Appendix B

Waste Site Supporting Information

This appendix contains and overview of supporting waste site information consisting of historical waste streams from operating facilities, availability of analytical and geophysical data, indications of historical groundwater impacts, and a preliminary screening of remedial technologies.

Contents

Tables

Terms

bgs	below ground surface
COPC	contaminant of potential concern
DNA	data needs assessment
EE/CA	environmental evaluation/cost analysis
ERDF	Environmental Restoration Disposal Facility
ET	evapotranspiration barriers
GHG	greenhouse gas
HEIS	Hanford Environmental Information System
IMUST	Inactive Miscellaneous Underground Storage Tank
ISGR	In Situ Gaseous Reduction
MNA	monitored natural attenuation
N/A	not available
NCP	"National Oil and Hazardous Substances Pollution Contingency Plan"
O&M	operations and maintenance
OU	operable unit
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyl
PFP	Plutonium Finishing Plant
PRTR	Plutonium Recycle Test Reactor
R&D	Research and Development
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation Plant
RI/FS	remedial investigation/feasibility study
RTD	removal, treatment, and disposal
TBP	tributyl phosphate
TRU	transuranic
UNH	uranyl nitrate
WIPP	Waste Isolation Pilot Plant

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Table B-1. T Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)[d]	Receiving Waste Site	Comment
Coating Removal Waste (221-T)	NaOH $NaNO_3$ NaA_lO_2 Na_2SiO_3 $NaNO_2$	4,700 gal per 1.5 metric tons of fuel	Tank Farm	This was an alkaline waste stream.
Metal Dissolution (221-T)	NO_x Xe I_2		To Stack	Released to atmosphere.
Metal Waste (221-T)	UNH (uranyl nitrate hexahydrate) Fission products HNO_3 H_2SO_4 H_3PO_4 $NaNO_3$ NaOH Na_2CO_3	5,700 gal per 1.5 metric tons of fuel	Tank Farm	This waste stream contained most of the residual uranium from the irradiated fuel. This was an acidic waste stream that was made alkaline before transfer to the tank farm.
First Cycle Waste (221-T)	$CaPO_4$ $Zr_3(PO_4)_2$ H_3PO_4 HNO_3 $BiPO_4$ $Fe_2(SO_4)_3$ $Cr(NO_3)_3$ $(NH_4)_2SO_4$ $(NH_4)_2SiF_6$ $NaNO_3$ NH_4NO_3 $Pu(NO_3)_4$ Fission products NaOH	4,700 gal per 1.5 metric tons of fuel	Tank Farm	This acidic waste stream was made alkaline before transfer to the tank farm.

Table B-1. T Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)[d]	Receiving Waste Site	Comment
Second Cycle Waste (221-T)	H_3PO_4 HNO_3 $BiPO_4$ $Fe_2(SO_4)_3$ $Cr(NO_3)_3$ $(NH_4)_2SO_4$ $(NH_4)_2SiF_6$ $NaNO_3$ NH_4NO_3 Fission products NaOH	3,600 gal per 1.5 metric tons of fuel	Tank Farm[a]	This acidic waste stream was made alkaline before transfer to the tank farm. As tank farms became full and tank space for waste was limited, this waste stream was discharged to selected cribs and trenches.
Plutonium Concentration Waste (224-T)	H_3PO_4 HNO_3 LaF_3 $BiPO_4$ KOH $Cr(NO_3)_3$ $NaNO_3$ KNO_3 HF KF $H_2C_2O_4.2H_2O$ $Mn(NO_3)_2$ NH_4NO_3 $Pu(NO_3)_4$ Fission products NaOH	24,000 to 31,000 L/day (6,340 to 8,200 gal/day)	From 1945 to 1946, to 216-T-3 Reverse Well[b] via 241-T-361 Settling Tank. After 1946, to 216-T-6 Crib[b] via 241-T-361 Settling Tank.	This acidic waste stream was made alkaline before transfer to the settling tank and 216-T-6 crib..
Cell Drainage (221-T and 224-T)	Any of the materials in the waste streams above	Not a routine release	Tank Farm or, from 1945 to 1946, to 216-T-3 Reverse Well[b] via 241-T-361 Settling Tank. After 1946, to 216-T-6 Crib[b] via 241-T-361 Settling Tank.	A high-suspended solid waste stream.

Table B-1. T Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)[d]	Receiving Waste Site	Comment
Cooling Water and Steam Condensate	Water	About 26.8 million L (7.1 million gal/day)	216-T-4-1 Pond/Swamp via 207-T Retention Basin, then to 216-T-4-1D ditch; later to 216-T-4-2 Ditch.[c]	This waste stream could become radiologically contaminated during system upset/equipment failure episodes. Waste stream could be held up in retention basis, but there was no diversion capability.
Chemical Sewer Waste (221-T and 224-T)	Any of the nonradioactive materials listed above	Not a routine release	216-T-4-1 Pond/Swamp via 207-T Retention Basin, then to 216-T-4-1D ditch; later to 216-T-4-2 Ditch.[c]	
222-T Process Control Laboratory Waste	Liquid waste containing any of the materials listed above	About 1,000 to 3,000 L/day (260 to 800 gal/day)	To 216-T-2 Reverse Well (1945 to 1950) and later to 216-T-8 Crib (1950 to 1951).	Reverse well estimated to have received 2.6 Ci of fission products and 600 mg of plutonium per month for approximately 60 months; expect similar discharge to crib for approximately 12 months.

a. The waste tank farms (e.g., 241-T, -TX, and –TY) received high-level waste from T Plant; however, they are assigned to RCRA waste management areas and are not further assessed in this 200-WA-1 OU RI/FS.

b. Waste sites 216-T-3 Reverse Well and 216-T-6 Crib are assigned to the 200-DV-1 OU and are not further assessed in this 200-WA-1 OU RI/FS.

c. Waste site 216-T-4-2 Ditch is assigned to the 200-SW-2 OU and is not further assessed in this 200-WA-1 OU RI/FS.

d. Additional information on rates and volumes of discharge can be found in Appendices D and H.

Table B-2. PFP Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)**	Receiving Waste Site	Comment
Plutonium Isolation Process Wastes from 231-Z Building	$La(NO_3)_2$ KNO_3 $(NH_4)_2SO_4$ $(NH_4)_2SO_3$ HNO_3 H_2SO_4 H_2O_2 $NaNO_3$ $KMnO_4$ Fission products $Pu(NO_3)_4$	Variable flow, ranging from 400 L/day to 43,000 L/day (106 gal/day to 11,300 gal/day).	Transferred to 231-W-151 tank for pH adjustment prior to discharge to cribs: • 216-Z-10* (1945) • 216-Z-4 (1945) • 216-Z-5* (1945 to 1947) • 216-Z-6 (1945) • 216-Z-7 (1947 to 1967)	This waste stream was primarily composed of water jet effluent from the process cell vacuum system, and evaporator/condenser overhead condensate streams. The waste stream was acidic and was made alkaline before discharge to cribs. Some of the waste was recycled back to Pu concentration operations at 224-T and 224-B.
Emergency Blower Condensate	Water (steam condensate)	Discharge only when steam-powered blowers were used.	216-Z-13 and 216-Z-14 French drains	
Ventilation Evaporative Cooler Condensate	Water	Discharge when evaporative cooler is in service.	216-Z-15 French drain	
234-5-Z Complex Steam Condensate and Cooling Water	Water		Transferred to 207-Z Retention Basin	This waste stream could become contaminated during upset conditions or equipment failure.
Metallurgy Laboratory Waste Water (231-Z Building)	Water Plutonium		216-Z-16 Crib 216-Z-17 Crib	The 216-Z-16 and 216-Z-17 Cribs received discharge of cooling water that had passed through the glove boxes and hoods within 231-Z Building.

* Waste sites 216-Z-5 Crib and 216-Z-10 Reverse Well are assigned to the 200-PW-6 OU and are not assessed further in this 200-WA-1 OU RI/FS.

** Additional information on rates and volumes of discharge can be found in Appendices D and H.

Table B-3. U Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)[c]	Receiving Waste Site	Comment
Cooling Water and Steam Condensate	Water		216-U-10 Pond via 207-U Retention Basin* and 216-U-14 Ditch. Later, 216-U-16 Crib via 207-U Retention Basin.	This stream could become contaminated during periods of system upset or equipment failure. The 207-U Retention Basin offered hold-up capacity, but no diversion capability.
271-U and 224-U Chemical Sewer	Any of the nonradioactive chemicals used in the tributyl phosphate (TBP) process. This includes: • HNO_3 • NaOH • Na_2SO_4 • $CaCO_3$ • H_2NSO_3H • $Fe(SO_4).(NH_4)_2SO_4.6H_2O$ • TBP • NPH (Kerosene range hydrocarbons)	Not a routine discharge	216-U-10 Pond via 207-U Retention Basin and 216-U-14 Ditch.	
Process Condensate from 221-U, 224-U, and 224-UA	Water HNO_3 $CaCO_3$ F^- NO_3^- PO_4^{-3} Na^+ K^+ TBP NPH (kerosene-range hydrocarbons) Fission products Uranium	Variable, ranged from 1,000 L/day to 132,000 L/day (260 to 35,000 gal/day)	216-U-8 Crib via 270-W Neutralization Tank (1952 to 1960). 216-B-12 Crib[b] via 270-E Neutralization Tank[b] (1952 to 1960). 216-U-12 Crib (1960 to 1988). 216-U-17 Crib via 224-U-CNT (1988 to 1994).	This acidic waste stream was initially pH-adjusted to near neutral by passing through a limestone bed prior to discharge to 216-U-8 and 216-B-12 Cribs. Later, it was discharged in its original acid condition to 216-U-12 Crib. During final years of operation, the stream was again adjusted to near neutral pH before discharge to216-U-17 Crib.

Table B-3. U Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)[c]	Receiving Waste Site	Comment
Solvent Cleanup Waste from 276-U	Water HNO_3 $CaCO_3$ F^- NO_3^- PO_4^{-3} Na^+ K^+ TBP NPH (kerosene-range hydrocarbons) Fission products Uranium	Average discharge 8,000 L/day (2,100 gal/day)	216-U-1 and 216-U-2 Cribs via 241-U-361 Settling Tank. 216-U-15 Trench.	A single release of unrecoverable solvent was made to 216-U-15 Trench.
Laboratory Waste from 222-U	The laboratory streams likely contained any and all process constituents.	Totals of 3.0E+05 L (7.9E+05 gal, 5.45E+05 L (1.44+05 gal), and 3.3+04E+04 L (8.7E+03 gal)	216-U-4 Reverse Well (1947 to 1955). 216-U-4A French Drain (1955 to 1970). 216-U-4B (1960 to 1970).	Relatively low volumes.
221-U Uranium Recovery Cold Start Waste	Uranium recovery process chemicals with unirradiated uranium and no fission products.		216-U-5 Trench and 216-U-6 Trench.	
221-U High Level Uranium Recovery Waste	Uranium recovery process chemicals, bismuth phosphate process chemicals, fission products.		Returned to tank farms via 241-WR Vault through underground pipelines.	The volume of waste returned to the tank farms was approximately equal to the volume of uranium recovery process feed stock initially removed from the tanks.

a. 207-U Retention Basin was demolished in 2010 and is not considered further in this 200-WA-1 RI/FS.

b. 216-B-12 Crib and 207-E Neutralization Tank are assigned to the 200-EA-1 OU and are not further evaluated in this 200-WA-1 OU RI/FS.

c. Additional information on rates and volumes of discharge can be found in Appendices D and H.

Table B-4. REDOX Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)*	Receiving Waste Site	Comment
Cooling Water and Steam Condensate	Water	About 1.9E+06 to 1.1E+07 L/day (5E+05 to 2.9E+06 gal/day)	Initially, 216-S-17 Pond via 207-S Retention Basin. Later, 216-S-5 Crib and 216-S-6 Crib via 207-S Retention Basin. Then to 216-S-16 Ditch and Pond with diversion of off-normal flows to 216-S-6 Crib.	This stream became grossly contaminated during equipment failure on numerous occasions, resulting in contamination of 207-S Retention Basin and 216-S-17 Pond. 207-S Retention Basin offered hold-up capacity, but no diversion capability. When 216-S-5 and -S-6 Cribs were found to be unable to handle the stream flow, S-5 Crib was abandoned. The stream was sent to the new 216-S-16 Ditch and Pond with 216-S-6 Crib maintained for diversion of contaminated water.
202-S Chemical Sewer	Any of the nonradioactive chemicals used in the REDOX process. This includes: • HNO_3 • NaOH • Mn • $NaNO_2$ • $NaNO_3$ • Aluminum Nitrate Nonahydrate (ANN) • Hexone (MIBK) • $NaAlO_2$ • $Na_2Cr_20_7$	Not a routine discharge	216-S-17 Pond via 207-S Retention Basin. Later, 216-S-10 Ditch.	

