-1A Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/ Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-26	UPR-200-W-26, Contamination Spread During Burial Operation	Assumed to be 218-W-1A Landfill and along the railroad tracks.	1953	221-T	Soil contamination from 221 T spent equipment	N/A	N/A	Wind dispersed contamination while a box of used connectors was being unloaded from a flatcar. Contamination spread onto the flatcar and onto the surrounding ground. Although source documentation (PNL-6456) indicates the release occurred in 218-W-4A, this is likely in error since the landfill did not begin operations until 1961 and the release occurred in 1953. This release is probably associated with the 218-W-1A Landfill, near the railroad line as described in the source documentation.

Information from photos and logbooks contradicting literature.

Although SWITS indicates the landfill stopped receiving waste in 1953, photos and site drawings indicate burials in 1959, 1961, and possibly 1965.

Cross Section



218-W-2
Landfill

Dry Waste Alpha

October 1955: waste in 218-W-2 landfill trench. The waste in all older dry waste and alpha dry waste landfills is likely to have a similar form.

Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Poor

Subsidence: No

Soil gas detection: No

Landfill Summary

WIDS Code & Aliases	218-W-2, 200-W Area Dry Waste No. 002, Dry Waste Burial Ground No. 2
Landfill Type	Dry Waste Alpha
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1953 to 1956
Location	Northwest of the 234-5Z Building between 218-W-4B and 218-W-1
General Description	Before backfilling, waste was observed to be within 46 cm (18 in.) of the ground surfaces. Sinkholes were filled in 1974. The site was surface stabilized in 1983 with a minimum of 0.6 m (2 ft) of clean fill and vegetated. A surface radiological survey is performed annually.
Source Facilities Contributing More Than 5% of Waste by Volume	West Inner Area
References	WIDS; BHI-00175; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	8,200	13
Used Area (hectares)	2.8	13
Plutonium Mass (kg)	130	1
Uranium Mass (kg)	1,400	8
Curies (Ci) decayed to 2015	220	12

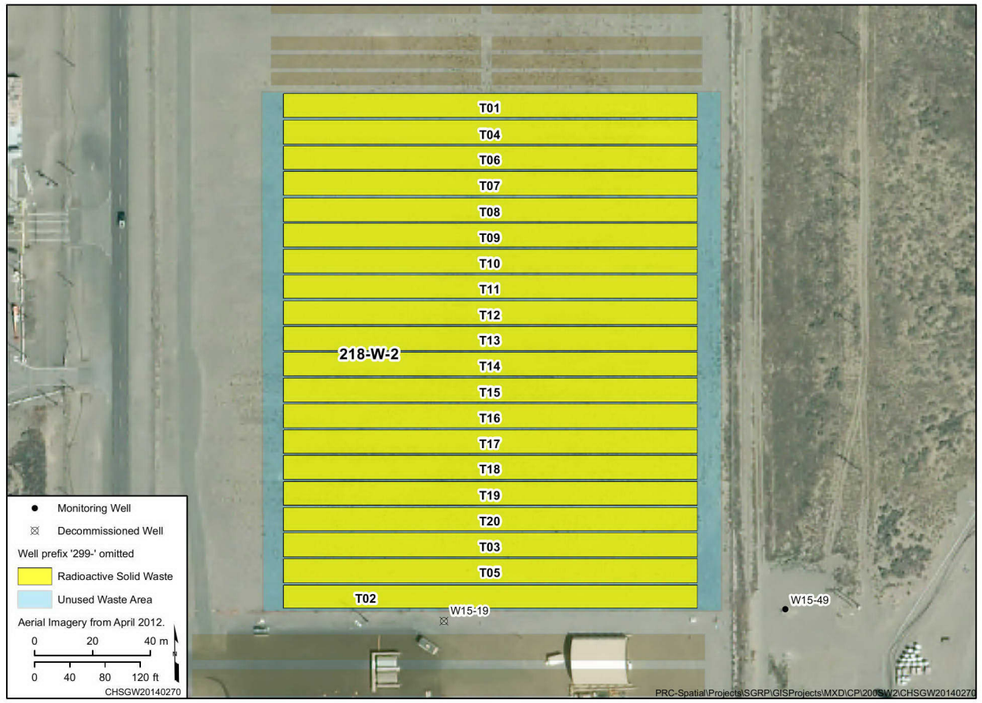
WASTE RECORDS

Number Available	Rank	Record Quality
25	16	Poor

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	The site is a burial ground that contains 20 miscellaneous dry waste trenches, running east-west. The site has been backfilled and stabilized. Each trench is about 140 m (460 ft) long, 8 m (25 ft) wide at surface.			
Number of Trenches	20				
Subsidence	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed
No landfill inventory records available for this landfill. (SWITS)

Information from photos and logbooks contradicting literature.

None.

CHSGW20140270

Figure D-17 | CSM for the **218-W-2 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-2 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — 2009: This landfill was sampled at four locations. There were no significant detections of any constituent (three very low detects in one location of carbon tetrachloride at 36 ng, carbon tetrachloride at 19 ng, and trichloroethene at 31 ng; and one very low detect at another location of 1,1,2-trichlorotrifluoroethane at 43 ng).

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
1,1,2-Trichlorotrifluoroethane	1	--	--	--	--	43
Carbon tetrachloride	1	--	--	--	--	36
Chloroform	1	--	--	--	--	19
Trichloroethene	1	--	--	--	--	31

Note: 4 total sample locations are at the 218-W-2 Landfill.

Surface Radiation Surveys

- 218-W-11, 218-W-1, and 218-W-2 Landfills: Based on the 2010 survey, less than ten areas were identified having counts per second (cps) greater than 1500. They were evenly distributed amongst the three landfills.

Geophysics Summary

- 2006: All 20 of the trenches shown on Hanford Site Drawing H-2-02503, 218-W-2 Dry Waste Burial Ground, were evident in the geophysical data. Pockets of debris and metallic waste were identified in most of the trenches.
- Techniques used: EMI, GPR, TMF

Photographic History

Photo October 1955 of waste in 218-W-2 landfill trench.

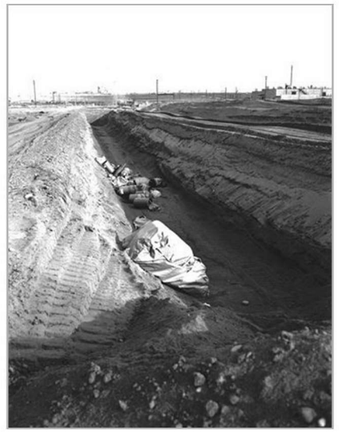
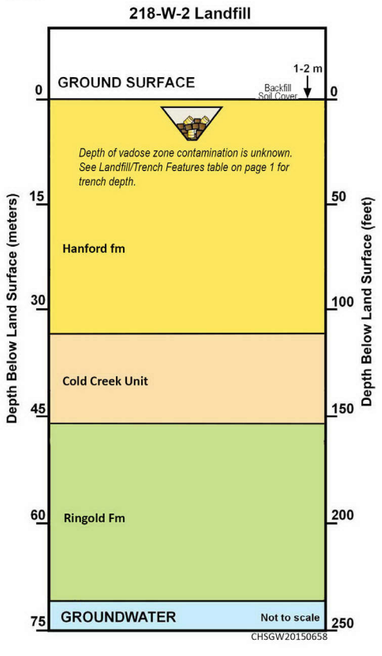


Photo October 1955 of waste in 218-W-2 landfill trench.

A May 1969 aerial photo shows backfilled trenches in 218-W-2.

Cross Section



Unplanned Releases Collocated with or Near 218-W-2 Landfill

None.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Poor records; There were four low detects of dense non-aqueous phase liquid (DNAPL) chemicals that can travel in the landfill and vadose zone without the presence of water if sufficient quantities had been released. Due to the very low concentrations detected, these chemicals are not expected to be present as mobile liquids in the landfill. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – fewer than 10 areas in W-11, W-1 and W-2 with greater than 1500 cps.	Obtain additional records and information, if possible. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and records, Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to understand potential for direct exposure. Need to identify potential of downward flow.	Drill horizontal boring and direct push for leak detection. Visual inspection/monitoring of surface for erosion and subsidence.
Transport Media	Dry waste with no evidence of soil gas. No transport likely.	Need data about fluid flow.	Horizontal boring and direct push to confirm lack of transport media.
Exposure Point	Direct exposure to contents.	No data gaps or needs.	No plans to investigate the exposure point.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

218-W-2A
Landfill

Industrial

A 1955 REDOX equipment burial in 218-W-2A was well-depicted by photographers with Life Magazine, who were illustrating a feature story. Photo shows large burial box with industrial pot inside being loaded onto train for transport to landfill.

Curie Content: High

Green Islands: No

Hydraulic Driving Force: Yes

Record Quality: Moderate

Subsidence: No

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-W-2A, Industrial Waste No. 02A, Equipment Burial Ground #2
Landfill Type	Industrial
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1954 to 1985
Location	West of the 221T Building and directly east of the 218-W-3 Burial Ground
General Description	Solid wastes disposed to the site includes tanks, concrete blocks, facility wastes, process equipment, contaminated soil scraped from the 216-T-4-1 Pond (Trench 27), REDOX centrifuges, jumpers, pumps, filters, and miscellaneous cell equipment and wastes. Trench 21 contains a plutonium glovebox. In January 1959, a contamination spread occurred when a burial box containing REDOX jumpers collapsed during backfill operations (UPR-200-W-53). The site was backfilled and surface stabilized in 1980. However, the site remained active until 1985 because of two unused trenches and the cell block burial sites. An undocumented burial box was discovered in June 1983 while extending an active trench. The site was re-stabilized with clean fill and gravel in 2001.
Source Facilities Contributing More Than 5% of Waste by Volume	Inner Area facilities including T Pond soil, REDOX, B Plant, and 234 5Z Building
References	WIDS; SWITS; 218-W-2A Logbook; ARH-2757; ARH-2015 Part 4; D&D-28379, Rev. 1

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	25,000	6
Used Area (hectares)	15.3	6
Plutonium Mass (kg)	6.4	7
Uranium Mass (kg)	2,700	7
Curies (Ci) decayed to 2015	7,300	8

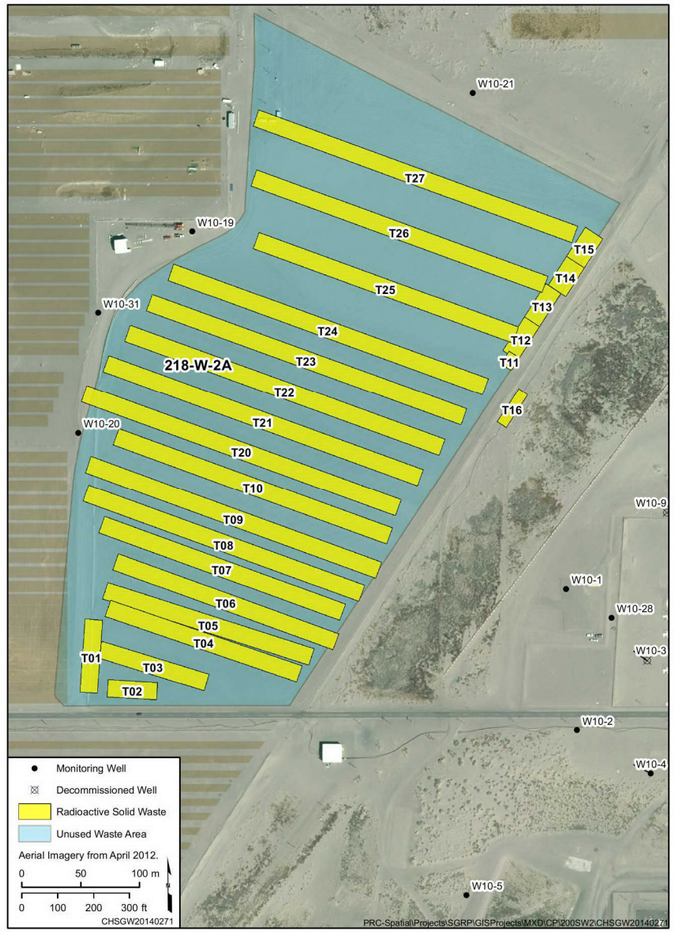
WASTE INFORMATION

Number Available	Rank	Record Quality
201	11	Moderate

LANDFILL/TRENCH FEATURES

Trench Depth (m)	8	24 alpha dry waste trenches - 18 trenches (#1-10 and #20-27) plus 5 short trenches containing cell blocks in the northeast corner of the burial ground (#11-15) plus one short trench (#16) containing railroad rails, which were removed in the 1970s.			
Number of Trenches	24	Pond site (216-T-4) located in site boundary.			
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	Y

Site Map



216-T-4A Pond

The 216 T 4A Pond was a natural surface depression that received discharge from the 216 T 4 1D Ditch. The pond intermittently received the following waste streams: process cooling water from 221 T and 224 T Buildings, steam condensate from 221 T Building, condenser cooling water and steam condensate from the 242 T Evaporator, and decontamination waste from 2706 T Building. The dimensions of the pond were approximately 549 m (1,800 ft) by 182 m (600 ft), essentially covering 6.5 ha (16 ac). The pond became active in 1944 and was exhumed in 1972 to make room for the expansion of the 218 W 2A waste site. In 1995, the pond was interim stabilized with uncontaminated backfill and revegetated.

216-T-4B Pond

The 216-T-4B Seepage Pond received condensate and condenser cooling water from the 242 T Evaporator and nonradioactive wastewater from 221-T air conditioning units and floor drains. The pond is located east of 216-T-4A Pond. The size of the pond is estimated at 6,100 m2 (1.5 ac). The pond was often dry, since the majority of the effluent was absorbed in the 216-T-4-2 Ditch. The pond was constructed in 1972 to replace the old 216-T-4-1 Pond (216-T-4A). The pond was considered dry by 1977. However, the pond was not isolated from the ditch until 1995; therefore, a potential existed for effluent to reach the pond until that time.

*see page 2 of this figure for information on the 216-T-4-1D Ditch and 216-T-4-2 Ditch

Figure D-18 | CSM for the **218-W-2A Landfill** *2 of 3*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-2A Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — 2009: This landfill was sampled at 19 locations. There were no significant detections of any constituent (nine locations with low detections, the highest being for tetrachloroethene at 159 ng, with no other detection exceeding 58 ng).

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Tetrachloroethene	6	1	--	--	--	159
Toluene	2	--	--	--	--	11

Surface Radiation Surveys

- Based on the 2010 survey, two areas were identified having counts per second (cps) greater than 1500. The areas were located in the center of the landfill on the east side.

Geophysics Summary

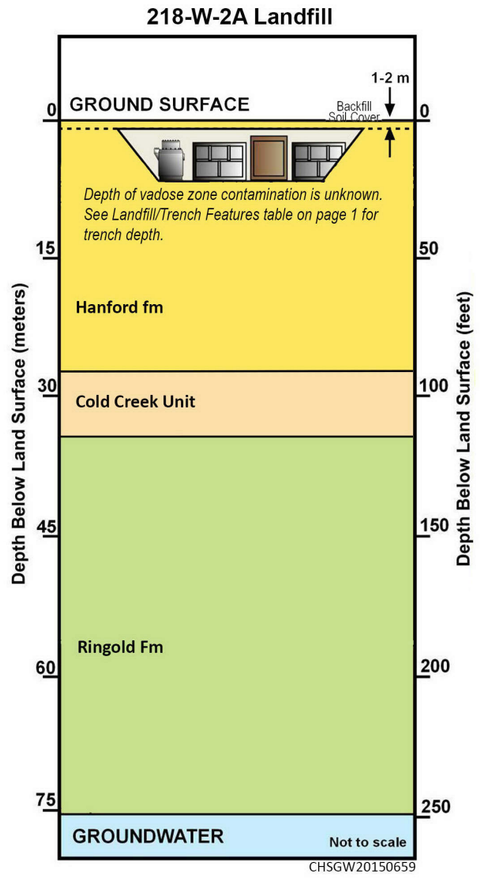
- 2005, 2006: The geophysical data indicate that there are trenches at most of the locations shown H-2-32095, *218-W-2A Industrial Burial Ground and 218-W-3 Dry Waste Burial Ground*. No geophysical evidence exists for buried waste at some of the trench locations shown on the drawing. One trench was interpreted in the geophysical data at a location that was not indicated on the drawing (see Trench A description). Most of the debris or objects in the trenches have a ferrous metal content; some have a significant ferrous content. More specific details for the trenches depicted on H-2-32095 are as follows:

GEOPHYSICAL TRENCH DATA

Trench 1	A northwest southeast trending trench that is located in southwest corner of the landfill. The trench location correlates well with its location shown on site drawings.
Trenches 2, 9, 25, 26	There was no geophysical evidence of a trench in this location.
Trench 3	This southernmost east west trending trench was identified in the investigation. The trench location correlates well with its location shown on site drawings.
Trenches 4-10, 20-24	These east west trending trenches correlate well with their locations shown on site drawings.
Trenches 11-15	Parallel the west side of the railroad tracks. The geophysical data indicate that buried debris extends roughly 100 m (328 ft) further to the south than shown on site drawings.
Trench 16	The only trench documented as being located on the eastern half of the railroad tracks.
Trenches 17-19	No trenches with these numbers are shown on Hanford site drawings.
Trench 27	At this trench location, GPR data indicate a relatively short, irregular excavation at the eastern end, and another section on the western edge of the landfill that does not line up with the first section.
Trench A	An undocumented trench that parallels the west side of the railroad tracks in the southeast corner of the landfill.

- Techniques used: EMI, GPR, TMF

Cross Section



Landfill Inventory

Items Known to be Disposed

Pumps, Process Tube Sections, Lumber, Misc. Hardwire, Plywood, Burial Log Reports BNW Waste 10-10-73, Buried Contaminated Railroad Tracks, Cell Equipment, Contaminated Soil, D-12 Concentrator, D-14 Vessel PDR 89-63, H-4 Vessel, L 1 Vessel, Lines and Whaler Box, Misc. Redox Cell Equipment, Old Purex Pump Box, Redox B-12 Tower, Redox B-4 Filter, Redox H-4 Pot, Redox Tube Bundles, Silo Jumpers (Brandy), "D" Cell Sludge, B Plant Centrifuge Yoke, 1951 International Harvester Dump, 1B-3 Cask Fuel Assembly, 2 B Plant Filter Assembly, Pumps, 324 Bldg "Hot Cell" - Dry Solid Wastes, 2 VBH Filter from Redox, Redox Centrifuge, Vapor Line from the B-4 Pot, Agitator Motor, Agitators, Agitators and the Tunnel Door, AR Filter, B-3 Dissolver Lower From Purex, Barrels of Waste, Metal Junk Boxes, Box Containing Jumpers, Burial Vault Marked "B Plant 58526", Canyon Cleanup, Cell 2E Filter B Plant, Cell Cover Blocks, Chain Fall, Concrete, Concrete "Hot-Waste" Disposal Box Containing Dry-Solid Waste From 324 Bldg Cells, Concrete Plugs From 241-TX Tank Farm, Concrete Posts and Tumbleweed, Container Misc. Scrap from 271-T, Container Silo Jumpers, Contaminated Dirt, Contaminated Dirt From Laundry Berm, Contaminated Load Dirt, Contaminated Railroad Iron, Contaminated Soil, CR Filter, Diatomaceous Earth, Dirt, Dirt Scraped from Top of the Bottom of Old 216-T-4-1 Pond, Dump Truck Loads of Contaminated Soil from 200-W Laundry Ditch, Dump Truck Loads of Contaminated Soil Removal from Laundry Berm-West Area, Galvanized, Gaskets, Glove Boxes, Gondolas Containing Misc. Materials from B Plant, Gravel From Roof of Building 222S, H-2 Redox Centrifuges, H4 Redox Vessels, Iron, Irradiated Ring from Fuel Case, Jumpers, Laboratory and Building Equipment, Lard Cans, Lids from Diversion Box 241-TX Tank Farm, Metal, Misc. Lab Waste, Misc. Purex Connector Heads, Misc. Waste From Redox Canyon, Miscellaneous Items from Redox, Misc. Items from U Plant, Obsolete Parts, Pallets, Pipe, Pipe Plugs from 241-SX Tank Farm, Pipes, Pumps, Purex Dissolver Tower Jig, Purex Tube Bundles, Rad. Signs and Chains, Railroad Steel Rails and Short Ties from 241-TX, Railroad Ties, Redox Agitators, Redox D-12 Vessel, Redox Heat Exchanger Tube Bundles, Redox L3 Concentrator Loop Without Tube Bundle, Redox Offgas Heaters Stainless Clad, Redox Process Solution Pump, Redox Pumps Black Iron, Redox Silver Reactors, Redox D-13 Agitator Motor, Scrap Materials, Scrap Steel, Sheet, Sheet, Shim Rod Sections, Small Contaminated Parts, Small Pumps, Soil, Sprockets, Stainless Steel Rods Used for Hanging Fuel Elements in the PRTR and Test Assembly, Steel Posts, Tank Farm Exhaust Filter, Titanium Tube Bundle - Purex H-4 Tube Bundle #58, Tumbleweeds, Tunnel Door, Vent Blower Motor, Waste Mgt Sheeting 25-1 Tank, Waste-Scavenging Equipment, Wood.

216-T-4-1 Ditch

The 216-T-4-1 Ditch intermittently received the following waste streams; process cooling water from the 221-T and 224-T Buildings, steam condensate from the 221-T Building, decontamination waste from 2706-T, and condenser cooling water from the 242-T Building. The ditch operated from November 1944 to May 1972 and received waste streams via the 207-T Retention Basin and 200-W-163-PL. Pipeline 200-W-163-PL also connected to the ditch. The original bottom dimensions were 259 m (850 ft) by 2.4 m (8 ft). The ditch was replaced by the 216-T-4-2 Ditch in 1972 and the first 15 m (50 ft) of the original ditch was reused in the replacement ditch construction. Both the original and replacement ditches were surface stabilized in 1995.

216-T-4-2 Ditch

The 216-T-4-2 Ditch was dug as a replacement for the 216-T-4-1 Ditch. The first 15 m (50 ft) of the original ditch (216-T-4-1) was reused in the 216-T-4-2 Ditch construction. The ditch received T-Plant cooling water and condensate via the 207-T Retention Basin and the 200-W-164-PL. The ditch discharged to the 216-T-4B Pond. The original bottom dimensions were 533 m (1,750 ft) long by 2.4 m (8 ft) wide by 1.2 m (4 ft) deep. The ditch was backfilled and interim stabilized in July 1995 and permanently isolated by filling the last pipeline manhole.

