U.S. Department of Energy
Hanford Site

21-PFD-000794 March 9, 2021

Mr. Craig E. Cameron, Project Manager
Superfund and Emergency Management Division
Site Cleanup Section 4
U.S. Environmental Protection Agency
825 Jadwin Avenue, Suite 210
Richland, Washington 99352

Dear Mr. Cameron:

REMOVAL ACTION WORK PLAN FOR THE REDUCTION-OXIDATION COMPLEX, DOE/RL-2017-06, REVISION 1 AND AIR MONITORING PLAN FOR REDOX REMOVAL ACTION WORK PLAN, DOE/RL-2018-46, REVISION 1

This letter transmits the Removal Action Work Plan (RAWP) for the Reduction-Oxidation (REDOX) Complex, DOE/RL-2017-06, Revision 1 (Attachment 1), and Air Monitoring Plan (AMP) for REDOX RAWP, DOE/RL-2018-46, Revision 1 (Attachment 2), to you for information. The RAWP describes the activities necessary to complete the non-time-critical removal action for the REDOX Complex and addresses necessary changes to the AMP to allow for the REDOX facility to run both fans at once in order to get better flow within the facility. In addition, a CAP88 air modeling run was incorporated after various comments from the Washington Department of Health.

The Review Comment Record is also included (Attachment 3).

If you have any questions, please contact me, or your staff may contact Patty Ensign, of my staff, on (509) 372-3442.

Sincerely,

Mark S. French

Digitally signed by Mark S. French
Date: 2021.03.09 14:32:02 -08'00'

Mark S. French, Director
Project and Facilities Division
Richland Operations Office

PFD:PGE

Attachments

cc: See page 2

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DOE/RL-2017-06
Revision 1

Removal Action Work Plan for the Reduction-Oxidation Complex

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office

P.O. Box 550
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Approved for Public Release;
Further Dissemination Unlimited

DOE/RL-2017-06
Revision 1

Removal Action Work Plan for the Reduction-Oxidation Complex

R. Cathel
CH2M HILL Plateau Remediation Company

Date Published
December 2020

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY | Richland Operations Office
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APPROVED
By Sarah Harrison at 11:57 am, Dec 10, 2020

Release Approval Date

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Signature Page

Having considered the extent to which the *Removal Action Work Plan for the Reduction-Oxidation Complex* could be inconsistent with *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* processes, or could alter schedules set forth in Appendix D of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement), the U.S. Department of Energy approves this document.

	Mark S. French Digitally signed by Mark S. French Date: 2021.01.29 13:37:46 -08'00'	
Mark S. French U.S. Department of Energy Richland Operations Office	Signature	Date

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Executive Summary

This removal action work plan describes the activities necessary to complete the non-time-critical removal action for the Reduction-Oxidation (REDOX) Complex. The REDOX Complex structures addressed in this removal action are the 202S Building (including the canyon, silo, and annex); the 293S Nitric Acid and Iodine Recovery Building (293S Building); and the *Resource Conservation and Recovery Act of 1976*[1] 276S Hexone Storage and Treatment Facility treatment, storage, and disposal unit.

The removal action alternatives were identified and evaluated in DOE/RL-2016-16, *Engineering Evaluation/Cost Analysis for the REDOX Complex*,[2] with the alternative selection documented and authorized in DOE/RL-2016-52, *Action Memorandum for the Reduction-Oxidation Facility Complex*.[3] The selected removal action is Alternative 4: Continued Surveillance and Maintenance with Hazard Abatement of 202S Galleries, Demolition Preparation of 202S Silo Service Area, Demolition of 276S Hexone Storage and Treatment Facility treatment, storage, and disposal unit, Demolition and Grouting of 293S Building, Demolition Preparation of 202S Annex and Canyon Abovegrade, and Demolition of 202S Annex. The processes used to implement the removal action for the REDOX Complex are described herein.

This removal action work plan establishes the following methods and activities required to implement the selected removal action:

- Removal action elements and their implementation, including safety, health, and radiological management and controls.
- Environmental management and controls, including applicable or relevant and appropriate requirements, waste management, airborne emissions, reporting for nonroutine releases, and cultural/ecological resources.
- Project administration.

---

[1] *Resource Conservation and Recovery Act of 1976*, 42 USC 6901, et seq. Available at: https://elr.info/sites/default/files/docs/statutes/full/rcra.pdf.

[2] DOE/RL-2016-16, 2016, *Engineering Evaluation/Cost Analysis for the REDOX Complex*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0073619H.

[3] DOE/RL-2016-52, 2019, *Action Memorandum for the Reduction-Oxidation Facility Complex*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: https://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0064141H.

The sampling and analysis design for this removal action is documented in DOE/RL-2017-05, *Sampling and Analysis Plan for the REDOX Complex*[4] and is considered part of this RAWP.

[4] DOE/RL-2017-05, *Sampling and Analysis Plan for the REDOX Complex*, Rev. 1, pending, U.S. Department of Energy, Richland Operations Office, Richland, Washington.

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Terms

ACM	asbestos-containing material
ALARA	as low as reasonably achievable
AM	action memorandum
AMP	air monitoring plan
AMU	aqueous makeup unit
ARAR	applicable or relevant and appropriate requirement
BCA	beryllium controlled area
BFA	building footprint area
CAA	*Clean Air Act of 1990*
Cat I	Category I
Cat II	Category II
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CSER	criticality safety evaluation report
CWC	Central Waste Complex
D4	deactivation, decontamination, decommissioning, and demolition
demo prep	demolition preparation
DOE	U.S. Department of Energy
DOE-RL	U.S. Department of Energy, Richland Operations Office
DQO	data quality objective
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
HASP	health and safety plan
HEPA	high-efficiency particulate air
HPT	health physics technician
HSTF	Hexone Storage and Treatment Facility
LLW	low-level waste

MCC	motor control center
MEI	maximally exposed individual
MLLW	mixed low-level waste
NESHAP	National Emission Standards for Hazardous Air Pollutants
NPH	normal paraffin hydrocarbon
NRC	National Response Center
NTCRA	non-time-critical removal action
PCM	periodic confirmatory measurement
PPE	personal protective equipment
PTE	potential-to-emit
QA	quality assurance
RAWP	removal action work plan
RCRA	*Resource Conservation and Recovery Act of 1976*
REDOX	Reduction-Oxidation (Complex)
RWP	radiological work permit
S&M	surveillance and maintenance
SAP	sampling and analysis plan
SWDP	State Waste Discharge Permit
SWP	Special Work Permit
TEDE	total effective dose equivalent
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TRU	transuranic
TRUM	transuranic mixed
TSCA	*Toxic Substances Control Act of 1976*
TSD	treatment, storage, and disposal
WIDS	Waste Information Data System
WIPP	Waste Isolation Pilot Plant

1 Introduction

This removal action work plan (RAWP) provides guidance for implementing the selected removal action for the Reduction-Oxidation (REDOX) Complex located within the 200 West Area of the Hanford Site. This removal action scope is authorized by DOE/RL-2016-52, *Action Memorandum for the REDOX Complex*. The action memorandum (AM), hereinafter referred to as the REDOX AM, selected Alternative 4 – Continued surveillance and maintenance (S&M) with hazard abatement, demolition preparation (demo prep), demolition, and grouting activities. This alternative was identified, evaluated, and recommended in DOE/RL-2016-16, *Engineering Evaluation/Cost Analysis for the REDOX Complex*, hereinafter called the engineering evaluation/cost analysis.

The REDOX Complex structures addressed in this removal action are the 202S Building, including the Canyon, silo, and annex; the 293S Nitric Acid and Iodine Recovery Building; and the 276S Hexone Storage and Treatment Facility (HSTF). The structures are chemically and/or radiologically contaminated. Implementation of this non-time-critical removal action (NTCRA) will minimize the potential for a release or threat of release of hazardous substances from selected facilities to human health and the environment. The RAWP identifies technical requirements for the removal action and details the work elements, performance measurements, project management and oversight, and schedule for implementing the removal action.

The U.S. Department of Energy (DOE) was delegated the authority to conduct removal actions under Section 104, "Response Authorities," of the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) by Executive Order 12580, *Superfund Implementation*. This removal action will be performed in a manner that is consistent with the planned final remedial action under authority of CERCLA and the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989a), also known as the Tri-Party Agreement, which designates the U.S. Environmental Protection Agency (EPA) as the lead regulatory agency for this removal action.

1.1 Purpose

This RAWP identifies the requirements and establishes the methods to conduct the selected removal action for the REDOX Complex structures. This RAWP describes the following details:

1. Removal action elements and how they will be implemented, as well as safety and health management controls
2. Environmental management and controls, including applicable or relevant and appropriate requirements (ARARs), waste management, airborne emissions, reporting for nonroutine releases, and cultural/ecological resources
3. Project administration

The intent of the RAWP is to identify the basis and provide criteria for the preparation of work packages and procedures to conduct removal activities and to meet the removal action objectives. Using the most recent information concerning the conditions for each building or structure, field-level work packages and procedures will be developed to direct work activities and instruct workers in the applicable work methods.

This removal action is consistent with the overall Hanford Site cleanup initiative and will, to the extent practicable, contribute to the efficient performance of the anticipated long-term remedial action, as required by 40 CFR 300.415(d), "National Oil and Hazardous Substances Pollution Contingency Plan," "Removal Action." The following removal action objectives were identified in the REDOX AM (DOE/RL-2016-52):

1. Reduce the inventory and any potential threat to human health and the environment from an unacceptable exposure to hazardous and radioactive substances.
2. Minimize the general disruption and adverse impacts to cultural resources and wildlife habitat.
3. Safely treat, as appropriate, and dispose of waste generated by the removal action.
4. Be consistent with anticipated remedial actions at the REDOX Complex.
5. Minimize or eliminate the need for future S&M activities.

The purpose of the S&M phase is to ensure adequate containment of contaminants, to provide physical safety and security controls, and to maintain the facility such that risk to human health and the environment is minimized. S&M will be performed until demolition activities render the S&M activity obsolete or unnecessary. This document, through incorporation of substantive requirements for S&M activities, becomes the implementing document for S&M, including annual surveillances when other removal action activities are not occurring.

The DOE, as the lead agency for Hanford Site removal actions, will assign a Removal Action Manager from the Richland Operations Office (DOE-RL) to oversee the removal activities.

1.2 Scope

The REDOX Complex structures addressed in this removal action are the 202S Building (including the canyon, silo, and annex), the 293S Nitric Acid and Iodine Recovery Building (293S Building), and the *Resource Conservation and Recovery Act of 1976* (RCRA) 276S HSTF. The structures addressed by this NTCRA are chemically and/or radiologically contaminated.

Additionally, the following buildings will be included as part of the S&M activities: 211S Liquid Chemical Storage Tank Farm; 233S & SA Slabs (remaining after demolition); 2706S slab (remaining after demolition); 2708S Lager Storage Building; 2710S slab (remaining after demolition); 2711S slab (remaining after demolition); 2715S Storage Building; 2718S slab (remaining after demolition); 276S Solvent Handling Facility (276S Building); 2904SA Cooling Water Sampling Building; 291S Canyon Exhaust System (exhaust building, sand filter and stack); and 292S Control and jet pit house.

The selected removal action scope for the REDOX Complex structures includes the following activities:

- Hazard abatement of the 202S Canyon Galleries
- Demo prep of the 202S Silo Service Area, 202S Annex, and abovegrade areas of the 202S Canyon
- Demolition of the 293S Building, the 276S HSTF, and the 202S Annex
- Grouting of belowgrade areas of the 293S Building
- S&M

Included in this removal action are characterization activities of remaining hazardous substances to facilitate demolition and waste disposal, determine worker controls, as well as to document post-removal conditions for future remedial action.

1.3 Site Conditions and Background

The Hanford Site encompasses approximately 580 mi^2 in southeastern Washington State (Figure 1-1). It is north of the confluence of the Columbia, Yakima, and Snake Rivers. The Columbia River flows east through the northern part of the Hanford Site and, turning south, forms the eastern boundary of the site. The Yakima River runs along part of the southern boundary and joins the Columbia River at the City of Richland, which bounds the Hanford Site on the southeast. The REDOX Complex is in the 200 West Area of the Hanford Site. Highway 240 is to the southwest of the REDOX Complex, and the Columbia River is north-northeast.

Public access to the Hanford Site is currently restricted and controlled at the Wye Barricade on Route 4 and the Yakima and Rattlesnake Barricades on State Highway 240. Unauthorized access to the REDOX Complex is prohibited. The complex structures are locked and a 6 ft cyclone fence encloses the immediate areas.

The REDOX Complex is within the 200-CR-1 Operable Unit. The 202S Canyon Building (REDOX), also known as S Plant, was constructed between 1950 and 1952 and began operations in 1952. It was the first large-scale, continuous-flow, solvent extraction process plant in the United States. REDOX operated for the recovery of plutonium from irradiated fuel rods. Shutdown activities began in 1967 and were completed in 1969, at which point the REDOX Complex was transferred to long-term S&M (HNF-13830, *Documented Safety Analysis for the Reduction-Oxidation Facility*). Initial deactivation included multiple flushes using water, diluted hot nitric acid, permanganate, and oxalic acid. The facility piping systems and vessels were then systematically flushed regularly with water for nearly a year thereafter to remove additional contaminates and decontamination fluids.

The structures in the scope of this removal action are located within the REDOX Complex in the 200 West Area of the Hanford Site (Figure 1-2 and Table 1-1). The NTCRA covers the 202S Building, including the Crane Cab Gallery, Operating Galleries, Pipe Galleries, Sample Galleries, Storage Gallery, canyon deck, silo, and annex. The NTCRA also addresses the 293S Building and the HSTF treatment, storage, and disposal (TSD) unit. The closest operational building is the 222S Laboratory and associated support structures. These structures are not included in the scope of this removal action.

Various soil and groundwater investigations have been conducted in the Central Plateau in the 200 West Area. Previous investigations have been performed at the HSTF and the nearby 233S Plutonium Concentration Facility (now demolished), as provided in the REDOX AM (DOE/RL-2016-52). Multiple structures within the REDOX Complex that are not part of this removal action have been removed or are planned to be removed under DOE/RL-2010-33, *Removal Action Work Plan for Central Plateau General Decommissioning Activities*.

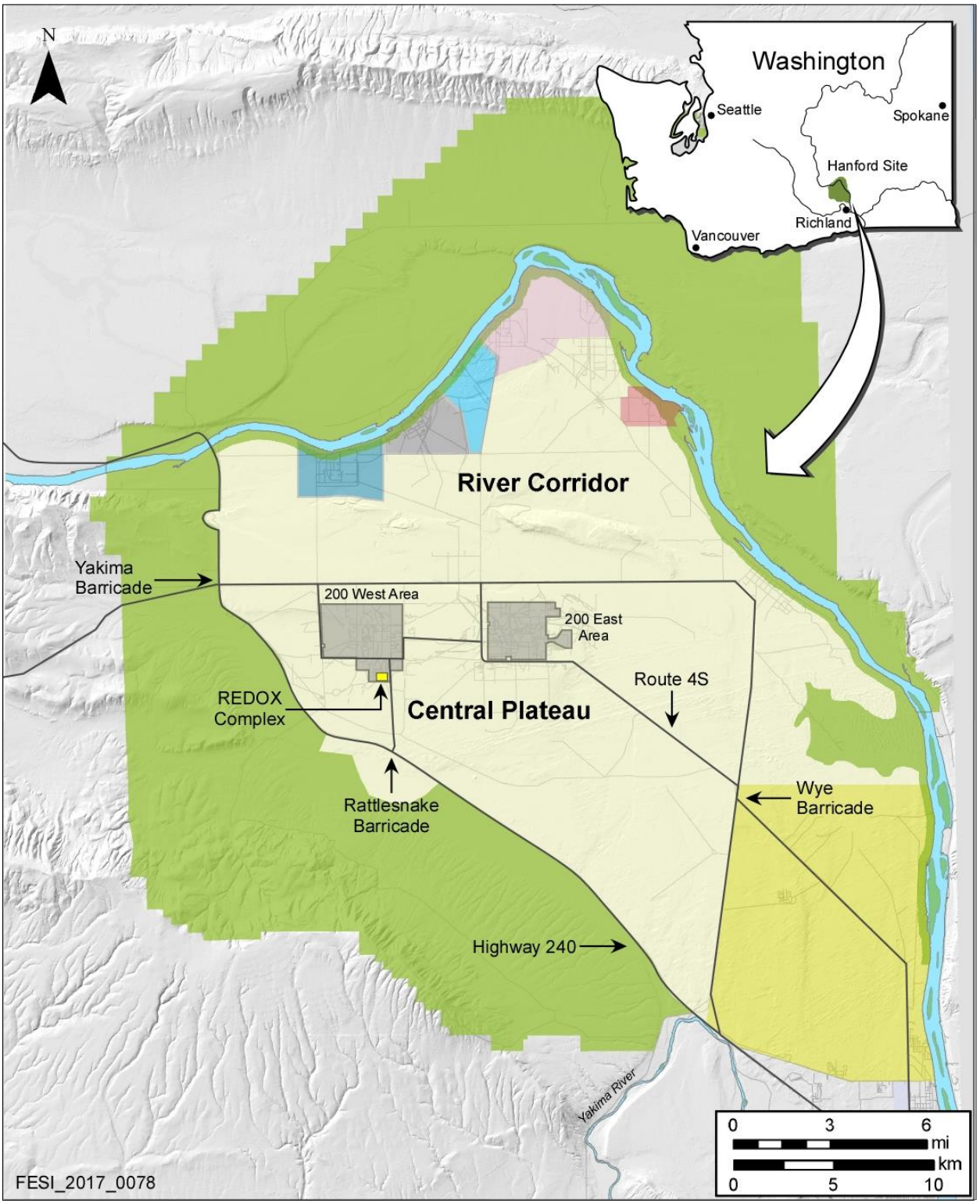

Figure 1-1. Hanford Site and REDOX Complex Location

Figure 1-2. REDOX Complex Structures

Table 1-1. REDOX Complex Structures in the Scope of this NTCRA

Structure Identification	Structure Name
202S	REDOX (including canyon, silo, and annex)
276S HSTF	276S Hexone Storage and Treatment Facility
293S	Nitric Acid and Iodine Recovery Building
211S	Liquid chemical storage tank farm
233S & SA	Slabs (remaining after demolition)
2706S	Slab (remaining after demolition)
2708S	Lager storage building
2710S	Slab (remaining after demolition)
2711S	Slab (remaining after demolition)
2715S	Storage building
2718S	Slab (remaining after demolition)
276S	Solvent handling facility
2904SA	Cooling water sampling building
291S	Canyon exhaust system (exhaust building, sand filter and stack)
291SI	Exhaust stack
292S	Control and jet pit house

1.3.1 202S Building

The 202S Building and support buildings were designed to separate uranium, plutonium, and neptunium as individual product streams from fission products in the irradiated fuel. The building consists of three major substructures: canyon, silo, and annex. The canyon and silo are large, heavily shielded metal and concrete structures. The annex is a concrete structure made up of three subsections: north, southwest, and east. Figures 1-3 and 1-4 provide cross-sectional views of the 202S Building along the west-east and north-south building axes. S&M activities are performed in accordance with the S&M plan, DOE/RL-98-19, *Surveillance and Maintenance Plan for the 202-S Reduction Oxidation (REDOX) Facility*. Figures 1-5 through 1-10 are plan view illustrations of the building by gallery level and the current radiological conditions.