Table B-4. REDOX Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)*	Receiving Waste Site	Comment
Process Condensate from 202-S	Water HNO_3 NaOH Mn $NaNO_2$ $NaNO_3$ ANN Hexone (MIBK) $NaAlO_2$ Fission products Uranium	About 61,000 L/day (16,000 gal/day)	216-S-1 and -2 Cribs (1952 to 1956). 216-S-7 Crib (1956 to 1965). 216-S-9 Crib (1965 to 1969). 216-S-23 Crib (1969 to 1972).	These cribs were used sequentially to receive process condensate from 202-S Building.
Solvent Cleanup Waste from 276-S	Water HNO_3 NaOH Mn $NaNO_2$ $NaNO_3$ ANN Hexone (MIBK) $NaAlO_2$ Fission products Uranium	About 700 L/day (180 gal/day)	216-S-13 Crib.	Waste generated in batch process from cleanup of solvent phase; about 3,600 gal of waste per 10,000 gal of solvent processed.
Combined High Level Waste	Water HNO_3 NaOH Mn $NaNO_2$ $NaNO_3$ ANN Hexone (MIBK) $NaAlO_2$ Fission products Uranium	39,700 L/day (10,500 gal/day)	241-S Tank Farm. Later to 241-SX and 241-SY Tank Farms.	This waste stream included cladding removal waste, fuel dissolution waste, and separation waste. The waste stream contained an average of 23.6 Ci/gal of combined beta and gamma emitters and 17 g/gal of plutonium.
Laboratory Waste from 222-S and 300 Area	The laboratory streams likely contained any and all process constituents.	18,750 L/day (5,000 gal/day)	216-S-20 Crib via 207-SL Retention Basin.	This waste stream is suspected to be the source of 1,4-Dioxane detected in groundwater downgadient of 216-S-20 Crib.

Table B-4. REDOX Plant Waste Streams and Disposition to Waste Sites in 200 West Area

Waste Stream	Composition	Volume (Rate or Total)*	Receiving Waste Site	Comment
Acid Recovery Waste from 293-S	Acid recovery waste was likely primarily nitric acid in water with some fission products.	About 27 L/day (7 gal/day)	216-S-22 Crib.	
Steam Condensate from 242-T Waste Evaporator	Steam condensate occasionally contaminated by tank waste constituents and fission products.		216-S-25 Crib.	216-S-25 Crib also received groundwater remediation waste water from initial response to uranium contamination in vicinity of 216-U-1 and U-2 Cribs.
Condensate Waste Water from Tank Riser Condensers at 241-S-101 and 241-S-104 Tanks	This stream likely contained water, tritium, some entrained fission products, and other waste constituents.		216-S-3 Crib and 216-S-4 Crib.	
Cold Startup Waste from 222-S	All of the nonradioactive REDOX process chemicals, with unirradiated uranium and no fission products.		216-S-8 Trench (aqueous inorganic startup waste). 216-S-14 Trench (contaminated organic startup waste).	
291-S Stack Flush Wastewater	Fission products, water.		216-S-12 Trench.	This site received a single discharge of wastewater used to flush the REDOX main stack in 1954.
Equipment Decontamination Wastewater	Steam condensate, water, fission products, and REDOX process chemicals.		218-S-18 Pit.	The pit was exhumed in 1972 and subsequently used to bury contaminated surface soil from the vicinity of 241-S Tank Farm.

* Additional information on rates and volumes of discharge can be found in Appendices D and H.

Note: The waste tank farms (e.g., 241-S, -SX, and –SY) received high-level waste from the REDOX plant; however, they are assigned to RCRA waste management areas and are not further assessed in this 200-WA-1 OU RI/FS.

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Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
200-E-14	200-E-14, 216-BC-201 Siphon Tank, 216-B-201, Inactive Miscellaneous Underground Storage Tank (IMUST)	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Underground Storage Tank	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Candidate for RTD[1]	No	Balance of Inner Area 200W
200-W-1	200-W-1, REDOX Mud Pit West	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Drilling Mud	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	REDOX
200-W-101	200-W-101, Contaminated Material West of 216-S-12 Crib	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Contaminated Debris	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	REDOX
200-W-106	200-W-106, Soil Contamination Area Adjacent to 200-W-55	Not defined	S Plant Vicinity	Surface Contamination Site	Shallow Contaminated Soil	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-11	200-W-11, Concrete Foundation South of 241-S, S-Farm Foundation and Dump Site	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Debris	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	Balance of Inner Area 200W
200-W-12	200-W-12, 201-W Soil Mound and Plastic Pipe	Not defined	U Plant Vicinity	Surface Contamination Site	Debris	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-127	200-W-127, Surface Stabilized Area East of UPR-200-W-29/ UPR-200-W-97 (UN-216-W-5)	T Plant Operations	T Plant Vicinity	Surface Contamination Site	Possible Leak from Underground Transfer Line	Liquid Process Waste	No	Candidate for RTD	No	Balance of Inner Area 200W
200-W-128	200-W-128, Underground Radioactive Material Area East of 218-W-4A	Burial Ground Operations	T Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate for RTD	No	2W Landfill 1
200-W-13	200-W-13, 2713-WB Green Hut Complex	Not defined	T Plant Vicinity	Surface Contamination Site	Radiological- and Petroleum-Contaminated Soil	Solid Waste	No	Candidate for RTD	No	Balance of Inner Area 200W
200-W-136	200-W-136, Underground Radioactive Material Area Including 222-U Building Foundation, Demolished 203-U Area and Contaminated Soil	U Plant Operations	U Plant Vicinity	Structures and Foundations	Soil and Foundations Contaminated by Process Solutions	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling ≤4.6 m (15 ft) bgs	U Plant
200-W-14	200-W-14, 200 West Heavy Equipment Storage Area	Not defined	T Plant Vicinity	Surface Contamination Site	Petroleum-Contaminated Soil	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	Balance of Inner Area 200W

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
200-W-15	200-W-15, S Plant Project W-087 Hexone Discovery	S Plant Operations	S Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Hexone Solvent	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling ≤10 m (33 ft) bgs	REDOX
200-W-2	200-W-2, REDOX Berms West	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Disturbed Soil	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	REDOX
200-W-21	200-W-21, 204-T Unloading Station, T Plant Waste Railcar Unloading Facility, Unloading Station 1, and Unloading Station 2	300 Area Operations	T Plant Vicinity	Surface Contamination Site	Consolidated Liquid Waste from 340 Building	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	T Plant
200-W-22	200-W-22, 203-S/204-S/205-S Stabilized Area	S Plant UNH Cleanup	S Plant Vicinity	Structures and Foundations	UNH Solutions, Ion Exchange Regeneration Solutions	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	REDOX
200-W-231	200-W-231, Temporary Facilities Construction Trailer Septic Tank and Tile Field	241-TY Tank Farm Construction	T Plant Vicinity	Septic Tank and Drain Field	Sanitary Waste and Possible X-ray Film Development Chemicals	Sanitary Wastewater	No	Candidate for RTD	No	Balance of Inner Area 200W
200-W-42	200-W-42, U Plant Radioactive Process Sewer from 221-U to 216-U-8 and 216-U-12 Cribs, 200-W-42-PL	U Plant Operations	U Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Process Condensate from 224-U and 221-U	Liquid Process Waste	No	Adequate Characterization –RTD completed under TCRA (still need regulators to agree on soil cleanup values using the graded approach)	No	U Plant
200-W-53	200-W-53, UPR-200-W-166, UN-216-W-31	241-T Tank Farm Operations	S Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	Balance of Inner Area 200W
200-W-54	200-W-54, Contamination Migration from 241-SX Tank Farm	241-SX Tank Farm	S Plant Vicinity	Surface Contamination Site	Animal Feces, Contaminated Specks, Contaminated Plants	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-6	200-W-6, 200-W Painter Shop Paint Solvent Disposal Area	200-West Operations	T Plant Vicinity	Surface Contamination Site	Paint Solvent Contaminated Soil	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-63	200-W-63, Contaminated Concrete Pad	Not defined	T Plant Vicinity	Structures and Foundations	Contaminated Concrete Slab	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-67	200-W-67, Contaminated Soil at the Corner of Cooper and 16th Street	241-U Tank Farm Operations	U Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
200-W-71	200-W-71, Undocumented Trench, Undocumented Burn Pit	Not defined	U Plant Vicinity	Surface Contamination Site	Burned Debris	Solid Waste	No	Adequate Characterization[3]	No	U Plant
200-W-75	200-W-75, Radiological Logging System (RLS) Calibration Silos	S Plant Operations	S Plant Vicinity	Underground Storage Tank	Sealed Radioactive Sources in Soil-Filled Tank	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	REDOX
200-W-77	200-W-77, Posted Contamination Area East of 216-U-14 Ditch	Not defined	U Plant Vicinity	Surface Contamination Site	Contaminated Specks and Tumbleweeds	Airborne Particulate Deposition	No	Candidate for RTD	No	U Plant
200-W-80	200-W-80, Stabilized Contaminated Soil Area Southwest of T Plant, Mound of Contaminated Soil Southwest of T Plant	Not defined	T Plant Vicinity	Surface Contamination Site	Debris	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	T Plant
200-W-81	200-W-81, Contaminated Tumbleweed Fragments along Railroad Track East of 218-W-3AE	Burial Ground Operations	T Plant Vicinity	Surface Contamination Site	Contaminated Soil and Tumbleweeds	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	2W Landfill 1
200-W-82	200-W-82; Risers East of 216-TY-201 and 216-T-26, 216-T-27, and 216-T-28 Cribs; Crib Unloading Station	300 Area Operations	T Plant Vicinity	Structures and Foundations	Concrete and Pipe Risers Contaminated with Liquid Waste from 340 Building	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-83	200-W-83, Contamination Area North of 2727W	Not defined	U Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate For RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-85	200-W-85, Soil Contamination Area East of 2727 W	Not defined	U Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
200-W-86	200-W-86, Contamination Area Around Light Pole	Not defined	U Plant Vicinity	Surface Contamination Site	Contaminated Soil	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	U Plant
200-W-87	200-W-87, Unplanned Release on Chemical Spur Railroad Track Northwest of 221-U Plant	Not defined	U Plant Vicinity	Surface Contamination Site	No Documented Release, Site is Erroneous	Solid Waste	No	Adequate Characterization	No	U Plant
200-W-89	200-W-89, 252-U, U Plant Electrical Substation, C8S17 Substation, U-Cat Substation	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Contaminated Specks on Equipment that No Longer Exists	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
200-W-9	200-W-9, Project W291 Excavation VCP Contamination	T Plant Operations	T Plant Vicinity	Cribs, Trenches and Pipe Leaks	Leaking Process Sewer Contaminated Soil	Liquid Process Waste	No	Candidate for RTD[3]	No	T Plant

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
200-W-90	200-W-90, Underground Radioactive Material Areas Posted Along 23rd Street in 200 West Area	241-U Tank Farm Operations	U Plant Vicinity	Surface Contamination Site	High-Level Tank Waste	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
200-W-92	200-W-92, Contaminated Mound of Soil and Debris, Soil Mound West of 241-TY Tank Farm	Not defined	T Plant Vicinity	Surface Contamination Site	Debris and Contaminated Soil	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	Balance of Inner Area 200W
207-S	207-S, REDOX Retention Basin, 207-S Retention Basin	S Plant Operations	S Plant Vicinity	Retention Basin	Cooling Water/Steam Condensate	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	No	REDOX
207-T	207-T, T Plant Retention Basin, 207-T Retention Basin	T Plant Operations	T Plant Vicinity	Retention Basin	Cooling Water/Steam Condensate/Chemical Sewer	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	No	Balance of Inner Area 200W
207-Z	207-Z, 207-Z Retention Basin, 241-Z Retention Basin, 241-ZRB, 241-Z-RB	Plutonium Finishing Plant Operations	Z Plant Vicinity	Retention Basin	Cooling Water/Steam Condensate	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	No	PFP
216-B-14	216-B-14, 216-BC-1 Crib	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Process Waste Crib	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Adequate Characterization	No	Balance of Inner Area 200W
216-B-15	216-B-15, 216-BC-2 Crib	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Process Waste Crib	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-14	No	Balance of Inner Area 200W
216-B-16	216-B-16, 216-BC-3 Crib	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Process Waste Crib	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-14	No	Balance of Inner Area 200W
216-B-17	216-B-17, 216-BC-4 Crib	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Process Waste Crib	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-14	No	Balance of Inner Area 200W
216-B-18	216-B-18, 216-BC-5 Crib	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Process Waste Crib	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-14	No	Balance of Inner Area 200W
216-B-19	216-B-19, 216-BC-6 Crib	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Process Waste Crib	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-14	No	Balance of Inner Area 200W
216-B-20	216-B-20, 216-BC-7 Trench, 216-B-20 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-21	216-B-21, 216-BC-8 Trench, 216-B-21 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-22	216-B-22, 216-BC-9 Trench, 216-B-22 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-23	216-B-23, 216-BC-10 Trench, 216-B-23 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-24	216-B-24, 216-BC-11 Trench,	High-Level Tank	BC Cribs and	Cribs, Trenches, and	Scavenged Tank Waste	Liquid	No	Comparable to 216-B-26	No	Balance of Inner