Information from photos and logbooks contradicting literature.

None.

Figure D-18 | CSM for the **218-W-2A Landfill**

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Moderate quality records. EMFLUX suggests some presence of mobile constituents. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – two areas with greater than 1500 cps.	Obtain additional records and information, if possible. Additional passive soil gas data. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics and review existing records on contents. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	EMFLUX data suggests some release of mobile vapor constituents upward. Historical presence of disposal pond suggests earlier release(s) of mobile constituents downward (leaching).	Need to identify vadose zone preferential pathways that may control leaching/ downward flow.	Perform MASW to identify preferential pathways. Drill horizontal boring and Direct Push for leak detection.
Transport Media	Soil gas upward, leachate downward, including from earlier disposal ponds.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Horizontal boring and Direct Push for soil/fluid samples. Obtain active soil gas samples in areas of passive soil gas hits (> 1,000 ng/sample).
Exposure Point	Surface or near-surface (e.g., burrows) – soil gas. Groundwater exposure points – fluids/water.	Need to evaluate burrow/bioturbation activity at the surface. Need to confirm no impacts to groundwater.	Review/inspect site surface for ecological activity. Review groundwater data for evidence of impacts by 218-W-2A and/or previous pond disposal.
Exposure Route	Inhalation/dermal – soil gas. Ingestion/dermal – fluid/water.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment

Unplanned Releases Collocated with or Near 218-W-2A Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-53	UPR-200-W-53, Burial Box Collapse	East from the 218-W-2A Landfill to within 275 m (902 ft) of the east perimeter fence of the 200 West Area.	1959	REDOX	Spent equipment caused contaminated soil and airborne particles	N/A	101 ha (250 ac)	A burial box containing process equipment from REDOX collapsed and released fission product contamination into the West Inner Area in January 1959. Skin and/or personal clothing contamination occurred to 12 employees and 15 vehicles. Personnel and property were decontaminated, and measures to prevent the spread of contamination were implemented. (“Consolidated”) Also known as UPR-200-W-45.

Photographic History

1954 photo of large wooden dragoff box placed in 218-W-2A industrial landfill.

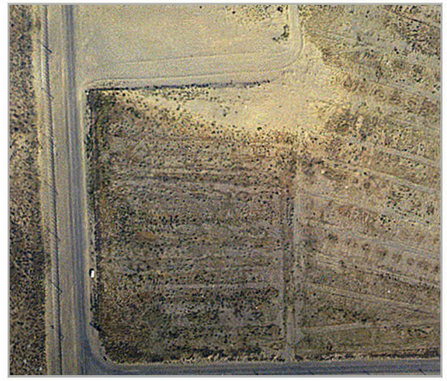
1954 photo of 218-W-2A showing open trenches.

A 1955 REDOX equipment burial in 218-W-2A was well-depicted by photographers with Life Magazine, who were illustrating a feature story. These two pictures show an industrial pot being removed from REDOX and its final resting place as boxed waste in the landfill prior to backfilling.

A 1975 aerial photo of 218-W-2A showing open trenches.

218-W-3
Landfill
Dry Waste Alpha

A September 1975 photo of 218-W-3 shows the backfilled trenches.



Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Moderate

Subsidence: No

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-W-3, Dry Waste No. 003
Landfill Type	Dry Waste Alpha
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1957 to 1961
Location	West of the 221T Building and directly west of the 218-W-2A Burial Ground
General Description	The site received miscellaneous unsegregated wastes including drums of depleted uranium, a 1951 pickup truck, and other miscellaneous items, mainly in cardboard boxes. The site is backfilled and was surface stabilized in 1983. A surface radiological survey is performed annually.
Source Facilities Contributing More Than 5% of Waste by Volume	PFP
References	WIDS; D&D-30708; SWITS; 218-W-3 Logbook

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	11,000	11
Used Area (hectares)	3.1	12
Plutonium Mass (kg)	68	3
Uranium Mass (kg)	70,000	4
Curies (Ci) decayed to 2015	130	16

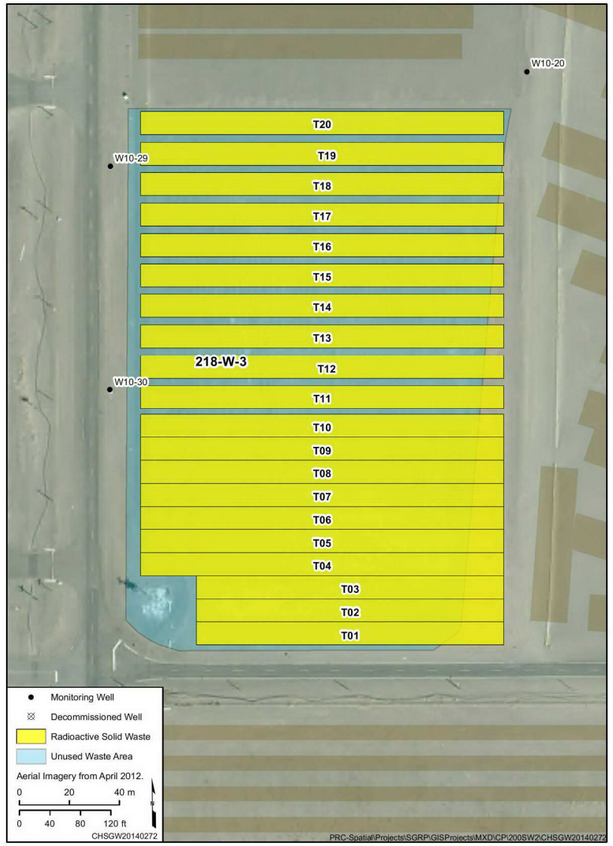
WASTE INFORMATION

Number Available	Rank	Record Quality
809	8	Moderate

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	The burial ground has 20 individual trenches. Trenches #1 to #3 are 122 m (400 ft) long and Trenches #4 to #20 are 145 m (475 ft) long. Exact trench widths are unknown.			
Number of Trenches	20				
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

109SX Pump, Misc Lumber, 10-ft Tube, 200-ft Hose, 3-ft Pipe, 30-gal Drum Concrete, 30-gal Drums, 55-gal Barrel, 5-gal Cans, Agitator Motor, Asst. Cylinders, Bales Misc Paper, Barrel Oil, Barrels, Broken Hand Tools, Buckets of Dirt, Cartons, Container Hood Panel, Container Poppy Instr, Containers, Containers Filters, Leached UO3 Powder Bags, Misc Plastic, Misc Pipe, Misc Pipe Double-Wrapped in Plastic, Misc Trash, Cones, Containers Paper, Containers Rock and Dirt, Containers Waste Oil, Metal Box from U Plant, Conveyor and Process Hood, Crates, Disposable Supplies, Drums, Drums Depleted “U”, Ductwork from 241-WR, Dump Truck Load of Misc Waste from UO3, Exhauster and Tube Bundle, Failed Dissolver Pot, Motor, Fiber Barrel of Misc Scrap, Filter and Vent Pipe, Filters and Frames, Flat Car Decking, Gravel, Hood, Hood Panel, Iron Tanks, Junk, K-9 Pump, KOH Cans, Loads Junk, Loads of Duct and Scrap Roofing, Loose Metal, Misc Junk, Misc Lumber, Misc Pipe, Obsolete Z Plant Conveyor Belt, Obsolete Z Plant Filter Boats, Obsolete Z Plant RC Line Hoods and Associated Process Equipment, Pails, Palletized 30-gal Drums, Paper, Cardboard, Paper Sacks, Pipe, Plastic Covered Panel, Pumps in Boxes, Reduplex Processing Vessels, Rubber Gloves, Scrap Lead, Scrap Roofing, Shelves, Shipment of California Package Waste, Small Z Plant Centrifuge, Special Wood Box, Stainless Tanks, Standard Carton, Tumbleweeds, Vehicle/Carryall Id-491, Vent Pipes, Windows, Wood Box and Stainless Steel Cabinet, Wooden Box, Wooden Box Covered, Z Plant Condenser Tanks D24 and D25, Z Plant Nash Hycor Vacuum Pumps of Cast Iron, Z Plant RMA Line Fluorinator, Z Plant Vacuum Receivers.

Information from photos and logbooks contradicting literature.

Trench numbering system in a 1960s era logbook is not the same as system on Hanford Site drawings.

Figure D-19 | CSM for the **218-W-3 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-3 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil-vapor sampling
  - — Stages 3 and 4—2009: In Stage 3, this landfill was sampled at 12 locations. There were no significant detections of any constituent (detections in 11 locations, the highest being for chloroform at 164 ng, with only one other detection exceeding 100 ng - carbon tetrachloride at 123 ng with lesser amounts of tetrachloroethene). In Stage 4, this landfill was sampled at 56 locations. Low levels (<100 ng/sample) of carbon tetrachloride, chloroform, and tetrachloroethene were detected at numerous locations. Only one site showed possibly significant amounts, with carbon tetrachloride at 1,368 ng/sample and chloroform at 125 ng/sample.

STAGE 3 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Carbon tetrachloride	6	1	--	--	--	123
Chloroform	4	1	--	--	--	164
Tetrachloroethene	9	--	--	--	--	60

Note: 12 total sample locations are at the 218 W-3 Landfill for Stage 3.

STAGE 4 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Carbon tetrachloride	13	--	--	1	--	1,368
Chloroform	4	1	--	--	--	125
Tetrachloroethene	37	--	--	--	--	51

Note: 56 total sample locations are at the 218 W-3 Landfill for Stage 4.

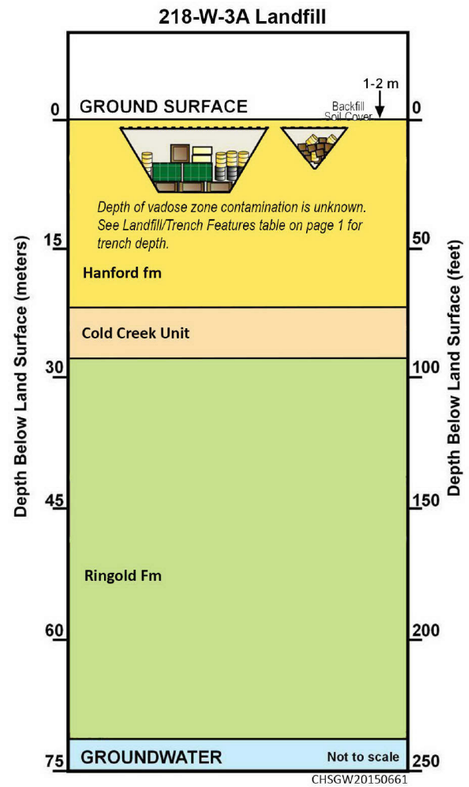
Surface Radiation Surveys

- Based on the 2010 survey, three areas were identified having cps between 1001 and 1250. Two of the areas that were identified were located in the western half and one was located in the center of the eastern half of the landfill.

Geophysics Summary

- 2006: Hanford Site Drawing H-2-32095 shows 20 trenches at this landfill. In contrast, the geophysical data for the 218-W-3 Landfill indicate that there are approximately 14 east-west trenches containing varying amounts of metallic debris. Other than the two southernmost trenches, the interpreted trench locations do not correlate with the locations shown on the drawing.
- Techniques used: EMI, GPR, TMF

Cross Section



Unplanned Releases Collocated with or Near 218-W-3 Landfill

None.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Medium quality records, and EMFLUX suggests presence of some mobile constituents. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – two areas with between 1001 and 1250 cps.	Need additional records and information, if possible. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	No evidence of downward driving force, upward flow of soil gas is likely the only release	Need to identify soil gas release areas. need to identify potential of downward flow.	Drill horizontal boring and Direct Push for leak detection. Review existing EMFLUX data
Transport Media	Soil gas upward	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Horizontal boring and Direct Push for soil/fluid samples. Obtain active soil gas samples in areas of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Surface or near-surface (e.g., burrows) – soil gas	No data gaps or needs	No plans to investigate the exposure point
Exposure Route	Inhalation/dermal – soil gas	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment

Photographic History

Motor vehicles, such as this one parked in the 200 West landfills in 1954, sometimes became too contaminated for further use and were buried. At least one similar van is buried in 218-W-3.

218-W-3A
Landfill

RCRA TSD

This photo depicts a load of equipment on its way for disposal at the landfills. The items are typical of waste in industrial landfills, and include equipment, tanks, wooden, and concrete burial boxes. The REDOX facility is in the background.

Curie Content: High

Green Islands: Yes

Hydraulic Driving Force: Yes

Record Quality: Good

Subsidence: No

Soil gas detection: Yes

CHSGW20140273

Landfill Summary

WIDS Code & Aliases	218-W-3A, Dry Waste No. 003A
Landfill Type	Dry Waste
OU & Category	200-SW-2, Treatment, Storage, and Disposal
Dates of Waste Receipt	1970 to 1998
Location	West of the 221T Building and north of 218-W-3 Burial Ground
General Description	This burial ground received contaminated equipment and waste from various Hanford Site operations, especially from the 200 West Area, and offsite waste generators. This was the first burial ground in 200 West Area to receive TRU waste for retrievable storage.
Source Facilities Contributing More Than 5% of Waste by Volume	100 Area, West Inner Area, 300 Area, PFP, Tank Farms
References	WIDS; WHC-EP-0912; RHO-CD-673

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	98,000	1
Used Area (hectares)	21	4
Plutonium Mass (kg)	0.6	16
Uranium Mass (kg)	58,000	5
Curies (Ci) decayed to 2015	400,000	2

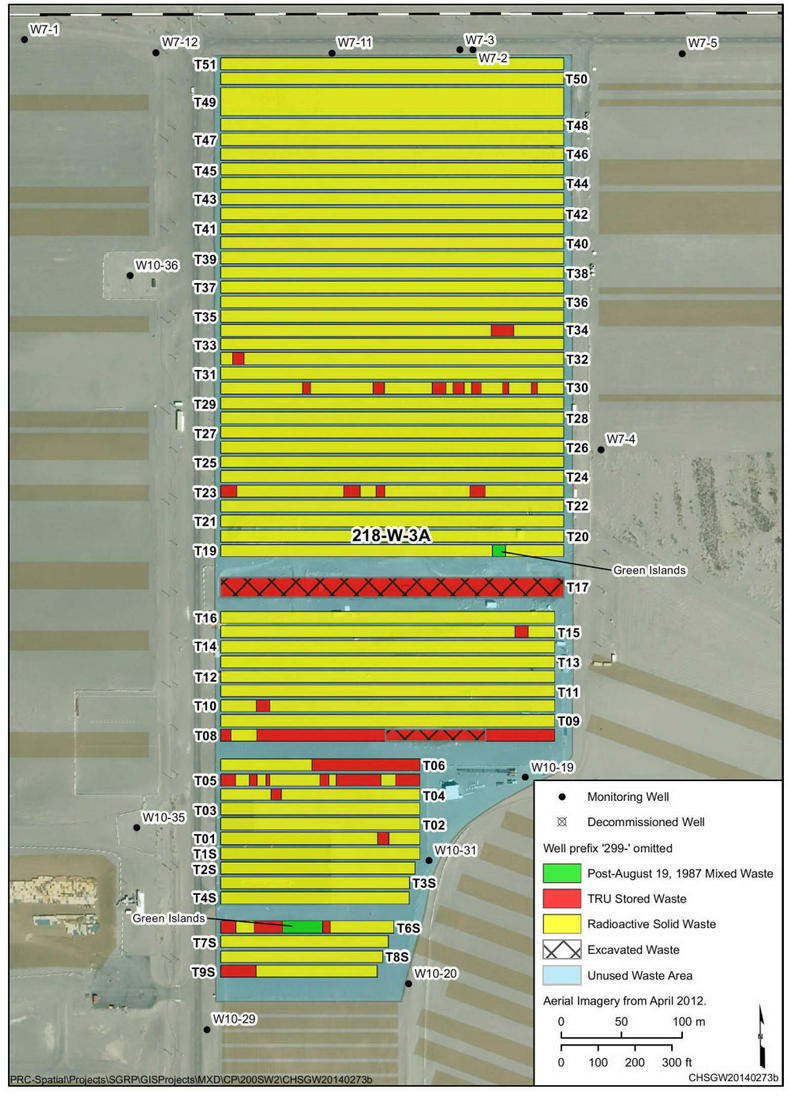
WASTE RECORDS

Number Available	Rank	Record Quality
26,382	2	Good

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	The site consists of 57 used trenches (of 61 constructed) running east to west. Four trenches never used (TS5, TS10, T7, T18). T17 is a wide-bottom trench that used specially constructed burial boxes.			
Number of Trenches	57	Disposal pond complex 216-T-4 along eastern border with 218-W-3AE and 218-W-2A			
Subsidence?	N	RSW?	Y	Green Islands?	Y
Episodic Water?	Y	Caissons?	N	Disposal Pond?	Y

Site Map



*Some of the post-August 19, 1987 mixed waste (green islands) in trench T6S is currently being considered for removal from RCRA. See DOE/RL-2014-43 for more information.

Retrievably Stored Waste (RSW) TRU Retrieval

*All volumes are estimates based on SWITS 5/4/2016.

Beginning RSW (m^3)	RSW Retrieved (m^3)	RSW Remaining to be Retrieved (m^3)
4329	3399	930

Figure D-20 | CSM for the **218-W-3A Landfill** *2 of 3*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-3A Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil-vapor sampling (EMFLUX 2006, 2009)
  - — Stage 1, 2006: Biased sampling locations were analyzed for 28 organic contaminants of concern. Maximum concentrations of carbon tetrachloride were detected at trench T3S at 149 ng/sample and at trench T9S at 1,185 ng/sample.
  - — Stage 2, 2009: Sampled at 135 locations. Sampling results are provided in the Passive Soil Vapor Sampling Results table.

2009 PASSIVE SOIL VAPOR SAMPLING RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
1,1-Dichloroethane	59	5	2	1	1	6,882
1,1-Dichloroethene	54	37	--	2	--	3,059
1,1,1-Trichloroethane	40	38	20	32	2	8,087
1,1,2-Trichlorotrifluoroethane	57	8	--	--	--	436
1,2-Dichloroethane	1	--	1	--	--	703
1,2-Dichloropropane	1	1	--	--	--	212
Methyl ethyl ketone	5	--	--	--	--	14
n-Butanol	1	--	--	--	--	10
Carbon tetrachloride	39	5	2	--	2	16,557
Chloroform	50	7	2	3	1	5,013
Dichloromethane	6	--	--	--	--	80
Tetrachloroethene	38	36	26	27	3	9,367
Trichloroethene	43	7	--	--	--	447

- Vent riser soil-vapor sampling
  - — Soil-vapor sampling on retrievably stored TRU waste trench segments is required by Tri-Party Agreement Milestone M-091-40, Requirement 2. This waste is not in the scope of this work plan; these results are included for informational purposes only. For more sampling details see Appendix H.
  - — Step I Results (pre-retrieval): The 200-PW-1 Operable Unit dispersed carbon tetrachloride vadose zone plume remedial investigation field-screened soil vapor sampling data was used in lieu of performing additional vent riser soil-vapor sampling.
    - Carbon tetrachloride was detected at the highest concentration during field screening in the west end of trench T-08 at 36 ppmv. Tetrachloroethylene and methyl chloride were found at elevated concentrations in trench T-08 at 460 ppmv and 186 ppmv, respectively. Laboratory analysis detected tetrachloroethylene at 4,200 ppmv in trench T-08. Trichloromethane was detected at 4 ppmv in trench T-05. Other compounds and maximum concentrations detected include 1,1,1-trichloroethane (18.8 ppmv) and trichloroethylene (13 ppmv).

Geophysics Summary

- Not performed.

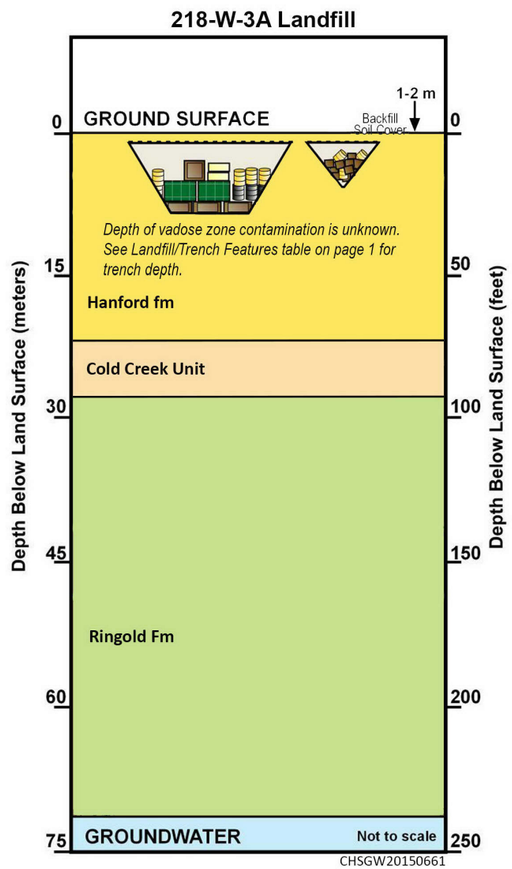
RCRA Groundwater Monitoring

- LLWMA-3: Monitoring well sampling started in 1988 for contaminant indicator parameters (TOC, TOX, pH, and specific conductivity), groundwater quality parameters, drinking water parameters, and site specific parameters as required by WAC 173-303-400(3).
- The critical mean (established in 1989 using data from upgradient wells 299-W9-1 and 299-W 10-13) was exceeded for TOX in well 299-W7-4 and for TOC in wells 299-W7-5 and 299-W8-1 in September 1989. Resampling confirmed the elevated TOX, and an interim status groundwater quality assessment program was initiated (WHC-SD-EN-AP-022). Subsequent sampling indicated that the critical mean for TOC was not exceeded. The groundwater monitoring sampling at LLWMA-3 between 1988 and December 1993 and groundwater quality assessment indicated that elevated TOX in well 299-W7-4 was due to carbon tetrachloride from upgradient sources. In January 1994, LLWMA-3 re-established background for one year and then returned to indicator evaluation monitoring. The upgradient wells have gone dry, so statistical comparisons have not been performed since 2004.