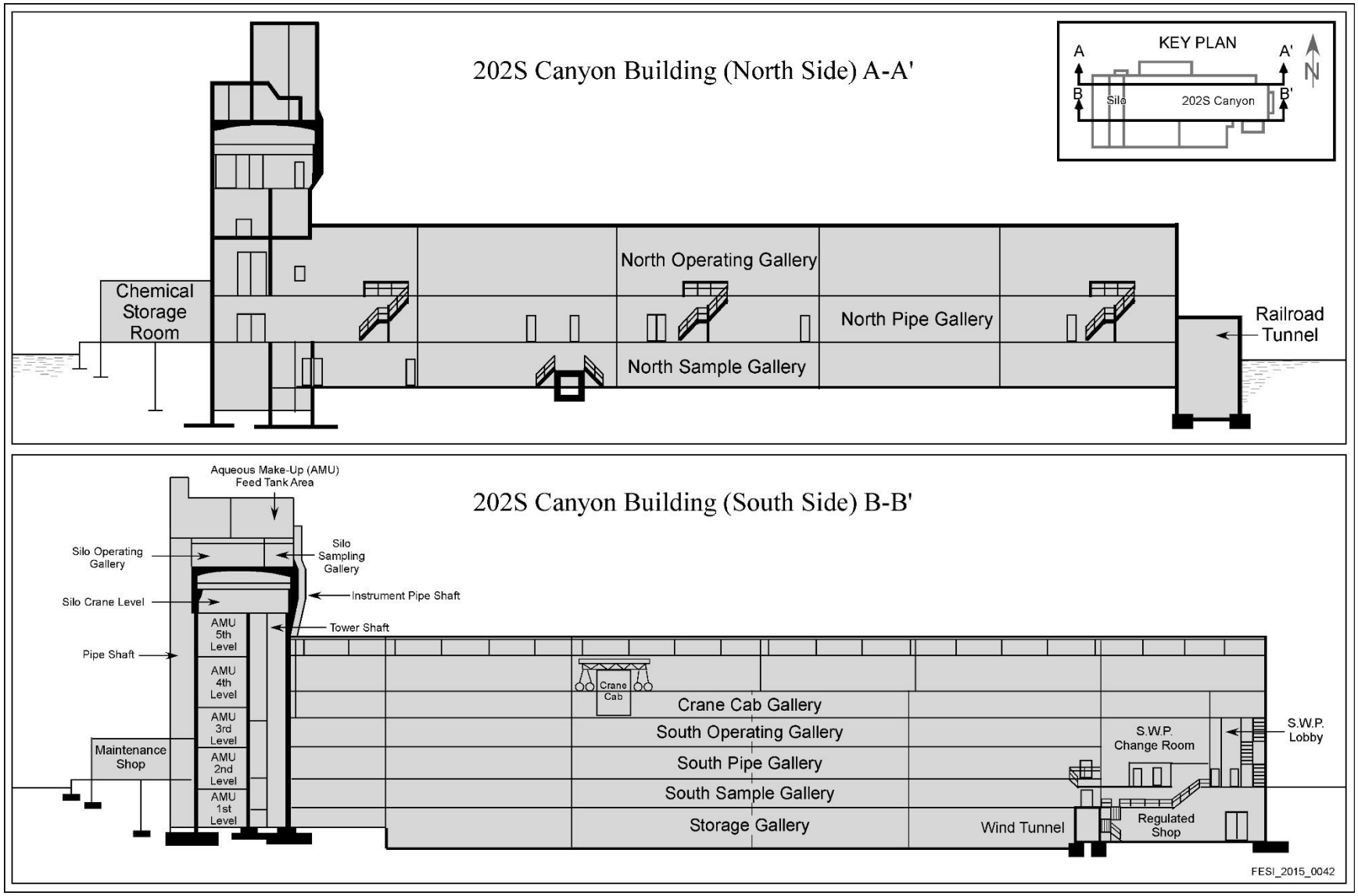

Figure 1-3. 202S Building Cross Section West to East

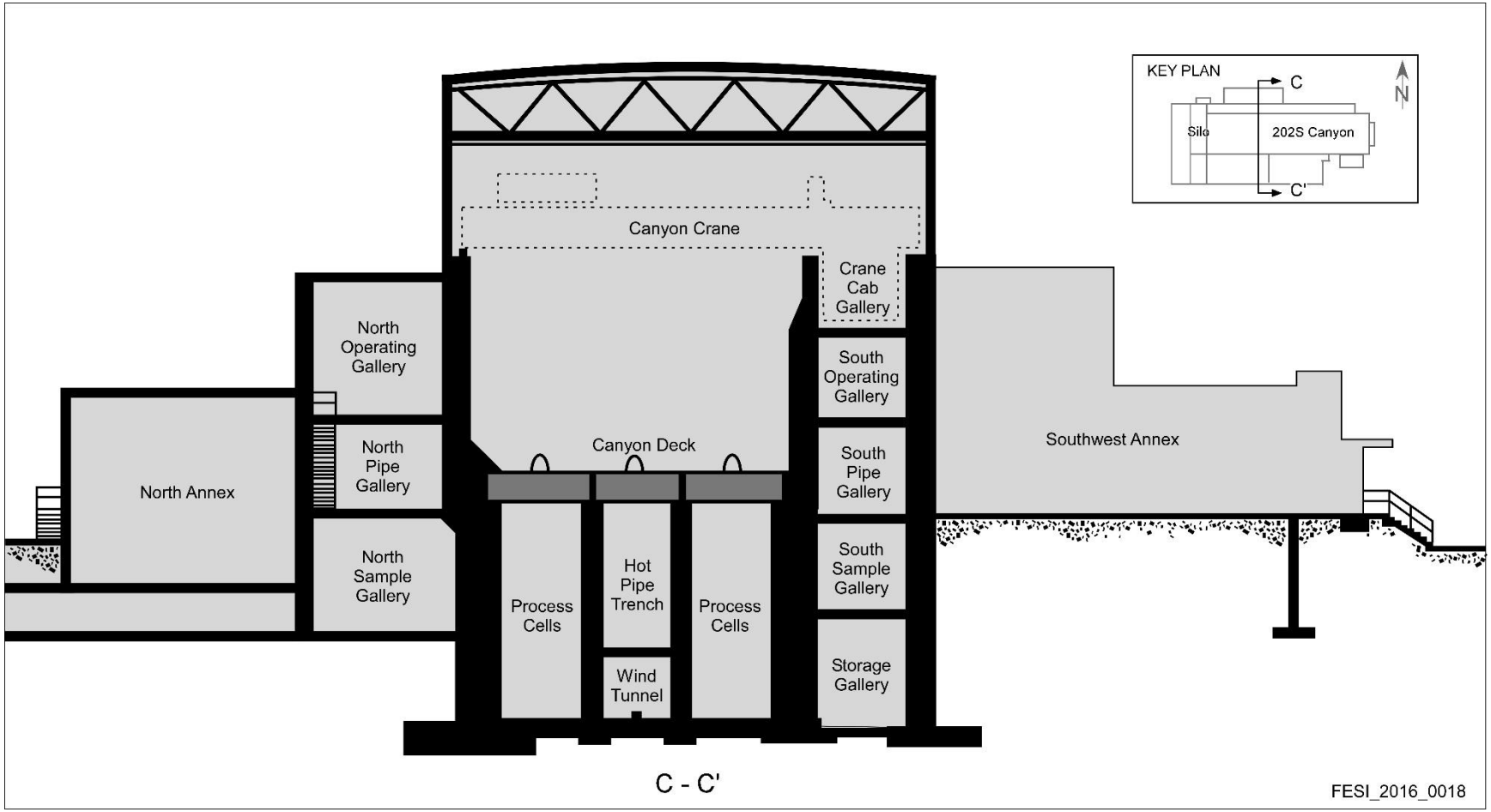

Figure 1-4. 202S Building Cross Section North to South (Facing East)