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
	216-B-24 Trench	Waste Scavenging	Trenches	Pipe Leaks	Supernatant	Process Waste				Area 200W
216-B-25	216-B-25, 216-BC-12 Trench, 216-B-25 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-26	216-B-26, 216-BC-13 Trench, 216-B-26 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Adequate Characterization	No	Balance of Inner Area 200W
216-B-27	216-B-27, 216-BC-14 Trench, 216-B-27 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-28	216-B-28, 216-BC-15 Trench, 216-B-28 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-29	216-B-29, 216-BC-16 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-30	216-B-30, 216-BC-17 Trench, 216-B-30 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-31	216-B-31, 216-BC-18 Trench, 216-B-31 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-32	216-B-32, 216-BC-19 Trench, 216-B-32 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-33	216-B-33, 216-BC-20 Trench, 216-B-33 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-34	216-B-34, 216-BC-21 Trench	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-52	216-B-52, 216-B-52 Trench, 216-BC-22	High-Level Tank Waste Scavenging	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Scavenged Tank Waste Supernatant	Liquid Process Waste	No	Comparable to 216-B-26	No	Balance of Inner Area 200W
216-B-53A	216-B-53A, 216-B-53A Trench, PRTR Trench	300 Area Laboratory, R&D	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Accumulated Waste from 304 Building	Liquid Process Waste	No	Adequate Characterization	No	Balance of Inner Area 200W
216-B-53B	216-B-53B, 216-B-53 Trench, 216-B-53B Trench	300 Area Reactor Operations	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	PRTR Decontamination Solution	Liquid Process Waste	No	Comparable to 216-B-53A	No	Balance of Inner Area 200W
216-B-54	216-B-54, 216-B-54 Trench	300 Area Laboratory, R&D	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Accumulated Waste from 304 Building	Liquid Process Waste	No	Comparable to 216-B-58	No	Balance of Inner Area 200W
216-B-58	216-B-58, 216-B-58 Trench, 216-B-59 Crib	300 Area Laboratory, R&D	BC Cribs and Trenches	Cribs, Trenches, and Pipe Leaks	Accumulated Waste from 304 Building	Liquid Process Waste	No	Adequate Characterization	No	Balance of Inner Area 200W
216-S-1&2	216-S-1&2, 216-S-5 Crib, 216-S-1&2	S Plant Operations	S Plant Vicinity	Process Waste Crib	Process Condensate and Cell Drainage	Liquid Process Waste	Yes	Planned Characterization Not Completed	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	REDOX

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
216-S-12	216-S-12, UPR-200-W-30, 291-S Stack Wash Sump, REDOX Stack Flush Trench	S Plant Operations	S Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Exhaust Stack Flush Water	Process Waste Water	Yes	Site Not Characterized	Soil Sampling ≤33 m (100 ft) bgs	REDOX
216-S-14	216-S-14, Buried Contaminated Hexone, Cold Organic Trench or Grave, 216-S-4 Burial Contaminated Hexone	S Plant Operations	S Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Spent Hexone Solvent	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling ≤33 m (100 ft) bgs	REDOX
216-S-18	216-S-18, 241-SX Steam Cleaning Pit, 216-S-14 Steam Cleaning Pit	S Plant Operations	S Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Vehicle Decontamination Water	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	Balance of Inner Area 200W
216-S-20	216-S-20, 216-SL-1&2 Crib, 216-SL-2	222-S Laboratory Operation and 300 Area	S Plant Vicinity	Process Waste Crib	Liquid Waste from Analytical Laboratory	Liquid Process Waste	No	Adequate Characterization	No	REDOX
216-S-22	216-S-22, 216-S-22 Crib	293-S Building Acid Recovery	S Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Liquid Waste from Recovered Nitric Acid and Sodium Hydroxide	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	REDOX
216-S-23	216-S-23 Crib	S Plant Operations	S Plant Vicinity	Process Waste Crib	Process Condensate and Cell Drainage	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	REDOX
216-S-25	216-S-25 Crib	S Plant Operations	S Plant Vicinity	Process Waste Crib	Process Condensate and Effluent	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	REDOX
216-S-3	216-S-3, 216-S-5, 216-S-3 Crib		S Plant Vicinity	Cribs, Trenches, and Pipe Leaks			Yes	Site Not Characterized	Soil Sampling ≤33 m (100 ft) bgs	Balance of Inner Area 200W
216-S-4	216-S-4, 216-S-7, 216-S-4 Sump or Crib, UN-216-W-1	241-S Tank Farm Tank Vapor Condensation	S Plant Vicinity	Injection Wells and French Drains	Tank Farm Vapor Condensate	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	Outside Current Inner Area Boundary
216-S-5	216-S-5, 216-S-5 Cavern #1, 216-S-6 Crib, 216-S-9 (See Subsites)	S Plant Operations	S Plant Vicinity	Cooling Water/Steam Condensate/Chemical Sewer, Cribs, and Ditches	Contaminated Cooling Water and Steam Condensate	Process Waste Water	Conditional	Comparable to 216-S-6	Comparable to 216-S-6	Balance of Inner Area 200W
216-S-6	216-S-6, 216-S-6 Cavern #2, 216-S-5 Crib, 216-S-13 Crib	S Plant Operations	S Plant Vicinity	Cooling Water/Steam Condensate/Chemical Sewer, Cribs, and Ditches	Contaminated Cooling Water and Steam Condensate	Process Waste Water	Yes	Previous Characterization Not Complete	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	Balance of Inner Area 200W

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
216-S-7	216-S-7, 216-S-7 Crib, 216-S-15	S Plant Operations	S Plant Vicinity	Process Waste Crib	Process Condensate and Cell Drainage	Liquid Process Waste	No	Adequate Characterization	No	REDOX
216-S-8	216-S-8, Cold Aqueous Trench, Cold Aqueous Crib, 216-S-3, Unirradiated Uranium Waste Trench, Cold Aqueous Grave	S Plant Operations	S Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Start-up Waste, Unirradiated Uranium	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	REDOX
216-SX-2	216-SX-2, 216-SX-2 Crib	241-SX Tank Farm Operations	S Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Air Compressor Condensate/Blow Down	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA	No	Balance of Inner Area 200W
216-T-10	216-T-10, Decontamination Trenches, Equipment Decontamination Area	Equipment Decontamination	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Vehicle Decontamination Water	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	T Plant
216-T-11	216-T-11, Decontamination Trenches, Equipment Decontamination Area	Equipment Decontamination	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Vehicle Decontamination Water	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	T Plant
216-T-12	216-T-12, 207-T Sludge Grave, 207-T Sludge Pit, 216-T-11	T Plant Operations	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Sludge from Bottom of 207-T Retention Basin	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	No	Balance of Inner Area 200W
216-T-13	216-T-13, 269-W Regulated Garage, 269-W Decontamination Pit or Trench, 216-T-12, 269-W Regulated Garage Decontamination Pit	Equipment Decontamination	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Vehicle Decontamination Water	Process Waste Water	No	Candidate for RTD[3]	No	Balance of Inner Area 200W
216-T-2	216-T-2, 222-T-110 Dry Well, 222-T Reverse Well	222-T Process Control Laboratory	T Plant Vicinity	Injection Wells and French Drains	Analytical Laboratory Waste	Liquid Process Waste	No	Candidate for RTD[3]	No	T Plant
216-T-20	216-T-20, 216-TX-2, 216-T-20 Crib, 241-TX-155 Contaminated Acid Grave	Uranium Recovery Operations	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Contaminated 60% Nitric Acid	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA[3]	No	Balance of Inner Area 200W
216-T-27	216-T-27, 216-TY-2 Cavern, 216-TY-2 Crib, 216-TX-2 Cavern, 216-TX-2 Crib	300 Area Operations	T Plant Vicinity	Process Waste Crib	Consolidated Liquid Waste from 340 Building	Liquid Process Waste	No	Comparable to 216-T-28	No	Balance of Inner Area 200W
216-T-28	216-T-28, 216-TY-3 Cavern, 216-TY-3 Crib, 216-TX-3 Cavern, 216-TX-3 Crib	300 Area Operations	T Plant Vicinity	Process Waste Crib	Consolidated Liquid Waste from 340 Building	Liquid Process Waste	No	Adequate Characterization	No	Balance of Inner Area 200W
216-T-29	216-T-29, 291-T Sand Filter Sewer, 216-T-29 French Drain	T Plant Operations	T Plant Vicinity	Injection Wells and French Drains	221-T Ventilation System Condensate	Liquid Process Waste	No	Candidate for RTD[3]	No	T Plant
216-T-31	216-T-31, 216-T-31 French Drain	241-TX Tank Farm Operations	T Plant Vicinity	Injection Wells and French Drains	Contaminated Steam Condensate	Process Waste Water	No	Candidate for RTD[3]	Site was Previously Exhumed	Balance of Inner Area 200W

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
216-T-33	216-T-33, 216-T-33 Crib	2706-T Equipment Decontamination	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Vehicle Decontamination Water	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	No	T Plant
216-T-34	216-T-34, 216-T-34 Crib	300 Area Operations	T Plant Vicinity	Process Waste Crib	Consolidated Liquid Waste from 340 Building	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	T Plant
216-T-35	216-T-35, 216-T-35 Crib	300 Area Operations	T Plant Vicinity	Process Waste Crib	Consolidated Liquid Waste from 340 Building	Liquid Process Waste	Conditional	Comparable to 216-T-34	Comparable to 216-T-34	T Plant
216-T-36	216-T-36 Crib	T Plant/U Plant/ 2706-T Operations	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Decontamination Solutions from T Plant/ U Plant/2706-T	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	Balance of Inner Area 200W
216-T-4-1D	216-T-4-1D, 216-T-4 Ditch, 216-T-4 Swamp	T Plant Operations/242-T Evaporator	T Plant Vicinity	Cooling Water/Steam Condensate/Chemical Sewer, Cribs, and Ditches	Cooling Water/Steam Condensate/Chemical Sewer	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	No	Balance of Inner Area 200W
216-T-8	216-T-8, 222-T-1&2 Cribs	222-T Process Control Laboratory	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Analytical Laboratory Waste	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	T Plant
216-T-9	216-T-9, Decontamination Trenches, Equipment Decontamination Area	Equipment Decontamination	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Vehicle Decontamination Water	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	T Plant
216-U-1&2	216-U-1&2, 361-WR (Crib 2), 216-U-3, 216-UR #1&2 Cribs, 216-U-1&2, 216-U-1, 216-U-2	U Plant Operations	U Plant Vicinity	Process Waste Crib	Solvent Cleanup Waste from 221-U	Liquid Process Waste	Conditional	Comparable to 216-U-8 and/or 216-U-12	Comparable to 216-U-8 and/or 216-U-12	U Plant
216-U-12	216-U-12, 216-U-12 Crib	U Plant Operations	U Plant Vicinity	Process Waste Crib	Acidic Process Condensate from 224-U	Liquid Process Waste	Yes	Previous Characterization Not Complete	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	U Plant
216-U-13	216-U-13, 216-U-13 Cribs, 216-U-13, Vehicle Steam Cleaning Pit	U Plant Operations	U Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Vehicle Decontamination Water	Process Waste Water	No	Candidate for RTD[3]	No	Balance of Inner Area 200W
216-U-14	216-U-14, 216-U-14 Ditch, Laundry Ditch	U Plant Operations	U Plant Vicinity	Cooling Water/Steam Condensate/Chemical Sewer, Cribs, and Ditches	Cooling Water/Steam Condensate/Chemical Sewer	Process Waste Water	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	No	Balance of Inner Area 200W
216-U-15	216-U-15, UN-216-W-10, 388-U Tank Dumping, UPR-200-W-125, UN-200-W-158, U-152 Interface Crud Burial	U Plant Operations	U Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Contaminated Off-Spec TBP/Kerosene Solvent	Liquid Process Waste	Yes	Previous Characterization Not Complete	Soil Sampling ≤4.6M (15ft) bgs	U Plant