Information from photos and logbooks contradicting literature.

None.

Cross Section



Landfill Inventory

Items Known to be Disposed

10 Mil Liner, Greenhouse (Carbon Steel and Plexiglas) and Conweb Pads Triple-Wrapped in Flexible Material Packaging (FMP) from N-Basin, Carbon Steel Cask Rotator and Conweb Pads Triple-Wrapped in FMP from N-Basin, Stainless Steel Table and Damaged Cotton PPE from N-Basin Wrapped in FMP, Cyclotron Accelerator Steering "C" Magnet, Self-Contained Equipment, Stainless Steel Test Weight Triple-Wrapped in FMP from N-Basin, Carbon Steel Sample Cabinet and Conweb Pads Triple-Wrapped in FMP from N-Basin, Carbon Steel Table and Conweb Pads Wrapped in FMP, Stainless Steel Table and Conweb Pads Triple-Wrapped in FMP from N-Basin, Carbon Steel Rotator Pad and Conweb Pads Triple-wrapped in FMP from N-Basin, 90-mil Plastic Drum Liner, Carbon Steel Cask Rotator Base Assembly and Conweb Pads Triple-Wrapped in FMP from N-Basin, Absorbed Aqueous Solution, Absorbent, Acid, Aluminum Box, Aluminum Wash Tank and Components Internally Contaminated with Depleted Uranium, Animal Waste, Anti-Corrosive Radpad, Asbestos, Ashes, Boron Balls and Boron Ball Dust, Brass Metal, Bulk Shipment Waste of Sludge, Butyl Hypalon Basin Liner, Cardboard, Catalyst Pack, Cement, Ceramics, Charcoal, Clay, Cloth, Compactor Truck of Tumbleweeds, Compressor Supply Fan #5, Concrete, Contaminated Forklift, Contaminated Tensile Tester, Conweb Pads, Copper Magnet Coil Coated with Cured Epoxy, Copper Metal, Copper Wire, Cork, Courtoy Rotary Pellet Press, Diatomaceous Earth, Diatomite, Dirt, Duct Tape, Equipment, Excavated Pavement and Soil, Feces, Ferrous Metal, Fiberglass, Filters, Flat Cars, Floor Sweeps, Floor, Tile, Foam, Glass, Glovebox, Graphite, Gravel, Grout, HEPA Filters, Hittman Liner, Hittman Metal Box, Hot Cell Waste, Insulation, Insulation Non-Asbestos, Ion Exchange Column, Ion Exchange Module, Ion Exchange Resins, Iron, Lab Waste, Lead Brick, Leather, Liquid, Magnets, Material from the D&D of the Imhoff Bldg, Mercury, Metal, Metal Dumpster, Metal I-Beam, Metal Piping, Metal Plate Padded with Cloth and Wrapped with Reinforced Plastic, Non-Hazardous Metals, Oils, Organics, Out-of-Date Equipment, P.V.C., Pallets, Paper, Pipe, Plaster, Plastic, Plastic Bags, Plastic Pyrofoam Rock, Plastic Wrap, Plastic-wrapped Arc Welder, Plastic-wrapped Concrete, Plastic-wrapped Electric Motor, Plastic-wrapped Railroad Flat Cart, Plastic-wrapped Steam Coil Heater, Plexiglas, Porcelain, Pyrofoam Rock, Rad-Sorb Absorbent, Resins, Rock, Roofing Material, Rubber, Rubber Hose, Salt Bath, Sand, Scrap Yard Cleanup, Sheetrock, Silica Gel, Sludge Waste, Sludges, Soap, Soil Organics, Stainless Steel, Stainless Steel Fuel Baskets, Steel, Steel and Concrete Beam Stop, Steel Blocks, Steel Plate, Steel Shot, Steel Storage Tank, Tank, Tank Farms Generator, Tape, Tar, Teflon, Telephone Poles, TMB V Container, Tower T-K2, Tower T-K3, Transite, Tumbleweeds, Vegetation, Waste from Accelerator Maintenance, Waste from D&D of Glove Box Facility, Waste from Hazardous Waste Facility Cleanup, Waste from Plasma Exhaust Process, Waste from R&D Activities, Waste from Scrap Yard Cleanup, Waste from Valve Changeout, Waste Tank from 200W Area Tank 50% Caustic, Water Treatment Process Waste, Wire, Wood, Wooden Structure Surrounding the Uni-I Caisson, Wrapped Railroad Flat Cart, Wyk Absorbent, Zircoloy

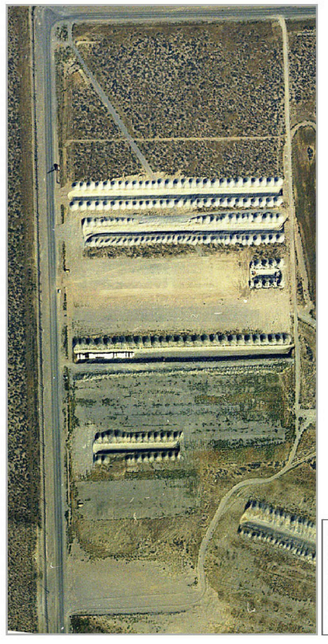
CHSGW20140XXX

Figure D-20 | CSM for the **218-W-3A Landfill** *3 of 3*

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Very good quality records, and EMFLUX suggests presence of some mobile constituents. See Appendix H for discussion on DNAPL behavior. Surface radiation survey was not performed.	No records needs; however, need for baseline geophysics. Evaluate potential mobile constituents. Obtain consistent surface radiation data for all landfills.	Conduct baseline geophysics to confirm trench boundaries and locate metallic anomalies. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	EMFLUX data suggests release(s) of mobile constituents upward. Historical presence of episodic water suggests potential for release(s) of mobile constituents downward.	Need to identify vadose zone preferential pathways related to release mechanism, especially for possible downward flow	Perform MASW to identify preferential pathways. Drill horizontal boring and Direct Push for leak detection.
Transport Media	Soil gas upward, fluid/water downward, including fluid/water from earlier disposal ponds.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Horizontal boring and direct push for soil/fluid samples. Obtain active soil gas samples at locations of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Surface or near-surface (e.g., burrows) – soil gas. Groundwater exposure points – fluids/water.	Need to know if releases have reached groundwater	Review groundwater data for evidence of impacts by 218-W-3A
Exposure Route	Inhalation/dermal – soil gas. Ingestion/dermal – fluid/water.	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment

Photographic History



Open trenches in 218-W-3A are shown in a September 1975 photo.

Carboard boxes disposed to 218-W-3A. Undated photo.

Unplanned Releases Collocated with or Near 218-W-3A Landfill

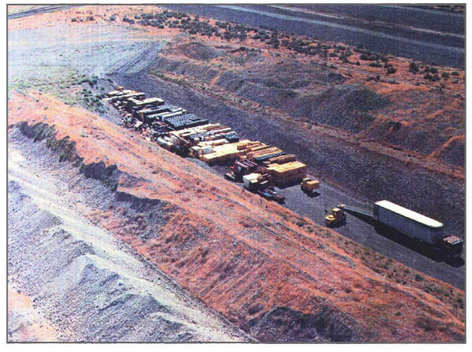
Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-84	UPR-200-W-84, Ground Contamination During Burial Operation at the 218-W-3A Burial Ground	Within the 218-W-3A Landfill, most likely Trench S9.	1980	N/A	Liquid waste	N/A	N/A	In July 1980, a liquid spill occurred in the 218-W-3A Landfill when chemical waste (beta/gamma) was being pumped from a truck to the landfill. The pump and contaminated soil were placed in a trench. The truck was cleaned and thoroughly decontaminated at a separate site. (“Consolidated”)

CHSGW20140XXX

218-W-3AE
Landfill

RCRA TSD

Undated photo showing workers placing waste in a trench in 218-W-3AE.



Curie Content: High

Green Islands: Yes

Hydraulic Driving Force: Yes

Record Quality: Good

Subsidence: No

Soil gas detection: Yes

CHSGW20140274

Landfill Summary

WIDS Code & Aliases	218-W-3AE, Industrial Waste No. 3AE, Dry Waste No. 3AE
Landfill Type	Industrial
OU & Category	200-SW-2, Treatment, Storage, and Disposal
Dates of Waste Receipt	1981 to 2004
Location	West and adjacent to the 218-W-3A Burial Ground in the 200 West Area
General Description	The location of this site also included a portion of the 216-T-4B Pond. The site received miscellaneous wastes including rags, paper, rubber gloves, disposable supplies, broken tools, laboratory wastes and industrial waste such as failed equipment, tanks, pumps, ovens, agitators, heaters, hoods, jumpers, decommissioned change trailers, etc. Trenches 5 and 8 contain post-1987 mixed waste.
Source Facilities Contributing More Than 5% of Waste by Volume	100 Area, 1100 Area (1171 Transportation & Maintenance Building), 300 Area, Offsite
References	WIDS; WHC-EP-0912

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	34,000	4
Used Area (hectares)	20	5
Plutonium Mass (kg)	0.4	17
Uranium Mass (kg)	370,000	2
Curies (Ci) decayed to 2015	310,000	3

WASTE RECORDS

Number Available	Rank	Record Quality
11,457	4	Good

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	6	The site contains 8 east-west trenches of varying lengths and widths. Trench 26 was designed for disposal of contaminated railroad cars and large tanks.			
Number of Trenches	8				
Subsidence?	N	RSW?	N	Green Islands?	Y
Episodic Water?	N	Caissons?	N	Disposal Pond?	Y

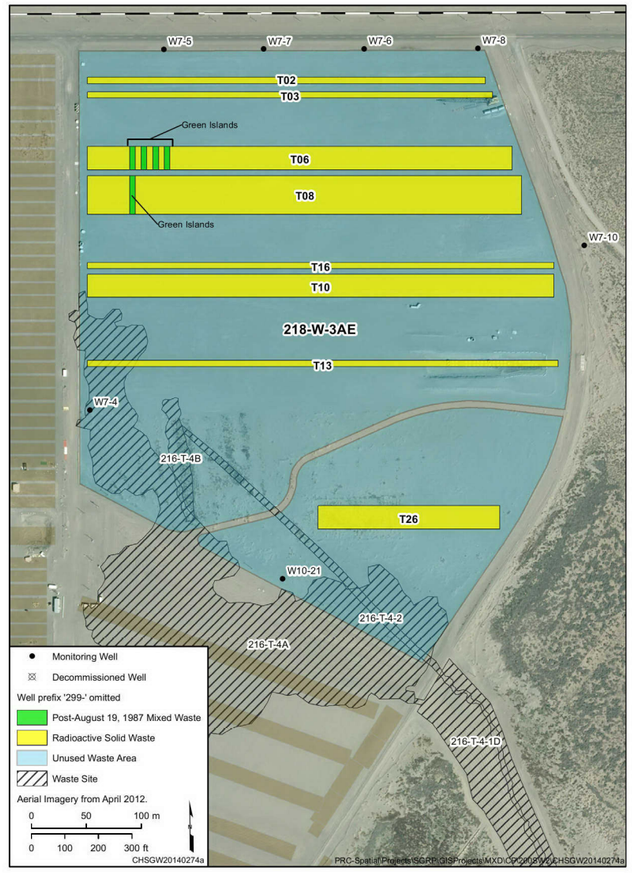
216-T-4-1D Ditch

The 216-T-4-1D Ditch intermittently received the following waste streams; process cooling water from the 221-T and 224-T Buildings, steam condensate from the 221-T Building, decontamination waste from 2706-T, and condenser cooling water from the 242-T Building. The ditch operated from November 1944 to May 1972 and received waste streams via the 207-T Retention Basin and 200-W-163-PL. Pipeline 200-W-163-PL also connected to the ditch. The original bottom dimensions were 259 m (850 ft) by 2.4 m (8 ft). The ditch was replaced by the 216-T-4-2 Ditch in 1972 and the first 15 m (50 ft) of the original ditch was reused in the replacement ditch construction. Both the original and replacement ditches were surface stabilized in 1995.

216-T-4-2 Ditch

The 216-T-4-2 Ditch was dug as a replacement for the 216-T-4D Ditch. The first 15 m (50 ft) of the original ditch (216-T-4D) was reused in the 216-T-4-2 Ditch construction. The ditch received T-Plant cooling water and condensate via the 207-T Retention Basin and the 200-W-164-PL. The ditch discharged to the 216-T-4B Pond. The original bottom dimensions were 533 m (1,750 ft) long by 2.4 m (8 ft) wide by 1.2 m (4 ft) deep. The ditch was backfilled and interim stabilized in July 1995 and permanently isolated by filling the last pipeline manhole.

Site Map



216-T-4A Pond

The 216 T 4A Pond was a natural surface depression that received discharge from the 216 T 4 1D Ditch. The pond intermittently received the following waste streams: process cooling water from 221 T and 224 T Buildings, steam condensate from 221 T Building, condenser cooling water and steam condensate from the 242 T Evaporator, and decontamination waste from 2706 T Building. The dimensions of the pond were approximately 549 m (1,800 ft) by 182 m (600 ft), essentially covering 6.5 ha (16 ac). The pond became active in 1944 and was exhumed in 1972 to make room for the expansion of the 218 W 2A waste site. In 1995, the pond was interim stabilized with uncontaminated backfill and revegetated.

216-T-4B Pond

The 216-T-4B Seepage Pond received condensate and condenser cooling water from the 242 T Evaporator and nonradioactive wastewater from 221-T air conditioning units and floor drains. The pond is located east of 216-T-4A Pond. The size of the pond is estimated at 6,100 m2 (1.5 ac). The pond was often dry, since the majority of the effluent was absorbed in the 216-T-4-2 Ditch. The pond was constructed in 1972 to replace the old 216-T-4-1 Pond (216-T-4A). The pond was considered dry by 1977. However, the pond was not isolated from the ditch until 1995; therefore, a potential existed for effluent to reach the pond until that time.

Figure D-21 | CSM for the **218-W-3AE Landfill** *2 of 3*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-3AE Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — Specific sampling locations were chosen based on detailed reviews of engineering drawings, historical documents, and waste burial record information located in the SWITS database. Samples were analyzed for the presence of 28 organic compounds identified to be contaminants of potential concern.
  - — Stage 1—2006 and Stage 2—2009: In Stage 2, this landfill was sampled at 27 locations. The compounds 1,1,1-trichloroethane and tetrachloroethene were detected at nearly every location; elevated levels were detected at several of the locations. A few other compounds, but no carbon tetrachloride, were detected in lesser amounts.

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
1,1-Dichloroethane	7	3	--	--	--	138
1,1-Dichloroethene	19	2	--	--	--	187
1,1,1-Trichloroethane	4	11	7	4	--	2,864
1,1,2-Trichlorotrifluoroethane	14	--	--	--	--	46
Methyl ethyl ketone	1	--	--	--	--	11
Tetrachloroethene	5	8	3	6	5	21,685
Trichloroethene	8	1	2	--	--	600

Surface Radiation Surveys

- Not available.

Geophysics Summary

- Not available.

Groundwater Monitoring

- LLWMA-3: Monitoring well sampling started in 1988 for contaminant indicator parameters (TOC, TOX, pH, and specific conductivity), groundwater quality parameters, drinking water parameters, and site specific parameters as required by WAC 173-303-400(3).
- The critical mean (established in 1989 using data from upgradient wells 299-W9-1 and 299-W 10-13) was exceeded for TOX in well 299-W7-4 and for TOC in wells 299-W7-5 and 299-W8-1 in September 1989. Resampling confirmed the elevated TOX, and an interim status groundwater quality assessment program was initiated (WHC-SD-EN-AP-022). Subsequent sampling indicated that the critical mean for TOC was not exceeded. The groundwater monitoring sampling at LLWMA-3 between 1988 and December 1993 and groundwater quality assessment indicated that elevated TOX in well 299-W7-4 was due to carbon tetrachloride from upgradient sources. In January 1994, LLWMA-3 re-established background for one year and then returned to indicator evaluation monitoring. The upgradient wells have gone dry, so statistical comparisons have not been performed since 2004.

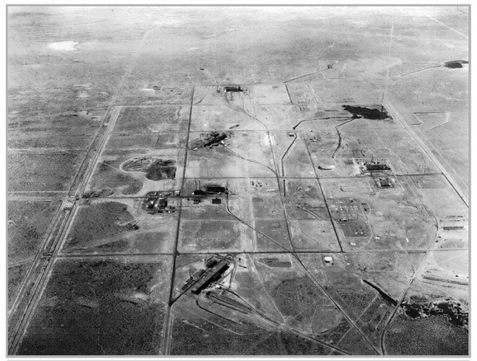
Information from photos and logbooks contradicting literature.

None.

Unplanned Releases Collocated with or Near 218-W-3AE Landfill

None.

Photographic History



A 1963 aerial photo of the 200 West area shows the 218-W-3AE area before solid waste was buried. The active 216-T-4A pond is shown, right foreground.

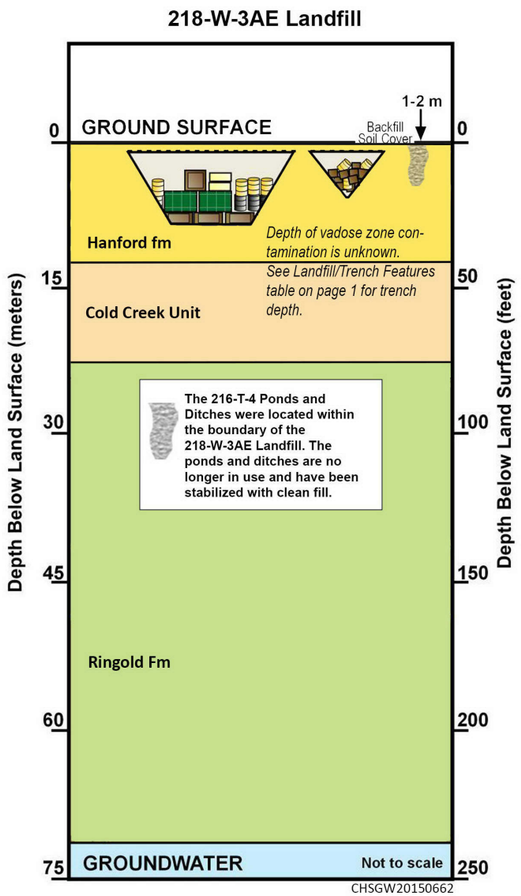
A 1982 photo shows an excavated trench in 218-W-3AE. The dried 216-T-4B Pond also is shown.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Very good quality records, and EMFLUX suggests presence of some mobile constituents. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – Not performed.	No records needs; however, need for baseline geophysics. Obtain consistent surface radiation data for all landfills.	Conduct baseline geophysics to confirm trench boundaries and locate metallic anomalies. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	EMFLUX data suggests release(s) of mobile constituents upward. Historical presence of disposal pond suggests earlier release(s) of mobile constituents downward.	Need to identify vadose zone preferential pathways related to release mechanism, especially for possible downward flow	Perform MASW to identify preferential pathways. Drill horizontal boring and Direct Push for leak detection.
Transport Media	Soil gas upward, fluid/water downward, including fluid/water from earlier disposal ponds.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Horizontal boring and Direct Push for soil/fluid samples. Obtain active soil gas samples from areas of passive soil gas hits (1,000 ng/sample).
Exposure Point	Surface or near-surface (e.g., burrows) – soil gas. Groundwater exposure points – fluids/water.	Need to know if releases have reached groundwater	Review groundwater data for evidence of impacts from previous pond disposal
Exposure Route	Inhalation/dermal – soil gas. Ingestion/dermal – fluid/water.	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment

Figure D-21 | CSM for the **218-W-3AE Landfill**

Cross Section



Landfill Inventory

Items Known to be Disposed

1-Gal Paint Cans, 10-Mil Drum Liner, 12-Mil Plastic Liner, Steel Heat Exchanger with Asbestos Wrapped in Plastic, 200 ADP B Plant LLW and HEPA Filters, 250-Ml Poly Bottles, 2714U Pad UO3 Drum Overpack, 291T Prefilter # 1, Electric Motor Wrapped in Plastic, Steel Motor with Asbestos Wrapped in Plastic, 300 ADP - 1.25% Enriched Fuel Billet, 300 ADP - Depleted Uranium Dioxide, Soil, Steel Pump Wrapped in Plastic, 324 Airlock Waste, 324 B Cell Grout Container, 324 B-Cell Clean Out - 1B Rack, 324 Facility A-Frame HEPA Filter with Steel Shielding, 324 Facility Non-Compactable Waste, 324 Facility Waste, 324 Legacy Waste - C-Cell Waste, 325 Waste Supercompacted at ATG, 327 Basement Waste (LLW), 327 Facility Compacted Waste, 327 Legacy Waste - IX Resin, 327 PNNL Legacy Waste, 3712 Building - Depleted Uranium Billets (Stuck Mandrels), Wood Box Filled with Wire Rope Chockers Wrapped in Plastic, Steel Plate Wrapped in Plastic, 55-Gal Crushed Drums, 55-Gal Metal Drum, Steel Plate Wrapped in Plastic, Lab Aqueous Solution - Solidified, Bag of Trash and Empty Poly Bottles from I&H Lab Filled with Kitty Litter, Empty 15-Gal Drum Filled with Kitty Litter, 90-Mil Plastic Drum Liner, Absorbent, Absorbent Rad Pad, Absorbed Liquid Waste, Absorbed LLW, Absorbed Non-Hazardous Liquid and Small Amount of Non-Hazardous Paint, Absorbed Oil, Absorbed Plain Water Radioactively Contaminated, Absorbed Sludge, Absorbed Tritiated Water, Absorbed Tritiated Water in Inner Containers, Absorbent, Acid Brick, Acid Brick and Concrete Mortar, Acid Neutralized, Activated Accelerator Components, Activated Charcoal, Activated Metal, Activated Metal from the High Beam Reactor Canal, Activated Metal in Lead-Shielded Cask, Activated Scrap & Equipment, Aerosol Can Empty, Airlock Waste, Aluminum Canisters, Aluminum Canisters & Cubicle Lids, Aluminum Frame, Aluminum Light Assembly, Aluminum Paper, Aluminum Pipes, Analytical Process Waste, Animal Waste, Asbestos, Asbestos Contaminated Equipment and Material Used for Decontamination, Asbestos Contaminated HEPA Filters, Asbestos Floor Tile, Asphalt, ATG Compacted LLR Waste, ATG Compacted LLR Waste from 222S Analytical Ops. Shipment 99-W-091, B-25 Metal Box, Bags, Bags Metal Pipes, Bags Paper, Basement Cleanout Waste, Batco - West Jefferson Compacted Low-Level Debris, Battelle Columbus LLW From Cell Cleanout, B-Cell Bridge Crane, B-Cell Cleanout - Grouted-Hittman Liner, Beam Line Dismantling, Bedding, Biological Material, Bldg 310 Retention Tanks, Blower, Brookhaven Graphite Research Fiberglass Mesh and Associated Framework, Buckets, Buggy Springs, Bulk LLW Waste from BDI Roll-Off Boxes, Bulk LLW Waste From Compactor Truck, Bulk LLW Waste from HO-68H-3500 Compactor Truck, Bulk LLW Waste from Mowatt Construction Dumpster, Bulk Shipment of Waste Byproduct of Iron Co-Precipitation, Bulk Shipment Waste of Sludge, Bulk Waste for Disposal, Bulk Waste Shipment, Burial Box, Butyl Hypalon Basin Liner, Camera, Canister Crusher From N-Basin Wrapped in Plastic, Cans, Canvas, Canvas Gloves, Canyon Deck Cleanout, Carbon And Stainless Steel, Carbon Steel, Cardboard, Cast Iron, Catalyst Pack, Category 1 Noncompactible LLW, Category 3 Noncompactible LLW, Cation Exchange Resin, Cell Equipment and Miscellaneous Solids, Cement, Cement Powder, Cemented Sludge, Ceramic, Cesium IX Columns from D-Cell, Chairs, Charcoal, Cheesecloth, Clamps Fittings, Clay, Cleanout of Contaminated Equipment from C-Farm, Cleanout of Legacy Waste From Pits and Trenches, Closure Head and Related Hardware, Closure Head Shipping Container, Cloth, Cloth, Co-60 Irradiator that Contains Lead Shielding, Coal Tar, Coke Breeze from Anodes, Compactable LLW,