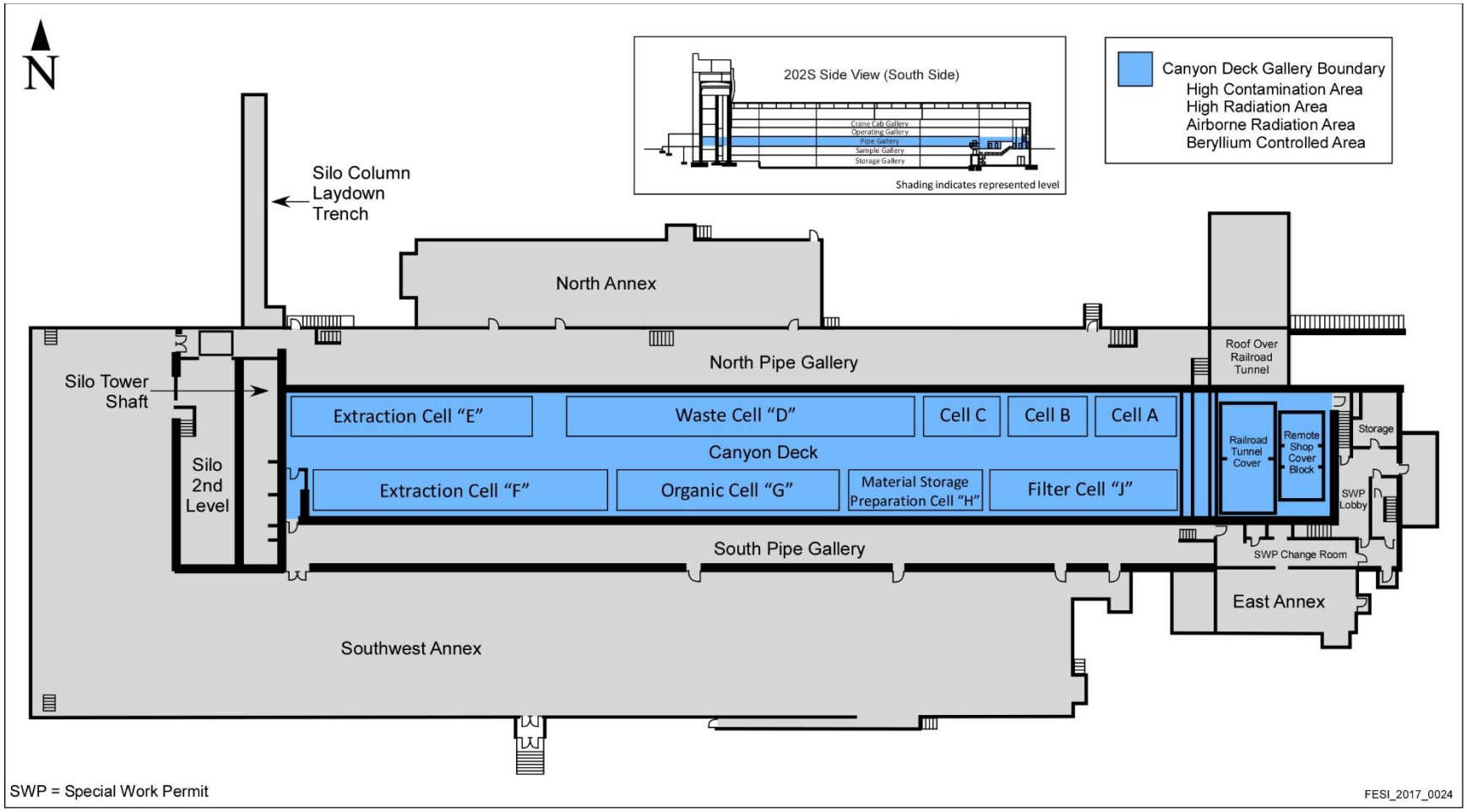

Figure 1-5. 202S Building Plan View – Canyon Deck at Pipe Gallery Level

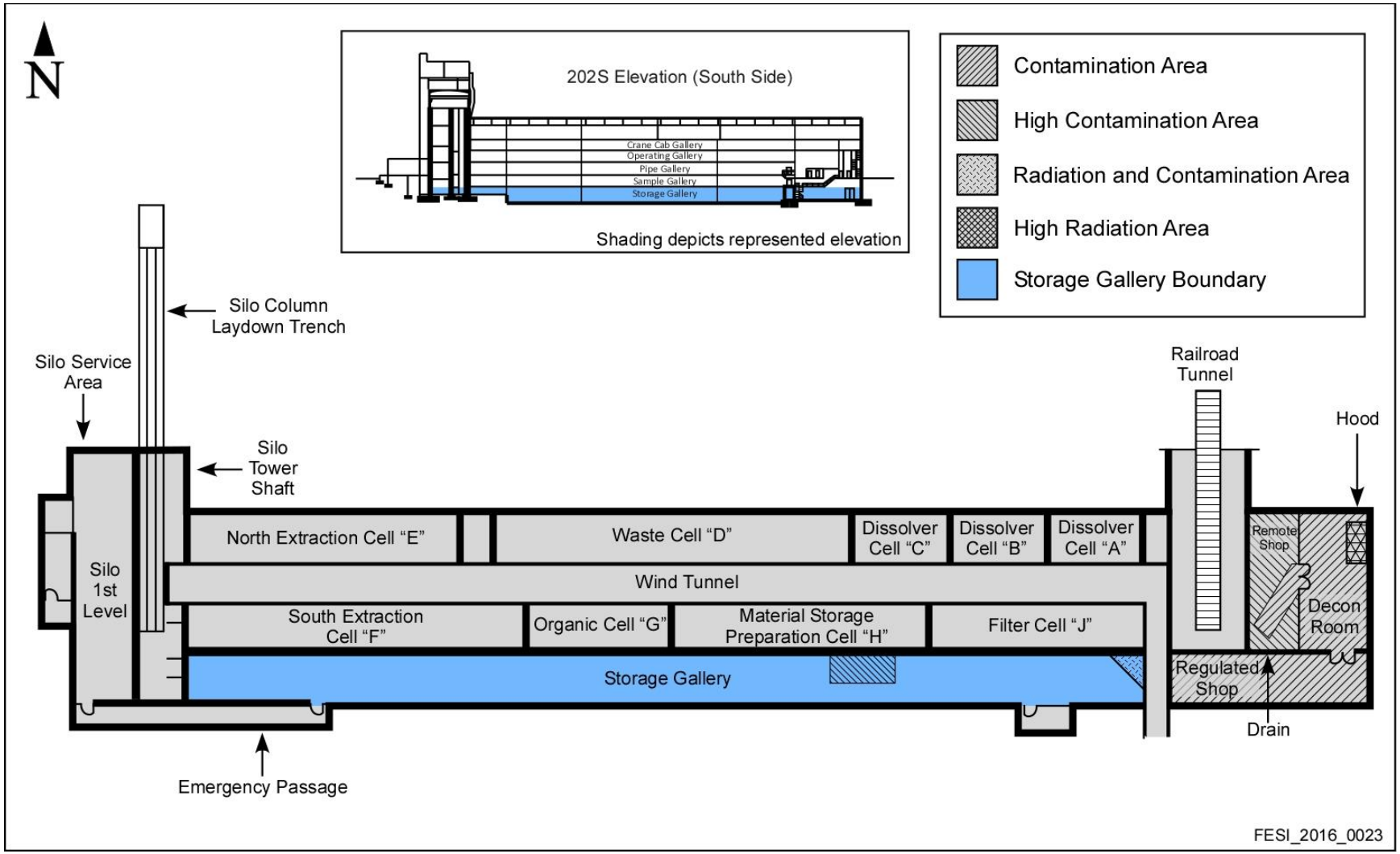

Figure 1-6. 202S Building Plan View – Storage Gallery Level

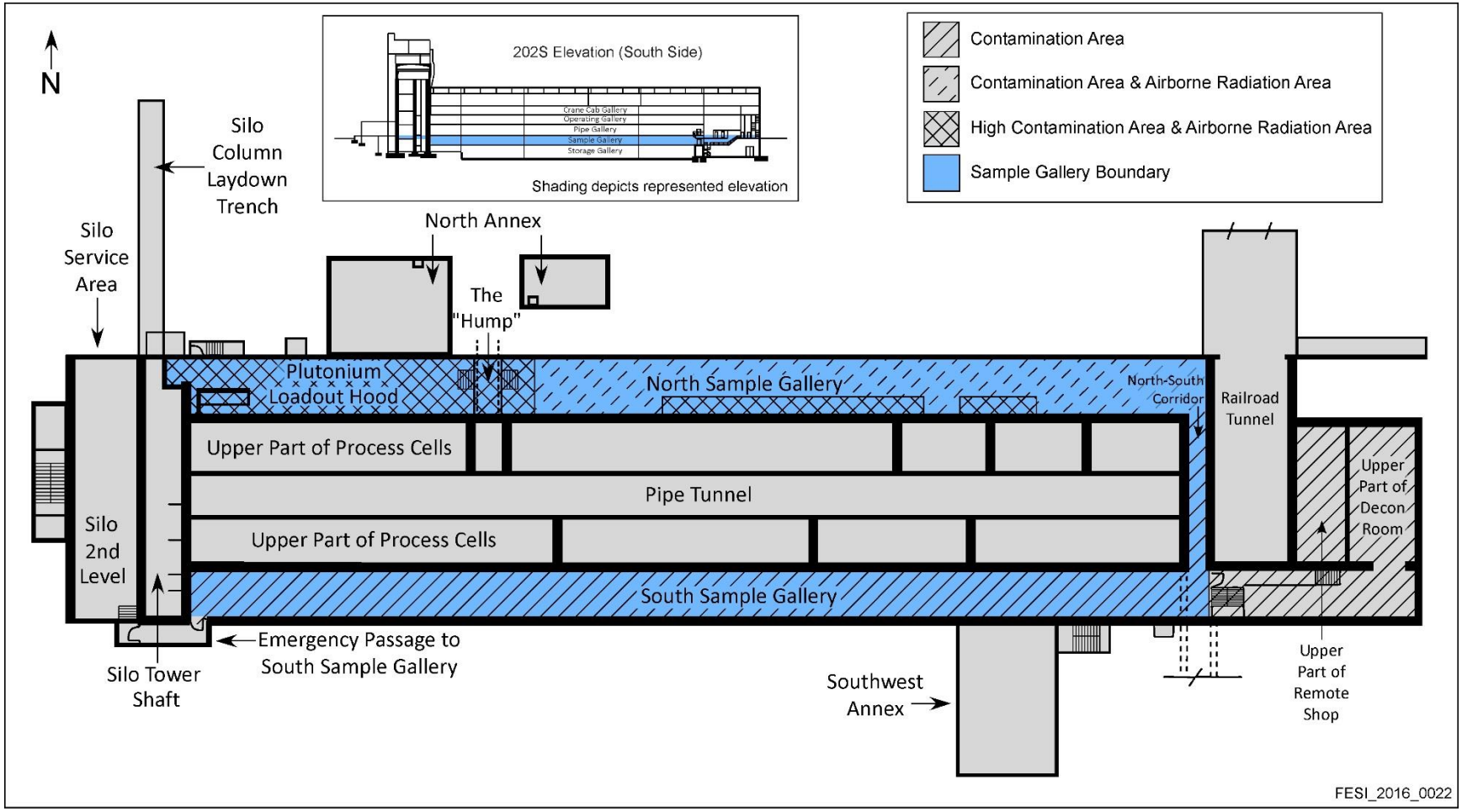

Figure 1-7. 202S Building Plan View – Sample Gallery Level

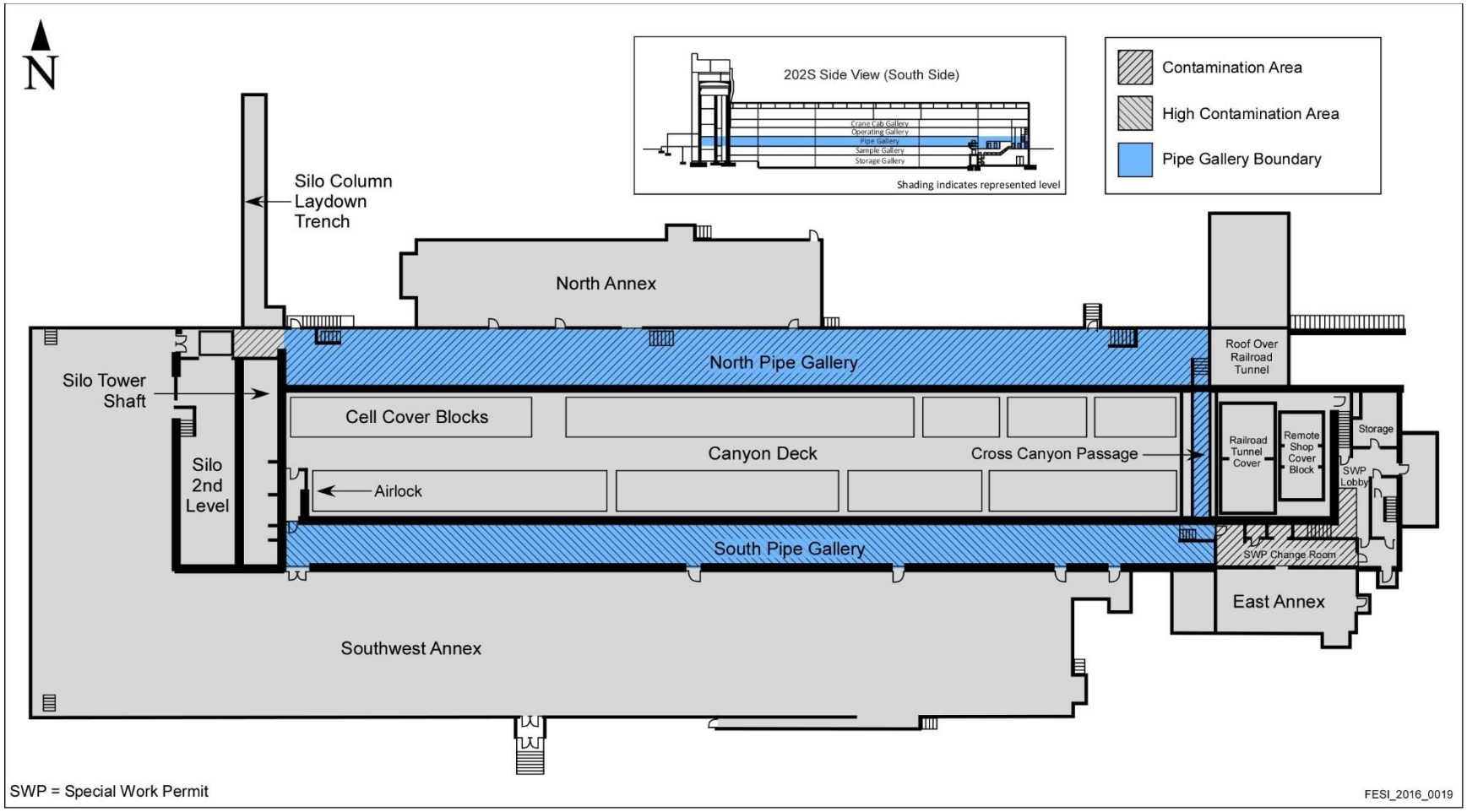

Figure 1-8. 202S Building Plan View – Pipe Gallery Level

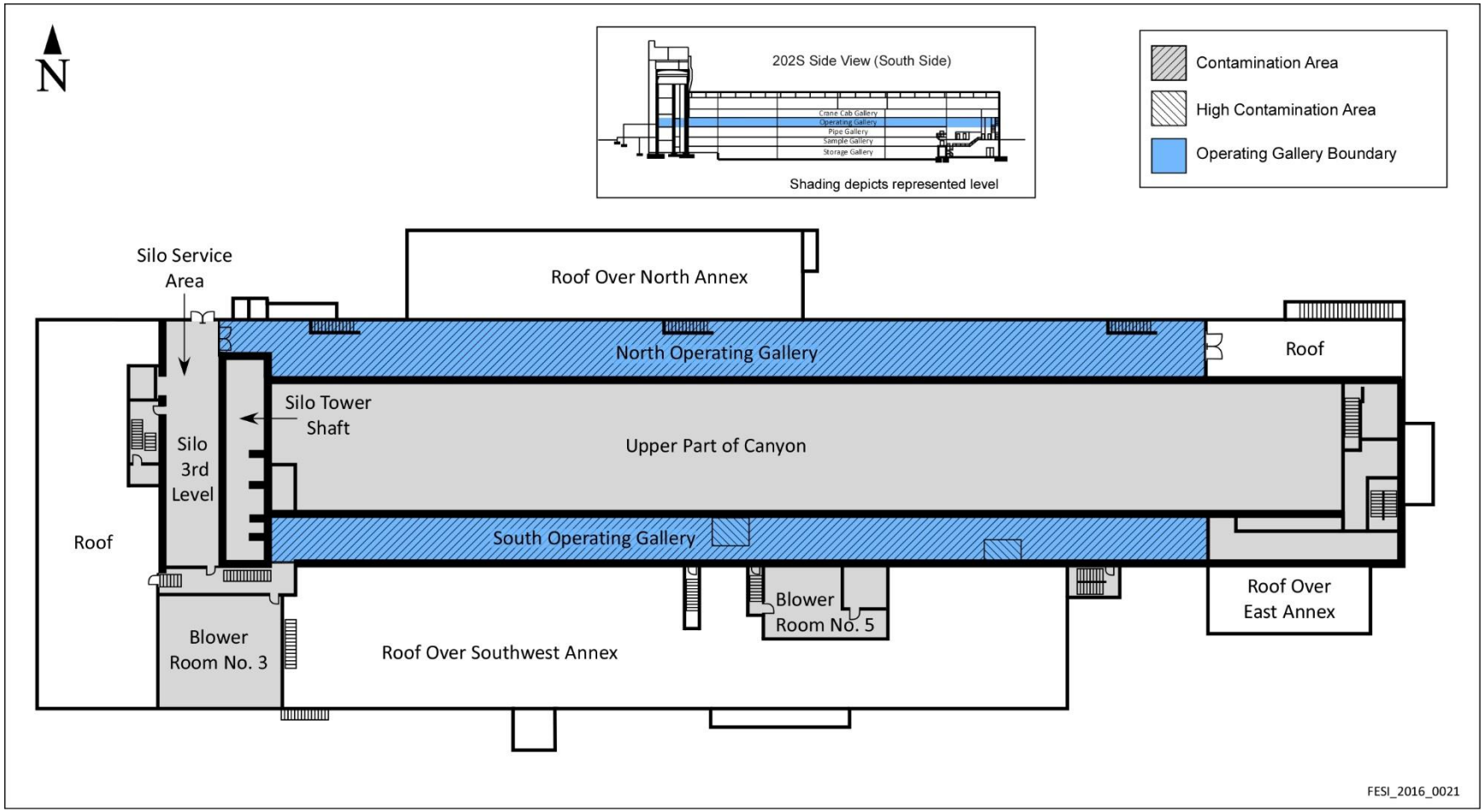

Figure 1-9. 202S Building Plan View – Operating Gallery Level

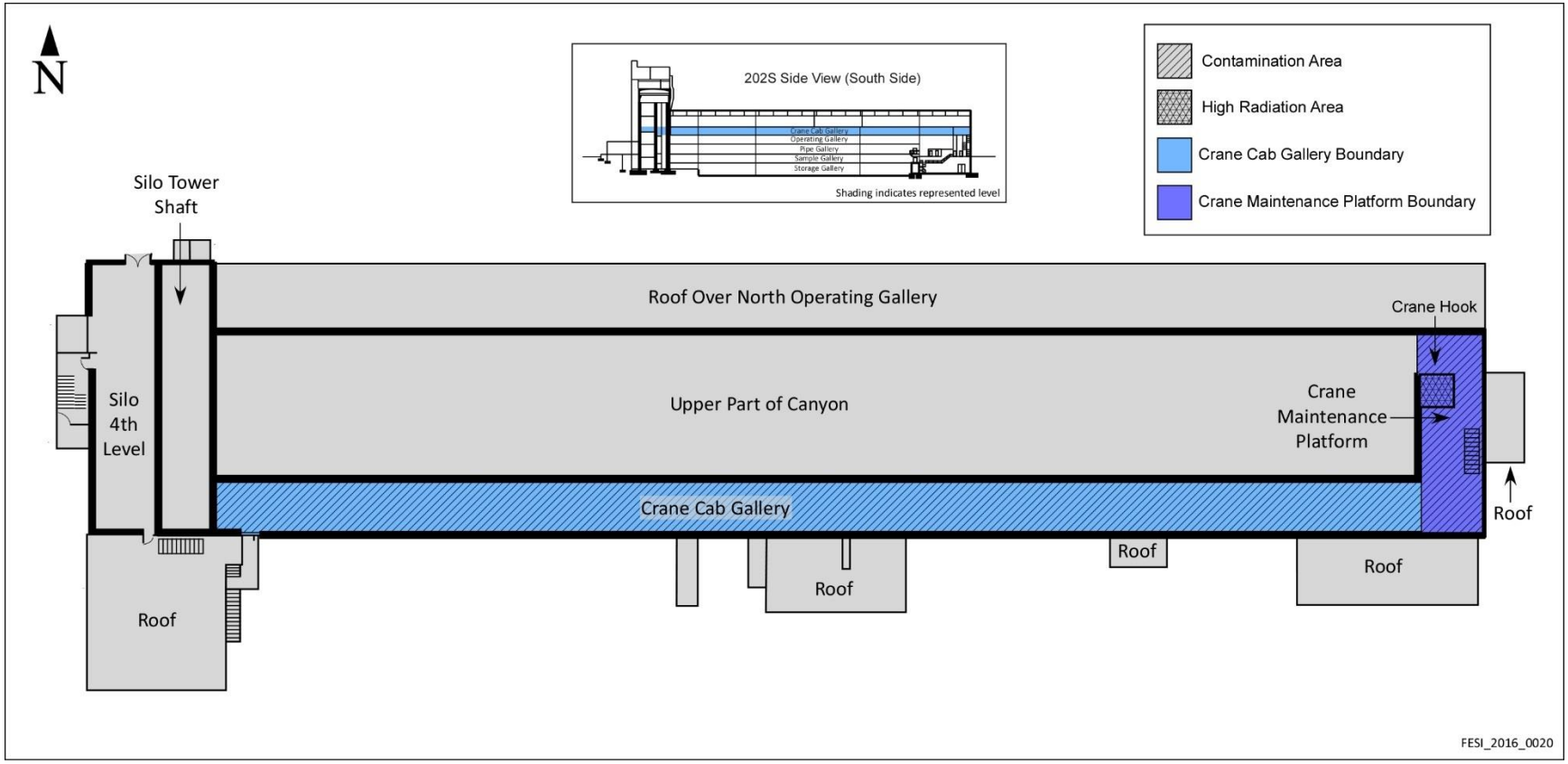

Figure 1-10. 202S Building Plan View – Crane Cab Gallery Level

1.3.1.1 202S Canyon

The 202S Canyon is a large, multistory, concrete structure with reinforced concrete walls. The building is 468 by 161 by 83 ft with 60 ft abovegrade. The canyon, which lies on an east-west axis, contains all the equipment for dissolving fuel elements, preparing radioactive column feeds, distilling solvents, concentrating and neutralizing waste, separating uranium, plutonium, and neptunium as product streams from fission products, and treating process gaseous wastes. Abovegrade areas include the canyon deck, North and South Pipe Galleries, North and South Operating Galleries, and south Crane Cab Gallery. Approximately one-fourth of the building is constructed belowgrade, with processes performed below the canyon deck for shielding purposes (Figure 1-4). Belowgrade areas include the North and South Sample Galleries and the Storage Gallery (located on the south side of 202S). The process cells, wind tunnel, waste line tunnel, and hot pipe trench are belowgrade and below the canyon deck and are outside the scope of this removal action.

Canyon Deck. One large area extends the entire length of the building with walls separating it from galleries on the north and south sides, and the floor separating it from the process cells and hot pipe trench. The floor of this area is called the canyon deck and consists of removable process cell cover blocks measuring 4 ft thick.

The concrete cover blocks are stepped to eliminate the direct path of radiation streaming. The cover blocks are removable by crane to access the process cells located below the canyon deck. Because the crane has been deactivated, the highly contaminated process cells are not currently accessible.

Crane Area. The canyon has two cranes. The largest is electrically driven and operates on tracks running lengthwise on both sides of the canyon. This crane has a 60-ton capacity main hoist, a 10-ton rotating auxiliary hook, and two dual-auxiliary hoists of 0.5- and 1-ton capacities. The 60-ton crane was operated via an attached crane cab that hangs below the southern end of the crane and was located behind a shielding wall. The area behind the shielding wall is referred to as the Crane Cab Gallery and is located on the south side of the canyon, directly above the South Operating Gallery (Figure 1-4). The crane was used to remove the cover blocks and move equipment between the canyon deck, process cells, and Railroad Tunnel. It was operated remotely from the Crane Cab Gallery. The second crane has a 2-ton capacity, is electrically operated, and is mounted on a monorail running cross-wise at the east end of the canyon. This crane was used for servicing the main crane.

Process Cells. The process cells contain deactivated processing equipment formerly used in spent fuel separations. Nine process cells are in two parallel rows with a concrete hot pipe trench and wind tunnel between the rows, separated by 2 ft thick concrete walls (Figures 1-4 and 1-5). While preparing for shutdown, all process equipment and piping were flushed to remove much of the chemical and radiological contamination. The process cells are estimated to contain the majority of the remaining chemical and radiological inventory in the 202S Canyon (Section 1.4). The hot pipe trench contains a network of transfer piping used to convey product and waste streams between process cells. During operations, the wind tunnel provided exhaust ventilation to all process cells and the silo tower shaft. The hot pipe trench and the wind tunnel were flushed during shutdown activities to remove and reclaim product and other chemical contaminates.

1.3.1.2 202S Galleries

Sample, Operating, and Pipe Galleries are located along the north and south sides of the canyon. A Storage Gallery is located below all the galleries on the south side of the canyon. Figures 1-6 through 1-10 provide plan views of the REDOX galleries and their current radiological conditions.

Storage Gallery. The Storage Gallery was used to store support equipment and materials (e.g., light hand tools, clean sampling equipment, decontamination fluids). The gallery is located on the south side of the building and is the lowest gallery level (Figure 1-6).

Sample Galleries. Located on the north and south sides of the canyon, the North and South Sample Galleries were used to collect radioactive samples from the canyon process equipment through highly shielded sample boxes on the walls shared between the galleries and the canyon cells. Solutions and products were collected using vacuum jets from process streams. The sampling equipment remains in the galleries, and the internal configuration of each sample box is not available. In addition to sample boxes, numerous chemical lines and unused equipment (e.g., carts, tanks, and lead bricks) are in these galleries. The Sample Gallery plan view is depicted in Figure 1-7.

North Sample Gallery. A rise with steps known as the Waste Line Tunnel (called the Hump) runs through the gallery on the west end of the North Sample Gallery. The Hump houses pipelines that diverted waste to the 240-S-151 Diversion Box located north of the 202S Building. Located east of the Hump are sample boxes and chemical lines. The area west of the Hump contains tank D-14-S, more sample boxes and chemical lines, as well as the Plutonium Loadout Hood (Figure 1-7).

The Plutonium Loadout Hood, also referred to as the Product Receiver Cage, is located at the west end of the North Sample Gallery (Figure 1-7). The hood was used to concentrate the plutonium product solution prior to shipment. The Plutonium Loadout Hood is composed of a metal frame supporting a series of Lexan™ panels that isolate highly contaminated hood vessels from the North Sample Gallery. The Lexan-paneled portion of the hood is approximately 8.5 ft high and sits on a raised concrete curb (0.5 ft high). The topmost 2 ft of the hood is enclosed by stainless steel panels. The hood is configured in an L shape, with the base leg 11 by 5 ft and the other leg 17 by 5 ft (BHI-01299, *Alternative Evaluation for the REDOX [202-S] Plutonium Loadout Hood*). Originally, this section of the hood was 21 ft, but part of the frame and paneling at the east end was removed, along with the equipment associated with the Product Removal Can, at the completion of loadout hood operations in 1955. A metal panel was used to cover the opening left by removing the east end section (BHI-01255, *Interim Characterization Report for the REDOX Plutonium Loadout Hood*). The hood was originally equipped with a stainless steel-lined floor for ease of spilled product recovery. Based on visual observations and reports, the stainless steel sheeting is no longer present (DOE/RL-97-75, *Sampling and Analysis Plan for the REDOX Plutonium Loadout Hood*).

The Plutonium Loadout Hood operated from 1951 to 1955. During operations, plutonium solutions from separation activities were transferred to the hood. The solutions were then concentrated and loaded out as a liquid plutonium nitrate product. In 1955, the system was deactivated as operations in the hood ceased because improved capabilities were provided by the 233S Plutonium Concentration Facility (demolished in 2004). The hood was serviced by a dedicated ventilation system that is no longer active. Currently, minimal ventilation to the hood is supplied by the 291S Exhaust System through the vessel vent header which results in a slight negative differential pressure differential when compared to the North Sample Gallery.

No reports have been found that document cleanout of the hood vessels after startup of the 233S Building, but it is expected that acid washes followed by water rinses were performed until the contamination level in the flushed solution did not change (DOE/RL-97-75). In 1999, the following stabilization activities were initiated:

- Plutonium Loadout Hood – stabilizing the interior surfaces and equipment, placing absorbent material in the sump, and isolating the hood from the exhaust system (EF-8 Exhauster)

™ Lexan is a trademark of Saudi Arabia Basic Industries Corporation (SABIC) Innovative Plastics, Houston, Texas.

- North Sample Gallery – decontaminating or stabilizing surfaces around the hood, stabilizing the L-16 to E-3 sampling line (adjacent to the hood), and removing any loose contamination (BHI-01255; 0200W-US-N0156-02, *Pu Loadout Hood Stabilization*)

South Sample Gallery. The South Sample Gallery was used to collect samples from the process cells through highly shielded sample boxes on the walls shared between the galleries and the canyon (Figure 1-7). Solutions and products were collected using vacuum jets from process streams. This equipment remains, and the internal configuration is unknown. In addition to sample boxes, numerous chemical lines run overhead, and miscellaneous equipment remains (e.g., carts, tanks, and lead bricks). After deactivation, the South Sample Gallery was used for sample storage by the 222S Laboratory. Two of these storage areas (the lead brick areas on both sides of the H-7 and H-8 sample boxes), currently wrapped in craft paper, may contain unknown source or residual levels of contamination.

Pipe Galleries. There are two pipe galleries, the North Pipe Gallery and the South Pipe Gallery (Figure 1-8). The pipe galleries contain piping and junctions that were used to transfer nonradioactive chemicals via fixed wall-mounted flanges. Leaking pipes have been observed in several locations.

Operating Galleries. The North Operating Gallery and South Operating Gallery are located on the north and south sides of the canyon (Figure 1-9). The operating galleries include tanks, instrumentation panels, and control valves that were used to remotely control and monitor activities that occurred in the canyon cells.

1.3.1.3 202S East End Rooms

The East End Rooms are a maintenance area located at the east end of the canyon (Figures 1-6 through 1-8). This maintenance area consists of a lobby used as a central staging area and the remote shop, decontamination room, and regulated shop.

Special Work Permit (SWP) Lobby. The SWP Lobby is a central staging area that is accessed through an air lock on the South Pipe Gallery level. The SWP Lobby provides access to the Health Instrument Storage Room as well as a stairwell that leads to the canyon deck. In addition, the lobby has a stairway that leads to the Crane Maintenance Platform located at the east end of the upper portion of the canyon.

Remote Shop. Also known as the Hot Shop, the remote shop is two stories located to the east of the Storage Gallery and North and South Sample Galleries, directly east of the Railroad Tunnel. The remote shop is a 40.5 by 15 ft room with a 26.25 ft ceiling and a removable 4 ft thick concrete cover block that provides access into the canyon process area. Equipment, tools, and other supplies could be transferred between the canyon deck and remote shop via the overhead crane. The remote shop is equipped with a stainless steel floor and a hot drain where contaminated equipment was flushed and rinsed with decontaminants. This drain is a high radiation area. Due to the nature of the work conducted in this room, surface contamination of mixed fission products is present and the floor is known to be contaminated. The main canyon air tunnel is connected to the remote shop via a ducted louvered port that provided exhaust ventilation to this area.

Decontamination Room. Directly east of the remote shop is the decontamination room, a 40.5 by 24 ft room with a 19.67 ft ceiling. Equipment and tools delivered to the remote shop from the canyon process area were likely contaminated from processing activities. Equipment requiring repair or modification as well as any tools used in contaminated areas were moved to the decontamination room to undergo decontamination activities to reduce or remove contamination. This room contained two hooded sinks equipped with water, steam, and acid service for further decontamination of equipment. Decontamination activities were conducted under a ventilation hood. The area in and around these hoods may have significant levels of contamination.

Regulated Shop. Following decontamination in the decontamination room, equipment would undergo contact maintenance in the Regulated Shop. A 65.5 by 12.75 ft room with a 19.75 ft ceiling, the shop may be highly contaminated.

1.3.1.4 202S Silo

The 202S Silo is an eight-story structure located at the west end of the 202S Building. The silo houses solvent extraction columns and aqueous makeup unit (AMU) vessels. The silo is 84 by 41 by 132 ft, with 117 ft abovegrade. The silo is segregated into two parts: Silo Service Area (operating area) and silo tower shaft (process area) (Figure 1-11). The exterior walls of the silo vary in thickness from 1.5 ft to 3.5 ft. The silo crane level, silo tower shaft, and column laydown trench are not included in the scope of the removal action and will not be addressed in this document.

Silo Service Area. The Silo Service Area has eight levels: the first five are AMU levels, and the sixth level is occupied by the silo crane. The Silo Operating Gallery and Sample Gallery are on the seventh level. The eighth level contains the Blower Room and Feed Tank Area. The silo crane, an electrically driven railway crane with a 10 ton capacity and two auxiliary hoists rated at 0.5 and 1 ton capacities, has been deactivated. The 202S Silo Service Area may be used as an emergency egress route from other areas of the 202S Building (e.g., South Sample Gallery and Storage Gallery).

There are two elevators in the silo. Elevator 1 is a freight elevator located on the west side of the building that served all levels of the silo and the former chemical storage room in the southwest annex (later converted to offices). Elevator 2 is a smaller passenger elevator located on the north side of the building. Elevator 2 provided access to the sixth and seventh levels of the silo from the North Sample Gallery. Both elevators are currently out of service.

Two vertical pipe shafts provide routes for utility and chemical piping to the AMU levels, Silo Operating Gallery, and Feed Tank Area. The No. 1 Pipe Shaft is on the west wall of the silo, and the No. 2 Pipe Shaft is on the north wall. The No. 2 Pipe Shaft contains the transfer line for treated hexone from the 276S Building to the organic head tank (TK-804). A spray nozzle is installed at the top of the shaft for decontamination purposes and fire suppression. Two vertical instrument pipe shafts (No. 1 and No. 2) run externally on the east wall of the silo from the Tower Shaft to the Operating and Sampling Galleries on the seventh level. The pipe shafts are not included within the scope of the removal action.

During the 1970s and 1980s (after deactivation), several test assemblies were installed and operated in the 202S Silo Service Area, reactivating some existing silo equipment. Any post-testing decontamination activities for the test equipment and repurposed silo equipment is not available.

1.3.1.5 202S Annex

The 202S Annex is separated from the main canyon structure by massive concrete wall. Three subannexes comprise the REDOX Annex (Figures 1-7 through 1-10). These areas contain offices, administrative support areas, and equipment rooms that are described in the following paragraphs. Historically, they are minimally contaminated due to cross-contamination vectors. The annex buildings were part of the original construction of the 202S Building.