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
216-U-16	216-U-16, UO3 Crib	U Plant Operations	U Plant Vicinity	Cooling Water/Steam Condensate/Chemical Sewer, Cribs, and Ditches	Cooling Water/Steam Condensate/Chemical Sewer	Process Waste Water	No	Adequate Characterization	No	U Plant
216-U-17	216-U-17, 216-U-17 Crib	U Plant Operations	U Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Neutralized Process Condensate from 224-U	Liquid Process Waste	No	Adequate Characterization	No	U Plant
216-U-3	216-U-3, 216-U-11, 216-U-3 French Drain	241-U Tank Farm Operations	U Plant Vicinity	Injection Wells and French Drains	Tank Farm Vapor Condensate	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA[3]	EE/CA Recommended Confirmatory Sampling	Balance of Inner Area 200W
216-U-4	216-U-4, 222-U Dry Well, 222-U-110 Dry Well, 216-U-2, 216-U-4 Dry Well	222-U Process Control Laboratory	U Plant Vicinity	Injection Wells and French Drains	Analytical Laboratory Waste	Liquid Process Waste	No	Adequate Characterization	No	U Plant
216-U-4A	216-U-4A, 216-U-4 Reverse Well Replacement French Drain, 216-U-4 Dry Well	222-U Process Control Laboratory	U Plant Vicinity	Injection Wells and French Drains	Analytical Laboratory Waste	Liquid Process Waste	No	Adequate Characterization	No	U Plant
216-U-4B	216-U-4B, 216-U-4B Dry Well, 216-U-4B French Drain	222-U Process Control Laboratory	U Plant Vicinity	Injection Wells and French Drains	Analytical Laboratory Waste	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
216-U-5	216-U-5, 216-U-4, 221-U Cold U Trench #2	U Plant Startup	U Plant Vicinity	Process Waste Crib	TBP Process Cold Start-up with Unirradiated Uranium	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
216-U-6	216-U-6, U Facility Unirradiated Uranium Waste Trench, 221-U Cold U Trench, 216-U Cold U Trench #1, 216-U-5, 221-U Cold U Grave #1	U Plant Startup	U Plant Vicinity	Process Waste Crib	TBP Process Cold Start-up with Unirradiated Uranium	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
216-U-7	216-U-7, 221-U Counting Box French Drain, 221-U Vessel Vent Blower Pit French Drain	U Plant Operations	U Plant Vicinity	Injection Wells and French Drains	Acidic Process Condensate	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling ≤4.6M (15ft) bgs	U Plant
216-U-8	216-U-8, 216-WR-1,2,3 Cribs, 216-U-9	U Plant Operations	U Plant Vicinity	Process Waste Crib	Neutralized Process Condensate from 224-U and 221-U	Liquid Process Waste	Yes	Previous Characterization Not Complete[4]	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	U Plant
216-Z-16	216-Z-16 Crib	231-Z Metallurgical Lab Operations	Z Plant Vicinity	Process Waste Crib	Plutonium-Contaminated Wastewater	Liquid Process Waste	Yes	Site Not Characterized	Soil Sampling to Groundwater ≈75 m (246 ft) bgs	PFP
216-Z-17	216-Z-17, 216-Z-17 Ditch	231-Z Metallurgical Lab Operations	Z Plant Vicinity	Process Waste Crib	Plutonium-Contaminated Wastewater	Liquid Process Waste	Conditional	Comparable to 216-Z-16	Comparable to 216-Z-16	PFP

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
216-Z-4	216-Z-4, 231-W-3 Pit, 231-W-3 Sump, 231-W-3 Crib, 216-Z-3, 216-Z-4 Crib	231-Z Plutonium Isolation Operations	Z Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Neutralized Evaporator Condensate and Vacuum Jet Water	Liquid Process Waste	Conditional	Comparable to 216-Z-7	Comparable to 216-Z-7	PFP
216-Z-6	216-Z-6, 231-W-4 Crib, 231-Z-6, 216-W-4, 231-W Crib, 216-Z-4, 216-Z-6 & 6A Crib	231-Z Plutonium Isolation Operations	Z Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Neutralized Evaporator Condensate and Vacuum Jet Water	Liquid Process Waste	Conditional	Comparable to 216-Z-7	Comparable to 216-Z-7	PFP
216-Z-7	216-Z-7, 231-W Crib, 231-W Trench, 216-Z-6	231-Z Plutonium Isolation Operations	Z Plant Vicinity	Process Waste Crib	Neutralized Evaporator Condensate and Vacuum Jet Water	Liquid Process Waste	Yes	Planned Characterization Not Completed	Geophysical Logging of Existing Wells	PFP
218-W-8	218-W-8, 222-T Vault	222-T Process Control Laboratory	T Plant Vicinity	Underground Storage Tank	Radioactive Solid and Containerized Liquid Wastes	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA[1]	No	T Plant
218-W-9	218-W-9, Dry Waste Burial Ground No. 9, Non-TRU Dry Waste No. 009	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Shallow Debris and Process Condensate from Crib Pipeline Leak	Solid Waste	No	Candidate for RTD	EE/CA Recommended Confirmatory Sampling	REDOX
231-W-151	231-W-151, 231-W-151 Vault, 231-W-151-001 (Tank), 231-W-151-002 (Tank), 231-W-151 Sump, 231-Z-151 Sump, IMUST, Inactive Miscellaneous Underground Storage Tank (See Subsites)	231-Z Plutonium Isolation Operations	Z Plant Vicinity	Underground Storage Tank	Acidic Evaporator Condensate and Vacuum Jet Water	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	PFP
241-T-361	241-T-361, 241-T-361 Settling Tank, 361-T-TANK, IMUST, Inactive Miscellaneous Underground Storage Tank	T Plant Operations	T Plant Vicinity	Underground Storage Tank	Precipitated Radioactive Process Waste Solids	Solid Waste	No	Candidate for RTD[3]	No	T Plant
241-U-361	241-U-361, 241-U-361 Settling Tank, 361-U-TANK, IMUST, Inactive Miscellaneous Underground Storage Tank	U Plant Operations	U Plant Vicinity	Underground Storage Tank	Precipitated Radioactive Process Waste Solids	Solid Waste	No	Adequate Characterization	No	U Plant
2607-W8	2607-W8	231-Z Building Operations	Z Plant Vicinity	Septic Tank and Drain Field	Sanitary Waste	Sanitary Wastewater	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	PFP
270-W	270-W, 270-W Tank, 270-W Neutralization Tank, IMUST, Inactive Miscellaneous Underground Storage Tank	U Plant Operations	U Plant Vicinity	Underground Storage Tank	Acidic Process Condensate from 224-U	Liquid Process Waste	No	Candidate for RTD[1]	No	U Plant

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
600-70	600-70, Solid Waste Management Unit (SWMU) #2—Miscellaneous Solid Waste	S Plant Construction	S Plant Vicinity	Surface Contamination Site	Shallow Debris	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	ERDF
UPR-200-W-101	UPR-200-W-101, UN-216-W-9, 221-U Acid Spill R-1 through R-9, UN-200-W-101	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Recovered Nitric Acid	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	U Plant
UPR-200-W-103	UPR-200-W-103, 216-Z-18 Line Break, UN-216-W-13, UN-200-W-103, Pipe Line Leak	236-Z Building Operations	Z Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Process Waste Bound for 216-Z-18 Crib	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA	No	PFP
UPR-200-W-111	UPR-200-W-111, Sludge Trench at 207-U, UN-216-W-21	U Plant Operations	U Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Sludge from Bottom of 207-U Retention Basin	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA	No	Balance of Inner Area 200W
UPR-200-W-112	UPR-200-W-112, Sludge Trench at 207-U, UN-216-W-22	U Plant Operations	U Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Sludge from Bottom of 207-U Retention Basin	Solid Waste	No	Candidate for RTD—Evaluated under 200-MG-2 EE/CA	No	Balance of Inner Area 200W
UPR-200-W-116	UPR-200-W-116, UN-216-W-26, Ground Contamination North of 202-S, UN-200-W-116	203-S UNH Operations	S Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	REDOX
UPR-200-W-117	UPR-200-W-117, Railroad Track Contamination, 221-U Railroad Cut Contamination, UN-216-W-27, UN-200-W-117	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Process Chemicals/ Fission Products	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
UPR-200-W-118	UPR-200-W-118, Contamination at 211-U, UN-216-W-28, UN-200-W-118	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Recovered Nitric Acid	Liquid Process Waste	No	Adequate Characterization	No	U Plant
UPR-200-W-138	UPR-200-W-138, 221-U Vessel Vent Blower Pit French Drain, UN-216-W-11, UN-200-W-138, UN-200-W-22, UPR-200-W-22	U Plant Operations	U Plant Vicinity	Surface Contamination Site	No Release to the Environment	Liquid Process Waste	No	Candidate for RTD	No	U Plant
UPR-200-W-14	UPR-200-W-14, Waste Line Leak at 242-T Evaporator, UN-200-W-14	242-T Evaporator Operations	T Plant Vicinity	Cribs, Trenches, and Pipe Leaks	Contaminated Steam Condensate	Process Waste Water	No	Candidate for RTD[3]	No	Balance of Inner Area 200W
UPR-200-W-162	UPR-200-W-162, Contaminated Area on East Side of 221-U, UN-216-W-37	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate for RTD	No	U Plant
UPR-200-W-166	UPR-200-W-166, Contamination Migration from 241-T Tank Farm, UN-216-W-31	241-T Tank Farm Operations	S Plant Vicinity	Surface Contamination Site	Contaminated Soil and Tumbleweeds	Airborne Particulate Deposition	No	Candidate for RTD	No	Balance of Inner Area 200W

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
UPR-200-W-19	UPR-200-W-19, 241-U-361 Overflow, UN-200-W-19	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Solvent Cleanup Waste from 221-U	Liquid Process Waste	No	Adequate Characterization	No	U Plant
UPR-200-W-20	UPR-200-W-20, UN-200-W-20, Spread of Contamination from a Diversion Box		S Plant Vicinity	Surface Contamination Site			No	Candidate for RTD[3]	No	Balance of Inner Area 200W
UPR-200-W-3	UPR-200-W-3, Railroad Contamination, UN-200-W-3	T Plant Operations	T Plant Vicinity	Surface Contamination Site	Nonspecified Waste	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	T Plant
UPR-200-W-33	UPR-200-W-33, Ground Contamination at 224-U, UN-200-W-33	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Acidic Process Condensate from 224-U	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
UPR-200-W-36	UPR-200-W-36, Groundwater Contamination at 216-S-1&2	S Plant Operations	S Plant Vicinity	Effluent from 216-S-1&2 Cribs Discharged to Groundwater through Failed Well Casing	Process Condensate and Cell Drainage	Liquid Process Waste	Conditional	Comparable/Contiguous with 216-S-1&2	No	REDOX
UPR-200-W-39	UPR-200-W-39, UN-200-W-39, 224-U Buried Contamination Trench	U Plant Operations	U Plant Vicinity	Surface Contamination Site	UNH Solution from 224-U	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	U Plant
UPR-200-W-4	UPR-200-W-4, Railroad Contamination, UN-200-W-4	T Plant Operations	T Plant Vicinity	Surface Contamination Site	Nonspecified Waste—Speck Contamination along Railroad Track	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	T Plant
UPR-200-W-41	UPR-200-W-41, Railroad Contamination, UN-200-W-41, REDOX Railroad Cut Contamination	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Drips and Leaks from Containers on Train cars	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	REDOX
UPR-200-W-46	UPR-200-W-46, Contaminated Railroad Track, H-2 Centrifuge Burial, UN-200-W-46	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Drips and Leaks from Containers on Train Cars	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	REDOX
UPR-200-W-51	UPR-200-W-51, Release from 241-S Diversion Box, UN-200-W-51, UPR-200-W-52	S Plant Operations	S Plant Vicinity	Surface Contamination Site	Contaminated Specks	Airborne Particulate Deposition	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	S-SX Farm
UPR-200-W-60	UPR-200-W-60, Railroad Contamination, UN-200-W-60	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Contaminated Shielding Water	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-UW-1 FS/PP	No	U Plant
UPR-200-W-63	UPR-200-W-63, Road Contamination along the South Shoulder of 23rd Street, UN-200-W-63	241-TX Tank Farm Operations	T Plant Vicinity	Surface Contamination Site	Waste Dripped from Diversion Box Jumper	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	Balance of Inner Area 200W