Compactable Trash, Compacted 55-Gal Drums of General Concrete Vault, Conded Pads, Contact Handled LLW from SFO, Contaminated Dumpster, Contaminated Earth, Contaminated Equipment, Contaminated Ion Exchange Columns and Associated Material, Contaminated Material from the Hot Cell, Contaminated Pre-Filter Form 100K Basins, Contaminated Supplies from 324 Facility, Contaminated Water, Conveyor Belts from KEH Hot Yard, Conwed Pads, Coolant Pump and Motor, Copper, Core Basket Thermal Shield and Related Hardware, Cotton, CP5 Reactor Metal, CP5 Reactor Paper, CP5 Reactor Plastic and Concrete with Steel, CPC Metal Box, Crushed Aluminum Fuel Storage Canisters and Cubicle Lids, Crushed Drums Used to Store and Ship Radioactive Liquid, Crushed Glass, Cured Chico Compound, Cut-Up Cement Mixer, D&D Clean-Up Waste, D-Cell Skids, Debris, Decommissioned Change Trailer, Dewatered Filter Press Sludge, Dirt, Depleted Cf-252 Source, Disposal of Old Equipment, Drained Metal Pumps, Drained Vacuum Pumps, Dried Sludge Cake, Drill Press from N-Basin Wrapped in Plastic, Drop Light, Dry Solid Material Segregated in Oil Solidification Project, Dry Vermiculite, Duct Tape, Ductwork, Dunnage Plate, Eclectic Motor, Electric Wire And Plug, Electrical Wire, Electro-Static-Precipitator, Empty Collection Poly Bottle, Empty Thermocouple Receiver (Steel), Encapsulated Radium Beryllium Source, Enduropak, Equipment, Excavated Soil and Pavement, F-102 Filter Assembly, Fan Wheels from Duct Level, Fiber Glass, Fiberglass, Filter Frames, Filter Wheel from Duct Level, Filters, Fire Retardant Blankets (Fiberglass), Floor Sweeping Compound, Floor Tiles, Fuel Basket, Fuel Spacers, Gantry Crane, Garbage Cans, Garden Hose, Gasket, General Lab Waste, Glass, Glove Box Waste, Glove Port “O” Rings, Glovebox, Glovebox Filters, Gloves, Graphite Blocks, Gravel, Grease, Grit Blast Media, Groundwater Slurry, Grout, Grouted Hittman Liner from B-Cell Cleanout, Grouted Uranium, Grouted Waste, H-3 Contaminated Water, Hard Tool Slurries from Water Table, Heavy Equipment, Hemp Rope, HEPA Filters, HEPA Vacuum Pre-Filters, HEPA Vacuums, HERH Process Tubes, Hittman Cask, Hood Parts Generated from Maintenance Operations, Hood Waste, Hoses, Hot Cell and Gallery Waste at 324 Facility, Hot Cell Compactable Waste, Hot Cell LLW, Hot Cell Metal Hardware, HWMF Yard Waste, Hydraulic Fluid Filters, Hypalon Gloves, Industrial Waste Water Gravity Filter Media, Insulation, Insulation and Absorbed Non-Haz Liquids, Insulation and Rubber, Irradiated Hardware, Irradiated Metal LLW, Kitty Litter, Ladder, Lathe, Lathe from N-Basin Wrapped in Plastic, Laundry By Products from Interstate Nuclear Services, Lead (Used as Shielding), Leather, Legs From Columns, Light Metal, Lime and Animal Feces, Liner, Old Style Cartridge Filters Packaged Inside 2-Inch Metal Liner Om Poly Reinforced Bag with Radsorb, Enduropak (Tritium Absorbed on Charcoal Filter), Machinery Parts, Manipulator Body, Mask Filters, Material from D&D of A Reactor Facility, Material from D&D of the Imhoff Building, Materials Loaded from B-Cell, Metal, Metal Bolts, Metal Cabinet, Metal Carts, Metal Ducting, Metal Ducting Plastic And Rubber Debris, Metal Framed and Wood Framed HEPA Filter, Metal Framed HEPA Filters in 12-Mil Liner, Metal Glovebox, Metal I-Beam, Metal Rail Car Used to Transport Recovered Acid, Metal Scaffolding, Metal Steel Shot, Metal Tools, Metal Valves, Milling Press from N-Basin Wrapped in Plastic, Mirvada Ore (Dirt), Miscellaneous Solids with Tritium (Absorbed), Miscellaneous Solids with Tritium Gas, Molecular Sieve, Mono Tube Pistons, Mop Head, Motor, Mud, N Reactor <1% Enriched Contaminated Finished Fuel, N Springs Bottle

Hypalon Gloves, Non-Regulated Mask Filters, N-Reactor Carbon Steel Fuel Spacers, Nylon Reinforced Plastic Liner, Nylon Rope, Oil, Oil Mist Bound in HEPA Filter Media, Oil Solidified with Petroset II, Oils (Lab Pack Form), Organics Solidified, Paint Chips, Pam Probe, Pans, Paper, Pipettes, Plasma Exhaust Treatment Waste, Plastic, Plastic Fire Blanket, Plastic Glove Rings, Plastic Scraps, Plastic Sheets, Plastic Strike Plates, Plastic Wrap, Plastic Wrapped HEPA Filters and 12-Mil Liner, Plate, Plexiglas, Poly Bag, Portland Cement, Powder Sources, PPE, Precipitate with Portland Type III Cement, Pre-Filter #2 from 291T Filter Changeout, Pre-Filters and Tent from 242A, Prefilters and Stepoff Pad Waste, Pressure Washers, Pumice, Pump, Pump Capsule and Pump Sleeve, Pyrofoam, Quinto Lubric on Rags and Filters, Rabbit Feces, Rad Gloves, Rad Pad and Pyrofoam Void Space Filler, Rad Rope, Rad Sorb, Rad. Contaminated Material from the Hot Cell, Radiologically Contaminated Equipment Which Has No Further Use, Radium Sources, Radium-Beryllium Neutron Sources Shielded with DU and Polyethylene, Rags, Rail Car Truck (Wheel Assembly), Railroad Ties, RARA Tumbleweed Cleanup, Reactor Closure Head, Reactor Parts from the CP-5 Reactor, Rebar, Rec Airlock Waste, Regulated Low Level HEPA Filters, Remote Filer Media and Metal Framing, Resins, RH Debris Waste from 327 Hot Cells, RH LLW Hot Cell Waste Shielded to CH Levels, Ridge Nuclear Cutting Fluid on Rags, RMW Grease #2, Rock, Rod Sections, Rollers, Rolls of Plastic, Roofing Material, Room 301 Waste Removal, Rope, Rope (Hemp), Rubber, Rubber Bucket, Rubber Hoses, Rubber Matting, Rubber Shoes, Rubber(Electrical Wire), Rubble, Sample Liners, Sampler and Universal Liners, Sand, Saw Blades, Scissors, Scrap, Scrap Metal, Self-Contained Equipment, Self-Contained Prefilter from 291T Filter Banks, Sheeting, Sheetrock, Shovel, Shredder, Signs, Sissel Craft Paper, Size-Reduced Dunnage, Small Metal Carts, Small Tools, Soil, Solidified Liquids, Source and Source-Like Material, Sources in Pigs, Spacer, Spacer Funnel, Sr-90 Stainless Steel Source Tabs, Stainless And Aluminum Canisters, Stainless Pipe, Stainless Steel, Stainless Steel Fuel Basket, Steel, Steel Bearings, Steel Shot, Steel Tools, Step-Off Pad Waste, Stir Mechanism, Strippable Coating And Metal Wire, Sump Cooler Squirrel Cage, Supertiger Waste, Suspect Radioactive Pipe with Smaller Pipes Inside, Table, Tank Contacted Waste, Tank Scale, Tank Solids, Tape, TEDF Bulk Shipment of Sludges, Telephone Poles Wrapped in Plastic, Thorium Metal Samples, Tk-131 Pump and Riser Pipes, TMB-V Container, Tool Box, Tools, Transite Ductwork, Treated Grouted Uranium, Tritium Target Canisters, Trolley from 30-Ton Crane System, Truck Assembly from Rail Cars, Tumbleweeds, Unirradiated Aluminum Clad Fuel, Vadose Zone Hard Tool Slurry, Vegetation, Vent Duct, Vermiculite, Waste from Cleanout and Relining of Process Sewer, Waste from D&D of A Reactor Facility, Waste from D&D of Glove Box Facility, Waste from Membrane Filter Press, Waste From O And M of TFTR, Waste From Pad Cleanup, Waste from Water Treatment, Waste Generated From Analytical Operations, Waste from the Supertiger Waste Substream, Waste Water Filter Samples, Water, Water Table Sand and Groundwater, Water Tower Pieces 3902-B Demolition, Water Treatment Process Waste, Welding Rod Wood Towel, WESF Hot Cell Cleanout, West Jefferson Compacted Low Level Waste, Wiring, Wood, Wrap Process Area Room Waste Drum. Paper, Wrap Room Waste Drum Pucks Containing Imbiber Beads Rinse - Solidified, Neoprene Hose, Non-Containerized Tumbleweeds, Non-Reg Oily Rags, Non-Regulated Leaded and Unleaded Hypalon Glovebox Gloves.

CHSGW20140274X

218-W-4A
Landfill

Dry Waste Alpha

Caissons

Cover blocks from processing canyons were commonly buried in 200-SW-2 landfills. These coverblocks, buried January 30, 1964, are probably from T-Plant and are buried in 218-W-4A.

Curie Content: Moderate

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Good

Subsidence: Yes

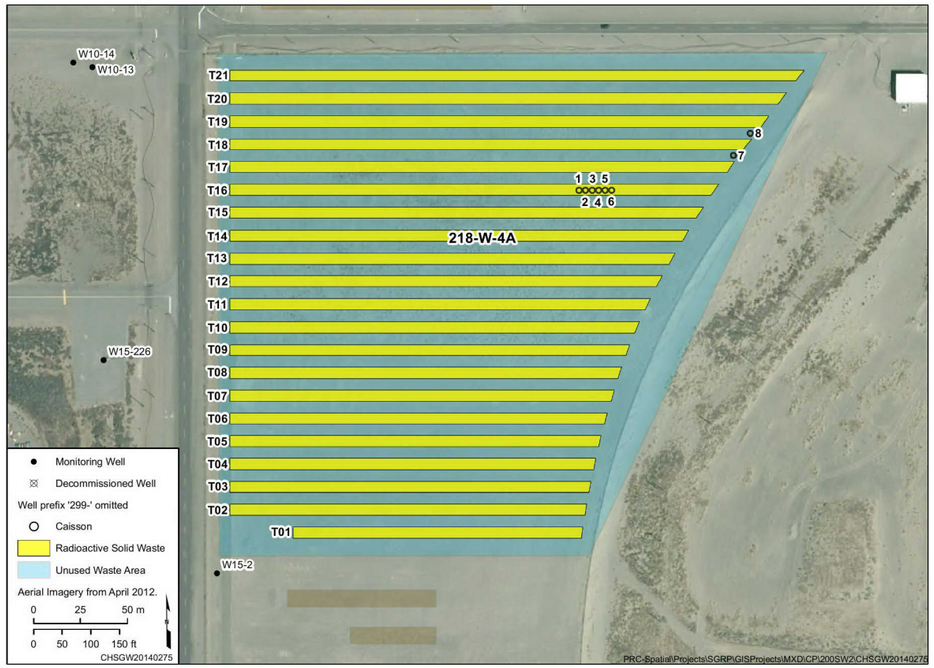
Soil gas detection: No

CHSGW20140275

Landfill Summary

WIDS Code & Aliases	218-W-4A, Dry Waste No. 04A
Landfill Type	Dry Waste Alpha
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1961 to 1968
Location	Southwest of the 221T Building, northwest of 234-5Z, adjacent to and north of 218-W-11
General Description	Vertical pipe units were installed near the east end of Trench 16. Each consists of two 55-gal drums welded together with the ends removed except the bottom of the lower drums; they were placed 4.6 m (15 ft) bgs. After each drop containing waste, dirt was shoveled into the well to shield the gamma radiation. Two vertical pipe units as deep as 15 m (48 ft) may be located near the east end of Trench 18. No information has been found on their contents. Drawing H-2-32487 shows details of many individual burials. One unplanned release associated with this site is a fire in the landfill (UPR-200-W-16). According to WIDs, UPR-200-W-26 is associated with this landfill, but it was determined that the correct location is in association with 218-W-1A. The site was stabilized in 1983.
Source Facilities Contributing More Than 5% of Waste by Volume	West Inner Area, PFP, REDOX
References	WIDS; 218-W-4A Logbook; SWITS

Site Map



Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	18,000	7
Used Area (hectares)	7	9
Plutonium Mass (kg)	35	4
Uranium Mass (kg)	400,000	1
Curies (Ci) decayed to 2015	160	13

WASTE RECORDS

Number Available	Rank	Record Quality
4,947	6	Good

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	The unit contains 21 miscellaneous dry waste trenches. The trenches are oriented in an east to west direction with Trench #1 on the southern end of the site and Trench #21 on the northern end. The site also contains six vertical pipe units that are 5 m (15 ft) deep and may contain two additional caissons that are 15 m (48 ft) deep.			
Number of Trenches	21				
Subsidence?	Y	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	Y	Disposal Pond?	N

Figure D-22 | CSM for the **218-W-4A Landfill** *2 of 4*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-4A Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- No Detections (2009)

Surface Radiation Surveys

- Based on the 2011 survey, two areas (one on the west edge, one on the east edge) were identified having a cps greater than 1500. Seven areas, distributed throughout the footprint of the landfill, were identified having counts per second (cps) between 1001 and 1250.

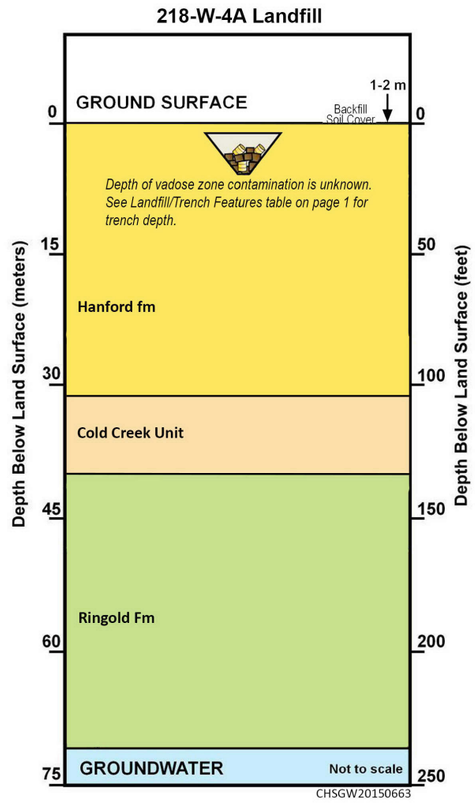
Geophysics Summary

- 2009: Confirm 21 trench locations in the geophysical survey data. Six caissons in Trench 16 and one caisson in Trench 17 are not confirmed in the geophysical data. One caisson was correlated with an anomaly in Trench 18. The trenches are on approximately 12 m (40 ft) centers and are approximately 9 m (30 ft) wide. The trenches contain metallic and non metallic debris located between 0.5 and 2.0 m (1.6 and 6.6 ft) bgs. Five trenches were identified in the southern part of 218-W-4A during the geophysical investigation of 218-W-11 in June 2006.
- Techniques used: TDEM, EMI, GPR, TMF

GEOPHYSICAL TRENCH DATA

Trench 1	Trench #1 is the shortest trench, starting about 30 m (98 ft) further east than the other trenches, at coordinate E289. This trench appears to contain both non-metallic and metallic debris, covered by 0.8 to 1.5 m (2.6 to 4.9 ft) of fill. The trench boundary correlates well with the documentation.
Trench 2	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 2.0 m (3.3 to 6.6 ft) of fill. One shallow anomalous area at 0.5 m (1.6 ft) bgs is observed at coordinate E158. The trench boundary correlates well with the documentation.
Trench 3	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. One shallow anomaly at 0.5 m (1.6 ft) bgs is observed at coordinate E176. The trench boundary correlates well with the documentation.
Trench 4	The trench appears to contain both non-metallic and metallic debris, covered by 1.5 to 2.0 m (4.9 to 6.6 ft) of fill. The trench boundary correlates well with the documentation.
Trench 5	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. The eastern portion of the trench appears to contain minimal metallic debris. The western half of the trench converges somewhat toward Trench #4. The trench boundary correlates with the documentation.
Trench 6	The trench appears to contain both non-metallic and metallic debris, covered by 0.7 to 1.5 m (2.3 to 4.9 ft) of fill. The anomalies/debris east of coordinate E230 are generally about 0.7 m (2.3 ft) bgs. The trench boundary correlates well with the documentation.
Trench 7	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. Metallic material appears more prevalent in the eastern portion of the trench. The trench boundary correlates well with the documentation.
Trench 8	The trench appears to contain both non-metallic and metallic debris, covered by 0.7 to 1.5 m (2.3 to 4.9 ft) of fill. Much of the buried metallic material is approximately 0.7 m (2.3 ft) bgs in the eastern portion of the trench. In general, the trench boundary correlates well with the documentation, but it appears to converge with (but is still separate from) Trench #9 east of coordinate E230.
Trench 9	The trench appears to contain both non-metallic and metallic debris, covered by 1.5 to 2.0 m (2.3 to 6.6 ft) of fill. The trench boundary correlates well with the documentation.
Trench 10	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. The trench appears to contain less metallic debris than the other trenches. The trench boundary correlates well with the documentation.
Trench 11	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. The eastern portion appears to contain minimal metallic material, and some of the debris may be as little as 0.5 m (1.6 ft) bgs. The eastern portion of the trench appears to trend slightly more northerly; otherwise, the trench boundary correlates well with the documentation.
Trench 12	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. The trench boundary correlates well with the documentation.
Trench 13	The trench appears to contain both non-metallic and metallic debris, covered by 0.5 to 1.5 m (1.6 to 4.9 ft) of fill. Between coordinates E245 and E290, the buried metallic material appears to be more concentrated along the northern side of the trench, appearing to make this portion of the trench closer to Trench #14. Otherwise, the trench boundary correlates well with the documentation.
Trench 14	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. The trench boundary correlates well with the documentation.
Trench 15	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m of fill (3.3 to 4.9 ft) of fill, with the exception of the most western end where some of the metallic debris appears to be approximately 0.5 m (1.6 ft) bgs. The trench boundary correlates well with the documentation.
Trench 16	The trench appears to contain both non-metallic and metallic debris, covered by 1.0 to 1.5 m of (3.3 to 4.9 ft) of fill. This trench is interpreted to contain six vertical pipe units, with the top of each pipe ranging from 0.7 to 1.0 m (2.3 to 3.3 ft) bgs. The vertical pipe units are located between the approximate coordinates E317 and E333 (in contrast to the location shown on the engineering documentation), about 30 m (98 ft) west of this location. A large "flat-topped" anomaly was detected at approximately coordinate E290, where engineering drawings show the vertical pipe units, at 2 m (6.6 ft) bgs. This is only pointed out here due to historical knowledge of the vertical pipe units and the possibility of caissons in the area. The trench boundary correlates well with the documentation.
Trench 17	The buried debris is covered by approximately 1.0 to 1.5 m (3.3 to 4.9 ft) of fill. Notes on the engineering drawing indicate that the western one-third of the trench was "…unable to dig due to tapering of Trench #18…" The geophysical data indicate that this trench does exist for the entire length and does contain both non-metallic and metallic debris. An engineering drawing shows a caisson near the eastern end of the trench, which does correlate with one of two geophysical anomalies in this area, but it is not clearly within the trench centerline. Generally, the trench boundary correlates well with the documentation.
Trench 18	The buried debris is generally covered by approximately 0.7 to 2.0 m (2.3 to 6.6 ft) of fill. The trench contains both metallic and non-metallic material. The western end appears to converge a bit with Trench #17, and the eastern end appears to be a few meters north of the location indicated on the engineering drawing. The drawing also shows a caisson at the eastern end, which does correlate with an approximate 8 m (26-ft)-diameter anomaly at about 0.8 m (2.6 ft) bgs. The trench boundary correlates well with the documentation.
Trench 19	A trench does not appear to have been dug at this location. None of the geophysical methods detected anomalous features at this trench location. The GPR data indicated characteristics of undisturbed soil.
Trench 20	The buried debris, both metallic and non-metallic, is generally covered by approximately 0.8 to 1.5 m (2.6 to 4.9 ft) of fill. The trench boundary correlates well with the documentation.
Trench 21	The buried debris, metallic and non-metallic, is generally covered by approximately 0.5 to 1.5 m (1.6 to 4.9 ft) of fill. The eastern end of the trench, at approximately coordinate E365, contains deeply buried metallic debris with 2.0 to 2.5 m (6.6 to 8.2 ft) of fill material. The trench boundary correlates well with the documentation.