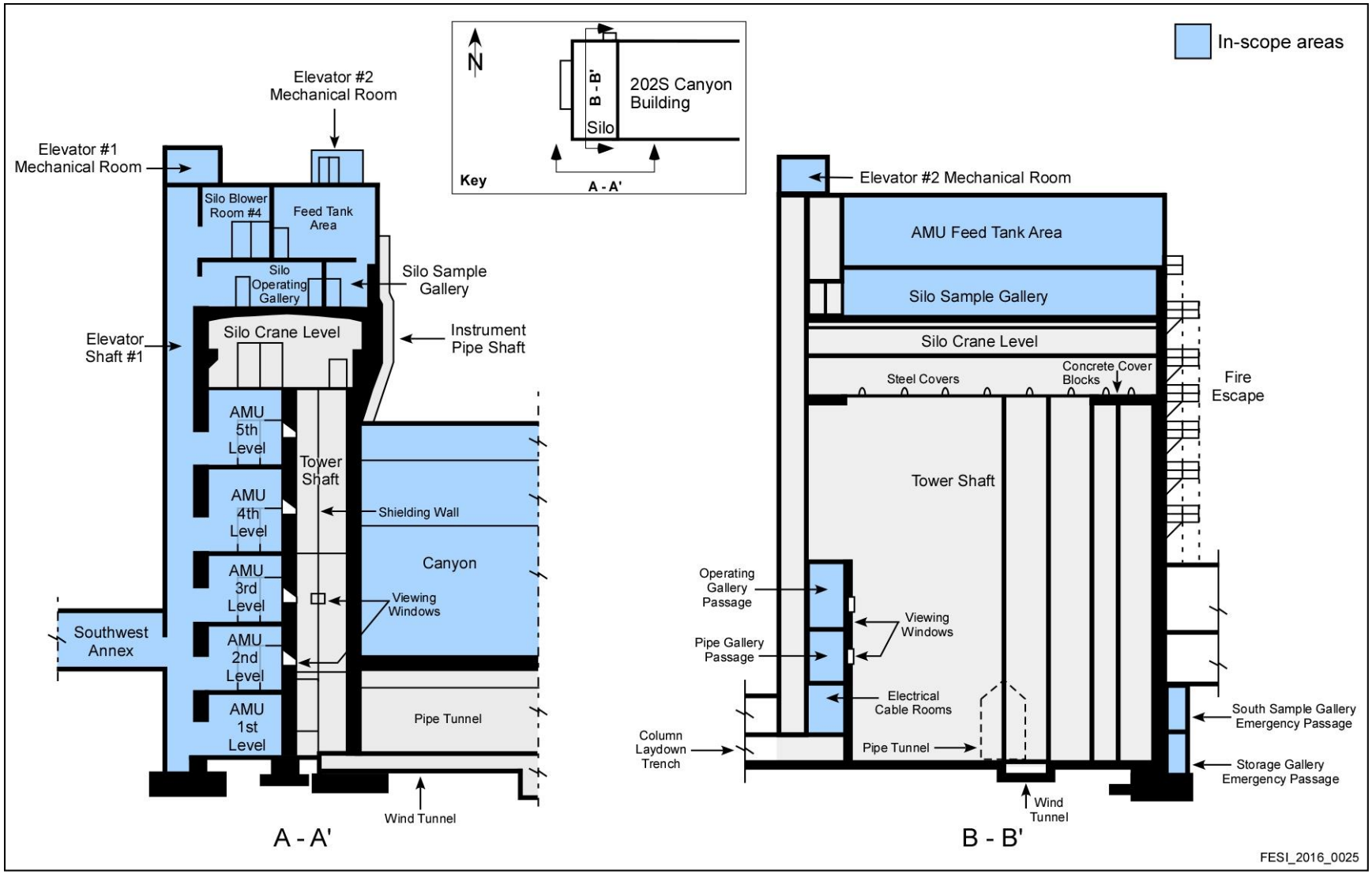

Figure 1-11. 202S Silo Cross Sections

North Annex. The north service area is located on the north side of the 202S Building and is 143.5 by 50 ft. The North Annex contains a 2.4 kV Switchgear Room, a wet cell Battery Room, the North 480 V Switchgear Room, Blower Room #2, Cable Room #1, Cable Room #2, the former electric shop, and an office. Blower Room #2 contains a deactivated supply fan for the North Pipe and Operating Galleries. The electrical shop contains the motor control center (MCC) and the lighting panels for the downsized electrical operating equipment that was installed in the late 1990s in the REDOX Building. There are no batteries remaining in the wet cell battery room.

Southwest Annex. The south and west service areas are an L-shaped annex that wraps around the south and west sides of the 202S Canyon and Silo. The base (north-south) leg is 83.5 by 40 ft; the other (east-west) leg is 353 by 47 ft. The Southwest Annex contains Blower Rooms #1, #3, and #5; Cable Room #3; a compressor room; and the South 480 V Switchgear Room. This annex also includes the former chemical storage area (northwest corner), maintenance and instrument shops, survey room, lunchroom, change rooms, and offices. Blower Room #1 houses three deactivated supply fans for the REDOX Complex. The compressor room contains an air compressor and an instrument air dryer, both of which are deactivated. The South 480 V Switchgear Room contains MCCs that have been deactivated.

East Annex. The east end segment of the service areas is located on the southeast side of the 202S Building and is 50 by 22 ft. The East Annex contains a locker room and an area used for storage of clean personal protective equipment (PPE), commonly referred to as laundry, and bulk supplies. The East Annex is used for access to the 202S Canyon for ongoing S&M activities.

1.3.2 276S Hexone Storage and Treatment Facility

The HSTF consists of following:

- Two hexone[5] storage tanks (276S141 [S141] and 276S142 [S142]) including ancillary equipment
- A distillation system (removed)
- Four railroad container cars (removed)

Figure 1-12 shows the HSTF location within the REDOX Complex. Figure 1-13 shows the HSTF components and the associated operable units. Removal action work will be conducted within the CR-1 Operable Unit boundary.

1.3.2.1 Storage Tanks (276S141 and 276S142)

Two underground hexone storage tanks (S141 and S142) were installed in 1951 and received commercial-grade hexone from vendors by railcar. The storage tanks are cylindrical carbon steel tanks placed horizontally with the tops of the tanks about 3 ft belowground. The tanks are 28 ft in length and 12 ft in diameter. The capacity of each tank is 23,575 gal, with a working capacity of 21,500 gal. The ancillary equipment associated with the tanks consists of the following:

- Two centrifugal transfer pumps
- Aboveground ventilation piping. Tank S141 vented to tank S142 through a flame arrestor and 3 in. vent pipe
- Mercury manometers for measuring pressure
- Weight factor liquid level instrumentation

[5] Hexone is also known as methyl isobutyl ketone or 4-methyl-2-pentanone.

Figure 1-12. Hexone Storage and Treatment Facility within the REDOX Complex

1.3.2.2 Distillation System

The distillation system was on the railroad spur east of the hexone tanks. The distillation system consisted of two sets of distillation equipment mounted on a railroad car. A secondary containment system was designed and installed under the railroad car. Except for the railroad track, all other equipment, including the railcar and the secondary containment, were removed.

1.3.2.3 Railroad Container Cars

Four railroad container cars were used for storage of hexone after the waste was distillated. Secondary containment structures were placed under each railcar, in the gaps between railcars, and under all threaded fittings on pipes carrying hexone. Except for the railroad track, all other equipment, including the railcars and the secondary containment, were removed for reuse or disposed. The railroad track was covered with about 2 ft of clean soil in 2003-2004 to allow vehicle traffic.

1.3.2.4 Operating History

The two underground tanks were used for hexone storage until 1967 and liquid mixed waste from REDOX thereafter. Tank S141 contained contaminated hexone, which had been used as a solvent at

REDOX. Tank S142 contained hexone, normal paraffin hydrocarbons (NPH)[6], and tributyl phosphate. The NPH and tributyl phosphate were used in a one-time 1966 campaign to separate americium, curium, and rare earth fission products from reactor blanket fuel.

In July through December of 1990, a campaign was conducted to treat the mixed waste in the tanks. The waste was pumped from tanks S141 and S142 through the distillation system to reduce the radioactivity of the waste. During pumping to the distillation system, water was added to float the hexone to assist in removing the remaining waste. After the waste was pumped out, the tanks were rinsed with NPH and the rinse liquid was also pumped through the distillation system.

From 1990 through 1992, a combined 35,000 gal of the solvent remaining in the tanks was recovered, distilled, and then transported and incinerated at an offsite location, as discussed in WHC-EP-0570, *The Distillation and Incineration of 132,000 Liters (35,000 Gallons) of Mixed-Waste Hexone Solvents from Hanford's REDOX Plant*. Residual sludge in the tanks from the distillation process was grouted as an interim closure activity in 2002 (HNF-13830). The remaining void space in the tanks was subsequently grouted and the tanks were left in place. Closure of the HSTF will be conducted in accordance with an approved closure plan. Waste generated from the closure activities will be disposed under this NTCRA as identified in Section 5.5 of the *Hanford Federal Facility Agreement and Consent Order Action Plan* (hereinafter called the Tri-Party Agreement Action Plan) (Ecology et al., 1989b).

1.3.3 293S Nitric Acid and Iodine Recovery Building

The 293S Nitric Acid and Iodine Recovery Building (293S Building) is located to the east of the 202S Building, directly south of the 291S Exhaust System. This building was built in 1957 and deactivated in 1969. It provided filter backup capabilities for radioactive iodine removal in combination with recovery of nitric acid vapors that developed when irradiated uranium rods were dissolved. The acid fumes were captured in a nitric acid absorber, and radioactive iodine was removed using a caustic scrubber system and sent for disposal.

The 293S Building was constructed of steel and concrete with a corrugated asbestos cement exterior siding. The concrete portion of the building (29 by 16 ft) extends from 12 ft belowgrade to 30 ft abovegrade (Figures 1-14 and 1-15). The main floor houses the absorption towers with a valve pit in the basement. The recovered nitric acid was stored in an underground stainless steel storage tank (10 by 10 ft), located directly west of the 293S Building. This tank has been documented as being empty (HNF-13830).

Remaining hazards within the 293S Building include radioactive material inventory (mixed fission products, plutonium, and americium), estimated to be approximately 4 Ci beta and 1 Ci alpha, present in the scrubber/absorption column and piping. The upper level of the building contains fiber filter media and is currently designated as a radiological buffer area while the lower area contains the exchange columns and is a contamination area.

[6] NPHs are a purified derivative of kerosene containing straight-chain hydrocarbons in the range of $C_{10}H_{22}$ through $C_{18}H_{38}$.

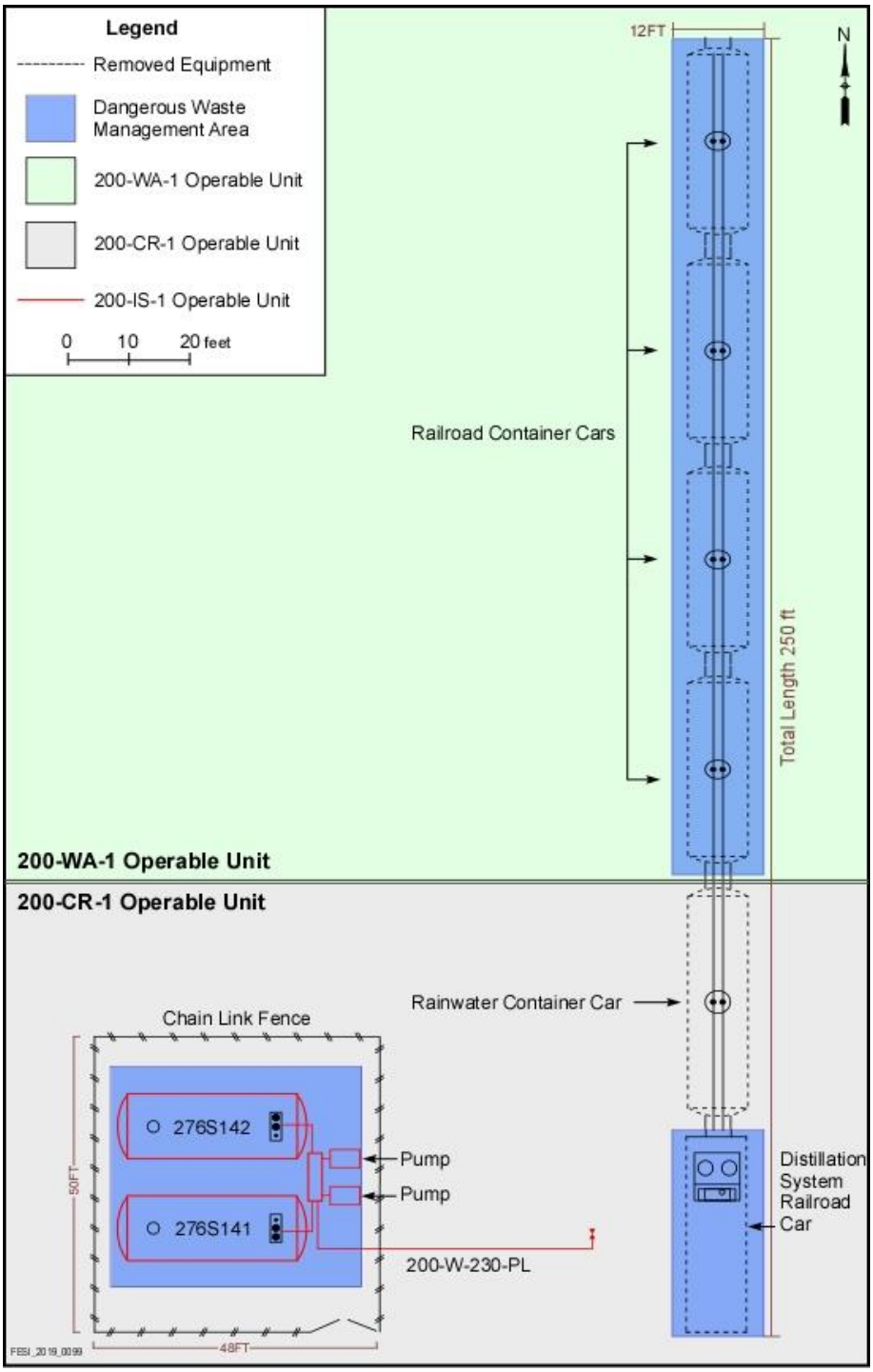

Figure 1-13. 276S Hexone Storage Area

Figure 1-14. 293S Nitric Acid and Iodine Recovery Building

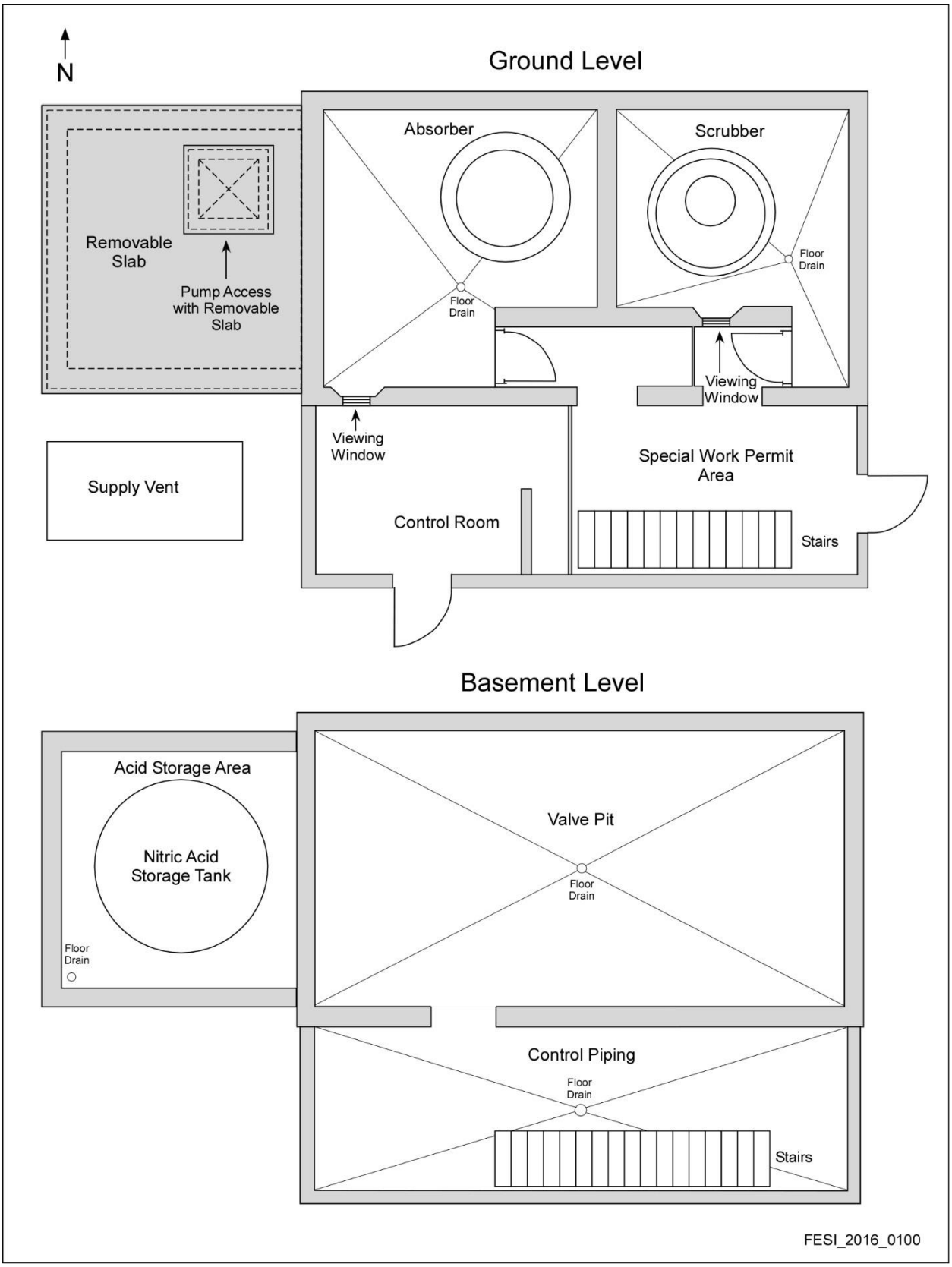

Figure 1-15. 293S Nitric Acid and Iodine Recovery Building – Plan View

1.3.4 291S Exhaust System

The 291S Exhaust System provides active filtration of radiological particulates before the exhausted air is released to the environment. The system consists of the following four main components:

- **Wind Tunnel** – A reinforced concrete, belowgrade structure that connects the 202S Building (e.g., silo tower shaft, process cells, and remote shop) to the 291S Sand Filter inlet plenum.
- **Exhaust Fans** – The EF-1 and EF-2 exhaust fans are located outside the 291S Building. Two stainless steel, direct-driven blowers are installed in parallel and are powered by 60-hp electric motors. The two fans are run alternately, as required.
- **291S Sand Filter** – The belowgrade sand filter removes radioactive particles from exhaust air before the air is discharged to the atmosphere. The discharge duct of the sand filter is connected to the EF-1 and EF-2 inlet plenum.
- **291S001 Exhaust Stack** – This stack is included in AOP-00-05-06, *Hanford Site Air Operating Permit*, for 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," (NESHAP) and WAC 173-401, "Operating Permit Regulation."

Although the exhaust system is not part of the removal action scope, it may be modified to support the removal activities (Section 2.3).

1.4 Release or Threat of Release into the Environment of Hazardous Substances, Pollutants, or Contaminants

The structures identified in this removal action, are, to different degrees, contaminated with both radioactive and chemical substances that were used or generated during facility operations and waste management activities. Some but not all hazardous substances were removed during the shutdown period (1966 to 1968). In addition to radiological and chemical hazards, structural hazards exist due to the degradation in the structural integrity of the buildings and structures. Structural degradation could result in partial loss of radiological material, confinement, and/or worker injury.

Removal activities will be performed in accordance with appropriate procedures that ensure control of hazardous substances. The standards and procedures for managing hazardous substances ensure that personnel removing, handling, and disposing of waste perform work in a manner that achieves the following objectives:

- Protect the safety of employees and the general public
- Minimize spills and releases to the environment
- Meet applicable DOE, federal, state, and local regulatory requirements

Table 1-2 provides a summary of the current hazard conditions in the 202S Building.