Table B-5. 200-WA-1/200-BC-1 RI Work Plan Waste Sites

Site Code	Site Name	Associated Plant Operations	DNA Geographic/ Operational Unit	Waste Site Type	Waste	Primary Source Types	Outstanding Data Need?	Decision Basis (preliminary for RI/FS data need purposes)[2]	Data Need	Geographic Closure Zone
UPR-200-W-65	UPR-200-W-65, Contamination in the T-Plant Railroad Cut, UN-200-W-65	T Plant Operations	T Plant Vicinity	Surface Contamination Site	Nonspecified Waste—Speck Contamination along Railroad Track	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	T Plant
UPR-200-W-67	UPR-200-W-67, Contamination Near 2706-T, UN-200-W-67	2706 T Operations	T Plant Vicinity	Surface Contamination Site	Nonspecified Waste Dripped from Equipment	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	T Plant
UPR-200-W-71	UPR-200-W-71, UN-200-W-71, Contamination Spread from 16th Street to Dayton Avenue	241-U Tank Farm Operations	U Plant Vicinity	Surface Contamination Site	High-Level Tank Waste	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	EE/CA Recommended Confirmatory Sampling	2W Landfill 1
UPR-200-W-73	UPR-200-W-73, Contaminated Railroad Track at 221-T, UN-200-W-73	T Plant Operations	T Plant Vicinity	Surface Contamination Site	Nonspecified Waste—Speck Contamination along Railroad Track	Liquid Process Waste	No	Candidate for RTD—Evaluated under 200-MG-1 EE/CA	No	T Plant
UPR-200-W-76	UPR-200-W-76, UN-200-W-76, Contamination Found at 241-TX-155	TX Tank Farm Operations	T Plant Vicinity	Surface Contamination Site	Tank Waste—Contaminated Soil and Rabbit Droppings	Liquid Process Waste	No	Candidate for RTD	No	Balance of Inner Area 200W
UPR-200-W-78	UPR-200-W-78, UO3 Powder Spill at 224-U, UN-200-W-78	U Plant Operations	U Plant Vicinity	Surface Contamination Site	Uranium Trioxide Powder	Liquid Process Waste	No	Adequate Characterization	No	U Plant
UPR-200-W-82	UPR-200-W-82, UN-200-W-82, Contamination Spread at 240-S-151		S Plant Vicinity	Surface Contamination Site			No	Candidate for RTD	No	REDOX
UPR-200-W-99	UPR-200-W-99, UN-216-W-7, 241-153-TX Diversion Box Contamination Spread, UN-200-W-99	241-TX Tank Farm Operations	S Plant Vicinity	Surface Contamination Site	Contaminated Soil	Airborne Particulate Deposition	No	Candidate for RTD	No	Balance of Inner Area 200W

Sources:

DOE/RL-2003-23, *Focused Feasibility Study for the 200-UW-1 Operable Unit*.

DOE/RL-2008-44, *Engineering Evaluation/Cost Analysis for the 200-MG-1 Operable Unit Waste Sites.*

DOE/RL-2008-45, *Engineering Evaluation/Cost Analysis for the 200-MG-2 Operable Unit Waste Sites*.

1. Underground Storage Tank.
2. Table B-6 provides additional types of characterization data (e.g., groundwater, soil, and geophysical logging) to support the decision basis.
3. May require additional evaluation in RI/FS.
4. Surface geophysics (HRR) and shallow boreholes have been completed for this crib. An approved SAP exists for two deep boreholes that will be approximately 75 m bgs (approximately 15-20 ft into unconfined aquifer) for this crib and one proposed for the 216-U-12 crib to be completed during the RI/FS stage.

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Table B-6. Summary of 200-WA-1/200-BC-1 OU Waste Sites with Direct Analytical Data and/or Site-Specific Geophysical Survey Data*

Site	Site Type	Soil	Geophysical Logging	Groundwater	Other
Geographical Area: 200-BC-1 OU (200 BC Cribs and Trenches)					
216-B-14	High-Volume Waste Crib	X	X	X	
216-B-15	High-Volume Waste Crib		X	X	
216-B-16	High-Volume Waste Crib		X	X	
216-B-17	High-Volume Waste Crib	X	X	X	
216-B-18	High-Volume Waste Crib		X	X	
216-B-19	High-Volume Waste Crib	X	X	X	
216-B-20	Medium-Volume Waste Trench		X	X	
216-B-21	Medium-Volume Waste Trench		X	X	
216-B-22	Medium-Volume Waste Trench		X	X	
216-B-23	Medium-Volume Waste Trench		X	X	
216-B-24	Medium-Volume Waste Trench		X	X	
216-B-25	Medium-Volume Waste Trench		X	X	
216-B-26	Medium-Volume Waste Trench	X	X	X	
216-B-27	Medium-Volume Waste Trench		X		
216-B-28	Medium-Volume Waste Trench		X	X	
216-B-29	Medium-Volume Waste Trench		X	X	
216-B-30	Medium-Volume Waste Trench		X		
216-B-31	Medium-Volume Waste		X	X	

Table B-6. Summary of 200-WA-1/200-BC-1 OU Waste Sites with Direct Analytical Data and/or Site-Specific Geophysical Survey Data*

Site	Site Type	Soil	Geophysical Logging	Groundwater	Other
	Trench				
216-B-32	Medium-Volume Waste Trench		X	X	
216-B-33	Medium-Volume Waste Trench	X	X		
216-B-34	Medium-Volume Waste Trench	X	X	X	
216-B-52	Medium-Volume Waste Trench	X	X	X	
216-B-53A	Low-Volume Waste Trench		X		
216-B-53B	Low-Volume Waste Trench		X		
216-B-58	Low-Volume Waste Trench	X	X	X	
Geographical Area: S Plant Vicinity					
200-W-54	Surface Contamination	X	X	X	
216-S-1&2	High-Volume Waste Crib		X	X	
216-S-5	High-Volume Cooling Water Crib	X	X	X	
216-S-6	High-Volume Cooling Water Crib	X	X	X	
216-S-7	High-Volume Waste Crib	X	X	X	
216-S-8	High-Volume Waste Crib	X	X	X	
216-S-20	High-Volume Waste Crib	X	X	X	
216-S-22	High-Volume Waste Crib		X	X	
216-S-23	High-Volume Waste Crib		X	X	
216-S-25	High-Volume Waste Crib	X	X	X	

Table B-6. Summary of 200-WA-1/200-BC-1 OU Waste Sites with Direct Analytical Data and/or Site-Specific Geophysical Survey Data*

Site	Site Type	Soil	Geophysical Logging	Groundwater	Other
UPR-200-W-36	High-volume Waste Crib		X		
216-S-14	Low-Volume Waste Trench	X	X		
UPR-200-W-165	Surface Contamination	X			
Geographical Area: T Plant Vicinity					
216-T-4-1D	High-Volume Cooling Water Ditch	X	X	X	
216-T-13	Low-Volume Crib	X			
216-T-27	High-Volume Waste Crib		X		
216-T-28	High-Volume Waste Crib	X	X	X	
216-T-33	Low-Volume Crib	X	X	X	
216-T-34	High-Volume Waste Crib		X	X	
216-T-35	High-Volume Waste Crib		X	X	
216-T-36	Moderate-Volume Waste Crib	X	X	X	
UPR-200-W-99	Surface Contamination	X	X	X	
241-T-361	Underground Storage Tank		X	X	X
Geographical Area: U Plant Vicinity					
216-U-1&2	High-Volume Waste Crib	X	X	X	
216-U-3	Injection Wells/French Drains	X	X		
216-U-4	Injection Wells/French Drains	X		X	
216-U-8	High-Volume Waste Crib	X	X	X	

Table B-6. Summary of 200-WA-1/200-BC-1 OU Waste Sites with Direct Analytical Data and/or Site-Specific Geophysical Survey Data*

Site	Site Type	Soil	Geophysical Logging	Groundwater	Other
216-U-12	High-Volume Waste Crib	X	X	X	
216-U-13	Low-Volume Trench		X	X	
216-U-14	High-Volume Cooling Water Ditch	X	X	X	
216-U-16	High-Volume Cooling Water Crib	X	X	X	
216-U-17	Moderate-Volume Waste Crib	X	X	X	
UPR-200-W-19	Surface Contamination	X	X	X	
200-W-42	Low-Volume Leak	X			
241-U-361	Underground Storage Tank	X	X	X	X
200-W-71				X	
200-W-89	Surface Contamination			X	
Geographical Area: Z Plant Vicinity					
216-Z-7	High-Volume Waste Crib	X	X	X	
216-Z-16	High-Volume Waste Crib		X	X	
216-Z-17	High-Volume Waste Crib		X		

Note: The presence of data does not indicate detection of contaminants.

* This table is a summary of available information. For specific data and references on individual waste sites, consult Appendix D, Waste Site Descriptions and Appendix H, Data Needs Assessment Checklists. A summary of all data sources for each waste site is also included in Appendix E.

Table B-7. Summary of Waste Sites with Apparent Historical Groundwater Impacts

Waste Site	Selected Target Analytes Detected in Historic Groundwater Samples						
	Cs-137	**Sr-90**	**Co-60**	**Tritium**	**Nitrate**	**Chromium**	**Tc-99**
216-T-33*		X		X	X	X	X
226-T-34	X	X	X	X	X	Not Measured	Not Measured
216-T-35	X	X	X	X	X	Not Measured	Not Measured
216-T-28	X	X	X	X	X	X	X
216-Z-7	X	X	X		X		
216-Z-16	X	X	X	X	X	X	X
216-U-1&2	X	X	X	X	X		X
216-U-14		X	X		X		
216-U-16	X	X	X		X		X
216-U-8		X	X	X	X	X	
216-U-12	X	X	X		X		
216-S-1&2	X	X	X	X	X		
216-S-7	X	X	X	X	X		
216-S-6	X	X	X		X		
216-S-5	X	X	X		X		
216-S-20	X	X	X	X	X	X	X
216-S-22	X	X	X		X		
216-S-23	X	X	X	X	X		X
216-S-25	X	X	X	X	X		X
216-B-14		X			X		
216-B-15		X			X		
215-B-16		X			X		
216-B-17		X			X		
216-B-18	X	X			X		X
216-B-19		X			X		
216-B-20*	X	X	X		X		
216-B-21*	X	X	X		X		
216-B-22*		X			X		

Note: Based on Historical Groundwater Monitoring Data in HEIS.

* Available data indicate, but are not conclusive, that observed groundwater contamination originated from this waste site.

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Table B-8. Preliminary Screening of Remedial Technologies for Vadose Zone Remediation of Radionuclides, Hexavalent Chromium, Other Metals, and Organic Compounds—Hanford 200 West Area

General Response Actions	Remedial Technology	Technology Process Option	COPC Applicability[a]	Depth Range[b]	Description	Effectiveness	Implementability	Relative Capital Cost	Relative O&M Cost	Sustainability[c]	Retained/ Not Retained	Screening Comment
No Action	No Action	No Action	All	Shallow/ Deep	No further actions to address contamination. Source areas and residual contaminants in the vadose zone are left untreated.	Low No remedial actions are taken, but effectiveness could be high if risk was previously mitigated.	High No administrative or technical implementability challenges are associated with this option because no actions are required.	Low No associated cost.	Low No associated cost.	Moderate/High Continued impact to soil resources.	Retained	Retained per the NCP.
Confirmatory Sampling	Confirmatory Sampling	Confirmatory Sampling	All	Shallow/ Deep	Sampling and analysis will be conducted to confirm that COPCs are not present at concentrations above cleanup criteria. Includes conducting radiological and geophysical (as appropriate) surveys in the initial site investigation as appropriate, to support the selection of sampling locations.	Low No additional remedial actions are taken; however, effectiveness could be high if risk was previously mitigated, or COPCs do not exceed cleanup criteria.	High Applicable to sites where prior cleanup activities have been performed, but insufficient data are currently available to close out the waste site. Low implementability on sites where sampling and analysis show concentrations above cleanup criteria.	Shallow – Low/Deep - High	Low No associated cost.	Moderate/High Action limited to sampling.	Retained	
MNA	MNA	MNA	Radionuclides with reasonable half-lives. Select organic compounds, select metals.	Shallow/ Deep	Contaminants in the vadose zone are allowed to attenuate over time from natural biological processes, chemical processes, radioactive decay, and/or flushing from surface water infiltration. Rates of flushing must be low enough that groundwater standards are not exceeded. Involves ongoing monitoring to verify attenuation processes are occurring. If site is well characterized, the graded approach to modeling could be applied. Contingency measures are developed if attenuation is not adequate to control the risks. Typically combined with other technologies that manage the source areas and mitigate exposure.	Low/Moderate Effectiveness of MNA is driven by the state of the existing site-specific intrinsic processes, given that under MNA, natural processes are not enhanced. Effectiveness is evaluated and documented through long-term monitoring and evaluation of geochemical conditions. Contaminant leaching into groundwater may be an acceptable component of the vadose zone remedy, if the resultant dissolved contaminant concentrations still meet the groundwater cleanup criteria.	High No administrative or technical implementability challenges are associated with this option.	Low/Moderate	Low	Moderate/High Continued impact to soil resources.	Retained	Retained as a possible component of alternatives.