Cross Section



Unplanned Releases Collocated with or Near 218-W-4A Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/ Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W -72	UPR-200-W-72, Contamination at the 218 W 4A Burial Ground	Within the 218-W-4A Landfill.	1975	N/A	Laboratory waste and contaminated soil	N/A	15 by 15 m (50 by 50 ft)	Contaminated laboratory waste was found with gross alpha and mixed fission product contamination in October 1975. The waste had been buried years before at the previously required 1.2 m (4 ft) depth. Soil erosion caused the waste to become exposed. The waste was removed, and the area was covered with 15 cm (6 in.) of sand, a layer of urea bore, a layer of 10 mil plastic, 31 to 36 cm (12 to 14 in.) of soil, and 8 to 10 cm (3 to 4 in.) of rock. ("Consolidated")

Figure D-22 | CSM for the **218-W-4A Landfill**

Landfill Inventory

Items Known to be Disposed

Containers, Ladders, Panel, Vacuum Pump, Wooden Boxes, #8 Filter Box, 002-Ur Agitator Assay from 106-Tx Tank Farm, Refrigerator, Loose Concrete, Blacktop, Roofing Grave, Hot Dirt, Gate, Coil (Helical), Boxes - Contaminated Filters, Wooden Box, 14-ft Stepladder, 1A Column & Capsule, 2 Sections of Down Comer Pipe, 2-Ton Dump Truck of Scrap Metal from Minor Construction, 22 Pallets Holding 88 Drums, 221-T Dissolver and Tower, 233S Ductwork, 233S Filters, 241 SX Pump, 241 SX Deep Well Pump, Filters, 30-Gal Drum Dirty Beryllium Parts and Scrap, 3P-SXB-5411-218 Broken Column, Cart, 4-Wheel Cart, Box with 108-F Hood, Drums, DXT Hood from Room 38, Small Paint Locker from 231Z, T-Canyon Waste Receptacle, Weighing Hood from Room 179-B, Agitator, Agitator Box, Agitator Parts, Air Duct from 100F, Air Ducts, Air Samplers, Iron Box from U Plant Containing a PUREX Tube Bundle and Misc. Other Debris, Ballast Pump, Barrel, Barrels from Coors, Batteries from Garage, Beam Off Roof, Belt Sander Buehler, Boeing Missile Waste, Box, Boxes from 234-5 Bldg Task 1 RMA, Broken Hand Tools, Buried 3-Stage Pumps, Buried 3-R Dissolver & Tower from 221-T Bldg, Cans, Cat, Centrifuge and Tank from U Canyon, Centrifuge Block, C-Line Hood 39, Coil, Coils from #5 Boiler Room at Redox, Column, Column Jumpers, Concrete, Concrete Block Classified Debris Samples, Container Paper, Containers Natural Uranium, Containers of Pipe, Containers of Silo Waste, Containers of Std Cartons & Buckets, Containers P.R. Can, Containers Special Burial P&Co Unloaded Box, Containers Waste Oil, Contaminated Parts, Cover Block, Crate, Cribbing, Cylinders Containing Unclassified Material, D-1 Dissolver from Recuplex, Deep Well Pump TX-115, Desks, Diffuser Pump, Dirt, Disposable Supplies, Dog Cage, Door, Down Comer Pipe Cones from Heaters, Drum, Drums Beryllium, Dry Blender Mixer, Dry Waste, Duct Boxes, Ducts, Dumped 221-T Canyon Waste, Failed Agitator Assembly with Motor, Fiber Barrels, Filters, Fire Brick Out of Incinerator, Food Mixer Hobart, 4 Hoods from 222-U, Fuel PRTR Element, Furnace, Glass, Glove Boxes, Gondola from T Plant, Gratings, Green Hut Junk, HEPA Filter, Hood #16, Hood 6-A, Hood from 234-5 Analytical Lab, Hood Panels, Hoods from 234-5 for Finished Products, Iron Lung from 233, Iron Plate, K-9 Vessel, Knockout Pots, L 16 Agitator 233S Bldg, Lab Capsule, Lard Cans, Large Box, Large Hood-Type Container, Laundry Boxes, Lead Shield, Light Bulbs, Load Asphalt from Roof, Loads Stones, Loose Automotive Parts, Machine Parts, Metal Container of Classified Scrap, Metal Turnings, Minor Const. Burials, Misc. Junk from T Plant Around Stack, Misc. Canyon Scrap, Misc. Waste from Redox Canyon, Wood Cabinets, Missile Parts from Boeing, Oil Drum, Oil Drums from 231-Z, Ore. Duck Dunk Truck, Package Ductwork, Pane, Pc Plywood, Pieces Dockwork, Pieces of Lumber, Pieces of Pipe, Plastic Greenhouse & Piping, Plow and Car Chassis, Pr Can, Propane Bottles, PRTR Shim Rods In Cap, Pump Motor, Pump Wrapped in Plastic, Pump X19 from 224-U, Pu-Oven, Purex 1-D Column Capsule, Purex Wall Racks, Radiator, Rags, RC Can, RECUPLEX Waste, Recycle Hood and Piping Reading, Redox Column Carrier, Redox Column Carrier Chain, Redox Dissolver Filters A4 & C4, Redox F-1 Pot, Redox Silo Equipment, Room Fan, Rubber Gloves, S Farm Steam Line Lagging TX, Salt Pot, Sand, Scaffolding, Scrap from 291-Z, Scrubbers, Several Dry Filters from 234-5, Sieve Testing Shaker, Electric Motors From 224-U, Slab Cover, Smokestack, Spray Ring, Stainless Steel Polishing Hoods from 234-5, Standard Cartons, Steam Radiators, Stove Port 234-5, SX-118 Pump, T Plant Junk Box, Tank #8 221-U Bldg, Ties, Tile, Tile Field from 234-5, Tires, Tower, Trailer Planking, Tubing and Tin Boxes, Tumbler, Valves, Vent Tubes, Weeds, Windows, Wood Crate, Wood-Crated Process Hood, Wooden Box, Wooden Boxes Containing Bamboo Scrap, Wooden Crates from 233S.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Good records, and no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey - two areas with greater than 1500 cps, 7 areas with between 1001 and 1250 cps.	Need to review existing data. Need to understand caissons better. Need to confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics. Focused and random test pits. Attempt use of multi-detector probe on caissons. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence. No past history of driving force or constituent mobility via gas or leachate flow.	Need to identify potential of downward flow. Need to understand current erosion/subsidence activity and potential.	Perform MASW to identify preferential pathways. Visual inspection/monitoring of surface for erosion and subsidence. Drill horizontal boring and Direct Push for leak detection.
Transport Media	Dry waste with no evidence of soil gas or leaching. Potential for direct transport of waste after being uncovered by erosion/subsidence.	Need data about fluid flow. Need to review site history to assess if waste has been directly transported (e.g., blown about by wind, exposed by storms)	Perform STS resistivity and ERT for fluid data. Horizontal boring and Direct Push for soil/fluid samples. Analyze directly exposed or transported waste, if present.
Exposure Point	Direct exposure to contents.	Need to confirm site conditions and waste containment.	Review/inspect site surface for exposed waste.
Exposure Route	Dermal/ingestion – direct exposure.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Photographic History

Photo (January 30, 1964) of waste destined for burial in Trench 10 of 218-W-4A landfill.

Photo January 30 1964 of T-Plant waste placed in Trench 10 of 218-W-4A landfill. Burial records indicate that waste buried this day includes the 3-R Dissolver & Tower from 221-T, PUREX wall racks and 221-T Canyon waste box. Workers are spraying water during the burial to keep contamination down.

Cover blocks from processing canyons were commonly buried in 200-SW-2 landfills. These coverblocks, buried January 30, 1964, are probably from T-Plant and are buried in 218-W-4A.

The 218-W-4A landfill in 1965.

Information from photos and logbooks contradicting literature.

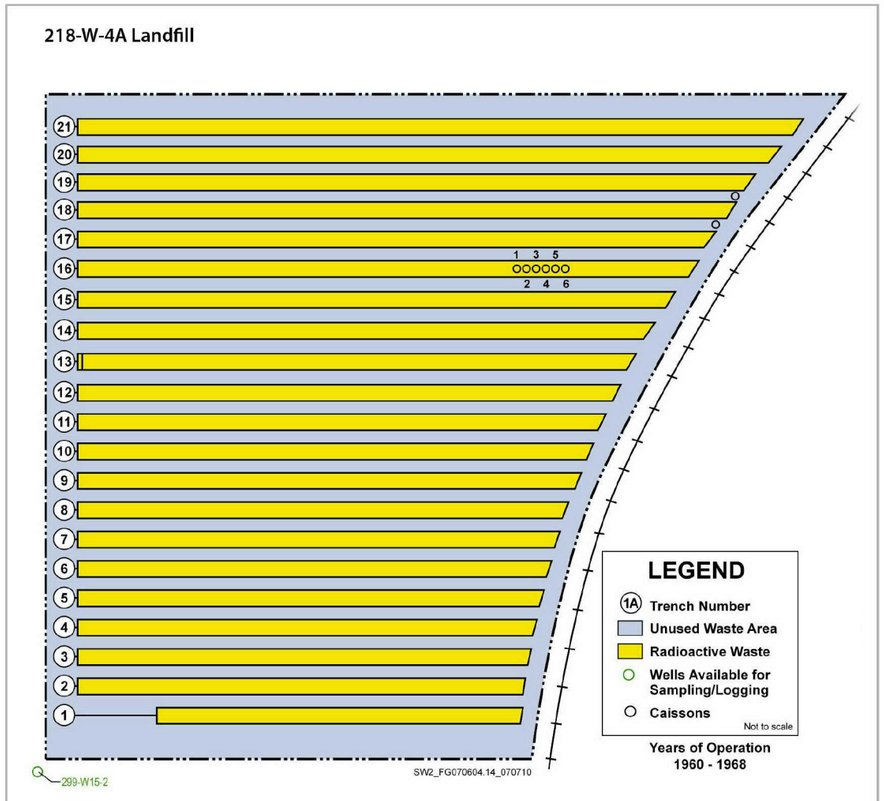
None.

CHSGW20140275

Figure D-22 | CSM for the **218-W-4A Landfill** *4 of 4*

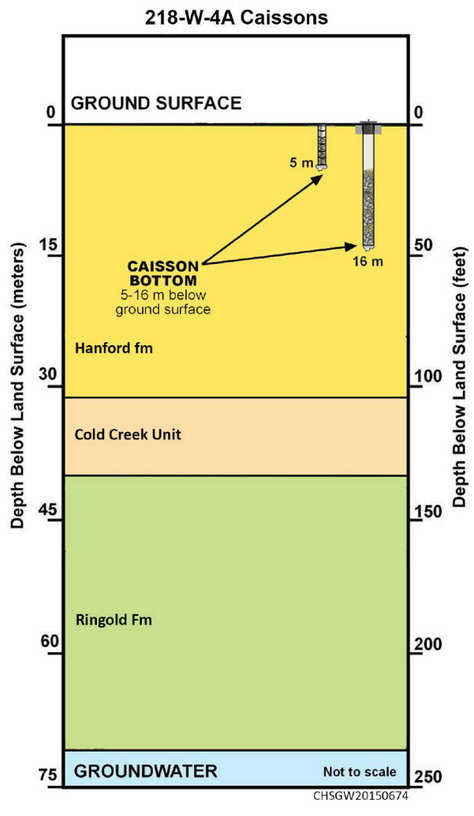
218-W-4A Caissons

Locations

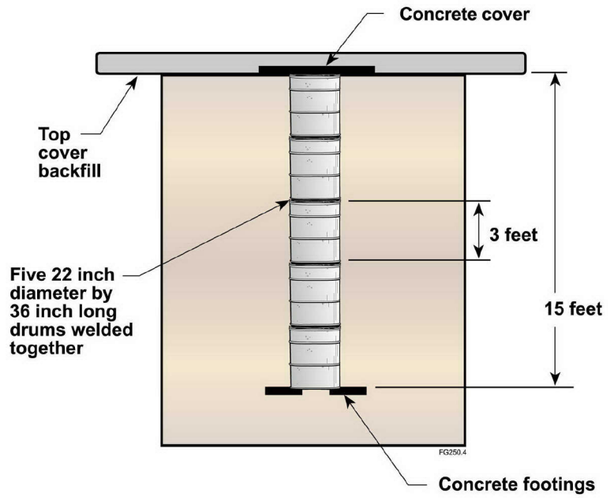


- High dose rate (up to 10,000 mR/hr)
- Typically remote handled waste
- Small containers (1-5 gallons)
- High beta-gamma radiation
- Potential for small volumes of sorbed organics (lab packs)
- 4 caissons believed unused

Cross Section



Diagram



Photographs

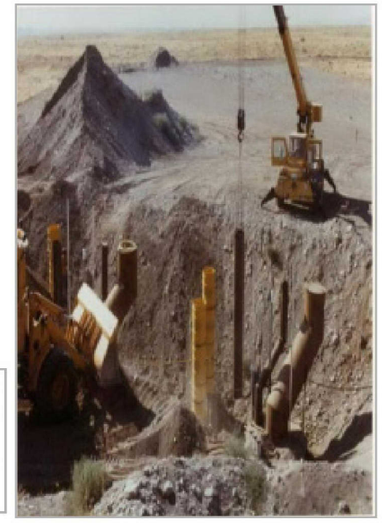


Photo shows 218-W-4A and 218-W-4B caisson types during a practice installation.

Vertical Pipe Units

The 218-W-4A landfill contains 21 miscellaneous dry waste trenches oriented east to west and 6 or 8 vertical pipe units or drywells, also known as caissons. The vertical pipe units were installed near the east end of Trench 16 and consist of two to five 55-gal drums welded together with the lids and bottoms removed. They were placed 4.6 m (15 ft) below ground surface. Two deeper caissons may be located between Trenches 17, 18, and 19.

CHSGW20140XXX

218-W-4B
Landfill

RCRA TSD

Caissons

September 9, 1975: hotcell waste being placed in caisson in 218-W-4B landfill.

Curie Content: High

Green Islands: No

Hydraulic Driving Force: Yes

Record Quality: Good

Subsidence: Yes

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-W-4B, Dry Waste No. 04B
Landfill Type	Dry Waste
OU & Category	200-SW-2, Treatment, Storage, and Disposal
Dates of Waste Receipt	1967 to 1990
Location	Northwest of the 234-5Z Building, directly west of the 231-Z Building
General Description	The site contains miscellaneous debris including rags, paper, cardboard, plastic, and equipment. Trenches 7 and 11 and the alpha caissons contain TRU waste planned to be retrieved under M-91. Four of the five alpha caissons were used from 1970 to 1979; the fifth is believed to be empty. The alpha and MFP caissons are up to 2.7 m (8.8 ft) diameter, 3 m (10 ft) high concrete and/or corrugated steel containers with an access chute diameter of approximately 90 cm (36 in). The silo-type caisson is a 3 m (10 ft) diameter, 9 m (30 ft) tall container placed on a concrete foundation with a concrete shielding top slab; it has a 107 cm (42 in) diameter access chute. All caissons are equipped with air-filtering systems. Trenches 1 through 6 were surface stabilized and backfilled with clean soil in 1983. Trench 7 is covered with a 1.2 m (4 ft) soil mound. The remaining trenches were backfilled after use and stabilized with clean gravel in 1995.
Source Facilities Contributing More Than 5% of Waste by Volume	222-S, 300 Area, PFP, and T-Plant
References	WIDS; WHC-EP-0912; RHO-CD-673

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	7,300	15
Used Area (hectares)	3.5	10
Plutonium Mass (kg)	9.0	6
Uranium Mass (kg)	4,200	6
Curies (Ci) decayed to 2015	46,000	6

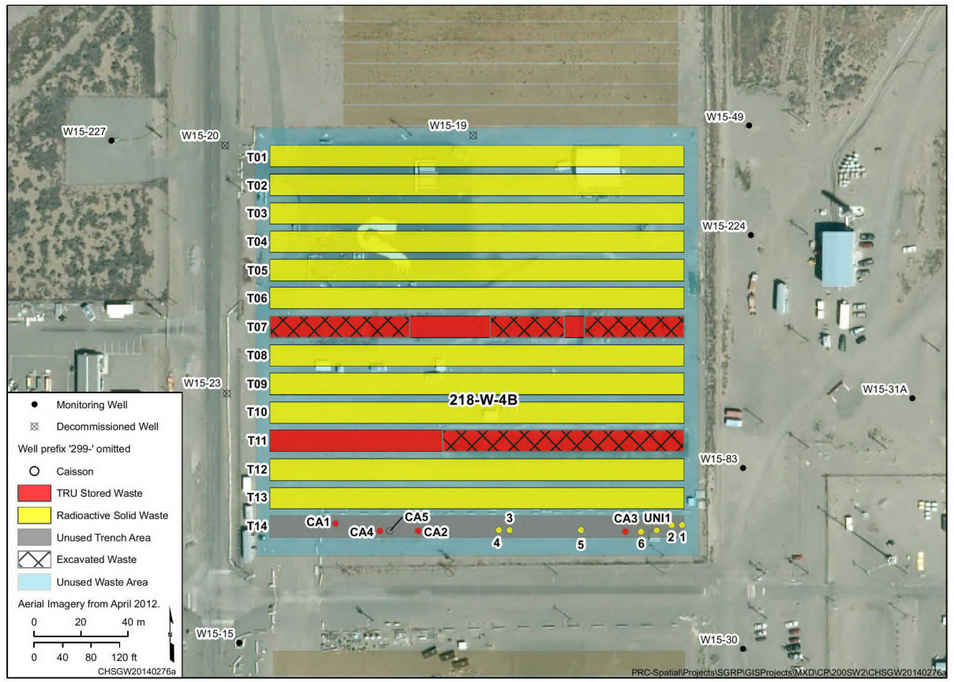
WASTE RECORDS

Number Available	Rank	Record Quality
4,717	7	Good

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	4	The site contains 13 trenches and one row of 12 caissons. The row of caissons include 5 alpha caissons, 6 mixed fission product (MFP) caissons and one silo type caisson used for high activity N-Reactor waste. The alpha caissons are out of scope of this work plan.			
Number of Trenches	13				
Subsidence?	Y	RSW?	Y	Green Islands?	N
Episodic Water?	Y	Caissons?	Y	Disposal Pond?	N

Site Map



Landfill Inventory

Items Known to be Disposed

17-ft Boat and 60-hp Outboard Motor, 165-lb Furnace, 2-inch Hand Rail, 55-Gal Drums Encased in Concrete, 9B Filter Head Assembly, Absolute Filters, Beryllium-Contaminated Waste, Blocks, Box, Burial Box, C.W.S. Filters, Cables, Canyon Waste Boxes, Carbon Steel Tank, Cartons, Cell Waste, Centrifuge, Chem Pumps, Concrete, Conduit, Construction Scaffolding, Crushers, D-6 Agitator Motor Assembly, Dead Animals, Drive Heads, Drum Dot 6M, Drums of Sand, Dry Boxes, Dry Filters - 55-Gal Drums, Duct Units, Ductwork, Evaporator Pot, Exhaust Line, Failed Crane Wheels, Filter Box, Filters, Fittings, Flange, Fume Hood Filters, Furnaces, Gear Reducer, Glove Boxes, Grinder Machine and Hood, Hardware Steel, HEPA Filter, Hood, Hoods, Hot Dirt in Rags, Hot Sand, Hydrostatic Pump, Ice Chest, Inlet/Outlet Exhaust Dampers, Kinney KC-3 Vacuum Pump, Lab Misc. Waste, Lab Paper Waste, Lab Stool, Ladders, Lumber, Manipulator Boots, Metal Boxes, Metal Canyon Waste Boxes, Metal Dry Filters, Milling Machine and Hood, Misc. Laundry, Misc. Scrap, Non-Combustible Waste, Oily Rags, Pallets of Lead Brick, Paper, Piping, Plastic, Plate, Plywood, Plywood Boxes, Process Filter, Process Waste, Pumps, Radiation Boxes, Rats, Rubber Gloves, Safeway Scaffold, Saw Fines, Scaffold Board, Scrap from VIPAC, Shelving, Steel Boxes, Steel Decking, Steel Table, Transite Pipe, Two Boxes From 292-T, Vacuum Gauge, Vacuum Pumps, Valves, Vinyl Bags, Wood, Wood Box with Lab Equipment, Wood Decking from Railroad Flatcar, Zak Machine, Absorbent, Animal Waste, Cardboard, Ceramics, Cloth, Concrete, Cotton, Diatomaceous Earth, Dirt, Filters, Galvanized, Glass, Graphite, Insulation Non-Asbestos, Iron, Kitty Litter, Kotex, Lumber, Metal, Nylon, Oils, Paper, Plastic, Polyurethane, Rags, Resins, Rubber, Sheet, Stainless Steel, Vermiculite, Wood.

Retrievably Stored Waste (RSW) TRU Retrieval

*All volumes are estimates based on SWITS 5/4/2016.

Beginning RSW (m^3)	RSW Retrieved (m^3)	RSW Remaining to be Retrieved (m^3)
3327	1763	1564

Figure D-23 | CSM for the **218-W-4B Landfill** *2 of 4*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-4B Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — Specific sampling locations were chosen based on detailed reviews of engineering drawings, historical documents, and waste curial record informaiton located in the SWITS data base. Samples were analyzed for the presence of 28 organic compounds identified to be contaminants of potential concern.
  - — One sample location had carbon tetrachloride levels greater than 100 nanograms: targeted location, trench 8 had carbon tetrachloride levels in excess of 70,000 nanograms.
  - — Stage 1—2006 and Stage 2—2009: In Stage 2, this landfill was sampled at four locations. Elevated levels of carbon tetrachloride and chloroform were detected at two locations. The maximum amount of carbon tetrachloride detected during Stage 2 occurred in this landfill (26,138 ng/sample), which is consistent with the results form Phase I-A. Small amounts of several other compounds were also detected.