Table 1-2. Current REDOX Complex Hazard Conditions

Area	Surveyed Area	Documented Conditions
Canyon Deck	No	The canyon deck has not been entered since 1997. Conditions on the deck are not known at this time. Based on current conditions in areas where surveillance inspections are performed, water accumulation, animal intrusion, structure deterioration, and contamination spread are expected. Currently, this area is not part of the removal action.
Silo (Service Area)	Yes	Substantial structural deterioration has been observed in the silo. Significant water stains, dirt deposits, animal intrusion, and chemical stains are noted on all levels of the silo. White chemical crystals and powder are found on several tanks, flanges, valves, and pipes from prior operational usage. Characteristics of all the chemical residues are not know at this time. Deteriorated asbestos insulation has also been noted on most levels. Because of the presence of chemical crystals and deteriorating asbestos there is a need for a removal action to mitigate the potential for a threat of release.
Plutonium Loadout Hood Area	No (since 2013)	The Plutonium Loadout Hood that is located at the west end of the North Sample Gallery contains a large quantity of radiological inventory (140 Ci of plutonium and 840 Ci of strontium-90). Surveillance reports indicate that the boundaries of the radiological contamination within the confinements of the North Sample Gallery in every entry from 2012 to 2015 were not fully defined. In 2012, the surveillance inspection of the west end of the North Sample Gallery was halted because water was seen running down the loadout hood, and the contamination level in the gallery exceeded RWP limits. The HCA boundary was extended to the east. In 2013, high contamination levels were again found outside of the established HCA boundary. In 2015, the RWP was voided again after nearing the Waste Line Tunnel (commonly referred to as the "Hump"). Because of the elevated contamination levels and the distribution of the contamination there is a need for a removal action to mitigate the potential for a threat of release.
North Sample Gallery	Yes	Plutonium nitrate residue remained in pipelines prior to shutdown activities in the late 1960s. HCAs along the sample boxes are spreading, there are contaminated water intrusions resulting from the leaking roof, and expansion joints are spalling. The survey route is limited to a walk path. Because of the potential for leaks to develop and the spread of HCAs there is a need for a removal action to mitigate the potential for a threat of release.
South Sample Gallery	Yes	Expansion joint filler is deteriorated and crumbled on the gallery floor. Water intrusions were evident. Leaking mercury from manometers was noted. The survey route is limited to a walk path. Because of deterioration and water intrusions there is a need for a removal action to mitigate the potential for a threat of release.
North Pipe Gallery	Yes	Multiple chemical leaks in both liquid and solid form, water intrusions, and degraded asbestos insulation were noted in the surveillance inspection report. Areas of sagging pipe insulation and chemical leaks have been isolated. Because of the potential for leaks to develop and degradation of asbestos there is a need for a removal action to mitigate the potential for a threat of release.

Table 1-2. Current REDOX Complex Hazard Conditions

Area	Surveyed Area	Documented Conditions
South Pipe Gallery	Yes	Water stains and white chemical crystals throughout the gallery were reported. In 2015, radiologically contaminated water migrated in the west end of the gallery from the Crane Cab Gallery and South Operating Gallery above and resulted in an HCA. Since then, the area was covered with craft paper and down posted to a contamination area. Because of the migration of radiologically contaminated water and the presence of chemical crystals there is a need for a removal action to mitigate the potential for a threat of release.
North Operating Gallery	Yes	Multiple chemical leaks, water intrusions, and degraded asbestos insulation were noted in the surveillance inspection report. Because of these conditions there is a need for a removal action to mitigate the potential for a threat of release.
South Operating Gallery	Yes	Radiological contamination has spread, possibly due to roof leakage or rain seeping through expansion joints and from water intrusions from the Crane Cab Gallery above. HCAs were established in the gallery. Oily chemical leaks were noted in the surveillance report. Because of these conditions there is a need for a removal action to mitigate the potential for a threat of release.
Storage Gallery	Yes	Stains due to water intrusion were observed throughout the gallery. In 2014, the surveillance inspection of the Storage Gallery was stopped due to high levels of contamination that exceeded RWP limits. The area was entered again in 2015. The high levels of contamination exceeding RWP limits necessitate the need for a removal action.
293S, Nitric Acid and Iodine Recovery Building	Yes	Water intrusions and stains were noted in surveillance inspections reports. Spacers for transite panels had fallen to the ground, and the rubber transition piece from an exhaust duct was falling apart. There is a possibility that a potential beryllium instrument is present in the control instrument room. Because of these conditions, there is a need for a removal action to mitigate the potential for a threat of release.
276S, Hexone Storage and Treatment Facility (HSTF)	Yes	Only exterior surveillance is performed of the 276S HSTF. No hazard conditions were noted in surveillance reports from 2012 to 2017.

Reference: CP-60203, *REDOX Complex FY17-FY19 Deactivation Plan*.

HCA = high contamination area

RCRA = *Resource Conservation and Recovery Act of 1976*

RWP = radiological work permit

1.4.1 Radiological Hazards

The primary hazardous substances associated with the 202S Building and ancillary structures are radioactive materials. Radionuclide contaminants include but are not limited to uranium-234/235/238; plutonium-239/240/241; americium-241; neptunium-237; and mixed fission products such as strontium-90, cesium-137, and cobalt-60. The majority of contaminants are found in the form of adherent films and residues within the structures. Estimated radiological inventories are shown in Table 1-3.

Table 1-3. Estimated REDOX Complex Radioactive Material Inventories

Location	Type	Inventory
202S Building* Canyon (including process cells, equipment and piping, and deck)	Pu-239 Sr-90	1,500 Ci alpha (24.5 kg of Pu-239) 4,500 Ci beta (64 g of Sr-90)
202S Building North Sample Gallery, Plutonium Loadout Hood	Pu-239 Sr-90	140 Ci alpha (2,155 g of Pu-239) 840 Ci beta (6.0 g of Sr-90)
202S Building North Sample Gallery (excluding Plutonium Loadout Hood); South Sample Gallery; North and South Operating, Pipe, and Storage Galleries	Mixed fission products, plutonium, and americium in hoods, ducting, and piping; also present as surface contamination	Residual amounts included in inventory estimates for canyon
202S Building Remote Shop (east end of the canyon at the cell floor level)	Mixed fission products, plutonium, and americium present as surface contamination	Minor residual amounts included in inventory estimates for canyon
202S Building Silo	Mixed fission products, plutonium, and americium in hoods, ducting, and piping; also present as surface contamination	Included in inventory estimates for canyon
293S Building	Mixed fission products, plutonium, and americium present as surface contamination and contamination in equipment	4 Ci beta activity, 1 Ci alpha
276S Hexone Storage and Treatment Facility	Mixed fission products, plutonium, and americium; contamination is present in fixed and hardened residue	Residual amounts to less than 0.1 Ci alpha. Each tank contains approximately 130 gal of phosphate tar. No ponding liquid was observed.

*Distribution of the residual contamination in the process area is approximately 46% in vessel piping, 44% as surface contamination in process cells, and 10% as surface contamination in the silo and Column Laydown Trench (HNF-13830, *Documented Safety Analysis for the Reduction-Oxidation Facility*).

1.4.2 Nonradiological Contamination

The following subsections provide a brief description of chemical hazards that may be present at the REDOX Complex.

1.4.2.1 Arsenic

Arsenic may be present in oils, grease, or other chemicals. If waste containing arsenic above regulatory limits is generated, it will be treated as appropriate, prior to disposal.

1.4.2.2 Barium

Barium metal is an intermediate decay product of the uranium fission reaction (HW-18700, *REDOX Technical Manual*). Barium may also be present in some oils or grease, white paints, and other chemicals. If waste containing barium metal above regulatory limits is generated, it will be treated as appropriate, prior to disposal.

1.4.2.3 Beryllium

Beryllium epoxy was used in resins at REDOX. Beryllium was also used in REDOX process equipment and piping. The 202S Canyon may contain small quantities of beryllium from the fuel element assemblies. Trace quantities of beryllium are conceivably present in the dissolver and waste processing cells (Cells A through D) and associated piping. The contact shoes of the 2.4 kV switchgears are also impregnated with beryllium.

A beryllium characterization of the 202S Building completed in 2011 found beryllium contamination in the east end of the upper South Pipe Gallery (near the R-5 pump panel) and the first-floor administrative rooms located in the 202S Southwest Annex (Lobby, Office 114 A-B, Office 105, and Men's Locker Room). These two areas are currently posted as beryllium-controlled areas (BCAs). The canyon deck was not sampled as part of the 2011 characterization, so it is conservatively posted as a BCA.

1.4.2.4 Cadmium

Cadmium is a byproduct of the metal-finishing process and may also be present in electrical equipment. If waste containing cadmium above regulatory limits is generated, it will be treated as appropriate, prior to disposal.

1.4.2.5 Lead

Lead could exist in surface coatings (i.e., lead-based paint) and as shielding or components of plumbing inside the REDOX Complex. In the electrical system, lead was used as contacts and for soldering. Lead bricks for shielding are in the North and South Sample Galleries. Lead sheeting was used to seal penetrations (i.e., vents, conduit, piping, and flashing) to roof membrane coverings. If waste containing lead above regulatory limits is generated, it will be treated as appropriate, prior to disposal.

1.4.2.6 Mercury

Mercury may be present in manometers and electrical equipment (including thermostats, switches, and vapor lighting). Waste containing mercury above regulatory limits will require treatment prior to disposal.

1.4.2.7 Selenium

Selenium was used as a paint pigment and a stainless-steel additive. If waste containing selenium above regulatory limits is generated, it will be treated as appropriate, prior to disposal.

1.4.2.8 Silver

Silver contacts may be present in the electrical system. At certain levels, silver is regulated as a hazardous waste. If waste containing silver above regulatory limits is generated, it will be treated as appropriate, prior to disposal.

1.4.2.9 Zinc

Zinc may be present in galvanized piping used in the electrical and plumbing systems. Zinc was used as soldering in the electrical systems. Zinc may also be present in paints or coatings in the supply air washer assemblies.

1.4.2.10 Asbestos

Asbestos-containing material (ACM) is found in and around the REDOX Complex in the form of insulation (thermal system insulation), ductwork, gasket/packing material, transite siding, and floor tiles/adhesives.

1.4.2.11 Miscellaneous Industrial Chemicals

The potential exists for the discovery of residual, used, or unused chemicals (e.g., solvents, hydraulic and fuel oils, and greases). These materials will be recycled or disposed of in accordance with requirements of the receiving facility.

1.4.2.12 Corrosives

Corrosives (including both acids and caustics) may be encountered. Corrosive solids and liquid waste above the regulatory limits must be treated, as appropriate, prior to disposal.

1.4.2.13 Lubricants/Oils

Lubricants and oils may contain hazardous substances. Equipment will be drained of lubricants/oils to the extent practicable prior to disposal.

1.4.2.14 Acetylene Tetrabromide

Acetylene tetrabromide was used in the manometers located in the North Operating Gallery, the South Operating Gallery, the Silo Operating Gallery, and the North Supply Fan Room. During risk mitigation activities in the late 1990s, the liquids were drained from the manometers. However, residuals may still be present in the manometer tubes.

1.4.2.15 Polychlorinated Biphenyls

Polychlorinated biphenyls (PCBs) may be found in and around the REDOX Complex (e.g., painted surfaces, light ballasts, and waste oils). Materials removed or demolished that contain or may contain PCBs will be removed for disposal consistent with substantive standards of the *Toxic Substances Control Act of 1976* (TSCA).

1.4.3 Biological Hazards

Biological hazards such as bird, bat, snake, lizard, and rodent carcasses and feces could be encountered. Such materials, if contaminated with hazardous substances, will be treated and disposed as appropriate.

1.4.4 Industrial Hazards

Industrial hazards may be encountered. Examples include tripping, falling, sharp edges, and lifting (ergonomic) hazards. In addition, demolition with heavy equipment introduces other industrial hazards such as uneven walking surfaces, excessive load noise, moving machinery parts, and falling objects.

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2 Removal Action Elements

This chapter provides general descriptions of the anticipated removal activities.

2.1 Removal Action Work Activities

The following list includes (but is not limited to) the general activities to implement this removal action:

- Initial characterization
- Hazard abatement (proactive mitigation by decontamination, stabilization, or equipment removal)
- Demo prep (a more aggressive removal of hazards and equipment)
- Demolition of select structures to grade
- Filling belowgrade void spaces
- Disposal of wastes generated during removal activities
- Cleanup of miscellaneous debris
- Final characterization (post-demolition screening or sampling)
- Equipment decontamination
- Stabilization of the area
- Conducting visual and radiological surveys and, if needed, stabilization of the area to fix or isolate contamination

Some activities will be ongoing throughout the entire removal action, such as the following:

- Air emissions and work activity monitoring
- Waste management and disposal
- S&M, during and after removal activities

Section 2.2 and its subsections provide additional detail on these work activities. Using the most recent information concerning field conditions, work packages will be developed in accordance with this RAWP using existing procedures and specifically developed instructions to perform and control the removal and disposal activities.

2.2 Field Activities

The following subsections describe the field activities associated with this removal action.

2.2.1 Mobilization and Site Preparation

Mobilization and site preparation may include the following activities:

- Establish site utility services (e.g., temporary power, lighting, and water) (Section 2.3).
- Construct roads, field support facilities, waste container survey and storage areas, and decontamination stations. Hanford Site roadways will be constructed from existing site materials, except the surface course, which may be imported.
- Isolate or verify isolation of utilities and systems (Section 2.3).

- Identify underground injection control wells in the proximity of the work area and notify the Hanford Site single point of contact.

2.2.2 Characterization Activities

Characterization is necessary to support waste disposal activities, define pre- and post-removal activity contaminants, establish worker protection controls, and possibly support future remedial action. All waste (including unexpected waste) generated by sampling activities will be managed in accordance with the substantive provisions as described in the ARARs.

Characterization activities will be conducted in accordance with the approved REDOX sampling and analysis plan (SAP) (DOE/RL-2017-05, *Sampling and Analysis Plan for the REDOX Complex*). The data quality objective (DQO) process for data collection, sampling and analysis rationale, strategy, and requirements was used to develop the REDOX SAP. The results of the DQO process are also documented in DOE/RL-2017-05. For the 276S HSTF, RCRA sampling will be performed in accordance with an approved closure plan.

2.2.2.1 Initial Characterization

Facility-specific historical information (including process knowledge and previous characterization data) will be used to identify expected waste streams and initial characterization data needs. This historical information will also provide input for the rationale, strategy, and requirements for data collection and analysis. Data collection may include field survey and analytical sample data. The initial characterization data will be for the following activities:

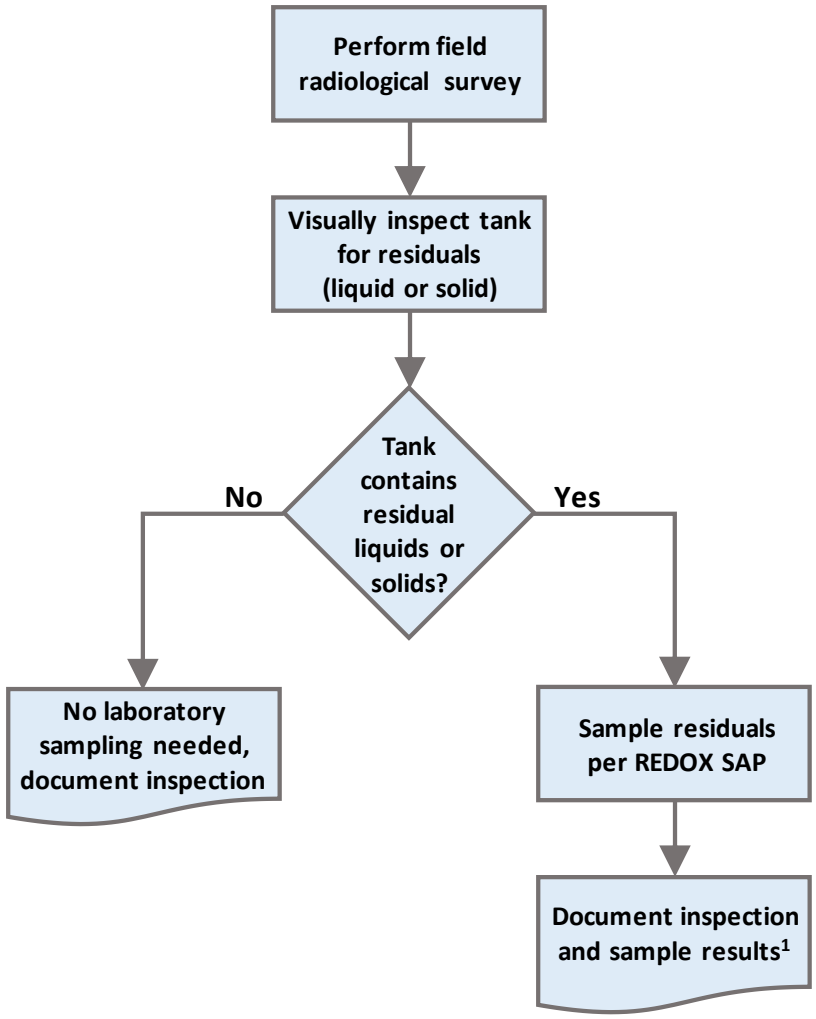
- Specify worker health and safety requirements
- Identify radiological and hazardous conditions that will be encountered during removal activities
- Characterize waste for treatment and/or disposal

In some cases, physical sampling and analysis are not needed because process knowledge, historical analytical data, and radiological and chemical screening are sufficient to characterize waste for disposal.

Using a phased approach for the removal action, initial characterization will not be completed for the entire scope of the removal action. Initial characterization will be performed on each structure or discrete area (e.g., Silo Service Area, North Sample Gallery) as it is funded and staffed for removal activities.

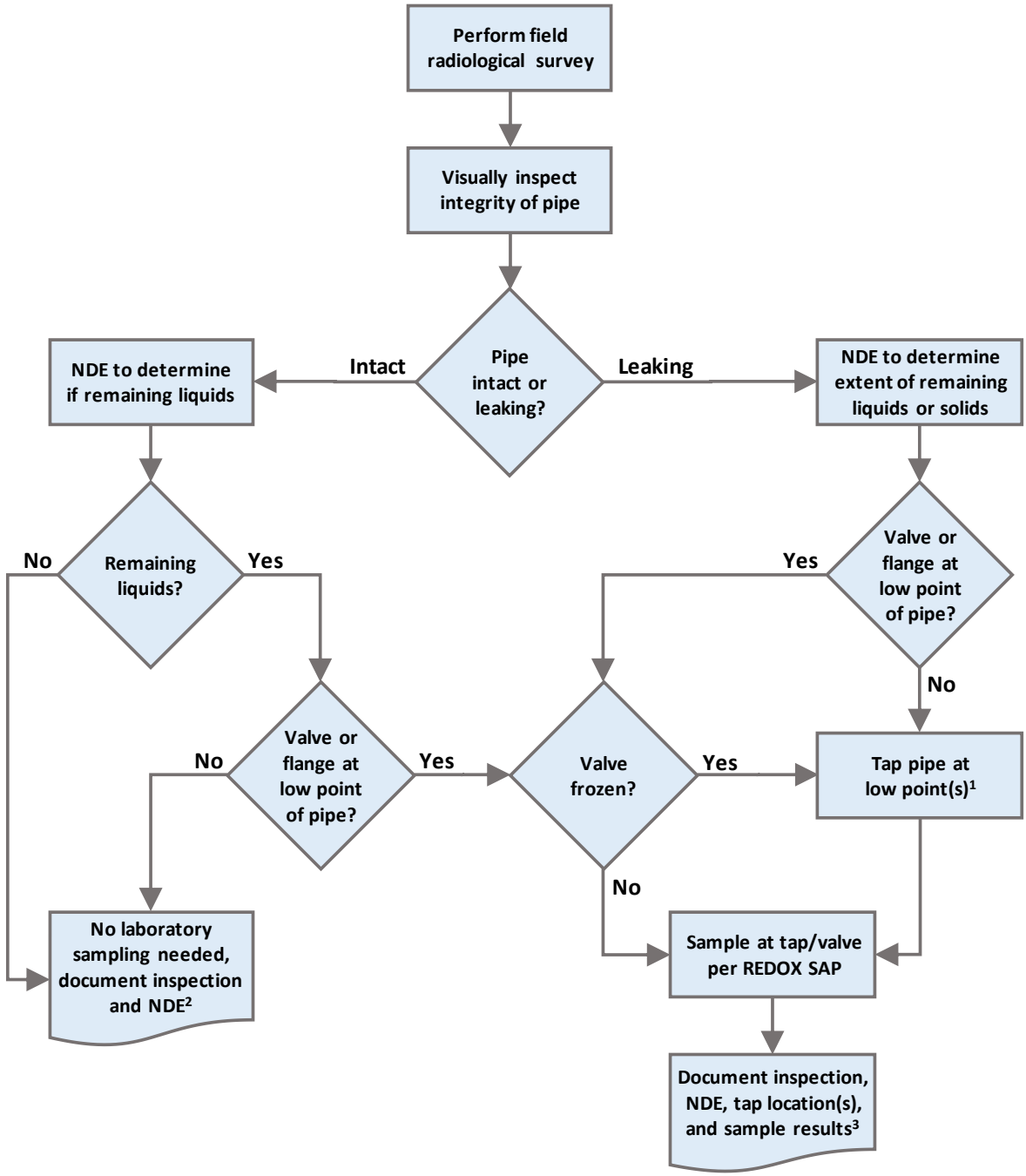
Initial characterization activities should focus on information needed for worker protection. Additional sampling to support waste profiling during initial characterization activities will be determined by the removal action project team. This determination will be affected by near-term equipment removals. Characterization activities to support waste profiling will be performed as waste is generated from the removal activities. As timing and funding allows, additional characterization sampling may also be performed to support a future remedial action.

General sampling strategy flow diagrams for tanks, pipes, and pumps are presented in Figures 2-1 through 2-3. Detailed sampling designs will be developed and documented in the characterization work packages in accordance with the REDOX SAP (DOE/RL-2017-05). RCRA sampling for the HSTF will be performed in accordance with an approved closure plan.