Table B-8. Preliminary Screening of Remedial Technologies for Vadose Zone Remediation of Radionuclides, Hexavalent Chromium, Other Metals, and Organic Compounds—Hanford 200 West Area

General Response Actions	Remedial Technology	Technology Process Option	COPC Applicability[a]	Depth Range[b]	Description	Effectiveness	Implementability	Relative Capital Cost	Relative O&M Cost	Sustainability[c]	Retained/ Not Retained	Screening Comment
Removal	Excavation	Standard Excavation	All	Shallow	Shallow soil in identified source areas is removed using conventional construction equipment. Excavation limited to a maximum depth of approximately 6 m [20 ft] bgs. Excavated soil is segregated (automated or laboratory based) to determine disposal or treatment requirements.	High Shallow sources removed.	High Shallow excavation is typically straightforward. A permit is required for excavation in the 100, 200, and 300Areas and the Hanford Reach National Monument.	Moderate/High	Low to none No associated cost.	Moderate/High Waste generation if excavated soil is disposed of; GHG and energy for excavation equipment.	Retained	Retained as potential component of remedy.
		Deep Excavation	All	Shallow/ Deep	Soil is removed from a depth greater than approximately 6 m [20 ft] bgs. Deep excavation would require implementation of more complex technologies such as large lay back for open-pit type excavation. Alternatively, use of shoring. Excavated soil is segregated (automated or laboratory based) to determine disposal or treatment requirements.	High Locations of the deep sources will be difficult to identify, meaning large areas would have to excavated to depth to ensure that the deep sources were removed.	Low/Moderate Shoring may be difficult with cobbles and boulders. Significant safety issues with very deep excavations. A permit is required for excavation in the 100, 200, and 300Areas and the Hanford Reach National Monument.	High	Low to none No associated cost.	Moderate/High Waste generation if excavated soil is disposed of; GHG and energy for excavation equipment.	Retained	Retained as potential component of remedy.
Ex Situ Treatment and Processing, and Onsite Backfilling	Ex Situ Treatment and Processing[d]	Solidification/ Stabilization	Mobile to semimobile contaminants (technetium-99, chromium(VI), strontium-90, and uranium)	Depends on excavation method.	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization). Agents include soluble phosphates, pozzolan/ portland cement, and polyethylene extrusion. The stabilized mass is returned to its original location, capped to shed water and prevent weathering, and the locale is engineered to withstand seismic activity.	Moderate Effective at immobilizing contaminants in excavated material. However, the stabilized mass must be protected from weathering and seismic activity for long-term durability.	High Well-established technology. Site-specific studies need to be completed to evaluate equipment required and appropriate cement agents. Significant health and safety concerns.	High	Low No associated cost.	Low GHG and energy used for production and delivery of reagent, and for transport and mixing.	Not Retained*	Screened out in favor of disposal in the ERDF. Additional handling of the excavated soil will significantly increase costs and increase the potential for industrial accidents and contaminant exposure, which could pose considerable risk to workers.

Table B-8. Preliminary Screening of Remedial Technologies for Vadose Zone Remediation of Radionuclides, Hexavalent Chromium, Other Metals, and Organic Compounds—Hanford 200 West Area

General Response Actions	Remedial Technology	Technology Process Option	COPC Applicability[a]	Depth Range[b]	Description	Effectiveness	Implementability	Relative Capital Cost	Relative O&M Cost	Sustainability[c]	Retained/ Not Retained	Screening Comment
		Soil Washing	Chromium(VI), technetium-99, nitrate and, possibly, uranium	Depends on excavation method.	Consists of size separation of highly contaminated soil fractions (fines) from minimally contaminated soil fractions (coarse), followed by mechanical abrasion or washing to remove surface contamination.	Low/Moderate	Moderate/High	Moderate	Low	Moderate	Not Retained	Not proven for Hanford soils; mechanically intense.
						Effectiveness is driven by the binding processes that exist between the contaminants and the soil particles (adsorbed or precipitated). Effectiveness is variable based on the nature of the COPC. Pilot testing at the Hanford Site suggests many contaminants strongly sorb to all soil types. Pilot test is necessary for chromium(VI).	Conventional aggregate washing and screening technology are used to separate soil particles by size fraction. Contaminated soils and water are disposed of or further treated. Soils that meet cleanup criteria (remediated coarse soil) can be returned to the site. Mechanically intense.		No associated cost.	Additional resource impact (water used in process); GHG and energy for process and additional treatment required (of contaminated fines and water).		
		Vitrification	All	Depends on excavation method.	Thermal treatment process that converts excavated soil and other materials into stable crystalline substances.	High	Low	High	Low	Low	Not Retained*	Very complex technology, safety concerns with implementation.
						Heavy metals and radionuclides are incorporated into the crystalline structure, which is generally resistant to leaching.	High complexity of equipment required. Ex situ joule heating vitrification uses furnaces that have evolved from the glass industry. Implementability is higher than for in situ application given use of proven technology (furnaces).		No associated cost.	GHG and energy for heat generation. High energy requirements to sustain required heat.		
		Thermal Desorption	Organics	Depends on excavation method.	Direct application of heat to soil piles to increase the temperature of soil and destroy or volatilize organic compounds. A vapor cover and vacuum system is needed to transport volatilized water and organics to the gas treatment system. Also completed using mechanical systems (e.g., rotary drum).	High	Low	High	Low	Low	Not Retained*	Very complex and challenging to implement.
						Technology can achieve rapid removal/destruction of a mix of volatile and semivolatile organics at low residual levels.	Equipment readily available and commonly used but can be mechanically complex.		No associated cost.	GHG and energy for production of heat vapor treatment.		
Disposal	Disposal	Backfill Treated Soil	All	Shallow/ Deep	Excavation and ex situ treatment followed by onsite disposal (backfill).	High	High	Low/Moderate	Low	Moderate	Retained	
						Contaminated material has been treated by ex situ technologies.	Excavated and treated soil will need to be compared to cleanup criteria to verify backfill is appropriate.		No associated cost.	GHG and energy for backfill.		
		Onsite Landfill	All	Shallow/ Deep	Disposal of excavated soil at ERDF. Treatment performed at the facility as required to meet land disposal restrictions.	High	High	Low/Moderate	Low	Low/Moderate	Retained	
							Implementability limited by COPC concentrations and onsite landfill requirements.		No associated cost.	GHG and energy for transport.		

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		Offsite Landfill	All	Shallow/ Deep	Disposal of excavated soil at offsite landfill.	High Contaminated material has been treated by ex situ technologies.	High Implementability limited by COPC concentrations and offsite landfill requirements.	Moderate	Low No associated cost.	Low GHG and energy for transport.	Retained	Liability concerns over off site landfills.
		Offsite Repository (WIPP)	TRU waste	Shallow/ Deep	TRU waste is soil and debris containing alpha-emitting TRU radionuclides having half-lives greater than 20 years at concentrations greater than or equal to 100 nCi/g at the time of assay. TRU radionuclides include elements with atomic numbers greater than 92 such as neptunium, plutonium, americium, and curium. TRU waste must be packaged and shipped to the WIPP in Carlsbad, New Mexico.	High	High Implementable, but it is an offsite activity, so substantial administrative requirements apply. Work must be coordinated through the Hanford Transuranic Waste Certification Program.	High	Low No associated cost.	High GHG and energy for transport.	Retained	May not be applicable to this geographic area but retained as a contingent remedial technology.
In Situ Treatment												
In Situ Treatment via Reagent—Reagent Approach												
Physical/Chemical/Biological—Solidification/Stabilization			Mobile COCs to semimobile radionuclides, other metals, and organics	Shallow	Contaminants are physically bound or enclosed within a stabilized mass (solidification), or chemical reactions are induced between the stabilizing agent and contaminants to reduce their mobility (stabilization). Agents include soluble phosphates, pozzolan/ portland cement, and polyethylene extrusion. Typically, only used for organics when the COPC exists as a free phase hydrocarbon to reduce mobility.	Low/Moderate There is debate about the long-term durability of the monolith and whether it is, in fact, permanent. Potential for exposure still exists.	Moderate Depends on delivery method.	Moderate	Low Assuming monolith is permanent.	Low/Moderate GHG and energy for production and delivery of substrate/ reagent.	Retained	Straightforward and proven option. Retained for strontium-90 and other PCOCs if applicable.

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Physical/Chemical/Biological—Chemical Treatment			Chromium(VI), technetium-99, uranium, and strontium-90	Shallow/ Deep	Chemical reductant (e.g., calcium polysulfide, hydrogen sulfide gas, ferrous sulfate, ZV iron, etc.) and/or sequestration agent (e.g., phosphate, calcite, etc.) is applied to the subsurface to treat contaminants within the vadose zone. Chemical can be combined with solidification/stabilization or other treatment mechanisms.	Moderate Chemical reductants are instantly reactive, which requires overloading to maintain reactive strength at depth. Reduction of technetium-99 and uranium is potentially reversible.	Low/High Depends on delivery method. Localized temporary generation of secondary byproducts may occur. May temporarily mobilize COPCs (in first pore volume) toward groundwater. Handling chemical reductants is a health and safety concern.	Low/Moderate	Moderate	Moderate GHG and energy for production and delivery of chemical agent.	Retained	
Physical/Chemical/Biological—In Situ Chemical Oxidation			Organics	Shallow/ Deep	Subsurface delivery of chemical oxidant (e.g., hydrogen peroxide, ozone, permanganate, persulfate, percarbonate) to degrade organic COPCs. Oxidants cause chemical destruction of toxic organic chemicals. Petroleum hydrocarbons and PAHs can be treated with a variety of oxidants (including peroxide, percarbonate, persulfate, and ozone); however, limited case studies demonstrate the successful treatment of PCBs with in situ chemical oxidation. Ozone is the most likely oxidant.	Moderate Effectiveness is a function of oxidant distribution and contact. Injection of ozone a possible alternative, but more complex than bioventing alone. Multiple applications may be required to achieve complete treatment.	Low/Moderate Chemical oxidants can be delivered using soil mixing, horizontal injections wells, or vertical injection wells.	Moderate	Low/High O&M costs would be low assuming complete treatment can be achieved with a single application; high O&M costs if multiple applications are required to achieve treatment.	Moderate GHG and energy for production and delivery of substrate/reagent; waste generation from soil cuttings.	Not Retained*	More challenging to implement compared to bioventing.
Physical/Chemical/Biological—Surface Bioremediation (Land Farming)			Organics	Shallow	Surface bioremediation involves tilling the soil and adding moisture and an amendment to stimulate natural degradation at shallow depths of 0.0 to 1.2 m (0 to 4 ft) bgs. Organic compounds are degraded by indigenous or inoculated microorganisms. May also be supplemented by additions of fertilizer.	Low/Moderate Surface bioremediation is effective for remediating low-level residual petroleum hydrocarbons in conjunction with source removal. PAHs and PCBs are more difficult to degrade. Effectiveness can be hindered by nonuniform amendment distribution, lack of appropriate microorganisms, or nonoptimal moisture and temperature.	Low Tilling equipment limits achievable treatment depth. Implementation is challenging in gravelly/ cobbly lithologies. Maintaining appropriate temperature and moisture conditions is more challenging for surface treatment.	Low/Moderate	Low	Moderate GHG and energy for production and delivery of substrate/reagent.	Retained	Potentially applicable to small volumes of petroleum contaminated soil.