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
1,1-Dichloroethane	2					16
1,1-Dichloroethene	2					50
1,1,1-Trichloroethane	2	2				258
1,1,2-Trichlorotrifluoroethane	3					31
1,2-Dichloropropane	2					29
1,2,4-Trimethylbenzene	1					29
Carbon tetrachloride				2	2	26,138
Chloroform		2		2		1,389
Tetrachloroethene	3	1				147
Trichloroethene	3					55

Note: 4 total sample locations are at the 218-W-4B Landfill.

- Vent riser soil-vapor sampling
  - — Soil-vapor sampling on retrievably stored TRU waste trench segments is required by Tri-Party Agreement Milestone M-091-40, Requirement 2. This waste is not in the scope of this work plan; these results are included for informational purposes only. For more sampling details see Appendix H.
  - — Step I Results: The 218-W-4B Landfill received retrievably-stored TRU in trenches T-07 and T-11. Trench T-11 did not receive vent risers and was not sampled. The highest concentrations of carbon tetrachloride were detected at the west end of trench T-07 ranging from 274 ppmv-7,580 ppmv. Other compounds and maximum concentrations detected include dichloromethane (51.2 ppmv), trichloromethane (155 ppmv), and tetrachlorethylene (124 ppmv), dichlorobenzene, m- (171.69 ppmv), and methyl ethyl ketone (193 ppmv)
- Soil vapor extraction
  - — During FY 2007, an SVE system was operated at the 218-W-4B Landfill from December 2006 through July 2007 (SGW-37111, *Performance Evaluation Report for Soil Vapor Extraction Operations at the 200 PW 1 Operable Unit Carbon Tetrachloride Site, Fiscal Year 2007*). Different vent risers were used at extraction points. Elevated concentrations of carbon tetrachloride were detected in Trench 7 during the environmental release investigation that was performed in support of retrieval operations for retrievably stored waste. The vapor extraction points were moved periodically from west to east as vapor extraction operations reduced the carbon tetrachloride concentrations and as waste retrieval progressed. The system was removed permanently to allow retrieval operations to remove the remaining waste at the end of Trench 7.

Surface Radiation Surveys

- Not performed.

Geophysics Summary

- Not performed.

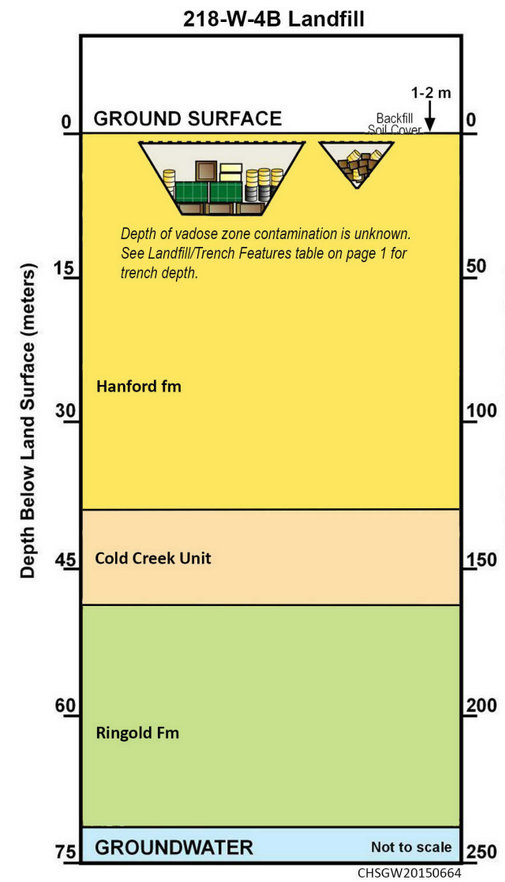
Groundwater Monitoring

- LLWMA 4-monitoring wells have been sampled since 1988 for contaminant indicator parameters, groundwater quality parameters, drinking water parameters, and site specific parameters as required by WAC 173-303-400(3).

Groundwater Monitoring continued...

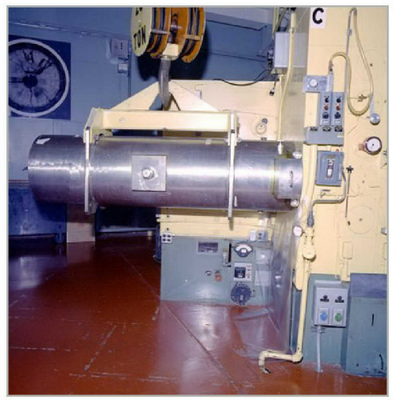
- Monitoring wells were installed at LLWMA-4 (218-W-4B and 218-W-4C) between 1987 and 1992. The original monitoring network included 17 wells. One well, 299-W18-29, was completed in a perched aquifer but went dry soon after it was drilled. Sampling at LLWMA-4 was suspended for a period of time during fiscal years 1990 and 1991. Groundwater flow was toward the west at the beginning of RCRA monitoring, but the hydraulic gradient altered dramatically with termination of discharges to U Pond and other facilities. The initiation of the 200-ZP-1 OU pump-and-treat groundwater remediation also impacted groundwater flow and quality at LLWMA-4. The monitoring network was updated in 1998 to redefine the upgradient and downgradient wells. Four shallow wells were chosen to monitor upgradient conditions, and three shallow wells were chosen to monitor downgradient of the landfill. In addition, one deep upgradient well and one shallow upgradient well remained in the monitoring network. Since that time, three additional upgradient wells have gone dry (299-W15-15, 299-W18-21, and 299-W18-23). After the monitoring network was updated in 1998 to reflect the changing flow directions, newly designated downgradient well 299-W15-16 exceeded the statistical comparison value for total organic halides (TOX). The exceedance was attributed to the regional carbon tetrachloride plume that moved into the area under previous flow conditions. This exceedance was first reported to Ecology in August 1999. The TOX values continue to exceed the critical mean value at LLWMA-4.
- The LLWMA-4 is affected by regional volatile organic compound (VOC) contamination, and the northern portion is within the capture zone of the 200-ZP-1 OU interim action pump-and-treat system. Carbon tetrachloride is the major contaminant in the plume, but chloroform, trichloroethene, tetrachloroethene, and nitrate are also present. The TOC concentration exceeded the critical mean of 790 µg/L in well 299-W15-224, with a concentration between 1,090 and 1,300 µg/L in August 2008. This was the first time that the well had exceeded the critical mean for total organic carbon (TOC). The well was resampled, and the new results available in November 2008 were 2,100 and 2,200 µg/L, again exceeding the critical mean. A request was then submitted to resample the well and analyze for an extensive list of VOCs, semivolatile organic compounds (SVOCs), and TPHs to identify the cause of elevated TOC. The resampling event occurred in December 2008, and the results received in January 2009 indicted that no organic compounds were identified that would account for the elevated TOC. In January 2009, the Soil and Groundwater Remediation Project notified DOE and other CH2M HILL Plateau Remediation Company organizations regarding the elevated TOC concentration at LLWMA-4, and DOE then notified Ecology. The project also prepared a groundwater quality assessment plan to evaluate the elevated TOC, which proposed sampling wells 299-W15-224, 299-W15-30, and 299-W15-83 for analysis of 40 CFR 264, Appendix IX organic constituents and other constituents potentially responsible for elevated TOC.
- Prior to assessment sampling, the pump was removed from well 299-W15-224 and a camera survey was completed to determine if any anomalies were present in the well. Nothing out of the ordinary was noted during the camera survey, the pump was replaced, and samples were collected on March 15 and 16, 2009. The samples were analyzed for 40 CFR 264, Appendix IX list of VOC and SVOC compounds, TOX, chemical oxygen demand, oil and grease, phenols, pesticides, herbicides, polychlorinated biphenyls, dioxans, dissolved oxygen, TPH (diesel, gasoline, and kerosene), and coliform bacteria. In July 2009, the results of the first determination did not find dangerous waste in the groundwater at LLWMA-4, and monitoring at the LLWMA returned to indicator evaluation monitoring.

Cross Section



Photographic History

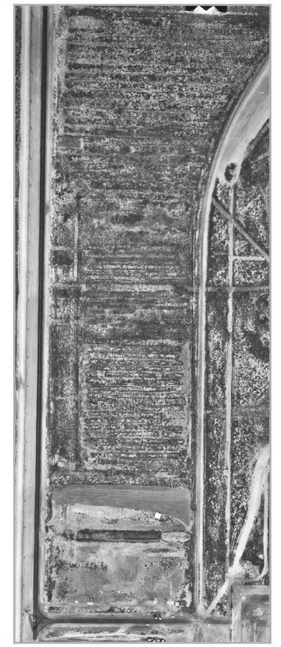
218-W-4B caisson contents.



September 9, 1975: hotcell waste shipping cask for caisson destined waste.

September 9, 1975: hotcell waste destined for disposal in caisson in 218-W-4B.

1978 photo of caisson installation in 218-W-4B.



A 1980 photo shows an open trench in 218-W-4B. The row of caissons in this landfill is visible at the bottom of the picture.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Good information indicating presence of some mobile constituents (i.e., gases/fluids), including EMFLUX data. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – Not performed.	No records needs; however, need for baseline geophysics and to understand caissons better. Obtain consistent surface radiation data for all landfills.	Conduct baseline geophysics to confirm trench boundaries and locate metallic anomalies. Attempt use of multi-detector probe on caissons. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	EMFLUX data suggests release(s) of mobile constituents upward. Historical presence of episodic water suggests potential for release(s) of mobile constituents downward.	Need to identify vadose zone preferential pathways related to release mechanism, especially for possible downward flow.	Perform MASW to identify preferential pathways. Drill horizontal boring and Direct Push for leak detection.
Transport Media	Soil gas upward, fluid/water downward, including fluid/water from earlier disposal ponds.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Horizontal boring and Direct Push for soil/fluid samples. Obtain active soil gas samples in areas of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Surface or near-surface (e.g., burrows) – soil gas. Groundwater exposure points – fluids/water.	Need to know if releases have reached groundwater.	Review groundwater data for evidence of impacts by 218-W-4B.
Exposure Route	Inhalation/dermal – soil gas. Ingestion/dermal – fluid/water.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Information from photos and logbooks contradicting literature.

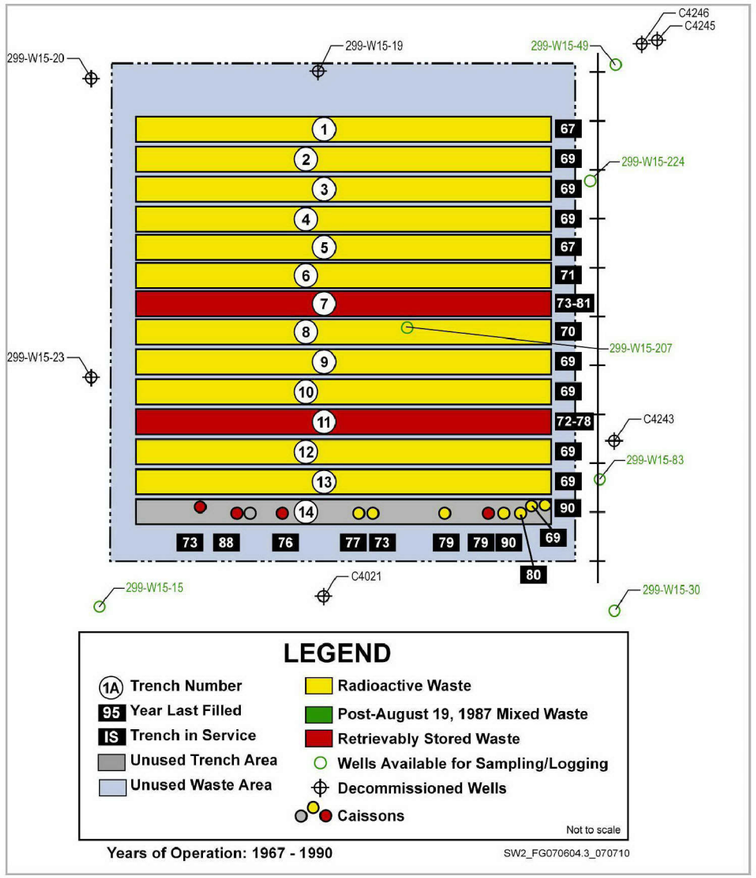
None.

Unplanned Releases Collocated with or Near 218-W-4B Landfill

None.

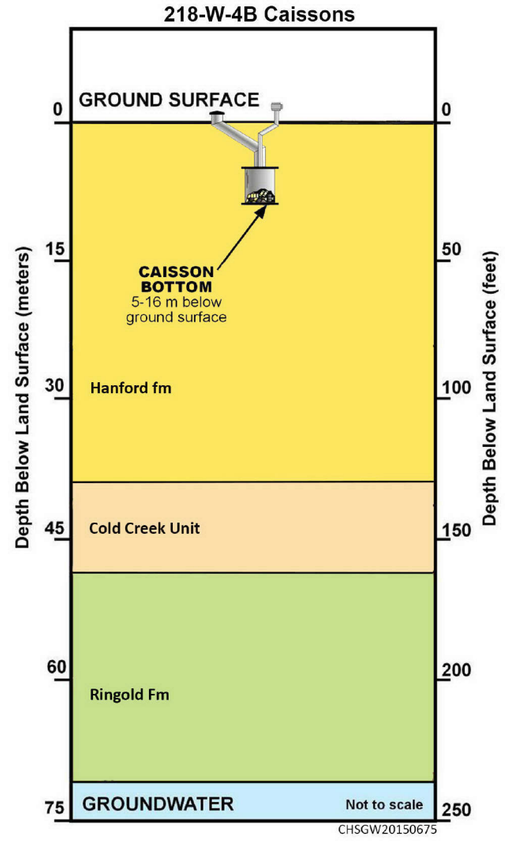
218-W-4B Caissons

Locations

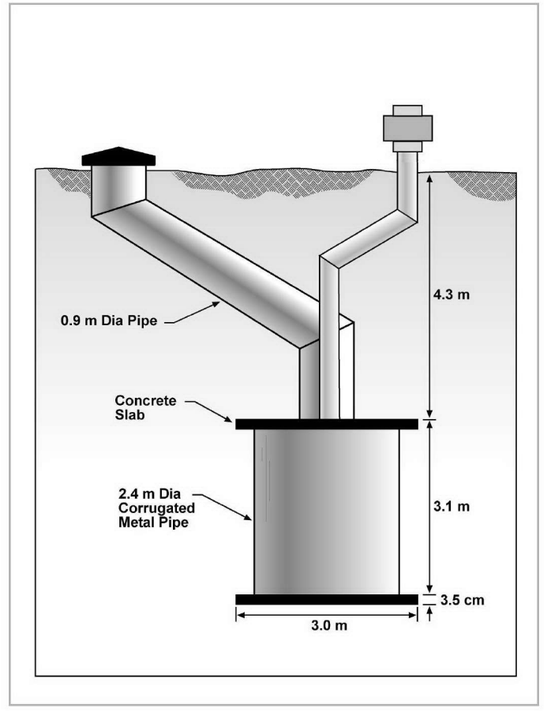


- High dose rate (up to 10,000 mR/hr)
- Typically remote handled waste
- Small containers (1-5 gallons)
- High beta-gamma radiation
- Potential for small volumes of sorbed organics (lab packs)
- 5 caissons in M-91 project scope
- 1 alpha caisson believed unused, two MFP caissons believed to contain fewer than 10 waste packages each.

Cross Section



Diagram



Photographs

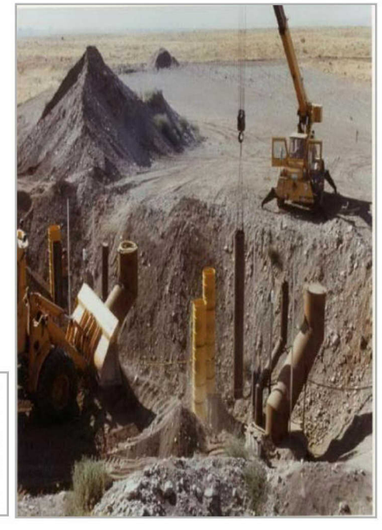


Photo shows 218-W-4A and 218-W-4B caisson styles during a practice installation.

The caissons contained within the 218-W-4B landfill were used for disposal of alpha and MFP containing waste.

Caissons CA1 through CA5 (also called alpha caissons) were planned for TRU waste. From 1970 to 1988, retrievably stored TRU waste was placed in four of the five. The caissons have been isolated; one caisson (CA5) never has been used. The five alpha caissons are approximately 2.7 to 3 m (8.75 to 10 ft) in diameter, 3 m (10 ft) high concrete and steel covered vaults with steel lifting lugs and a 0.9 m (3 ft) diameter access chute. The alpha caissons weigh approximately 11,800 kg (26,000 lb).

Six general (also called dry waste or MFP) caissons in this landfill containing LLW were filled from 1968 to 1979. Dry waste or MFP-type caissons are 2.4 m (8 ft) in diameter and 3.1 m (10 ft) high. According to WIDS, two of these caissons were constructed the same way as the alpha caissons, except with corrugated metal instead of steel and concrete. The last shipment of caisson waste in 218-W-4B was deposited into MFP Caisson #6 in 1990.

There is one caisson referred to in the literature as a United Nuclear Industries (UNI) below grade silo-type caisson used for high activity N Reactor waste. The UNI silo-type caisson is 3 m (10 ft) in diameter and 9 m (30 ft) tall with corrugated pipe containers placed on a concrete foundation with a top concrete shielding slab. It has a 1.1 m (3.5 ft) diameter access chute. Waste is placed beneath a concrete slab 4.6 m (15 ft) below grade. The chute of this caisson was plugged shortly after it began receiving waste and was taken out of service after plugging.

218-W-4C
Landfill

RCRA TSD

Undated photo showing waste emplacement in 218-W-4C Trench 33.

Curie Content: High

Green Islands: Yes

Hydraulic Driving Force: Yes

Record Quality: Good

Subsidence: Yes

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-W-4C, Dry Waste No. 004C
Landfill Type	Dry Waste
OU & Category	200-SW-2, Treatment, Storage, and Disposal
Dates of Waste Receipt	1978 to 2004
Location	Main section located west and southwest of the 234-5Z Building. Annex is located directly south of the 234-5 Building.
General Description	The site is divided into two parts, the section containing burial trenches to the west and an annex, which never has been used, to the east. The Z Plant burning pit, which operated during the late 1940s and early 1950s and burned only non-hazardous, non-radioactive waste, is near the west end of Trench 33. Trenches 1, 4, 7, 20, 24, and 29 contain retrievably stored, suspect TRU waste. Some of the TRU-containing trenches are asphalt lined. One drum of suspect TRU was buried in what is otherwise a LLW trench in 1981; records were later examined, and the drum and trench were redefined as containing only LLW. Trenches NC, 14, and 58 contain post-1987 mixed waste.
Source Facilities Contributing More Than 5% of Waste by Volume	100 Area, 300 Area, Offsite, PFP, REDOX
References	WIDS; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	15,000	8
Used Area (hectares)	15	7
Plutonium Mass (kg)	0.1	18
Uranium Mass (kg)	130,000	3
Curies (Ci) decayed to 2015	130,000	4

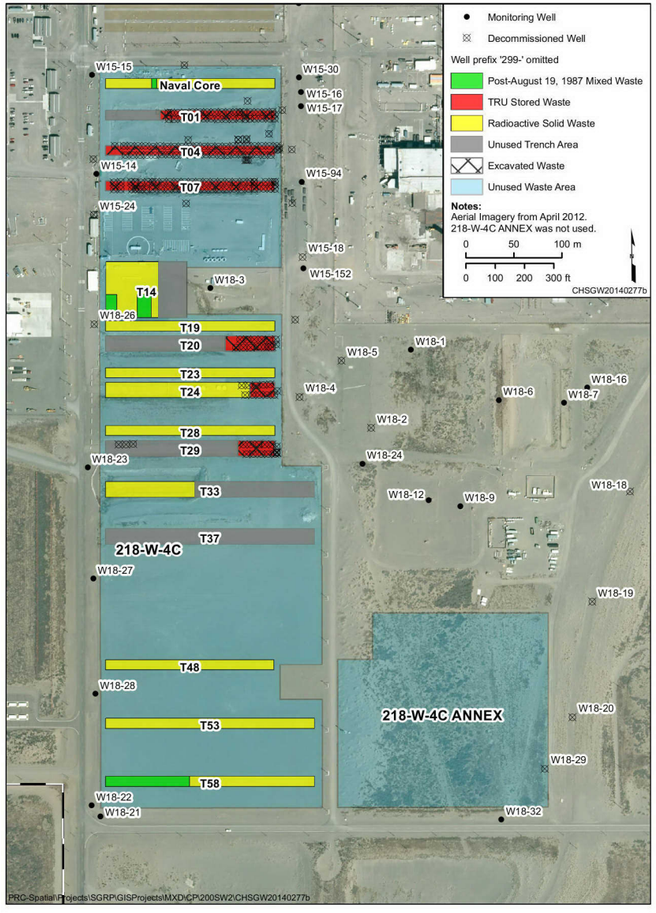
WASTE RECORDS

Number Available	Rank	Record Quality
7,127	5	Good

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	4	The shape of the main portion is an irregular polygon. Of the sixteen trenches constructed, only fifteen trenches in the main landfill have been used with trench numbers NC,1, 4, 7, 14, 19, 20, 23, 24, 28, 29, 33, 48, 53 and 58. The trenches run east to west and range in length from 50 m to 232 m (162 ft to 760 ft).			
Number of Trenches	15				
Subsidence?	Y	RSW?	N	Green Islands?	Y
Episodic Water?	Y	Caissons?	N	Disposal Pond?	N

Site Map



*Some of the post-August 19, 1987 mixed waste (green islands) in trenches T14 and T58 are currently being considered for removal from RCRA. See DOE/RL-2014-43 for more information.

Retrievably Stored Waste (RSW) TRU Retrieval

*All volumes are estimates based on SWITS 5/4/2016.

Beginning RSW (m^3)	RSW Retrieved (m^3)	RSW Remaining to be Retrieved (m^3)
6751	6751	0

Z-Plant Burn Pit

The Z-Plant Burn Pit is collocated with 218-W-4C Landfill. It was a disposal site for combustible, non-radioactive construction, office, and non-hazardous laboratory waste, including unnamed chemicals. The burn pit was exhumed during construction of the 218-W-4C Landfill. It was located near the west end of Trench 33. It was reported to have received 2,000 m^3 (2,600 yd^3) of waste for burning, including less than 1,000 m^3 (1,300 yd^3) of laboratory chemicals. The burn pit was 15 m (50 ft) long, 12 m (40 ft) wide, and 3 m (10 ft) deep. It was used from 1950 to 1960.