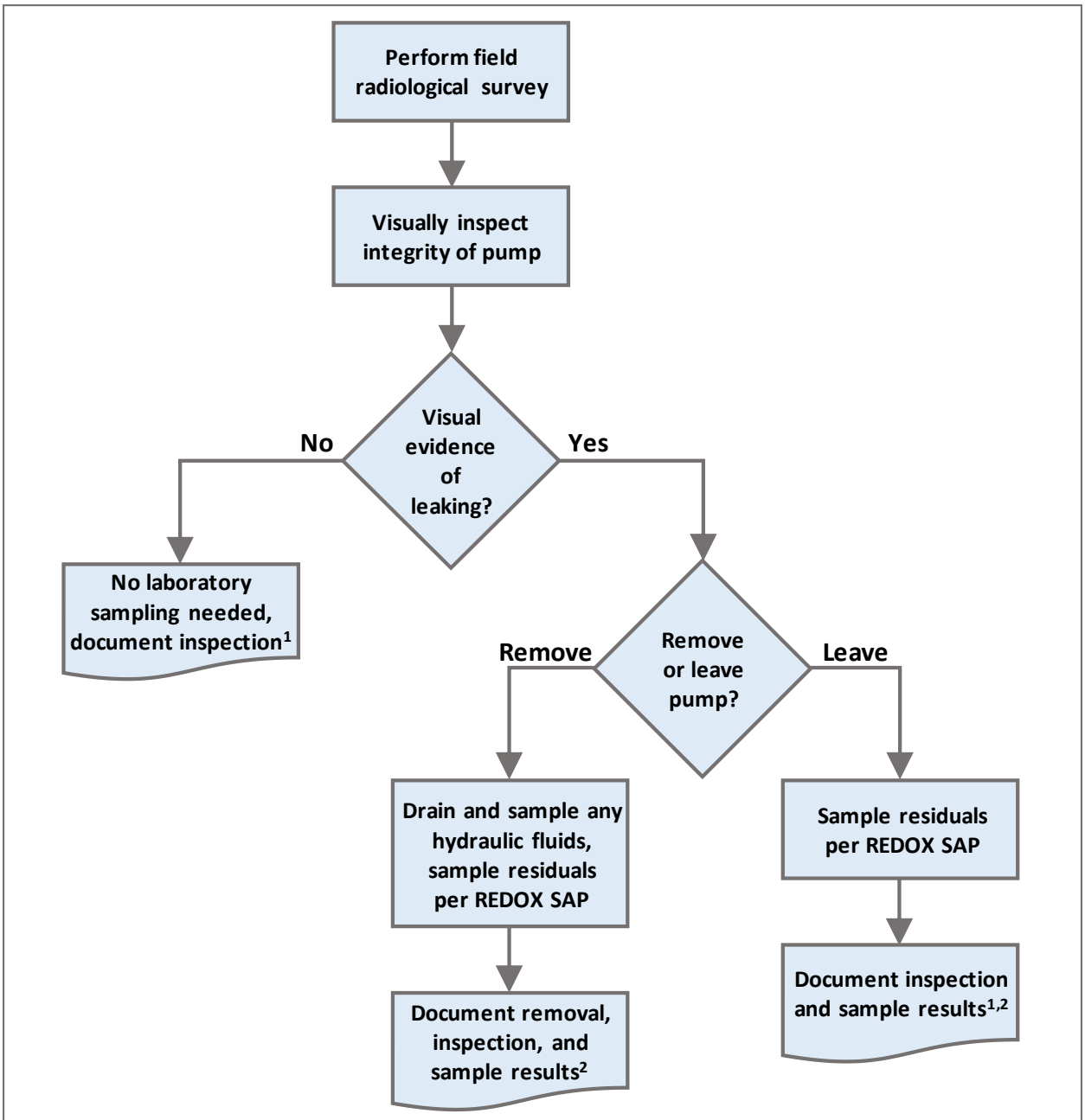
REDOX SAP = DOE/RL-2017-05, *Sampling and Analysis Plan for the REDOX Complex*.
1. Tank liquids may be drained at a later date.

Figure 2-1. General Sampling Strategy Flow Diagram for Tanks



REDOX SAP = DOE/RL-2017-05, *Sampling and Analysis Plan for the REDOX Complex*.
NDE = nondestructive examination
1. Number of taps and samples will depend on connections. Additional taps at higher elevations may be needed for fluid flow. Only applies to non-asbestos insulated pipes.
2. Pipe may be tapped and sampled at a later date.
3. Pipe may be drained at a later date.

Figure 2-2. General Sampling Strategy Flow Diagram for Pipes



REDOX SAP = DOE/RL-2017-05, *Sampling and Analysis Plan for the REDOX Complex*.
1. Pump may be drained of fluids (including hydraulic fluids) at a later date.
2. Pump evaluated for near-term removal or delayed to later field activities.

Figure 2-3. General Sampling Strategy Flow Diagram for Pumps

2.2.2.2 Final Characterization

The final data collection, survey, sampling, and analysis will be performed at the completion of the removal action and documented in the completion report (Section 5.7.2). Characterization areas include the abovegrade areas (202S Canyon and 202S Silo), belowgrade areas (202S Canyon, 202S Annex, 276S HSTF, and 293S Building), and surrounding soils. The primary purpose of this characterization activity is to document any remaining contamination (e.g., contaminants of concern, concentrations, and locations) for follow-on activities such as S&M, creation of a new Waste Information Data System (WIDS) site or addition of information to an existing WIDS site, and a future remedial action. This final characterization will take place after demolition, but prior to final stabilization activities.

2.2.3 Hazard Abatement

Hazard abatement differs from S&M in that it allows for a proactive response to mitigate or reduce risk before a major response would be required. Hazard abatement activities may range from decontamination or stabilization to complete removal of equipment and waste, as needed, to mitigate hazards. Identification of specific areas or equipment that will receive hazard abatement will be based on S&M activities and current facility inspections. Hazards will be identified, evaluated, and prioritized for mitigation. This includes radiological, chemical, biological, industrial safety, beryllium, and asbestos hazards.

Update Radiological Postings. Currently, many areas throughout the REDOX Complex have conservative radiological postings, given infrequent entries throughout the building over the last 10 to 15 years. As a part of hazard mitigation work, radiological surveys and air monitoring will be performed to establish the correct postings. Postings will be revised, as appropriate, as contributing hazards are mitigated.

Decontamination and Stabilization. Nonradiological hazardous substances will be removed from within and around the buildings/structures as needed prior to demolition to facilitate compliance with the ARARs and to meet waste acceptance criteria for the Environmental Restoration Disposal Facility (ERDF) (ERDF-00011, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*) or other EPA-approved facilities. Decontamination of equipment or structures, if needed, to support the removal action will generally be performed using dry methods to the extent possible (e.g., brushing or wiping, and using high-efficiency particulate air [HEPA]-filtered vacuum cleaners). When the use of wet methods (e.g., water wash and pressure washers) is necessary to achieve decontamination objectives, the associated water or cleaning solutions will be collected, and work will be conducted by trained site workers in accordance with the following best management practices:

- Decontamination activities will be performed within the area of contamination.
- The amount of water used to clean equipment will be minimized, using raw or potable water.
- Soaps, detergents, or other cleaning agents may be added to wash water as long as there are no regulated levels of constituents present.
- Decontamination fluid/wash water that is collected will be managed in accordance with Section 4.2.2.8.

More aggressive equipment decontamination methods (e.g., grinding or wet grit blasting) may be used if other methods fail. These methods will also be conducted by trained site workers using best management practices to minimize the potential for airborne contamination and waste generation.

Decontaminating or stabilizing process equipment or contaminated ventilation ductwork may involve the use of simple brush, spray, foams, or fixative procedures, or it may require more extensive preparations,

including special glovebags, vacuum systems, crawlers, chemicals, and/or other special equipment. Transuranic (TRU) or transuranic mixed (TRUM) waste being loaded into a container may not require stabilization, but fixatives may be required for the waste prior to removal to ensure environmental and personnel exposures are as low as reasonably achievable (ALARA).

Removing Equipment. Removal of tanks, pumps, and pipes will be evaluated on a case-by-case basis. The benefit of removal for risk reduction will be determined by the removal action project team. Equipment being removed will be drained of any free liquids. Pumps will also be drained of any lubricants, oils, hydraulic fluids, or greases. Sampling of the drained liquids will be performed in accordance with the REDOX SAP (DOE/RL-2017-05) (Figures 2-1 through 2-3). The liquids will be disposed to the Effluent Treatment Facility (ETF) or other approved facility, or absorbed or solidified for disposal as solid waste at ERDF or other EPA-approved facility.

Egress Pathways. Internal walls in the 202S Building may be partially or fully removed to facilitate emergency egress and removal of equipment for disposal. If needed, an engineering evaluation of the proposed modification will be performed.

2.2.4 Demolition Preparation

Demo prep is preceded by and is generally more aggressive than hazard abatement. Decontamination, fixing/stabilization of contamination, and isolation of systems may be performed. Interior portions of the structure may be removed, as practical and necessary, to support future access for final disposition activities. Overhead utilities and adjacent concrete and asphalt may be removed, as needed. These activities will be managed in accordance with procedures that address removing, handling, and disposing of these materials in a manner that protects the safety of employees and the public, minimizes spills and releases to the environment, and meets regulatory requirements, as well as maintaining structural stability of the affected area.

Contaminated process equipment will be characterized, decontaminated, stabilized, and/or removed as needed to support open-air or limited-containment demolition. The equipment will be fixed or stabilized, as necessary, for disposal or storage. Pipes and drain lines (including floor drains) that exit structures through the foundation/slab/grade will be isolated/sealed at the structure boundaries to prevent potential release pathways to the environment. Items requiring special handling will be identified, clearly marked, and prepared for removal before beginning structure demolition. Demolition planning will ensure these marked items will not be subjected to demolition techniques, as they require special handling.

Targeted Areas. Demo prep activities will occur in the 202S Silo Service Area, the 202S Annex, and abovegrade areas of the 202S Canyon, including the canyon deck. In the 202S Silo Service Area, demo prep areas will include levels one through five, seven, and eight.

The following subsections address specific pre-demolition removals by hazard types within the REDOX Complex: asbestos, beryllium, PCBs, other hazardous substances, radiological, and biological.

2.2.4.1 Asbestos

ACM could be found in and around the REDOX Complex structures. Removal and disposal of ACM will be performed in accordance with the substantive provisions of the *Clean Air Act of 1990* (CAA) (40 CFR 61, Subpart M, “National Emission Standard for Asbestos”) as identified in the REDOX AM (DOE/RL-2016-52), which requires special precautions to control airborne emissions of asbestos fibers during asbestos removal activities.

Asbestos abatement activities will be performed in full compliance with all substantive NESHAP (40 CFR 61) standards that are ARARs for the work. Before demolition begins, a thorough inspection of

the affected facility will be performed for the presence of asbestos, including Category I (Cat I) and Category II (Cat II) nonfriable ACM. All Cat II nonfriable ACM will generally be presumed potentially friable and will be removed before actual demolition activities begin. If DOE identifies any Cat II ACM that should be allowed to remain in place during demolition based on knowledge that the demolition will not render it friable, information identifying the planned demolition approach and describing how the Cat II ACM will not become crumbled, pulverized, or reduced to powder by the forces expected to act on it during the demolition or otherwise friable will be provided in advance to EPA for approval. Cat I nonfriable ACM will also be removed prior to the start of actual demolition activities, except in situations where demolition practices will be used that can be or have been demonstrated to the satisfaction of EPA not to render the Cat I ACM friable, consistent with NESHAP (40 CFR 61). Demonstration can be performed using existing EPA or Washington State guidance regarding asbestos abatement under NESHAP. Such Cat I nonfriable ACM must not be in poor condition, and planned demolition activities must not subject the ACM to sanding, grinding, cutting, or abrading. In all cases, ACM that is either friable or cannot be demonstrated to remain nonfriable during demolition will be removed prior to such demolition as required by NESHAP.

2.2.4.2 Beryllium

There are three areas in the 202S Building currently posted as BCAs: the canyon deck, the upper South Pipe Gallery, and the first floor administrative rooms in the Southwest Annex (Section 1.4.2.3). Although beryllium is not regulated as hazardous waste, certain health and safety requirements must be addressed when working in beryllium-contaminated structures. Beryllium-contaminated materials will be managed to ensure worker safety. Prior to demolition, beryllium contamination may be fixed in place, as required. Beryllium waste will be disposed in accordance with the ERDF waste acceptance criteria (ERDF-00011).

2.2.4.3 PCBs

PCBs may be found in the REDOX Complex structures (e.g., fluorescent light ballasts, painted surfaces, and waste oils). Materials removed or demolished that contain or may contain PCBs will be removed for disposal consistent with the substantive provisions of the TSCA.

Known liquid PCBs will be removed from structures prior to demolition and disposed in accordance with ARARs and the ERDF waste acceptance criteria (ERDF-00011). Other PCBs will only be removed as needed prior to demolition to facilitate proper disposal in accordance with ARARs and the waste acceptance criteria for ERDF or another receiving facility. PCB surface coatings and PCB spills (e.g., dried paints, adhesives) on concrete and other materials (porous and nonporous materials) may be stabilized or fixed in place prior to demolition and the resulting demolition debris may be disposed as PCB bulk product waste or PCB remediation waste.

Where slabs or belowgrade structures with suspected PCBs will be left in place, sampling may be performed to determine if potentially contaminated surfaces meet the substantive PCB decontamination standards of 40 CFR 761.79, “Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions,” “Decontamination Standards and Procedures,” without further action. When performed, the sample results will be used to determine the TSCA status of the slab or structure to be left in place. If the results indicate the presence of PCB contamination above applicable 40 CFR 761 levels, the contamination will be removed from the slab or structure to be left in place, if practicable, in accordance with substantive standards of 40 CFR 761.79(b) or (c). Materials separated from the contaminated slab or structure will be disposed as PCB waste. Subsequent sampling of the slab or structure to be left in place will be performed after decontamination. When decontamination is achieved to below applicable levels of 40 CFR 761.79, the slab or structure will no longer be subject to TSCA. If decontamination methods other than those identified in 40 CFR 761.79(b) or (c) are determined

necessary, concurrence of the alternate method(s) would be obtained from EPA prior to implementation. If decontamination is impracticable or unachievable, the contractor may consult with the DOE-RL Removal Action Manager to determine if placement of the slab or structure into the WIDS database is appropriate. If so, the site will be identified by DOE as a new site under the Tri-Party Agreement (Ecology et al., 1989a), with concurrence from the Washington State Department of Ecology (Ecology) and EPA.

2.2.4.4 Other Hazardous Substances

Hazardous substances, such as lubricants, hydraulic oils, fuel oils, aerosols, corrosive liquids, and chemical residues, will be drained and recycled or disposed, as appropriate. Equipment containing mercury (e.g., switches, gauges, and thermometers) and lights containing sodium or mercury vapor will be removed, recycled, or disposed per the requirements of the receiving facility.

Other hazardous substances on surfaces or embedded in structural materials (e.g., lead paint and heavy metals such as arsenic, cadmium, and selenium), may be fixed in place prior to demolition and the resulting structural materials are disposed as solid, hazardous, or mixed waste, as appropriate, depending on the levels of contamination and the waste characterization results.

2.2.4.5 Radiological Waste

The preferable way to control loose, accessible radiological contamination is to fix it in place. Removal of loose contamination will be performed only if necessary. Removal of fixed contamination must be performed using nonaggressive means (e.g., wet wiping or using decontamination solutions). Aggressive methods of decontamination (e.g., grinding or other abrasive/mechanical means) are used only as necessary to maintain ALARA radiological levels.

2.2.4.6 Biological Waste

Biological waste, such as bird, bat, lizard, snake, and rodent carcasses and feces could be encountered. Biological waste will be field surveyed and disposed in accordance with the ERDF waste acceptance criteria (ERDF-00011).

2.2.5 Demolition

Both hazard abatement and demo prep activities occur prior to demolition. Termination/isolation of structure utilities will be verified prior to demolition. All equipment, piping, and items left to be demolished as an integral component with the structures must meet ERDF waste acceptance criteria (ERDF-00011) or waste acceptance criteria at other EPA-approved facility.

Demolition of buildings and structures includes removal of abovegrade structures. The buildings will be demolished to slab-on-grade in order to minimize infiltration of precipitation to underlying soils. However, the 276S Hexone Storage Tanks, which are located belowgrade, will be removed and the belowgrade portion of 293S will be void filled. It is the intent of this RAWP to remove hazardous substances to the extent practicable by implementation of deactivation, decontamination, decommissioning, and demolition (D4) activities. After D4 of the buildings, the slab and belowgrade structures will be evaluated to determine if contamination is present that could constitute a near-term threat. The near-term threat evaluation will include consideration for any contamination with potential for immediate threats (e.g., removable radioactive or chemical contamination that could cause acute and/or readily noticeable effects) and contamination with potential for chronic threats (e.g., asbestos, beryllium dust that could cause slower developing and/or subtle effects). If contamination is found and deemed to be near-term threat that could cause an immediate or chronic threat if left in place, the slab and/or belowgrade structure will be removed as part of this NTCRA in order to protect human health and the

environment, as well as reduce future S&M costs. If remaining contamination is deemed not to be a near-term threat or if the remaining contamination can be properly treated to eliminate the potential for a near-term threat (either immediate or chronic), slabs and/or belowgrade structures will be stabilized to minimize migration of contamination, and final remediation will be deferred to a future action by adding the site to the Tri-Party Agreement Action Plan, Appendix C (Ecology et al., 1989), in accordance with RL-TPA-90-0001, *Tri-Party Agreement Handbook Management Procedures*, Guideline Number TPA-MP-14, "Maintenance of the Waste Information Data System (WIDS)."

The majority of demolition will require the use of heavy equipment (e.g., excavators with various attachments) to demolish structures. Other standard industry or conventional demolition practices may be used (e.g., hydraulic shears with steel shear jaws, concrete pulverizer or breaker jaws, pneumatic hammers, mechanical saws, cutting torches, and/or controlled explosives). Demolition methods will be selected based on the structural elements to be demolished, remaining contamination, location, and integrity of the structure. Controls such as portable ventilation filter units, HEPA-filtered vacuum cleaners, greenhouses, fogging agents, and/or water may be used to control dust generated through demolition activities. The amount of water used will be minimized to prevent ponding and runoff. Stormwater run-on and run-off controls may be implemented. Applicable controls will be described in the work packages. Belowgrade structural components (e.g., basements) will be left intact (with penetrations secured or blanked) and backfilled or grouted, as appropriate.

Wells located near or within the footprint of the REDOX Complex will be identified. The affected organization will be informed of the demolition activities. The well will be either protected or decommissioned, as needed.

Demolition will result in piles of bulk demolition waste. The bulk waste will be processed and loaded concurrent with demolition activities. The waste piles will be on or near the associated structure footprint and positioned to allow equipment access to both the structure undergoing demolition and the bulk waste.

Soil contaminated with substances known to be associated with normal structure operation or maintenance will be removed and disposed as determined by the DOE-RL Removal Action Manager, in consultation with EPA. These excavations will be followed by visual inspections, radiological and chemical field screening, and focused judgmental sampling where appropriate. To the extent practicable, the excavation depth will be consistent with anticipated future remedial action. The area will be stabilized (e.g., backfill, contour, and vegetate) as necessary and appropriate. Alternatively, if the contaminated soil has not been removed, contaminant information for the waste site will be added to the WIDS database.

202S Annex Demolition. The annex will be demolished to slab-on-grade. Care will be taken during demolition not to damage the silo or canyon portions of the 202S Building. Following demolition, any access points to the remaining canyon portion of the 202S Building will be isolated or sealed, as appropriate.

276S Hexone Storage and Treatment Facility Demolition. The HSTF will be demolished in accordance with an approved closure plan. Waste generated from the closure activities will be disposed at ERDF under this NTCRA.

293S Building Demolition. All abovegrade and belowgrade process equipment and tanks will be removed including the belowgrade nitric acid storage tank and piping located just west of the building. The building would be demolished to slab-on-grade to minimize infiltration of precipitation to underlying soils.

2.2.6 Site Stabilization

The following activities will be completed and documented in the completion report (Section 5.7.2) after demolition of abovegrade structures:

- Performing post-demolition survey
- Sealing of belowgrade accesses
- Documenting any remaining tubing, piping, ducting, drain lines that contain contamination
- Stabilizing contaminated slabs
- Area cleanup, surveys and postings
- Characterization, as needed
- Performing final cleanup/site stabilization
- Performing final surveys
- Final posting and access control measures

Final cleanup will be conducted as demolition activities are completed including activities such as sealing/eliminating confined spaces and manholes to prevent water intrusion and personnel access. Waste will be screened, segregated, removed, and disposed once it has been characterized. The site will be graded to original site contours where necessary.

Additional characterization sampling may be performed, if hazardous waste is suspected. Final site surveys will be completed once the site has been graded. Surveys will include radiation surveys and physical hazard surveys. These surveys will be documented to support the future remedial action.