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Physical/Chemical/Biological—Biological Treatment			Chromium(VI), technetium-99, uranium, and nitrate	Shallow/ Deep	Biological carbon source (e.g., molasses, sodium lactate, emulsified oil, etc.) is applied to the subsurface to treat contaminants within the vadose zone.	Moderate/High Carbon source follows source release pathways. Biological reductants are activated by microbial activity, so reactive strength is maintained over relatively longer distances. Reduction of technetium-99 and uranium is potentially reversible.	Low/High Depends on delivery method. Localized temporary generation of secondary byproducts may occur. May temporarily mobilize COPCs (in first pore volume) toward groundwater.	Low/Moderate	Moderate	Moderate GHG and energy for production and delivery of substrate. Depends on which substrate is used.	Retained	
Physical/Chemical/Biological—Combined Chemical/Biological Treatment			Chromium(VI), technetium-99, uranium, and nitrate	Shallow/ Deep	Chemical reductant (e.g., calcium polysulfide, hydrogen sulfide gas, ferrous sulfate, ZV iron, etc.) and biological carbon source (e.g., molasses, sodium lactate, emulsified oil, etc.) are combined and applied to the subsurface to treat contaminants within vadose zone.	Moderate/High Amendments follow source release pathways. Combined chemical and biological treatment might improve performance. Reduction of technetium-99 and uranium is potentially reversible.	Low/High Depends on delivery method. Localized temporary generation of secondary byproducts may occur. May temporarily mobilize COPCs (in first pore volume) toward groundwater. Handling chemical reductants is a health and safety concern.	Low/Moderate	Moderate	Moderate GHG and energy for production and delivery of substrate/reagent. Depends on which substrate is used.	Retained	
Physical/Chemical/Biological—Gaseous Ammonia Injection			Mobile COPCs	Shallow/ Deep	One of a number of possible gaseous reagents that are being investigated, along with In Situ Gaseous Reduction (ISGR). It involves the injection of ammonia gas to increase pH to dissolve silica. The pH naturally decreases to ambient conditions over time and aluminosilicate minerals precipitate and possibly coat and immobilize various contaminants.	Unknown Effectiveness is being studied as part of a laboratory-scale investigation.	Unknown Implementation is unknown at a full-scale level.	Unknown Technology evaluation has been limited to laboratory tests.	Unknown Technology evaluation has been limited to laboratory tests.	Unknown GHG emissions from injection activities.	Retained	Evaluation of results from the ongoing treatability study is needed prior to making a decision regarding its full-scale use at the Hanford Site. This technology could be evaluated as a remedial alternative at a later date.

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General Response Actions	Remedial Technology	Technology Process Option	COPC Applicability[a]	Depth Range[b]	Description	Effectiveness	Implementability	Relative Capital Cost	Relative O&M Cost	Sustainability[c]	Retained/ Not Retained	Screening Comment
Physical/Chemical/Biological—Bioventing			Organics	Shallow/ Deep	Process that stimulates the natural biodegradation of aerobically degradable compounds in soil by providing oxygen to existing soil microorganisms. Bioventing uses low air flow rates to provide only enough oxygen to sustain microbial activity.	Low/Moderate Technology is proven for remediating soils contaminated by petroleum hydrocarbons but is less effective for PAHs, and not effective for PCBs. Effectiveness can be limited by extremely low soil moisture content, which would limit biodegradation.	High Applied using horizontal or vertical wells.	Moderate	Low	Moderate GHG and energy for installation of delivery mechanism and delivery of air; waste generation from soil cuttings.	Retained	Retained for petroleum hydrocarbons and PAHs.
Physical/Chemical/Biological—Reductive Dechlorination Using ZV Metals and Bioremediation			PCBs	Shallow/ Deep	ZV metals have the potential to reductively dechlorinate PCBs. Metals include iron, palladium, and other combinations. The contaminated soil and the metals are mixed in some fashion to allow the reactions to occur. Bioremediation, via the addition of an organic substrate, is a very similar process and can be combined with ZV metal addition.	Unknown Very few published testing results are available.	Moderate Could be implemented by soil mixing with conventional excavation equipment if the contamination is shallow.	High	Low No associated cost.	Unknown	Not Retained*	Several laboratory and field-scale demonstrations have been conducted to evaluate the performance of using nano-scale ZV iron for PCB dechlorination. The effectiveness of this treatment technology is considered to be poorly known, given the limited availability of published testing results and/or conflicting technology demonstration data. Reductive dechlorination using ZV metals and bioremediation is not a proven technology and was not retained for further consideration. More field studies must be conducted to test methods of bioaugmentation and biostimulation for PCB dechlorinators.

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In Situ Treatment (cont.)												
In Situ Treatment via Reagent—Delivery Method												
ISGR with Chemical Reductant or Biological Substrate			Chromium(VI), technetium-99, uranium, and nitrate	Shallow/ Deep	A gaseous mixture of chemical reductants (e.g., hydrogen sulfide) or biological substrate (e.g., butane) is injected into and drawn through the vadose zone to reduce chromium(VI), technetium-99, and uranium. Research is underway to evaluate other reagents to immobilize contaminants.	Unknown Soil heterogeneity will result in preferential flow and limit treatment effectiveness of lower permeability soil.	Unknown Vapor extraction wells are installed aroundinjection well at a radial spacing of approximately 4.6 m (15 ft)—large numbers of wells are required. Because of health and safety risks, monitoring and emergency response plan are required for transporting, storing, and handling.	High	Unknown	Unknown GHG emissions from injection activities.	Not Retained*	Evaluation of results from the ongoing treatability study is needed prior to making a decision regarding its full-scale use at the Hanford Site. This technology could be evaluated as a remedial alternative at a later date.
Mixing with Conventional Excavation Equipment			N/A[d]	Shallow	Use of conventional excavation equipment (backhoes, excavators, front-end loaders, etc.) to mix amendments into the soil.	High Agents are uniformly mixed with soil column, providing good contact and reaction between COPC and chemical.	High Simple technology. Dust mitigation techniques will need to be implemented to control/prevent mechanical dispersion of contaminants.	Low/Moderate	Low No associated cost.	Low/Moderate GHG emissions from diesel or gasoline burning engines.	Not Retained*	Not retained in favor of surface infiltration. Could be retained if shallow mobile contaminants are identified in the future.
Deep Soil Mixing (Vertical/Horizontal)			N/A[d]	Shallow/ Deep	Large mixing augers (1.5 to 3 m [5 to 10 ft] in diameter) or horizontally rotating heads are used to blend and homogenize reactants with soil. The reactants may be chemical reductants, biological substrate, or solidification/stabilization agents.	High Chemical agents are uniformly mixed with soil column, providing good contact and reaction between COPC and chemical. Cement or clay can also be mixed with the chemical slurry to reduce the hydraulic conductivity and leachability of the soil.	Low Implementation will be more challenging in gravelly/ cobbly lithologies. Although deep soil mixing has been performed to depths of 30 m (100 ft) bgs, most field applications have been limited to approximately 15 m (50 ft) bgs.	High	Low No associated cost.	Low/Moderate GHG emissions from diesel or gasoline burning engines.	Not Retained*	Deep soil mixing implementability will be limited by site conditions and required depth of treatment.
Foam Delivery of Reagents			N/A[d]	Shallow/ Deep	Injection of a foam into the vadose zone. The foam is a mixture of a surfactant solution to create the foam, and a reagent, such as calcium polysulfide. The foam increases the horizontal migration of the reagent away from the injection well.	Unknown Technology evaluation has been limited to laboratory column tests. The stability of the foam, which will dictate the well spacing, is unknown, as is the ability of the foam to permeate a large volume of the vadose zone.	Unknown Technology evaluation has been limited to laboratory column tests.	Unknown Technology evaluation has been limited to laboratory column tests.	Unknown Technology evaluation has been limited to laboratory column tests.	Unknown	Not Retained*	Evaluation of results from the ongoing treatability study is needed prior to making a decision regarding its full-scale use at the Hanford Site. This technology could be evaluated as a remedial alternative at a later date.

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Gas Delivery of Reagents			N/A[d]	Shallow/ Deep	A gaseous mixture of chemical reagent is injected into and drawn through the vadose zone to reduce mobile COPCs.	Unknown Soil heterogeneity will result in preferential flow and limit treatment effectiveness of lower permeability soil.	Unknown Vapor extraction wells are installed around injection well at a radial spacing of approximately 4.6 m (15 ft)—large numbers of wells are required. Because of health and safety risks, monitoring and emergency response plan are required for transporting, storing, and handling.	High	Unknown	Unknown GHG emissions from injection activities.	Not Retained*	Evaluation of results from the ongoing treatability study is needed prior to making a decision regarding its full-scale use at the Hanford Site. This technology could be evaluated as a remedial alternative at a later date.
Injection Wells (Horizontal)			N/A[d]	Shallow/ Deep	Delivery of amendments using horizontal wells. Wells are installed using horizontal drilling techniques.	Moderate Effectiveness can be hindered by nonuniform amendment distribution. Soil heterogeneity will result in preferential flow and limit treatment effectiveness of lower permeability soil. Multiple injections could be required.	Low Implementation is challenging in gravelly/ cobbly lithologies. Lithology would also pose issues with maintaining target depth and alignment with horizontal drilling. A pilot test of this technology encountered significant implementation challenges.	Moderate/High	Low	Moderate GHG emissions from well installation, development, and injection activities; waste generation from soil cuttings.	Not Retained*	Testing at the Hanford Site has not been successful.
Injection Wells (Vertical)			N/A[d]	Shallow/ Deep	Delivery of amendments using conventional vertical wells.	Low Effectiveness can be hindered by nonuniform amendment distribution. Distribution of liquid amendments is highly ineffective because of gravelly/cobbly lithology. Better distribution would likely be obtained with gaseous amendment. Radius of influence could be low.	Moderate Radius of influence likely to be low with conventional liquid reagents requiring large number of injection wells, because of gravelly/cobbly lithology.	Moderate/High	Low	Moderate GHG emissions from well installation, development, and injection activities; waste generation from soil cuttings.	Retained for saturated zone	Not retained for vadose zone soils. Not adequate for distribution of liquid substrate. Retained for bioventing.
Jet Grouting			N/A[d]	Shallow/ Deep	High-pressure injection of reactive slurry into soil to hydraulically mix the soil with the slurry. Fluidization of the soil is preferred. Jet grouting can also be completed using super permeating molten wax by heating the soil and injecting the wax, resulting in an impermeable material.	Low While jet grouting is capable of reaching the required treatment depth, jet grouting is not likely to achieve effective distribution in this formation because of gravel/cobbles. Currently being pilot tested at 100-N for shallower and more limited application.	Low/Moderate Implementation will be more challenging in gravelly/ cobbly lithologies. Jet grouting has been performed to as deep as 91 m (300 ft) bgs.	High Limited radius of influence would make jet grouting cost-prohibitive over a large area.	Low	Moderate GHG emissions from injection activities.	Not Retained*	Not retained. Could be considered in the future if technology develops. Currently, jet grouting has potentially limited effectiveness.

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Surface Infiltration			N/A[d]	Shallow/ Deep	Reagent is applied to the ground surface to treat contaminants within the vadose zone. Surface infiltration can be done through drip irrigation and shallow basin systems. Systems are generally designed to be 30.48 cm (12 in.) below the surface and covered to be protected.	Moderate/High Amendments follow source release pathways. Distribution not likely to be uniform.	High Surface infiltration systems are simple to install and accessible for O&M.	Low/Moderate	Low	Low Limited infrastructure. GHG emissions from production and delivery of substrate.	Retained	Retained for liquid substrates.
Void Filing/Grouting			N/A[d]	N/A (Pipelines)	Grouting for solidification of buried wastes. Void grouting is considered for filling large voids, specifically pipelines.	High Established and commonly used technology for removing voids in pipelines and old landfills/buried waste	High Established and commonly used technology for removing voids in pipelines and old landfills/buried wastes. Pipe branch lines/breaks need to be identified.Lanfills require geophysics to identify void space in waste,	Low	Low No associated cost.	Moderate GHG and energy for production and delivery of grout used.	Retained	Retained for pipelines and waste sites (e.g. cribs with timbers) where an engineered barrier is selected and future subsidence can occur..
Physical/Chemical/Biological Desiccation			All	Shallow/ Deep	Remediation by injecting hot dry air and withdrawing moist air from soil, immobilizing contaminants by preventing their aqueous-phase transport.	Unknown A treatability test for this technology will be conducted for waste sites in the Central Plateau contaminated with technetium-99. Theoretically, desiccation would reduce moisture content in the vadose zone. Reduction of COPC migration would be effective until the soil is re-wetted. The technology is not effective in the long term without concurrent infiltration control (e.g. construction of an engineered surface barrier).	Unknown Implementation requires installation of injection and extraction wells, which are proven technologies. However, there is uncertainty related with the number of wells, well spacing, and well configuration details required for optimal field/full-scale implementation. Would also require implementation of infiltration control.	High	Unknown	Moderate GHG and energy for air injection.	Not Retained*	Evaluation of results from the ongoing treatability study is needed prior to making a decision regarding its full-scale use at the Hanford Site. This technology could be evaluated as a remedial alternative at a later date.
Physical/Chemical/Biological			Organics	Shallow/	Direct application of heat	High	Low	High	Low	Low	Not	Mechanically complex;