CHSGW20140277

Figure D-24 | CSM for the **218-W-4C Landfill** *2 of 3*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-4C Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — Specific sampling locations were chosen based on detailed reviews of engineering drawings, historical documents, and waste burial record information located in the SWITS data base. Samples were analyzed for the presence of 28 organic compounds identified to be contaminants of potential concern.
  - — Stage 1—2006 and Stage 2—2009: In Stage 2, this landfill was sampled at nine locations. Moderate amounts of 1,1,1-trichloroethane were detected at two locations. Small amounts of a few other constituents also were also detected.

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
1,1-Dichloroethane	1	--	--	--	--	10
1,1-Dichloroethene	4	--	--	--	--	90
1,1,1-Trichloroethane	2	4	--	2	--	1,764
1,1,2-Trichlorotrifluoroethane	2	--	--	--	--	22
Carbon tetrachloride	4	--	--	--	--	28
Tetrachloroethene	4	1	--	--	--	102

Note: 9 total sample locations are at the 218-W-4C Landfill.

- Vent riser soil-vapor samples
  - — Soil-vapor sampling on retrievably stored TRU waste trench segments is required by Tri-Party Agreement Milestone M-091-40, Requirement 2. This waste is not in the scope of this work plan; these results are included for informational purposes only. For more sampling details see Appendix H.
  - — Step I Results: The 218-W-4C Landfill received retrievably-stored TRU in trenches T-01, T-04, T-07, T-20, T-24, and T-29. Trench T-24 contained no vent risers. Field screening detected the highest concentrations of carbon tetrachloride at the east end of trench T-04 ranging from 114-668 ppmv. Trichloromethane was detected in trench T-04 at a maximum concentration of 283 ppmv. Carbon tetrachloride was detected in lab samples from trench T-07 and T-29 at 2.7 and 3.4 ppmv, respectively. Other detected compounds and maximum concentrations in the 218-W-4C landfill include dichloromethane (4.71 ppmv), 1,1-dichloroethane (28.1 ppmv), 1,1,1-trichloroethane (2,337 ppmv), trichloroethylene (25.5 ppmv), and tetrachloroethylene (1717 ppmv).
  - — Step II Results: Soil vapor samples were collected from the vadose zone along the edge of the asphalt pad through 168 direct-push holes. Carbon tetrachloride was detected at low concentrations in all trenches sampled. The highest concentration of carbon tetrachloride was at the east end of trench T-29 at 3.21 ppmv. Trench T-04 contained the highest concentration of tetrachloroethylene at 43.06 ppmv. Other compounds and maximum concentrations detected include 1,1-dichlorothane (13.89 ppmv), 1,1,1-trichloroethane (9.40 ppmv), 1,1,2-trichloroethane (8.64 ppmv), 1,2-dichloroethylene (3.87 ppmv), dichloromethane (7.12 ppmv), and methyl chloride (28.87 ppmv).
- Soil vapor extraction
  - — During FY 2004, an SVE system was operated at the 218-W-4C Landfill from November 2003 through April 2004 (WMP-26178, Performance Evaluation Report for Soil Vapor Extraction Operations at the 200 PW 1 Carbon Tetrachloride Site, Fiscal Year 2004). Elevated concentrations of carbon tetrachloride were detected at the east end of Trench 4 during the remedial investigation for the 200 PW 1 OU. The SVE system was operated from two to seven hours per day to remove the carbon tetrachloride from the trench to minimize the potential for a release to the groundwater. Vent risers at the east end of the trench were typically used as extraction points. Based on the decline in carbon tetrachloride concentrations and the absence of detectable radiological activity at the vapor extraction system, operation of the system was extended to 24 hours/day in January 2004. Approximately 11 kg of carbon tetrachloride were removed during FY 2004. The system was removed permanently to allow retrieval operations to remove bulk soil overburden covering the drums at the east end of Trench 4.

Surface Radiation Surveys

- The review of aerial radiation survey results from 1973 to 1974 did not reveal any sources of contamination that originated from the 218-W-4C Annex area.

Geophysics Summary

- Not performed.

Groundwater Monitoirng

- LLWMA 4-monitoring wells have been sampled since 1988 for contaminant indicator parameters, groundwater quality parameters, drinking water parameters, and site specific parameters as required by WAC 173-303-400(3).

Groundwater Monitoring continued...

- Monitoring wells were installed at LLWMA-4 (218-W-4B and 218-W-4C) between 1987 and 1992. The original monitoring network included 17 wells. One well, 299-W18-29, was completed in a perched aquifer but went dry soon after it was drilled. Sampling at LLWMA-4 was suspended for a period of time during fiscal years 1990 and 1991. Groundwater flow was toward the west at the beginning of RCRA monitoring, but the hydraulic gradient altered dramatically with termination of discharges to U Pond and other facilities. The initiation of the 200-ZP-1 OU pump-and-treat groundwater remediation also impacted groundwater flow and quality at LLWMA-4. The monitoring network was updated in 1998 to redefine the upgradient and downgradient wells. Four shallow wells were chosen to monitor upgradient conditions, and three shallow wells were chosen to monitor downgradient of the burial ground. In addition, one deep upgradient well and one shallow upgradient well remained in the monitoring network. Since that time, three additional upgradient wells have gone dry (299-W15-15, 299-W18-21, and 299-W18-23). After the monitoring network was updated in 1998 to reflect the changing flow directions, newly designated downgradient well 299-W15-16 exceeded the statistical comparison value for total organic halides (TOX). The exceedance was attributed to the regional carbon tetrachloride plume that moved into the area under previous flow conditions. This exceedance was first reported to Ecology in August 1999. The TOX values continue to exceed the critical mean value at LLWMA-4.
- The LLWMA-4 is affected by regional volatile organic compound (VOC) contamination, and the northern portion is within the capture zone of the 200-ZP- 1 OU interim action pump-and-treat system. Carbon tetrachloride is the major contaminant in the plume, but chloroform, trichloroethene, tetrachloroethene, and nitrate are also present. The TOC concentration exceeded the critical mean of 790 µg/L in well 299-W 15-224, with a concentration between 1,090 and 1,300 µg/L in August 2008. This was the first time that the well had exceeded the critical mean for TOC. The well was resampled, and the new results available in November 2008 were 2,100 and 2,200 µg/L, again exceeding the critical mean. A request was then submitted to resample the well and analyze for an extensive list of VOCs, semivolatile organic compounds (SVOCs), and TPHs to identify the cause of elevated TOC. The resampling event occurred in December 2008, and the results received in January 2009 indicted that no organic compounds were identified that would account for the elevated TOC. In January 2009, the Soil and Groundwater Remediation Project notified DOE and other CH2M HILL Plateau Remediation Company organizations regarding the elevated TOC concentration at LLWMA-4, and DOE then notified Ecology. The project also prepared a groundwater quality assessment plan to evaluate the elevated TOG, which proposed sampling wells 299-W15-224, 299-W15-30, and 299-W15-83 for analysis of 40 CFR 264, Appendix IX organic constituents and other constituents potentially responsible for elevated TOG.
- Prior to assessment sampling, the pump was removed from well 299-W15-224 and a camera survey was completed to determine if any anomalies were present in the well. Nothing out of the ordinary was noted during the camera survey, the pump was replaced, and samples were collected on March 15 and 16, 2009. The samples were analyzed for 40 CFR 264, Appendix IX list of VOC and SVOC compounds, TOX, chemical oxygen demand, oil and grease, phenols, pesticides, herbicides, polychlorinated biphenyls, dioxans, dissolved oxygen, TPH (diesel, gasoline, and kerosene), and coliform bacteria. In July 2009, the results of the first determination did not find dangerous waste in the groundwater at LLWMA-4, and monitoring at the LLWMA returned to indicator evaluation monitoring.

Cross Section

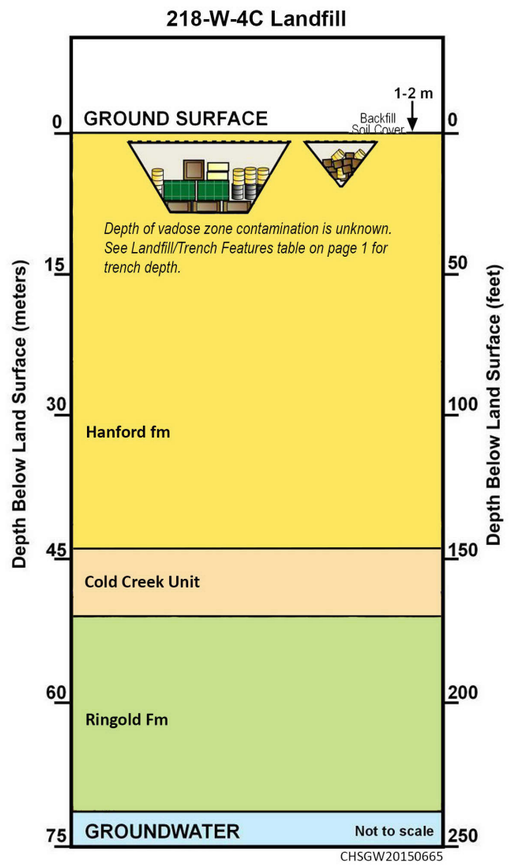


Figure D-24 | CSM for the **218-W-4C Landfill**

Photographic History

This June 1989 photo of 218-W-4C shows the layout of the landfill.

Information from photos and logbooks contradicting literature.

None.

Landfill Inventory

Items Known to be Disposed	
10-Mil Plastic Drum Liner, 100N Compacted Waste, 100N Compactor Drums, 26-inch Vac. Job, 30-Ton Cask, 327 Facility Compacted Waste, 55 Gallon Waste Drums, 8-Mil Liner, 90-Mil Plastic Drum Liner, Absorbed Aqueous Solution, Absorbed Liquid Waste, Absorbed Urine, Absorbent, Acid, Activated Accelerator Components, Activated Stainless Steel from FFTF Reactor, Aluminum Tubing, Animal Feces, Animal Tissue, Animal Waste, Anti-Corrosive Radpad, Asbestos, Asbestos Contaminated Equipment and Material Used for Decontamination, Ashes, Asphalt, Batco Pool Filters and Resins, Biological Material, Blacktop, Blood, Bolts, Boron Carbide Balls, Brass Metal, Brick, Bulked Waste, Carbon Steel, Carbon Steel Shot, Cardboard, Cask Coolant Pump, Cathode Tubes, Cell Equipment, Cement, Cemented Sludge, Ceramics, Charcoal, Chemical Stripper, Clay, Cleanout of Legacy Waste from Pits and Trenches, Cloth, Cloth Rags, Commercial Lab Sample Return, Compacted Empty Bottles, Compacted Gallery Waste, Compacted Lab Waste, Compacted LLR, Compacted LLSW, Compacted Paper, Compacted Plastic, Compacted RCRA-Empty Bottles, Compactable Waste, Compactor Drum, Concrete, Conweb Pads, Coolant Pump, Copper Metal, Copper Wire, Cork, Cotton, Crushed Glass, Debris Waste, Decon Tank, Depressurized Fire Extinguishers (Full), Desiccant, Dewatered Sludge, Diatomaceous Earth, Dirt, Drierite, Dry Vermiculite, Duct Tape, EAL Lab Labpack, Epoxy, Equipment, Excavation for 2706T Construction Project, Excess Non-Regulated Chemicals from Building Clean Out, Feces, Ferrous Metal, Fiberglass, Fiberglass Floor Filters, Fiberglass Floor Tiles, Fiberglass Prefilters, Filler, Filters, Firebrick, Fissile Waste Drum, Flanges, Floor Sweeps, Flume Hood Pre Filters, Foam, Foil,	Fuel, Galvanized, General Lab Waste, Glass, Glassware, Glovebox, Gloves, Graphite, Gravel, Grease, Grout, HEPA Filters, HIC, I-Beams, Insulation Non-Asbestos, Ion Exchange Column, Iron, Kitty Litter, Kotex, Lead, Leather, Light Bulbs, Lime, LLR From Duct Level, LLR Generated from Analytical Operations, LLR Soil from Room 1A Upgrade, LLW Cat 1 Used GAC and Powersorb, Lumber, Metal, Metal Bolts, Metal Cask, Mineral, Mineral Oil in KL, Non-Hazardous Metals, Non-Hazardous Paint Waste, Non-Infectious Biological Material, Non-Reg. Paint Related Waste, Non-Reg. Oily Rags, Nylon, Oilbase, Oils, Oily Rags, Organics (Nonhazardous), Oxides, Paint Chips, Paints, Paper, Paraffin Wax, Parks Township Soil, Pigmats, Pins or Rods, Plaster, Plastic, Plastic Liners from 200-BP-5 Pump and Treat, Plexiglas, Plywood, Polyacrylate, Polypropylene, Polyurethane, Powders, PPE, Pumice Rock, Pyrofoam, Pyrofoam Rock, Pyrofoam Void Space Filler, Rad Pad, Rags, Railroad Ties, Resins, RMW “Oil-Related Waste”, Rocks, Roofing Material, Rope, Rubber, Rubber Gloves, Rust Sweepings, Salt Bath, Sand, Sheet, Sheetrock, Silica Gel, Slaked Lime, Sludges, Soap, Soils, Solidified Sludge from Heel of 200-BP-5 Pump and Treat Tanks, Solvents, Special Fab Type A Container, Sponge, Stainless Steel, Steel, Steel Piping, Steel Shot, Styrofoam, Super 80 Rubber, Talc, Tape, Tar, Teflon, Thinners, Treated Acidic Solids, TRU Room Waste, Tubing, Tuf-Glide, Tumbleweeds, Twigs, Universal Polypropylenes, Used Hurrisafe on Towels, Valves, Vegetation, Vermiculite, Void Filler, Waste from B Cell Cleanout, Waste from D&D of the GA Hot Cell, Waste from Membrane Filter Press, Waste from O&M of TFTR Experimental Systems, Waste from R&D Activities, Waste from the Nat. Tritium Labeling Facility, Water, Water Treatment Process Waste, Wax, Weeds, Wire, Wood, Wyk (Silica Absorbent), Zircoloy.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Good information indicating presence of some mobile constituents (i.e., gases/fluids), including EMFLUX data. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – not performed.	No records needs; however, need for baseline geophysics. Obtain consistent surface radiation data for all landfills.	Conduct baseline geophysics to confirm trench boundaries and locate metallic anomalies. Collect EMFLUX data to confirm source knowledge. Conduct aerial radiation survey.
Release Mechanism	EMFLUX data suggests release(s) of mobile constituents upward. Historical presence of episodic water suggests potential for release(s) of mobile constituents downward.	Need to identify vadose zone preferential pathways related to release mechanism, especially for possible downward flow.	Perform MASW to identify preferential pathways. Direct Push for leak detection.
Transport Media	Soil gas upward, fluid/water downward, including fluid/water from earlier disposal ponds.	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Perform STS resistivity and ERT for fluid data. Direct push for soil/fluid samples. Obtain active soil gas samples in area of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Surface or near-surface (e.g., burrows) – soil gas. Groundwater exposure points – fluids/water.	Need to know if releases have reached groundwater.	Review groundwater data for evidence of impacts by 218-W-4C.
Exposure Route	Inhalation/dermal – soil gas. Ingestion/dermal – fluid/water.	Need to refine exposure model.	To be evaluated during risk assessment. Engineering and ICs to restrict.
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Unplanned Releases Collocated with or Near 218-W-4C Landfill

Site Code	Site Name	Location	Years of Operation	Source Facility	Contaminant Inventory/Volume Released	Depth	Waste Site Dimensions	General Description
UPR-200-W-37	UPR-200-W-37, Contaminated Boxes Found in a Burn Pit	East of Dayton Ave, southwest of Z Plant within the 218-W-4C Landfill.	1955	N/A	High-activity dry waste	N/A	N/A	Three boxes mistakenly containing dry, high-activity waste were sent to the Z Plant burn pit, which was located within what is now the 218-W-4C Landfill. The boxes were noticed before being burned, but during removal, it was noted that one box had opened in the pit causing radiological contamination. The boxes were removed and sent to the proper trench. (“Consolidated”)
Z Plant BP	Z Plant BP, Z Plant Burning Pit	Located east of Dayton Ave, within the boundaries of the current 218-W-4C Landfill.	1948 to 1960	N/A	The burn pit received 2,000 m^3 of wastes for burning, including less than 1,000 m^3 of laboratory chemicals.	3.0 m	12.2 by 15.2 m	Consolidated with the 218-W-4C Landfill. This unit is a rectangular burning pit located within (under) the 218-W-4C Landfill. The site was exhumed during the excavation of Trench 7 in the 218-W-4C Landfill. (“Consolidated”)

218-W-5
Landfill

RCRA TSD

This undated photo of waste emplaced in 218-W-5 shows stacked wooden and plastic boxes.

Curie Content: High

Green Islands: Yes

Hydraulic Driving Force: No

Record Quality: Good

Subsidence: Yes

Soil gas detection: Yes

Landfill Summary

WIDS Code & Aliases	218-W-5, Dry Waste Burial Ground, Low-Level Radioactive Mixed Waste Burial Grounds.
Landfill Type	Dry Waste
OU & Category	200-SW-2, Treatment, Storage, and Disposal
Dates of Waste Receipt	1986-2004
Location	In northwest corner of 200W area, west of and adjacent to 218-W-3A.
General Description	This unit is designed to store non-TRU waste and retrievable TRU waste. There are five distinct storage and disposal areas within the expansion: However, its current use includes only low level radiological soild waste and low level mixed waste. Trench 22 contains post-August 19, 1987 mixed waste. Trenches 31 and 34 are currently (2015) being used to dispose of MLLW, and are out of the scope of this project.
Source Facilities Contributing More Than 5% of Waste by Volume	100 Area, 300 Area, Offsite, PFP, Tank Farms
References	WIDS; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	72,000	2
Used Area (hectares)	24	1
Plutonium Mass (kg)	0.7	14
Uranium Mass (kg)	200	16
Curies (Ci)	11,000	7

WASTE INFORMATION

Number Available	Rank	Record Quality
39,218	1	Good

LANDFILL/TRENCH FEATURES

Trench Depth (m)	6	Currently there are 11 LLW trenches and 2 MLLW waste trenches. The MLLW trenches 31 and 34 are currently used, constructed with a polyethylene liner, and are out of scope of this workplan.			
Number of Trenches	13				
Subsidence?	Y	RSW?	N	Green Islands?	Y
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map

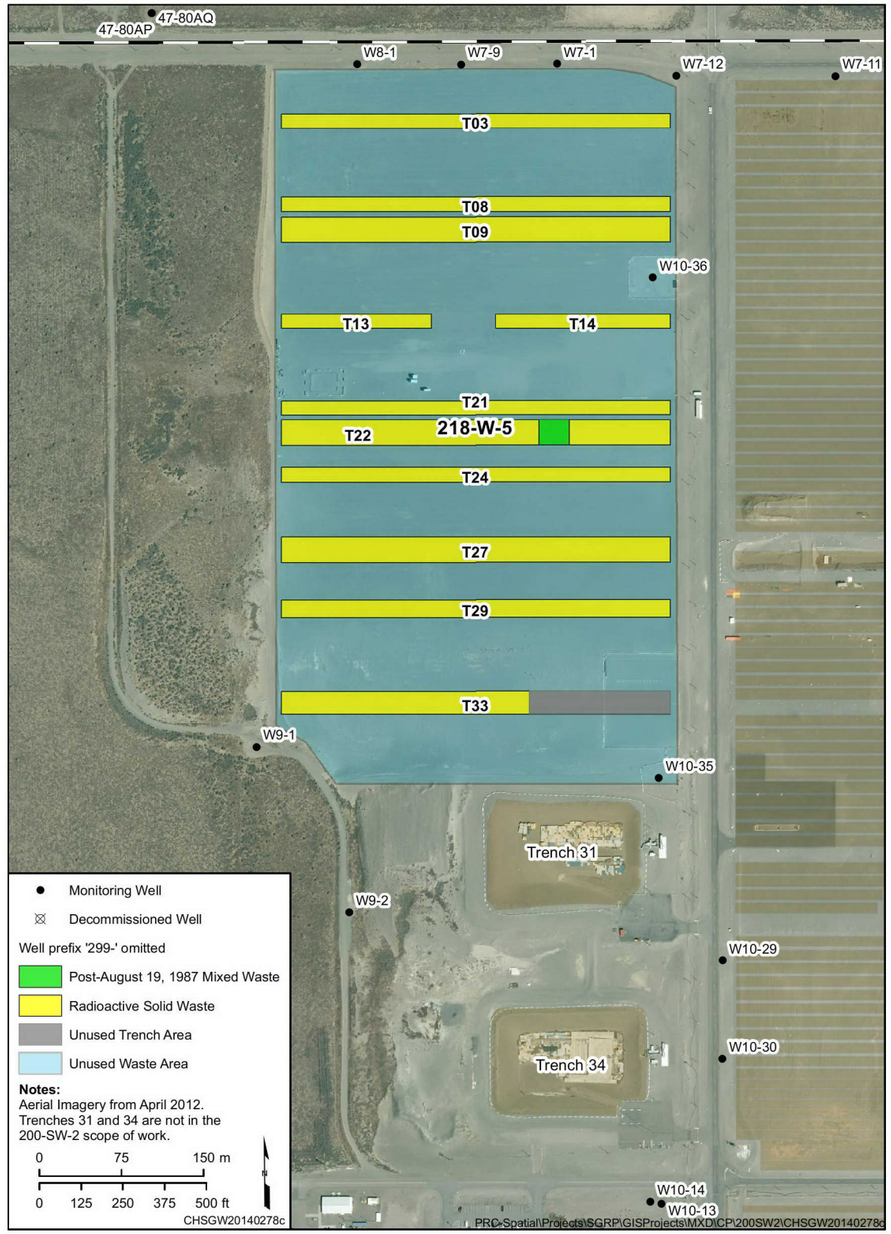


Figure D-25 | CSM for the **218-W-5 Landfill** *2 of 3*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-5 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — Stage 1—2006 and Stage 2—2009: In Stage 2, this landfill was sampled at nine locations. Moderate amounts of 1,1-dichloroethene, 1,1,1-trichloroethane, and tetrachloroethene were detected in many of the samples. Small amounts of a few other compounds also were detected.