Using the data from the final survey, a site access control plan will be developed. The plan will define areas where access must be controlled, such as belowgrade void areas. These sites will be posted and, if necessary, fences or other barriers will be built to prevent access to the area.

2.2.7 Grouting

Following removal of all building equipment including the underground nitric acid tank and demolition of the abovegrade structure, belowgrade areas of the 293S Building will be grouted. Void spaces will be grouted, as necessary, and/or backfilled as appropriate and practicable. Fill material such as controlled density fill or grout may be used to stabilize the material, provide shielding, and facilitate demolition and/or future removal or remedial actions.

2.2.8 Equipment Decontamination

Decontamination that is necessary to allow removal of demolition equipment or waste trucks from contamination areas will be accomplished using standard industry and best management practices. Gross equipment decontamination methods will be employed to remove loose contamination within the contamination area. Gross cleaning and/or decontamination of heavy equipment and vehicles may consist of using wipes and nonhazardous materials to remove loose contamination. Water may be used to clean equipment in the decontamination area. However, the use of large volumes of water will be minimized. Soaps, detergents, or other nonhazardous cleaning agents may be added to the water used in the high-pressure washer. Pressure washing, if required, will normally be performed using cold water. However, hot water may be used to avoid icing. Wet grit blasting, grinding, or steam cleaning will be used only after other decontamination methods prove to be ineffective. Additional or final decontamination may take place in the contamination reduction zone using the same or similar methods. Location and characterization of all decontamination areas will be documented after use.

2.2.9 Demobilization

At the completion of field activities, trailers and equipment used to perform this removal action are demobilized or turned over to another project for reuse. In some cases, equipment (including change rooms, shower trailers, and conex boxes) may no longer be used due to levels of contamination or disrepair. In these instances, the equipment may be deactivated and demolished with the facility in accordance with Section 2.2.5.

2.2.10 Air Emissions Monitoring

Air emissions and work activity monitoring will be accomplished through a combination of real-time monitoring, sampling and surveys at work locations, stack sampling, near-facility monitors, and the Hanford Site perimeter monitors (see Section 4.3 for additional information). Most of the removal activities will be conducted under the existing structure ventilation system; however, temporary exhausters may also be used. Emissions from the 202S Building are periodically sampled at the 291S001 Stack, as required by the air operating permit. Once the removal action is initiated, air emissions monitoring will be governed by the substantive portions of the ARARs.

2.2.11 Waste Management and Disposal

Several waste streams will be generated from this removal action (including waste generated from S&M activities). It is anticipated that most of the waste will be low-level waste (LLW). However, quantities of mixed low-level waste (MLLW), TRU/TRUM waste, PCB bulk product waste, dangerous waste, and ACM may be generated. The majority of the waste will be in a solid form, but some aqueous solutions might be generated. Waste will be packaged to meet the applicable waste acceptance criteria of the receiving facilities. Waste will be accumulated, staged, and/or stored within the REDOX area of contamination until such time that the waste is shipped to ERDF or a TSD unit.

Waste designated as TRU or TRUM will be sent to the Central Waste Complex (CWC) or another appropriate onsite area for interim storage. The waste will be treated, as necessary, certified, and disposed at the Waste Isolation Pilot Plant (WIPP).

Treatment of waste (onsite or offsite) may be necessary prior to disposal at ERDF or other EPA-approved disposal facility. In addition, containerized waste may be returned from offsite segregation or treatment for disposal at ERDF. Liquid waste will be sent to an approved facility, and any treatment residues that meet the waste acceptance criteria may be disposed at ERDF or a TSD unit.

Some materials may be eligible for salvage and recycling, if the appropriate regulatory and project requirements are met and if it is economically feasible for the project to do so.

2.3 Utility Systems

The REDOX Complex will be isolated from the current electrical power sources and a new temporary lighting and distribution system will be designed and installed. The new distribution system will include an independent electrical feed for the 291S Exhaust Fans and isolation of the current 202S feeder circuit. This will substantially reduce the potential for hazardous energy source impacts.

Mobilization activities will include confirmation that the water and steam systems have been isolated exterior to the structures. The plant compressed air system will also be confirmed to have been deactivated.

Modifications to the ventilation system may be performed to support removal activities. This may include accessing the partially buried exhauster (EF-8) port and access stairwell at the northwest corner of the

202S Building, next to Elevator Shaft #2. If modifications are needed, an engineering evaluation of the ventilation system and the proposed modifications will be performed.

A source of water for dust suppression during demolition will be required during the removal action. The water can be supplied from truck-mounted pumps or a fire hydrant, depending on the needs and proximity to a fire hydrant.

2.4 Surveillance and Maintenance

This section provides the description for S&M phase for the REDOX Complex structures, which occurs during and after completion of the selected scope for this removal action (Section 1.2). The objectives of the S&M phase are to ensure adequate containment of contaminants left in place, to provide physical safety and security measures, and to maintain the facility in a manner that will minimize risk to human health or the environment. Below is a generalized description of the types of surveillance activities and frequencies that are applicable to the structures in the scope of this work.

2.4.1 Facility Description

S&M will be conducted for major structures and operations of active systems for the 202S Facility until the S&M activity is rendered obsolete by the removal action activities. S&M work activities are performed and documented using the contractor's procedures, permits and work plans.

S&M of the REDOX Complex includes the 202S Building, ancillary buildings, and their associated equipment within the REDOX perimeter fence, which are listed in Table 2-1 (see area of contamination in Figure 2-4).

Table 2-1. REDOX Complex Structures and Components

Identification #	Building Description/Components
202S	Canyon and service building
211S	Liquid chemical storage tank farm
233S & SA	Slabs (remaining after demolition)
2706S	Slab (remaining after demolition)
2708S	Lager storage building
2710S	Slab (remaining after demolition)
2711S	Slab (remaining after demolition)
2715S	Storage building
2718S	Slab (remaining after demolition)
276S	Solvent handling facility
276S HSTF (Tanks)	Hexone Storage and Treatment Facility (S&M on tanks only)
2904SA	Cooling water sampling building
291S	Canyon exhaust system (exhaust building, sand filter and stack)
291S1	Exhaust stack
292S	Control and jet pit house
293S	Nitric acid recovery and iodine backup building

Figure 2-4. REDOX Complex Structures for Surveillance and Maintenance

Systems will be maintained in active status to support work or monitoring/reporting requirements as needed. Available systems include:

- Canyon Ventilation System
- Surveillance Lighting System
- Instrumentation, Monitoring and Control System.

2.4.2 Surveillance and Maintenance Activities

Surveillance activities include those performed to determine the operability of equipment, monitor radiological conditions, check safety-related items, provide for facility-security controls, and assess facility structural integrity. Maintenance includes activities required to sustain property in a condition suitable for the property to be used for its designated purpose. Maintenance activities are typically divided into two types: 1) preventive which is conducted on a pre-scheduled basis to ensure proper function of equipment, and 2) corrective which is performed after equipment has malfunctioned or requires repair, upgrade or other attention. The frequency for performing specific S&M activities is set to satisfy any number of requirements including those set by regulatory institutions, equipment manufacturer, government agencies like the DOE and its contractors, and applicable or relevant and appropriate requirements in accordance with Table 4-1.

Table 2-2 shows historical frequencies for S&M activities performed at the 202S Facility. While personnel are stationed at the facility performing removal action activities, frequent (i.e., near daily) entries are performed. Annual S&M inspection will not occur in these areas where removal action activities are being implemented. Areas where no other removal action activities have occurred will be inspected on the annual basis. In the event that all the other removal action activities are halted for significant portions of time (e.g., greater than one year), then Table 2-2 surveillance frequencies apply.

Corrective maintenance, by its nature, is not scheduled and does not appear in the table. As conditions change, equipment is removed from or placed in service, and removal actions begin, activities may be added or discontinued and frequencies may require adjustment.

Table 2-2. Frequency of Surveillance and Maintenance Activities at the REDOX Complex Structures

Activity	Annual	Other	Seasonal
Surveillance			
Walk-Through Inspection [a, b]	√		
Housekeeping	√		√
Roof/Structural for Confinement Ventilation [c]		Every 5 yr	
Maintenance			
Canyon Exhaust Fans & Bearings Inspection & Lubrication [d]		Monthly	
Instrument Calibration for Equipment Associated with Canyon Ventilation System [d]	Varies depending on operation		
Sand Filter Aerosol Test [d]	√		
Canyon Ventilation Stack Monitoring System Inspection [d]	√		
Cold Weather Protection [e]	√		√

Table 2-2. Frequency of Surveillance and Maintenance Activities at the REDOX Complex Structures

Activity	Annual	Other	Seasonal
Canyon Crane	When in service		

a. Annual documented walk-through surveillance inspection items: internal and/or external structural defects, posting deficiencies, contamination migration, suspect hazardous materials, hazardous conditions, electrical hazards, unidentified friable asbestos, failed lights, doors unlocked, water leaks, excess combustible materials, excess equipment or material, ground subsidence, inadequate housekeeping, occupational hazards, previously unidentified hazards, unidentified or unlabeled containers, and animal or insect intrusion.

b. Indoor surveillance will consist of a walkthrough of the 202S galleries, aqueous makeup, and silo galleries as identified in the contractor's annual REDOX Complex surveillance work processes and packages.

c. Periodicity and type of roof inspection and evaluation varies depending on level of operation of the facility and prior findings.

d. Activities performed in accordance with the Air Monitoring Plan.

e. Cold weather protection inspections vary depending on weather conditions and facility conditions.

3 Safety and Health Management and Controls

This chapter describes the safety and health management and controls performed for the removal activities.

3.1 Emergency Management

The contractor Emergency Management Program (including preparedness, planning, and response) contains the administrative responsibilities for compliance with DOE/RL-94-02, *Hanford Emergency Management Plan*, and all applicable DOE orders. The Emergency Management Program establishes a coordinated emergency response organization capable of planning for, responding to, and recovering from industrial, security, and hazardous material incidents. Emergency action plans for contractor-managed hazardous facilities identify the capabilities necessary to respond to emergency conditions, provide guidance and instruction for initiating emergency response actions, and serve as a basis for training personnel in emergency actions for each facility.

The emergency response actions within the emergency action plan are provided for recognizing incidents and/or abnormal conditions, initiating protective actions, and making the proper notifications. Emergency response for this project will include required notification to the National Response Center (NRC) for reportable quantity releases and DOE-RL Removal Action Manager notification for other emergency situations. Notification to the NRC only applies for hazardous substances discovered or released that were not evaluated as part of this CERCLA removal action. Hazardous substances that are subject to this CERCLA removal action are not subject to this reporting requirement because such substances are already subject to CERCLA cleanup authority.

3.2 Safeguards and Security

Access to the Hanford Site is restricted. Unauthorized access to the REDOX Complex is prohibited. The complex buildings/structures are locked, and an approximately 6 ft tall cyclone fence encloses the immediate deactivated area. Access to each removal action area is controlled by the contractor using items such as fences and signs. Access requirements for employees, nonemployees, and/or visitors are defined in a health and safety plan (HASP).

3.3 Safety and Health Program

As the structures in this removal action are contaminated with chemical and/or radiological hazardous substances, the HASP prepared for this action will address chemical, radiological, and physical hazards as described in the following subsections. The HASP will specify the physical and administrative controls and requirements for work activities for the protection of personnel and the environment.

3.3.1 Worker Safety Program

The Integrated Safety Management System/Environmental Management System, which includes the following elements, will be incorporated into all work activities:

- Organizational structure specifying the official chain of command and overall responsibilities of supervisors and employees
- Comprehensive work plan development before work begins at a site to identify operations and objectives and address the logistics and resources required to accomplish project goals
- HASP developed when workers could be exposed to hazardous substances

- Worker training commensurate with individual job duties and work assignments
- Medical surveillance program administered to comply with 29 CFR 1910.120, "Occupational Safety and Health Standards," "Hazardous Waste Operations and Emergency Response"
- Contractor internal work requirements and processes
- Voluntary protection program

3.3.2 Health and Safety Plan and Activity Hazards Analysis

A HASP will be prepared that defines the chemical, radiological, and physical hazards and specifies the controls and requirements for implementing the removal action in accordance with this RAWP and the associated REDOX SAP (DOE/RL-2017-05).

Access and work activities are controlled in accordance with approved work packages, as required by established internal work requirements and processes. A HASP addresses the health and safety hazards of each phase of site operation and includes the requirements for hazardous waste operations and/or construction activities, as specified in 29 CFR 1910.120. As part of work package development, a job or activity hazards analysis will be written to identify the hazards associated with specific tasks not already covered under a HASP. The following elements are included in a HASP:

- General overview of the hazards associated with the area
- List of employee training assignments
- List of PPE to be used at the work site
- Medical surveillance requirements
- Work site control measures
- Emergency response
- Confined space entry internal work requirements and processes
- Spill containment program

A prejob briefing will be held with the involved workers. This briefing will include reviews of the hazards that could be encountered and their associated worker protection requirements.

3.3.3 Radiological Controls and Protection

The radiological controls and protection program are defined in DOE approved programs and contractor approved internal work requirements and processes. The radiological controls and protection program implements the contractor policy for reducing risks to worker safety or health to ALARA levels and ensuring adequate protection of workers. The Radiological Protection Program of the contractor meets the requirements of 10 CFR 835, "Occupational Radiation Protection." Appropriate dosimetry, PPE, ALARA planning, periodic surveys, and health physics technician (HPT) support will also be provided.

In addition to the HASP, radiological work permits (RWPs) will be prepared, as needed, for work in areas with potential radiological hazards. The RWP extends the Radiological Protection Program to the specific work site or operation. All personnel assigned to the project and all work site visitors must strictly adhere to the provisions identified in the HASP and RWP.

Standard contractor controls for work in radiological areas are assessed as adequate to control project activities. These controls will identify the specific conditions and will govern the specific requirements for an activity, periodic radiation and contamination surveys of the work area, and periodic or continuous observation of the work by the radiological controls organization. The ALARA planning process will be

used to identify shielding requirements, contamination control requirements, radiation monitoring requirements, and other radiation control requirements for the individual project tasks.

Measures will be taken to minimize impacts to the environment during work activities. Section 4.3 of this RAWP addresses the controls to be used during project activities to address the potential release of radionuclides to the environment but not to the exclusion of 10 CFR 835 requirements. Radiological worker exposure will be monitored using approved occupational radiological protection methods.

3.3.4 Criticality Safety

The North Sample Gallery (excluding the Plutonium Loadout Hood) has nonexempt quantities of fissile material. A criticality safety evaluation report (CSER) has been developed but not implemented for the North Sample Gallery and will need to be implemented. Developing a new CSER for the Plutonium Loadout Hood is required as it also contains nonexempt quantities of fissile material. No intrusive activities will be permitted involving piping and vessels related to the Plutonium Loadout Hood without the new CSER. Additional work controls may be imposed by the CSER for the Plutonium Loadout Hood.

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4 Environmental Management and Controls

This chapter describes the environmental management and controls needed to conduct the removal action.

4.1 Applicable or Relevant and Appropriate Requirement Compliance

Removal activities will be performed in compliance with the substantive portions of the identified ARARs to the extent practicable. Waste streams will be evaluated, designated, and managed in compliance with the ARARs. Before disposal, waste will be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel.

ARARs for the removal action are identified in Appendix A of the REDOX AM (DOE/RL-2016-52). The key ARARs include compliance with standards for waste management, control of releases to the environment, reporting nonroutine releases to the environment, and protection of cultural and ecological resources. Table 4-1 lists the key waste management and air emissions requirements and where information for how they will be implemented is found.

4.1.1 Surveillance and Maintenance Before and During Demolition

Routine S&M will occur both before and during the removal action of the REDOX Complex structures. Surveillance activities include, but are not limited to, environmental monitoring of the 202S Facility, annual walk-through surveillance and routine surveillance. Maintenance activities include, but are not limited to, routine and preventive maintenance. Pertinent ARARs in Table 4-1 will apply during S&M activities that involve management/potential emission of hazardous substances. Provided below is a brief discussion of ARARs which could apply to S&M activities.

4.1.2 Waste Management Associated with S&M Activities

The REDOX Complex structures contains radionuclides, lead, mercury, polychlorinated biphenyls (PCBs), asbestos, various organic and inorganic chemicals, and other materials. Generation of wastes during S&M activities is typically minimal (most activities do not generate regulated wastes). Notwithstanding, any solid, dangerous, mixed, PCB or asbestos wastes generated during S&M activities will be evaluated and managed in accordance with applicable ARARs as identified in the Waste Management Plan.

4.1.3 Air Emissions Associated with S&M Activities

Emissions for the 202S Facility occur through the 291S Canyon Exhaust System, which qualifies as a minor stack under 40 CFR 61, Subpart H. This is based on a low potential-to-emit radionuclides from the facility into the air. Radionuclide emissions from the facility could not cause an effective dose equivalent to any member of the public in an unrestricted area in excess of 0.1 mrem/year. Performance of S&M activities does not typically cause radionuclide emissions; monitoring will be in accordance with applicable ARARs as identified in the Air Monitoring Plan.

Table 4-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Materials for the REDOX Complex

ARAR Citation	ARAR or TBC	Requirement	Requirement Implementation
Waste Management Standards Regulations Pursuant to the *Resource Conservation and Recovery Act of 1976*; Implemented through RCW 70.105, "Hazardous Waste Management"; "Dangerous Waste Regulations" (WAC 173-303)			
Solid Waste Identification Specific subsections: WAC 173-303-016 WAC 173-303-017	ARAR	These regulations define how to identify when materials are and are not solid waste.	Materials that are generated for removal from the CERCLA site during the removal action are to be identification as solid waste to ensure proper management. Implementation is accomplished through the Waste Management Plan, Section 4.2, using work processes and procedures.
Dangerous/Mixed Waste Designation WAC 173-303-070(3)	ARAR	This regulation establishes the procedures to be used to determine if solid waste requires management as dangerous waste. These procedures are used to identify which waste codes are appropriate for application to the waste.	Solid waste that is generated for removal from the CERCLA site during this removal action would be subject to the dangerous waste designation procedures to ensure proper management. Implementation is accomplished through Waste Management Plan, Section 4.2, using work processes and procedures.
Dangerous/Mixed Waste Management Specific subsections: WAC 173-303-073 WAC 173-303-077 WAC 173-303-170(3)	ARAR	These regulations establish the management standards for solid waste designated as dangerous or mixed waste. Special waste is addressed in WAC 173-303-073. Universal waste is addressed in WAC 173-303-077. Generator standards are identified through WAC 173-303-170(3).	The substantive standards for management of special waste and universal waste and the substantive standards for management of dangerous/mixed waste are applicable to the interim management of certain waste that will be generated during the removal action. For purposes of this removal action, WAC 173-303-170(3) includes the substantive provisions of WAC 173-303-200 by reference. WAC 173-303-200 further includes certain substantive standards from WAC 173-303-630 and -640 by reference. Implementation is accomplished through Waste Management Plan, Section 4.2, using work processes and procedures.
Dangerous/Mixed Waste Disposal Specific subsection: WAC 173-303-140(4)	ARAR	This regulation establishes state standards for land disposal of dangerous waste and incorporates by reference federal land disposal restrictions of 40 CFR 268, that are applicable to solid waste that designates as dangerous or mixed waste in accordance with WAC 173-303-070(3).	Dangerous/mixed waste that is generated and removed from the CERCLA site during the removal action for offsite (as defined by CERCLA) land disposal would be subject to the identification of applicable land disposal restrictions at the point of generation of the waste. The actual offsite treatment of such waste would not be ARAR to this removal action, but would instead be subject to all applicable laws and regulations. Implementation is accomplished through Waste Management Plan, Section 4.2, using work processes and procedures. However, most waste will be disposed of onsite at ERDF.

Table 4-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Materials for the REDOX Complex

ARAR Citation	ARAR or TBC	Requirement	Requirement Implementation
Recycling Requirements Specific subsections: WAC 173-303-120(3) WAC 173-303-120(5)	ARAR	These regulations define the requirements for the recycling of materials that are solid and dangerous waste. Specifically, WAC 173-303-120(3) provides for management of certain recyclable materials, including spent refrigerants, antifreeze, and lead-acid batteries. WAC 173-303-120(5) provides for the recycling of used oil.	Recyclable materials that are exempt from regulation as dangerous waste and that are not otherwise subject to CERCLA as hazardous substances can be recycled and/or conditionally excluded from certain dangerous waste requirements. Implementation is accomplished through Waste Management Plan, Section 4.2, using work processes and procedures.
Regulations Pursuant to the *Toxic Substances Control Act of 1976* (TSCA); "Polychlorinated Biphenyls Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" (40 CFR 761)			
PCB Waste Management and Disposal Specific subsections: 40 CFR 761.50(b)(1) 40 CFR 761.50(b)(2) 40 CFR 761.50(b)(3) 40 CFR 761.50(b)(4) 40 CFR 761.50(b)(7) 40 CFR 761.50(c)	ARAR	These regulations establish standards for storage and disposal of PCB wastes.	The specific identified subsections from 40 CFR 761.50(b) reference the requirements for management of each PCB waste type. Radioactive PCB waste can be disposed in accordance with 40 CFR 761.50(b)(7). Implementation is accomplished through Waste Management Plan, Section 4.2, using work processes and procedures.
Regulations pursuant to RCW 70.95, "Solid Waste Management—Reduction and Recycling," "Minimum Functional Standards for Solid Waste Handling" (WAC 173-304)			
Nondangerous, Nonradioactive Solid Waste Management Specific subsection: WAC 173-304-200(2)	ARAR	This regulation establishes requirements for the onsite storage of solid waste that is not dangerous or radioactive waste.	Nondangerous, nonradioactive solid wastes (i.e., hazardous substances that are only regulated as solid waste) that will be containerized for removal from the CERCLA site would be managed onsite according to the substantive requirements of this standard. Implementation is accomplished through Waste Management Plan, Section 4.2, using work processes and procedures. Note: This regulation has been replaced in its entirety by WAC 173-350.
To Be Considered Pursuant to Relevant Facility Acceptance Criteria			
ERDF Waste Acceptance Criteria	TBC	This document establishes waste acceptance criteria for ERDF.	Waste destined for management at ERDF must meet acceptance criteria to ensure proper disposal.