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In Situ Thermal Desorption				Deep	(e.g., using electrical heater elements, injection of hot air, steam, or hot water, radio frequency, etc.) to increase the temperature of soil and destroy or volatilize organic compounds. VOC capture required.	Technology can achieve rapid removal/destruction of a mix of volatile and semivolatile organics, and achieve low residual concentrations.	Technology is applied using vertical drilling methods and requires a spacing of 1.5 to 3.0 m (5 to 10 ft). Recovery of COPC vapors will require soil vapor extraction network and vapor barrier over entire treatment area.		No associated cost.	GHG and energy for production of heat and vapor recovery; waste generation from soil cuttings.	Retained*	challenging to implement.
Physical/Chemical/Biological In Situ Vitrification			All	Shallow/ Deep	Thermal treatment process that converts soil and other materials into stable crystalline substances. Contaminants are incorporated into the glass structure, which is generally strong, durable, and resistant to leaching.	High	Low	High	Low	Low	Not Retained*	Very complex and challenging to implement.
						Heavy metals and radionuclides are retained within the treated soil, which is generally resistant to leaching.	High complexity of equipment required. Process uses an electric current to melt soil or other earthen materials at extremely high temperatures (1,600 to 2,000 °C [2,900 to 3,650 °F]). It is important to also account for safety considerations from exposure to high heat.		No associated cost.	GHG and energy for heat generation. High energy requirements to sustain required heat.		
Physical/Chemical/Biological Electrokinetics			Anionic contaminants (chromium(VI), technetium-99, iodine-129, fluoride, uranium and, possibly, cyanide)	Shallow/ Deep	Current is applied using electrodes to encourage desorption of contaminants from media.	Low	Low	High	Low	Low	Not Retained*	Not retained because sufficient soil moisture is required to allow for ions to flow.
						Effectiveness is limited by the solubility of the COPCs, soil moisture content, and areas of poor electrical conductivity. Not likely to be effective for coarse soil conditions relevant in the vadose zone.	Extraction of concentrated contaminant could pose risk to workers. Equipment is complex, which might present implementability challenges in finding contractors.		No associated cost.	GHG and energy for heat generation. High energy requirements to sustain required heat.		
Physical/Chemical/Biological In Situ Flushing			Contaminants with high to moderate solubility in water (chromium(VI), technetium-99, and nitrate)	Shallow/ Deep	Clean or treated water is applied to the ground surface or in infiltration trenches to flush contaminants out of the vadose zone to the water table, where it would be captured/treated.	Moderate	High	Low/Moderate	Low	Low	Retained	
						Water follows source release pathways, but contaminants that remain in adsorbed phase will not be treated. May create a larger groundwater problem if the groundwater capture is not effective.	Drip irrigation system or trenches are simple to install and accessible for O&M.			GHG and energy for installation.		

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Physical/Chemical/Biological Phytoremediation			Bioavailable metals and organics	Shallow	Phytoremediation uses plants and their associated rhizospheric microorganisms to remove, degrade, or contain contaminants.	Low Phytoremediation is only effective when plants are active; thus, the technology is not effective during the winter. Phytoremediation only treats soils to the approximate depth of the plant roots and is only appropriate for low concentrations of contaminants. It is a slow process that is applied over long time frames of years or decades. Many metals and radionuclides are only taken up by the plants and not transformed to innocuous forms.	Moderate Involves large land requirements, and considerable work would be required to make a plot of land at the Hanford Site suitable for plant growth. If used to treat contaminants that are merely taken up and not transformed to innocuous forms, plants would need to be disposed of elsewhere to avoid ultimately returning the contaminants back to the soils they came from. Concerns about contaminants in the plants entering the food chain may need to be addressed.	Low	Low	High GHG and energy for installation. Implementation of phytoremediation could lead to a GHG reduction credit.	Not Retained*	Phytoremediation would only be effective for low concentrations of contaminants in shallow soils over long periods, and many metals and radionuclides would accumulate in the plants and would not actually be treated, posing risks to ecological receptors.
Containment												
Surface Barriers												
Maintain Existing Soil Cover with Monitored Natural Attenuation (MNA)			All	Shallow/ Deep	The existing soil cover on a waste site is maintained and/or augmented as needed to provide protection from intrusion by biological receptors. Existing soil covers include soil stabilization covers and clean overburden.	Moderate Does not reduce contamination. Effective in supporting mitigation of potential for direct contact with residual contaminants if consistently well-implemented for duration of elevated risk. Relies on natural attenuation to decrease contaminant concentrations to levels protective of human health and the environment.	High Applicable only on sites with existing soil covers. Simple to implement but requires maintenance and periodic monitoring throughout the attenuation period. Restrictions on future land use would be necessary.	Low No associated cost; system in place.	Low	Moderate Continued impact to soil resources.	Retained	Retained if used in conjunction with MNA
Hanford Barrier			All	Shallow/ Deep	A nine-layer barrier with a total thickness of 4.5 m (11.8 ft). Designed to be impermeable to prevent surface water infiltration through the vadose zone and limit contaminant leaching to groundwater. Will also prevent direct contact with contaminants.	Moderate/High Leaching of near-surface source COPCs will be controlled, but residual COPCs in capillary fringe and deeper vadose zone pore water will continue to affect groundwater because of water table fluctuation.	High Most ET surface barriers are simple to construct, however the 9-layered Hanford Barrier construction is complex. Biointrusion will need to be considered as part of the barrier/cap design and is in the Hanford Barrier.	High	Low	Moderate GHG and energy for installation. Continued impact to soil resources.	Not Retained*	Installation of large number of layers makes this technology difficult to implement. It has very few advantages over the ET barrier in comparison to cost.

Table B-8. Preliminary Screening of Remedial Technologies for Vadose Zone Remediation of Radionuclides, Hexavalent Chromium, Other Metals, and Organic Compounds—Hanford 200 West Area

General Response Actions	Remedial Technology	Technology Process Option	COPC Applicability[a]	Depth Range[b]	Description	Effectiveness	Implementability	Relative Capital Cost	Relative O&M Cost	Sustainability[c]	Retained/ Not Retained	Screening Comment
Modified RCRA Subtitle C and/or D Barrier			All	Shallow/ Deep	Modified RCRA Subtitle C barriers are designed for hazardous waste, Category 3 and Category 1 (mixed) low-level waste. Modified RCRA Subtitle D barriers are designed for nonradiological and nonhazardous solid waste, or Category 1 low-level waste where hazardous constituents are not present. Various modifications to a RCRA C barrier designed to be site-specific. Number of layers can vary from four to seven. Modified RCRA D is composed of approximately four layers with a relative thickness of 0.9 m (2.9 ft). Barriers are generally designed to be impermeable to prevent surface water infiltration through the vadose zone and limit contaminant leaching to groundwater. May also prevent direct contact with contaminants.	Moderate/High Leaching of near-surface source COPCs will be controlled, but residual COPCs in capillary fringe and deeper vadose zone pore water will continue to affect groundwater because of water table fluctuation. Prevention of direct contact will depend on specific design.	Low Most ET surface barriers are simple to construct, however the 9-layered Hanford Barrier construction is complex. Biointrusion will need to be considered as part of the barrier/cap design and is in the Hanford Barrier..	High	Low	Moderate GHG and energy for installation. Continued impact to soil resources.	Not Retained	Modified RCRA barriers have been demonstrated to fail in arid and semi-arid environments, as well as some humid climates. The smectitic clays will shrink and crack when dry and can allow significant quantities of precipitation to infiltrate through the cracks down into the underlying waste. In addition, man-made materials in RCRA barriers can have a limited life prior to failure.
Asphalt/Concrete Cap			All	Shallow/ Deep	Barriers used around structures to remain in place (e.g., reactors) in the short-term (75 years) to promote drainage, prevent infiltration into possible sources below the reactors, and prevent exposure to contaminated soil.	High For increased effectiveness, barrier needs to be properly sealed, given that asphalt and concrete are permeable. High effectiveness in the short-term.	High No technical or administrative challenges. Simple to construct.	Low	Low	Moderate GHG and energy for installation. Continued impact to soil resources.	Retained	Potential component of alternatives. May be applicable for small areas requiring short term effectiveness.

Table B-8. Preliminary Screening of Remedial Technologies for Vadose Zone Remediation of Radionuclides, Hexavalent Chromium, Other Metals, and Organic Compounds—Hanford 200 West Area

General Response Actions	Remedial Technology	Technology Process Option	COPC Applicability[a]	Depth Range[b]	Description	Effectiveness	Implementability	Relative Capital Cost	Relative O&M Cost	Sustainability[c]	Retained/ Not Retained	Screening Comment
Vegetative Cap (ET Cap)			All	Shallow/ Deep	There are two types of evapotranspiration (ET) barriers: a monofill ET and capillary barrier. Both barriers function on the premise of minimizing (<2mm) or stopping water from percolating through the engineered barrier through the processes of evaporation and transpiration. Barrier thickness and associated soil moisture storage capacity must take into account the local current and future climatic conditions. The barrier functions as a giant sponge soaking up the water and minimizing or preventing percolation. The monofill ET layer consists of a single layer whereas the capillary layers consists of a fine-grained soil layer overlying a relatively coarse-grained soil layer. The distinct textural interface in capillary ET barriers between the fine and coarse soil layers creates a capillary break, which functionally increases the water-holding capacity of the fine-grained soil layer. Pea gravel should be blended into the surface approximately 100 cm of the ET barrier to mitigate future erosion. See EPA, Fact Sheet on Evapotranspiration Cover Systems for Waste Containment (EPA-542-F-11-001) for additional information on ET barriers (provide link)	Low/Moderate Leaching of near-surface source COPCs will decrease once grasses have become established, but residual COPCs in capillary fringe and deeper vadose zone pore water may continue to affect groundwater because of water table fluctuation. Prevention of direct contact will depend on specific design.. See SGW-34095 for further detail.	High Vegetative cap readily installed. Biointrusion will need to be considered as part of the barrier/cap design. If the depth of waste is less than 15’, a bio-barrier will be needed (biobarriers in arid/semiarid zones often consist of a cobble layer)	Low	Low	High GHG and energy for installation.	Retained	In arid and semi-arid environments ET barriers are preferred over modified RCRA barriers due to superior performance, limited maintenance, costs and barrier life expectancy. Capillary barriers should not be used in areas susceptible to subsidence.

Table B-8. Preliminary Screening of Remedial Technologies for Vadose Zone Remediation of Radionuclides, Hexavalent Chromium, Other Metals, and Organic Compounds—Hanford 200 West Area

General Response Actions	Remedial Technology	Technology Process Option	COPC Applicability[a]	Depth Range[b]	Description	Effectiveness	Implementability	Relative Capital Cost	Relative O&M Cost	Sustainability[c]	Retained/ Not Retained	Screening Comment
Horizontal Subsurface Barriers												
Jet Grouting, Soil Freezing, or Wire Saw Barriers			All	Shallow/ Deep	Barriers placed beneath the contaminated zone to limit further migration. Jet grouting is as discussed above at one specific depth. Soil freezing involves placement of cooling media distribution systems into the subsurface to freeze a soil layer below the contamination. Wire saw barrier involves cutting a thin horizontal trench that is filled with grout using a diamond wire saw. The saw is placed in an excavation around the soil mass to be contained.	Low Significant uncertainty on the completeness of the barrier with all methods.	Low All methods would be difficult or impossible to implement at the Hanford Site because of the gravels and cobbles and the depths required.	High	Low	Low Large amount of waste would be generated during installation and GHG and energy for installation.	Not Retained*	Not implementable.
Compaction												
Dynamic Compaction			All	Shallow/ Deep	Dynamic compaction is used for consolidation of soils and buried wastes and can be used to minimize the potential subsidence for a subsequent barrier. The process involves dropping a weight from a predetermined height onto the area to be compacted or the use of heavy equipment..	Moderate/High Effective at removing void spaces and compacting surface soil, where voids exist around buried waste. Not effective for native soils. Not effective for treatment of hazardous wastes.	High Simple and widely used technology.	Low	Low No associated cost.	Low/Moderate GHG and energy for installation. Continued impact to soil resources.	Retained	Retained for waste sites that may require construction of an engineered barrier that could be prone to future subsidence (e.g., cribs).

Source: DOE/RL-2001-41, *Sitewide Institutional Controls Plan for Hanford CERCLA Response Actions*.

a. Indicates the contaminants that can be addressed by a technology based on geochemical properties. A COPC Applicability of "All" indicates implementation of a technology is not dependent on the nature of a chemical.

b. Depth range is based on practical limitations of implementing the given technology

c. Sustainability rating based on: E = energy use, GHG = air pollution and greenhouse gas emissions reduction, Water = water use and resource impacts, Waste = Reduce, reuse, and recycle waste, Eco = protect land and ecosystems.

d. Dependent on reagent approach.

e. Ex situ treatment does not include treatment done for ultimate disposal at the ERDF. Treatment performed at the ERDF or the site as required to meet disposal restrictions is assumed to be part of the "disposal to onsite landfill" process option. N/A = not applicable

* Additional details on technologies not retained will be provided in an appendix to the RI/FS report.

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B1 References

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