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
1,1-Dichloroethane	6	--	--	--	--	62
1,1-Dichloroethene	2	5	--	1	--	1,364
1,1,1-Trichloroethane	1	--	--	8	--	4,428
1,1,2-Trichlorotrifluoroethane	6	2	--	--	--	203
Carbon tetrachloride	5	--	--	--	--	16
Tetrachloroethene		6	1	2	--	1,329
Trichloroethene	3	--	--	--	--	27

Note: 9 total sample locations are at the 218-W-5 Landfill.

Surface Radiation Surveys

- Not performed.

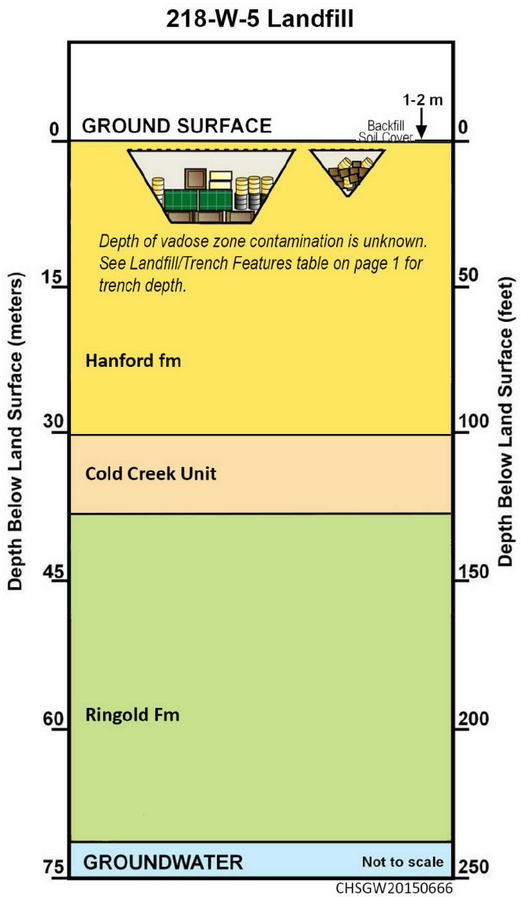
Geophysics Summary

- Not performed.

Groundwater Monitoring

- RCRA groundwater monitoring program for LLWMA-3 (218-W-3A, 218-W-3AE and 218-W-5) was initiated in 1987. Background monitoring at LLWMA-3 began in 1988. Critical mean values (WHC-SA-1 124-FP, Statistical Approach on RCRA Groundwater Monitoring Projects at the Hanford Site) for the indicator parameters TOC, TOX, pH, and specific conductivity were established in 1989 using data from four quarters from upgradient wells 299-W9-1 and 299-W10-13. The critical mean was exceeded for TOX in well 299-W7-4 and for TOC in wells 299-W7-5 and 299-W8-1 in September 1989. Resampling confirmed the elevated TOX, and an interim status groundwater quality assessment program was initiated (WHC-SD-EN-AP-022). Subsequent sampling indicated that the elevated TOC values were erroneous and that the critical mean for TOC was not exceeded. The groundwater monitoring network at LLWMA-3 was sampled quarterly between 1988 and December 1993, with the exception of the period between June 1990 and June 1991 when laboratory services were unavailable. The additional sampling and groundwater quality assessment indicated that elevated TOX in well 299-W7-4 was due to carbon tetrachloride from upgradient sources. Consequently, LLWMA-3 returned to a background evaluation program in January 1994 to re-establish background and then to indicator evaluation monitoring after one year. The LLWMA-3 has remained in indicator evaluation monitoring since that time. The upgradient wells have all gone dry, so statistical comparisons have not been performed since fiscal year 2004.

Cross Section



Photographic History

This 2007 photo of 218-W-5 shows the layout of the landfill. The outline includes trenches 31 and 34, in the foreground, which are out of scope of this work plan.

Information from photos and logbooks contradicting literature.

None.

Figure D-25 | CSM for the **218-W-5 Landfill**

Landfill Inventory

Items Known to be Disposed

Stainless Steel Canisters, EXIT Signs with H-3, 1-Inch Pipe, 10-Mil Liner, 152-ER Contamination, Light Pole, 1-Inch Bolts, 219-S Cell Cover Block, 221T Canyon Deck Clean off, 241BY Farm Cleanup, 241-TX Misc LLW, 242B Swamp Cooler Removed and Packaged Intact, 250 Ml Poly Bottles, 2706T and Headend Greenhouses, 2706T Cleanup and Step-Off Pad Waste, 2706T Decon and Housekeeping Activities, 3-ft Bottle Cart, 30-ft 1.5 ID Abs Pipe, 4-Inch Pipe, 5-Gal Paint Cans, 60 Horse Power Electric Motor, 85-Gal Empty Puck Drum, 90-Mil Liner, A Cell Equipment, Abandoned Exhauster Frame, Abs (PVC) Piping, Absorbent, Absorbed Liquid, Absorbed Oil, Absorbed Propylene Glycol, Absorbed Rad. Contaminated Water and Resin, Absorbed Rainwater, Absorbed Tritiated Water, Absorbed Water, Accelerator Waste, Acetylene Bottles, Acid Brick and Concrete Mortar, Acid Spill Pillows, Activated Accelerator Components, Activated Unused Spare Pump, Adsorbed Plasma Gas, Aerosol Cans, Agar, Air Filters, Air Sampling Equipment, Airline Hose, Airlock Waste, Alara Strip Paint, Aluminum Alloy Casting, Aluminum Channel, Aluminum Conduit, Aluminum Foil, Aluminum Ladder, Aluminum Tape, Angle Iron, Angled Steel, Animal Tissue, Animal Waste, Anion Resin, Annulus Pump Assembly, Asbestos, Ash, Asphalt, Automatic Transmission Fluid, B-12 Box, B-25 Box, B-25 Metal Box, B-26 Box, B87 Metal Box, Bag Floor Dry, Bag Floor Sweep, Bag Laundry, Bag Metal Clamps and Tube, Bag Rubber Boots, Bags Mineral Wool, Bags of Tape, Bags Rock, Barbed Wire, Barrel Rotator, Barrier Cream, Base cabinets, Basin Blow Sand Clean Up, Billet Boxes, Binders, Bio Rad Exchange Resin, Biological Waste, Bird Bones, Bird Carcasses, Bird Debris, Bird Droppings, Bird Nests, Black Beauty Abrasive, Black Mita Toner Cartridge, Bolts, Bone Char, Books, Boral Sheet, Boron Ball Dust, Boron Balls, Boron Carbide Balls, Boxes, Diamond Plate, Braided Steel Cable, Brass Chem-Pump, Brass Piping, Bricks, Broom End, Brooms, Brushes, Bucket, Cabinet, Cable, Phone, Canisters, Cans, Canvas, Canvas Gloves, Canvas Tarp, Canyon Cleanout Waste, Cardboard, Carbon Boiling Chips, Carbon Pieces, Carbon Rods, Carbon Steel Cable Trays, Carbon Steel Pipes, Carbon Steel Shot, Carbon Steel Shot from Scabble Machine, Carbon Steel Shot in Plastic Pail, Carbon Steel Valves, Carbon Steel Ventilation Piping Filled With Pyrofoam, Cardboard, Carpet, Cart, Cast Iron, Cast Iron Pipe, Catalyst Pack, Cathode Tubes, Cattails, Ceiling Grid, Ceiling Tile, Cement, Cemented Sludge, Ceramic Blocks, Ceramic Drywall, Ceramic Insulation, Ceramic Pipes, Ceramic Plates, Cernex, Chain Hoist, Chairs, Charcoal, Chips, Chukar Droppings, Circuit Boxes, Clay, Clay Pipe, Clips, Cloth, Cloth Rags, CLSR Chemical Labpack, Compacted 55 Gal. Drums, Compacted Air-Cooled Chiller, Compacted Gallery Waste, Compacted Tumbleweeds, Compaction Disks, Compactor Motor, Compressed Air Bottle(De-Energized), Computer Mouse, Concrete, Concrete Blocks, Conduit Pipe, Construction Debris, Containment Tent, Contaminated Equipment, Contaminated Rad HEPA Filters, Contaminated Refrigerator, Contaminated Ductwork, Contaminated Soil, Contaminated Tools, Contaminated Wood, Conwed Pads, Cooling Tubing, Copper From An Annulus Fan Motor, Copper Piping, Copper Rods, Copper Wiring, Cork, Corkboard, Cosmolubric Hydraulic Oil, Cotton, Cotton Filter, Cotton Insulation, Cotton Liners, Crane Cable, Crushed Spray Cans (Aluminum), Crushed Stainless Steel Canisters from N-Basin, Crushed Vessel (Injection Tank), Crushed Vials, Crylic Latex, Cured Epoxy, Cured Non-Hazardous Polyurethane Caulking, Custom Container Containing Molecular Sieve, Cut End Fuel Rods, D&D Cyclotron Waste, D&D from Janus Reactor, D-5 Pit Waste, Debris, Decon of Core Sample Truck, Depleted Uranium Turnings and Grout, Depressurized Gas Cylinders, Dewatered Sludge, Diatomaceous Earth, Diesel Motor, Diode Detector, Disassembled 105A Exhauster, Discarded Tools, Disk Drive, Dog Pen D&D, Doors, Drain Pipe, Drain Traps, Drum Rings, Dry Combustibles, Dry Silicone, Dry Sweep, Dry Transformers, Dry Vegetation, Drywall, Duct Tape,

Ducting, Dust Pans, Duststop Filters, Electric Cord, Electric Hacksaw, Electric Motors, Electric Submersible Pumps, Electrical Box, Electrical Guide Wire Spool, Electrical Switches, Electroplated Steel, Electropolisher Unit from 324 A-Cell, Empty Punctured Aerosol Cans, Empty Sand Bags from Sand Blast Operation, Empty Shipping Cask, Euroclean HEPA Vacs, Alpha Detectors, Extension Cord, Face Shields, Fan Housing, Feces, Felt, Fiberglass Carts, Fiberglass Insulation, Filler Rock, Filter Media, Fire Hose, Fission Chambers, Flanges, Flex Hose, Floor Tile with Asbestos, Flyash, Foam, Fuel Baskets Wrapped in Plastic, Fuel Rod Spacer, Funnel Covers, Furnace Brick, Furnace Filter, Furnace Slag, GAC Drums, Gas Analyzer, Gate Valve, Generators, Glass Bottles, Glass Insulation, Glass Test Tubes, Glass Wool, Gloves, Gorilla Pipe, Green Metal Fuel Monitor from 100N Basin, Green Tape, Grifflon Fire Retardant Plastic, H-3 Contaminated Water And Resin, Hand Tools, Hazardous Ion Exchange Resins, Headache Ball, Heater, Hemp Rope, HEPA Box, HEPA Filter, Herculite, Hittman Liner, Hoist, Hood Gloves with Plastic Ring and Rubber O-Ring, Hoses, HVAC Filters, Hydraulic Cylinder, Hydraulic Lift Table, Hydraulic Oil, Ion Exchange Column, Ion Exchange Resin, Irreparable Garments, Jascpo Pump, Kitty Litter, Ladder, Latex Gloves, Laundry, Laundry By Product, Lava Rock, Leachate from Collection Tank At 218W5, Leather, Lids, Life Preserver, Lint, Magnet, Mask Canisters, Mask Cartridge, Mask Cartridge Filters, Mass Spectrometer, Metal Bars, Metal Boxes, Metal Clam Bucket from KEH Hot Yard, Metal Equipment Known as “Blue Goose” from 325, Metal Garbage Can, Metal Lathe, Metal Mounting Bracket, Metal Nuts, Metal Pump from Empty Purgewater Truck, Metal Sprayer, Mops, Motors, Mouse Feces, Mylar Paper, Nails, Neutron Activated Construction Debris, Nickel Chromium Wire, Noncontainerized Tumbleweeds, Non-Friable Asbestos, Nonregulated Oil, Nuts, Nylon Ropes, Oscilloscope Camera, Paint Cans, Palmolive, Paper, Paper Cups, Paper Towels, Petrie Dishes, Piece of Rail Car Platform Shipped as Self-Contained Item, Pigeon Nests, Pigmats, Plasma Exhaust Treatment Waste, Plastic Brushes, Plastic Hard Hat, Plastic Port Ring, Porcelain Sinks, Portable Heater, Portable Light, PPE, PR Rubber Gloves, Propane Tank, Pucks With 90-Mil Liners, Pumice Rock, Pump, Pump Motors, Pump Valve, Purex Inlet Filters, Purex Supply Filters Waste, Purex Tower T-C3-1, Purex Tower T-G2, Purex Tower T-J4, Purex Tower T-L2, PVC Insulation, PVC Piping, Pyrofoam, Rabbit Droppings, Rad Crushed Glass, Rad Sings, Rad Sorb Pads, Radiation Barrier Rope, Radiation Monitors, Radiators, Radiologically Contaminated Equipment That Has No Further Use, Radios, Rags, Railroad Ties, Rain Gear, RCRA Empty Crushed Aerosol Cans and Debris, Rear Truck Assemblies from LLW Rail Flat Car, Rebar, Resin De-Watering Operation Waste, Respirator Cartridges, Respirator Filters, Returned Laundry, Roll of Foam, Rope (Hemp), Rope (Nylon), RR Wheels, Rubber, Rubber “O” Ring, Safety Helmets, Safeway Ladder, Sagebrush, Saw Blade, Sawdust, Scaffolding, Scrap Light Fixtures from Duct Level, Screws, Sea-Land Container, Shear Blocks, Sheet Metal, Shield Plugs, Shoring Materials, Silica Gel From Glove Box Ambient Air Exhaust Scrubber, Silica Gel From Vacuum Pump, Slurries, Smoke Detectors, Snow Roof from U-Cell Cover Blocks, Soft Trash, Solidified Animal Feces and Urine, Sound Proof Doors, Steel Balls, Steel Bellows Transformer, Steel Cable, Steel Elevator Shaft, Submersible Pump, Sump Pumps, Supertiger Waste, Surgeons Gloves, Swamp Cooler, Synthetic Polymeric Material, Tape, Tar Paper, Temp Gage, Teri Wipes, Texwipe Cloths, Thermocouples, Tools, Transformers, Transite Panel with Asbestos, Trash, Tumbleweeds, Tygon Hose, Unistrut, Vacuum Parts, Vacuum Vessel, Vacuums, Verification Tape, Vermiculite, Vinyl Flooring Containing Asbestos, Waste Byproduct of Iron Co-Precipitation, Waste from Animal Research, Water Fountain, Water Sampler, Water Tower 3902-A Demolition, Welding Hoses, Welding Machines, Welding Slag Is of Steel, Wood, Wood Blocks, Wood Carts, Zone 3 HEPA Filters, Zonolite Absorbent.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Excellent quality records, and EMFLUX suggests presence of some mobile constituents. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – was not performed.	No records needs; however, need for baseline geophysics. Confirm contents. Obtain consistent surface radiation data for all landfills.	Conduct baseline geophysics to confirm trench boundaries and locate metallic anomalies. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	No evidence of downward driving force, upward flow of soil gas is likely the only release	Need to identify soil gas release areas. Need to identify potential of downward flow	Review existing EMFLUX data. Direct Push for leak detection.
Transport Media	Soil gas	Need soil gas concentration data (active samples) for risk assessment. Need data about fluid flow.	Direct Push for soil/fluid samples. Obtain active soil gas samples in area of passive soil gas hits (>1,000 ng/sample).
Exposure Point	Surface or near-surface (e.g., burrows) – soil gas	Need to evaluate burrow/ bioturbation activity at the surface	Review/inspect site surface for ecological receptor activity
Exposure Route	Inhalation/dermal – soil gas	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment

Unplanned Releases Collocated with or Near 218-W-5 Landfill

None.

218-W-11
Landfill

Industrial

A 1965 aerial photo shows an open trench and items stored aboveground in 218-W-11.

Curie Content: Low

Green Islands: No

Hydraulic Driving Force: No

Record Quality: Poor

Subsidence: No

Soil gas detection: No

Landfill Summary

WIDS Code & Aliases	218-W-11, Regulated Storage Site
Landfill Type	Industrial
OU & Category	200-SW-2, Past Practice
Dates of Waste Receipt	1960 – 1960
Location	Northwest of the 234-5Z Building and north of 218-W-1
General Description	Before stabilization in 1983, a portion of the burial ground was used for above-ground storage of contaminated equipment. The waste is low-level contaminated equipment. A surface radiological survey is performed annually.
Source Facilities Contributing More Than 5% of Waste by Volume	Tank Farms - Uranium Recovery Process and Sr/Cs Recovery Operations
References	WIDS; BHI-00175; SWITS

Characterization Data

LANDFILL CONTENTS

Physical Characteristics	Quantity	Rank
Waste Volume (m^3)	1,200	22
Used Area (hectares)	0.87	20
Plutonium Mass (kg)	0	22
Uranium Mass (kg)	0	21
Curies (Ci)	0.002	24

WASTE INFORMATION

Number Available	Rank	Record Quality
3	21	Poor

LANDFILL/TRENCH FEATURES

Approx. Average Trench Depth (m)	5	This burial ground originally was used as an aboveground storage site for low-level contaminated equipment storage. Some literature sources and site drawings indicate two trenches while others indicate there is one trench. Geophysical data collected in 2005-2006 suggest one trench and a pit.			
Number of Trenches	2				
Subsidence?	N	RSW?	N	Green Islands?	N
Episodic Water?	N	Caissons?	N	Disposal Pond?	N

Site Map

Landfill Inventory

Items Known to be Disposed
No landfill inventory records available for this landfill. (SWITS)

CHSGW20140273

Figure D-26 | CSM for the **218-W-11 Landfill** *2 of 2*

Previous Investigations*

*Location details for the following investigations are mapped on the 218-W-11 Landfill plate provided on the CD associated with Appendix D.

Soil Gas Sampling

- Passive soil vapor sampling
  - — Stage 3—2009: This landfill was sampled at four locations. There were no significant detections of any constituent (three locations with low detections of tetrachloroethene, with the highest at 20 ng).

2009 DISTRIBUTION OF SAMPLE RESULTS

Compound	Number of Samples (ng/sample)					Maximum Result (ng/sample)
	10 – 100	100 – 500	500 – 1,000	1,000 – 5,000	>5,000	
Tetrachloroethene	3	--	--	--	--	20

Surface Radiation Surveys

- 218-W-11, 218-W-1, and 218-W-2 Landfills: Based on the 2010 survey, less than ten areas were identified having counts per second (cps) greater than 1500. They were evenly distributed amongst the three landfills. There is a large cluster of hits between 1001 and 1250 cps in the former location of UPR 200-W-16, which is in the southern end of 218-W-1.

Geophysics Summary

- The 2005 and 2006 geophysical surveys indicated the 218-W-11 Landfill most likely contains only one trench and one pit (contrary to the most recent Hanford Site Drawing H-2-94250). The pit is not depicted on any available drawings. The trench location correlates very well with the trench location identified in Hanford Site Drawing H-2-31268, Solid Waste Burial Grounds Plot Plan, which pre-dates H-2-94250.
- Techniques used: EMI, GPR, TMF

Photographic History

A 1969 aerial photo shows what appear to be open trenches in 218-W-11.

A 1969 aerial photo shows what appear to be open trenches in 218-W-11

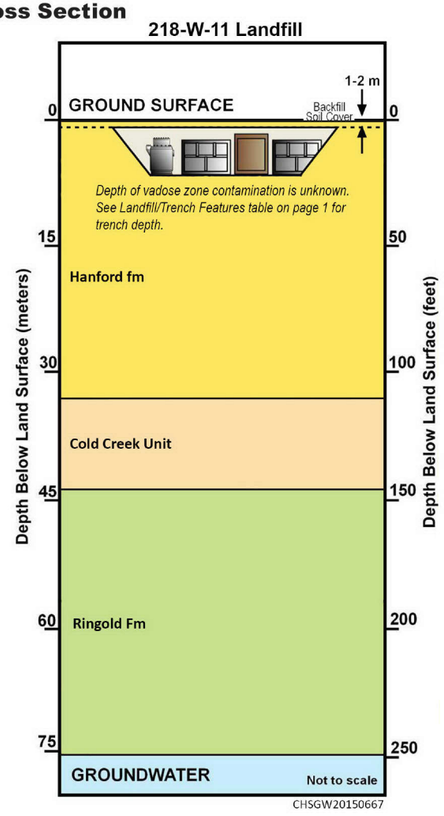
Information from photos and logbooks contradicting literature.

1965 and 1969 aerial photos show an open trench and items stored aboveground in 218-W-11. WIDS and SWITS indicated the burial ground stopped accepting waste in 1960. Some site drawings show one trench in this landfill while others show two. Some literature sources indicate that waste was removed from one of the trenches after burial.

Data Evaluation & Data Gap Summary

Risk Pathway	Current Information Assessment	Data Gap/Needs	Characterization Plan and Rationale
Source	Poor records; however, no indication of mobile constituents from EMFLUX. See Appendix H for discussion on DNAPL behavior. Surface radiation survey – fewer than 10 areas in 218-W-11, 218-W-1 and 218-W-2 with greater than 1500 cps.	Need additional records and information, if possible. Confirm contents. Obtain consistent surface radiation data for all landfills.	Review/reprocess existing geophysics landfill records. Focused and random test pits. Conduct aerial radiation survey.
Release Mechanism	Likeliest release mechanism is erosion/ subsidence leading to direct exposure. No past history of driving force or constituent mobility for downward or upward flow.	Need to understand potential for direct exposure. Need to identify potential of downward flow	Visual inspection/monitoring of surface for erosion and subsidence. Direct Push for leak detection.
Transport Media	Industrial waste with no evidence of soil gas. No transport likely	Need data about fluid flow	Direct push for soil/fluid samples.
Exposure Point	Direct exposure to contents	No data gaps or needs	No plans to investigate the exposure point
Exposure Route	Dermal/ingestion – direct exposure	Need to refine exposure model	To be evaluated during risk assessment. Engineering and ICs to restrict access and exposure
Receptor	Ecological and human receptors.	Need to develop receptor inventory.	To be evaluated during risk assessment.

Cross Section



Unplanned Releases Collocated with or Near 218-W-11 Landfill

None.