Table 4-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Materials for the REDOX Complex

ARAR Citation	ARAR or TBC	Requirement	Requirement Implementation
Standards Controlling Releases to the Environment Regulations pursuant to the *Clean Air Act of 1977*; "National Emission Standards for Hazardous Air Pollutants" (NESHAP) (40 CFR 61)			
40 CFR 61.92	ARAR	Emissions of radionuclides to the ambient air shall not exceed amounts that would cause any member of the public to receive in any year an effective dose equivalent of 10 mrem/yr.	This removal action may include activities such as open-air demolition of contaminated structures, excavation of contaminated soils, and operation of exhausters and vacuums, each of which may provide airborne emissions of radioactive particulates to unrestricted areas. As a result, requirements limiting emissions potentially apply. This activity is a risk-based standard for the purposes of protecting human health and the environment. Implementation is accomplished through Standards controlling Releases to the Environment, Section 4.3 and the AMP using work processes and procedures.
40 CFR 61.93	ARAR	Emissions from point sources of airborne radioactive material shall be measured. Measurement techniques may include, but are not limited to, sampling, calculation, smears, or other reasonable methods for identifying emissions as determined by the lead agency.	Point source emissions of radionuclides to the ambient air may result from activities performed during the removal action, such as open-air demolition of contaminated structures, excavation of contaminated soils, and operation of exhauster and vacuums. This standard exists to ensure compliance with emission standards. Implementation is accomplished through Standards controlling Releases to the Environment, Section 4.3 and the AMP using work processes and procedures.
40 CFR 61.145(a) 40 CFR 61.145(c) 40 CFR 61.150	ARAR	Regulated ACMs shall be removed in accordance with specific handling, packaging, and disposal requirements where the potential-to-emit asbestos exists.	This removal action includes abatement of asbestos and ACMs in the form of pipe and tank insulation, transite siding, and ductwork. As a result, there is potential-to-emit asbestos to unrestricted areas and the requirements for the removal, handling, and packaging of asbestos potentially apply. Implementation is accomplished through Standards controlling Releases to the Environment, Section 4.3 and the AMP using work processes and procedures.
Regulations pursuant to RCW 70A.15, "Washington Clean Air Act"; RCW 43.21A, "Department of Ecology"; "Radioactive Protection – Air Emissions" (WAC 246-247)			
WAC 246-247-040(3) WAC 246-247-040(4)	ARAR	Emissions shall be controlled to assure emission standards are not exceeded.	Fugitive, diffuse, and point source emissions of radionuclides to the ambient air may result from activities performed during the removal action, such as open-air demolition of contaminated structures, excavation of contaminated soils, and operation of exhauster and vacuums. Implementation is accomplished through Standards controlling Releases to the Environment, Section 4.3 and the AMP using work processes and procedures.

Table 4-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Materials for the REDOX Complex

ARAR Citation	ARAR or TBC	Requirement	Requirement Implementation
WAC 246-247-075		Emissions from nonpoint and fugitive sources of airborne radioactive material shall be measured. Measurement techniques may include but are not limited to sampling, calculation, smears, or other reasonable method for identifying emissions as determined by the lead agency.	Substantive requirements of this standard are applicable because fugitive and nonpoint source emissions of radionuclides to the ambient air may result from activities performed during the removal action such as open-air demolition of contaminated structures and excavation of contaminated soils. This standard exists to assure compliance with emission standards.
"General Regulations for Air Pollution Sources" (WAC 173-400)			
Air Contaminant Emission Standards Specific subsections: WAC 173-400-040 WAC 173-400113	ARAR	Methods of control shall be employed to minimize the release of air contaminants associated with fugitive emissions resulting from materials handling, construction, demolition, or other operations. Emissions are to be minimized through application of best available control technology.	Substantive requirements of these standards are relevant and appropriate to this removal action because there may be visible, particulate, fugitive, and hazardous air emissions and odors resulting from decontamination, demolition, and excavation activities. As a result, standards established for the control and prevention of air pollution may be relevant and appropriate.
"Controls for New Sources of Toxic Air Pollutants" (WAC 173-460)			
WAC 173-460-030 WAC 173-460-060 WAC 173-460-070	ARAR	Emissions of toxic air contaminants shall be quantified and ambient impacts evaluated. Best available control technology for toxics shall be used as determined by the lead agency to protect human health and the environment.	Substantive requirements of these standards are relevant and appropriate to this removal action because there is the potential for toxic air pollutants to become airborne as a result of decontamination, demolition, and excavation activities. As a result, standards established for the control of toxic air contaminants may be relevant and appropriate.

References: 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants."
40 CFR 61.50, "Applicability."
40 CFR 61.92, "Standard."
40 CFR 61.93, "Emission Monitoring and Test Procedures."
40 CFR 61.145, "Standard for Demolition and Renovation."
40 CFR 61.150, "Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations."
40 CFR 268, "Land Disposal Restrictions."
40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions."
40 CFR 761.50, "Applicability."
Clean Air Act of 1977.
Comprehensive Environmental Response, Compensation, and Liability Act of 1980.
RCW 43.21A, "Department of Ecology."
RCW 70A.15, "Washington Clean Air Act."

Table 4-1. Identification of Applicable or Relevant and Appropriate Requirements and To Be Considered Materials for the REDOX Complex

ARAR Citation	ARAR or TBC	Requirement	Requirement Implementation
RCW 70.95, "Solid Waste Management—Reduction and Recycling."			
RCW 70.105, "Hazardous Waste Management."			
Resource Conservation and Recovery Act of 1976.			
Toxic Substances Control Act of 1976.			
WAC 173-303, "Dangerous Waste Regulations."			
WAC 173-303-016, "Identifying Solid Waste."			
WAC 173-303-017, "Recycling Processes Involving Solid Waste."			
WAC 173-303-070, "Designation of Dangerous Waste."			
WAC 173-303-073, "Conditional Exclusion of Special Wastes."			
WAC 173-303-077, "Requirements for Universal Waste."			
WAC 173-303-120, "Recycled, Reclaimed, and Recovered Wastes."			
WAC 173-303-140, "Land Disposal Restrictions."			
WAC 173-303-170, "Requirements for Generators of Dangerous Waste."			
WAC 173-303-200, "Accumulating Dangerous Waste On-Site."			
WAC 173-303-630, "Use and Management of Containers."			
WAC 173-303-640, "Tank Systems."			
WAC 173-304, "Minimum Functional Standards for Solid Waste Handling."			
WAC 173-304-200, "On-Site Containerized Storage, Collection and Transportation Standards for Solid Waste."			
WAC 173-350, "Solid Waste Handling Standards."			
WAC 173-400, "General Regulations for Air Pollution Sources."			
WAC 173-400-040, "General Standards for Maximum Emissions."			
WAC 173-400-113, "Requirements for New Sources in Attainment or Unclassifiable Areas."			
WAC 173-460, "Controls for New Sources of Toxic Air Pollutants."			
WAC 173-460-030, "Applicability."			
WAC 173-460-060, "Control Technology Requirements."			
WAC 173-460-070, "Ambient Impact Requirement."			
WAC 246-247, "Radioactive Protection—Air Emissions."			
WAC 246-247-040, "General Standards."			
WAC 246-247-075, "Monitoring, Testing and Quality Assurance."			

ACM = asbestos-containing material
AMP = air monitoring plan
ARAR = applicable or relevant and appropriate requirement
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
ERDF = Environmental Restoration Disposal Facility
PCB = polychlorinated biphenyl
TBC = to be considered

4.2 Waste Management Plan

Management and disposal of wastes resulting from implementation of this RAWP will be performed in accordance with CERCLA and the ARARs specified in the REDOX AM (DOE/RL-2016-52). Several waste streams will be generated under this removal action. It is anticipated that much of the waste will be designated as LLW. However, quantities of dangerous waste, MLLW, TRU/TRUM waste, PCB-contaminated waste, and ACM may also be generated. The majority of waste will be in a solid form; however, some liquid wastes might be generated. The following is a list of laws and regulations from which the ARARS have been developed:

- *Atomic Energy Act of 1954* for DOE management of radioactive waste.
- As implemented by 40 CFR 260, "Hazardous Waste Management System: General," through 40 CFR 268, "Land Disposal Restrictions," and WAC 173-303, "Dangerous Waste Regulations," RCRA is used for management of dangerous waste. The identification and TSD of hazardous waste and the hazardous component of mixed waste are also governed by RCRA. The State of Washington, which implements RCRA requirements under WAC 173-303, has been authorized to implement most elements of the RCRA program. The dangerous waste standards for generation and storage will apply to the management of any dangerous or mixed waste generated by removal activities at Hanford Site excess industrial buildings/structures and as a result of debris cleanup activities. Treatment standards for dangerous or mixed waste subject to RCRA land disposal restrictions are in WAC 173-303-140, "Land Disposal Restrictions," which includes 40 CFR 268 by reference.
- The TSCA includes standards for managing PCB waste. PCB waste disposal is governed by the rules of 40 CFR 761, "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions." PCB wastes generated during removal action and debris cleanup activities will be disposed at ERDF or another EPA-approved disposal facility in accordance with the substantive provisions of 40 CFR 761. PCBs may be considered underlying hazardous constituents under RCRA for waste that designates as dangerous or mixed waste and could require treatment to meet WAC 173-303 and 40 CFR 268 requirements.
- As implemented by 40 CFR 61, Subpart M, the CAA regulates removal and disposal of asbestos and regulated asbestos-containing material prior to demolition or renovation. These regulations provide for special precautions to control airborne emissions of asbestos fibers during removal activities. The provisions of 10 CFR 851.23(7), "Worker Safety and Health Program," "Safety and Health Standards," implement the asbestos-related requirements of 29 CFR 1926.1101, "Safety and Health Regulations for Construction," "Asbestos," for the regulation of worker safety with respect to asbestos.

Wastes generated through implementation of this removal action and from S&M activities will be disposed at appropriate EPA-approved facilities, in accordance with the waste acceptance criteria of those facilities. ERDF is the preferred waste disposal facility for waste meeting ERDF waste acceptance criteria (ERDF-00011). Demolition debris will be transported to ERDF or other EPA-approved facilities, and treated as necessary, to meet applicable land disposal restriction requirements and waste acceptance criteria prior to disposal.

Waste that is characterized as either contact-handled or remote-handled TRU/TRUM waste will be staged at the CWC or another EPA-approved facility. This material will be packaged for eventual shipment to WIPP in accordance with the schedule established for completing remedial actions at the Hanford Site. WIPP meets 40 CFR 191, "Environmental Radiation Protection Standards for Management and Disposal

of Spent Nuclear Fuel, High-Level and Transuranic Radioactive Wastes," requirements for TRU/TRUM waste disposal and is a RCRA-permitted disposal facility.

Waste management activities addressed in the work packages may include waste characterization, designation, staging, packaging, handling, marking, labeling, segregation, storage, transportation, and disposal. These activities are briefly described in the following subsections.

4.2.1 Projected Waste Streams

One or all of the following solid waste streams are anticipated to be generated during the removal action, including S&M activities, and may fall into any combination of categories (nondangerous/nonradioactive, radioactive, mixed, hazardous, dangerous, suspect radioactive, suspect dangerous, and suspect mixed):

- Demolition debris (e.g., structural materials, concrete, wood, rebar, metal/plastic pipes, wire, equipment, pumps, tanks, boilers, compressors, ductwork, and electrical components)
- LLW and MLLW
- TRU and TRUM waste
- Liquids (e.g., decontamination liquids)
- Spent/excess chemicals/reagents and used oils
- Miscellaneous solid waste (e.g., rubber, glass, paper, PPE, cloth, plastic, wipes, wood, equipment, tools, pumps, wire, metal casing, plastic piping, and sample returns)
- PCB waste
- Asbestos and ACM
- Soils (e.g., soils surrounding building slabs)

4.2.2 Waste Management and Characterization

Waste will be managed in a protective manner to prevent releases to the environment or unnecessary exposure to personnel. Waste specific storage and packaging requirements will comply with the substantive requirements of WAC 173-303, as specified in the ARARs. Miscellaneous solid waste will be managed, as appropriate, for the nonradiological and radiological contaminants present or suspected to be present. The waste characterization process is discussed briefly in Section 2.2.2 and in the REDOX SAP (DOE/RL-2017-05).

Contamination on surrounding soils or portions of slabs may be encountered during the course of removal activities. Any soil or portions of the slab that are contaminated with substances that are known or easily determined to be associated with normal building/structure operation or maintenance may be removed for disposal during building/structure demolition, as appropriate.

Sampling for such excavation will be performed using an observational approach focused on process knowledge, with visual inspections, radiological and chemical field screening, and focused judgmental sampling where appropriate. For the HSTF TSD unit, RCRA sampling will be performed in accordance with an approved closure plan. Removal of contaminated soils that are associated with the HSTF TSD unit will be performed per an approved closure plan. Removal of contaminated soils that are not associated with TSD units are generally deferred to a future remedial action. Removal of contaminated soils is generally deferred to a future remedial action. The sites will be stabilized in a manner that will not hinder future remediation.

Waste generated through the removal action will be characterized in accordance with the approved REDOX SAP (DOE/RL-2017-05) and the waste acceptance criteria of the receiving facility (i.e., ERDF). The characterization criteria identified in the REDOX SAP provides the rationale and strategy for conducting sampling and analysis activities. Characterization is performed using a variety of information that includes, but is not limited to, process knowledge, historical analytical data, new sampling and analysis data, and radiological and chemical field screening. The REDOX SAP contains sampling, analysis, and radiological survey requirements to support waste designation and disposal decisions. Characterization data will be used to prepare waste profile summaries to determine appropriate disposal options.

4.2.2.1 Hazardous/Dangerous Waste, Low-Level Waste, and Mixed Waste

These wastes will be managed in a protective manner to prevent releases to the environment or exposure to personnel. Waste specific storage and packaging requirements will comply with the substantive requirements of WAC 173-303, as specified in the ARARs.

4.2.2.2 Transuranic Waste

TRU waste may be generated from this removal action. The Plutonium Loadout Hood enclosure and associated equipment (tanks, pumps, and piping) are potential sources of TRU waste. Some of the surface materials removed during decontamination may also be TRU waste, most likely in solid form. Liquids and sludges in the process system and drains may also be encountered. See Section 3.3.4 for additional requirements.

4.2.2.3 Transuranic Mixed Waste

TRUM waste may exist in the form of lead shielding and equipment and may be generated by this removal action. This waste will likely be solid; however, there could be residual liquid from decontamination activities or process-related systems. See Section 3.3.4 for additional requirements.

4.2.2.4 Solid Waste

Solid waste (e.g., PPE) will be managed, as appropriate, for the nonradiological and radiological contaminants present or suspected to be present. Miscellaneous solid waste that has contacted suspect dangerous or suspect mixed waste will be managed as such. Field screening will be used to segregate radioactive waste from nonradioactive waste. Containers will be properly marked and labeled. The containers will be segregated, as appropriate, and then stored within a designated waste container storage area within the area of contamination or at ERDF. The area of contamination will be established as part of the work planning process. Miscellaneous solid waste will be dispositioned based on waste characterization information.

4.2.2.5 Asbestos and ACM Waste

Removing, handling, packaging, and disposing of asbestos and ACM will be performed in accordance with the substantive provisions of 40 CFR 61.145(c), “Standard for Demolition and Renovation”; 40 CFR 61.150, “Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations”; and 29 CFR 1926.1101 for ACM removal. Additional information about asbestos and ACM waste generated from the removal activities will be specified in the field work packages and procedures, as necessary.

4.2.2.6 PCB Waste

The management and disposal of PCB wastes is governed by the TSCA, which is implemented by 40 CFR 761. The TSCA regulations contain specific provisions for PCB waste, including PCB waste that contains a radioactive component. PCBs are also considered underlying hazardous constituents under

RCRA and may be subject to WAC 173-303-140 and 40 CFR 268 requirements. Additional information about PCB waste generated from the removal activities will be specified in the field work packages and procedures, as necessary.

4.2.2.7 Returned Sample Waste

Screening and analysis of both solids and liquids may be conducted at the project site, at laboratories on and/or off the Hanford Site, or at a radiological counting facility. Samples analyzed at a radiological counting facility or at Hanford Site laboratories may be returned to the original waste location or to ERDF for disposition with other CERCLA waste. Unused samples and associated waste generated at offsite laboratories will be dispositioned in accordance with contract specifications.

4.2.2.8 Decontamination Fluids

Although CERCLA removal actions are exempt from the Hanford Site State Waste Discharge Permit (SWDP), decontamination fluids (water and/or nondangerous cleaning solutions) will be discharged if they meet the substantive provisions of the existing SWDP. If the decontamination fluids do not meet the Hanford Site SWDP, fluids generated from cleaning equipment and tools in the area of contamination may need to be contained, sampled, and as necessary, transported or solidified for disposal at ERDF or another EPA-approved facility.

4.2.2.9 Equipment Waste

Equipment used to support the removal action that is chemically or radiologically contaminated will be decontaminated as described in Section 2.2.8. If the equipment cannot be decontaminated, the equipment will be disposed at ERDF or other EPA-approved facilities.

4.2.2.10 Management of Bulk Waste

Bulk waste will be placed in ERDF cans for eventual disposal at ERDF or other EPA-approved facilities, and treated as necessary to meet applicable land disposal restriction requirements and waste acceptance criteria prior to disposal. Waste will be stored in the area of contamination or at a site-specific storage area at ERDF, as appropriate. Bulk containers will be covered when waste is not being added or removed. Lightweight material (e.g., plastic and paper) will be bagged, if appropriate, prior to placement in the bulk container to eliminate the potential for materials blowing out of the bulk container or truck. Applicable packaging and pre-transportation requirements for dangerous or mixed waste generated by the closure action will be identified and implemented before the waste container is moved. Additionally, a fixative will be applied, as needed, to the demolition site and any loose soil to control dust, which may contain radiological and nonradiological contaminants.

4.2.2.11 Management of Waste Containers

Prior to disposal, dangerous waste containers will be managed in accordance with the substantive provisions of WAC 173-303-200, “Accumulating Dangerous Waste On-Site,” as specified in the ARARs. Waste containers, including the ERDF roll-on/roll-off containers, are inspected before use to ensure container integrity. The containers will be stored inside the applicable site-specific waste container storage area or area of contamination. Containers awaiting analytical results will be marked and labeled, as appropriate. Weekly inspections of the containers will be performed to document the integrity, container marking/labeling, physical container placement, storage area boundaries/identification/warning signs, and sign of any potential leakage. Containers showing signs of deterioration will be identified on the container inspection form and will be over packed or repackaged, as necessary.

Spills or releases will be reported, as stated in Section 4.4. In the event of a spill or release, action will be taken to protect human health and the environment.

4.2.3 Waste Handling, Storage, and Packaging

Marking, labeling, segregating, and staging waste containers will be performed or directed by the waste specialist. Waste containers will be shipped directly to the disposal site. In the event that waste containers need to be temporarily stored pending final disposition, they will be stored at an approved facility. Dangerous or mixed waste may also be accumulated in accordance with the substantive generator requirements of WAC 173-303-200.

Applicable packaging and transportation requirements for dangerous or mixed waste generated by the removal action will be identified and implemented before movement of waste. Before being removed from the area of contamination or site-specific waste storage area, containers and haul trucks released from radiologically controlled areas will meet exterior contamination limits. Other waste type specific handling and packaging requirements may be applicable and will be described in the contractor's work documents, as appropriate.

The building footprint area (BFA) will include the individual building/structure footprint and the surrounding area suitable to support removal activities and excavations of the buildings/structures. The BFA will be established as part of the work planning process. Waste management locations outside of the BFA will meet the substantive requirements of the ARARs. For waste management inside the BFA, safe and effective management practices will be established to ensure protection of human health and the environment during performance of demolition and related work.

As an alternative to management within the BFA, waste that is not immediately transported to ERDF or other EPA-approved disposal facility may be stored in staging piles. Staging piles used for management of dangerous waste will be operated in accordance with substantive provisions of standards and design criteria prescribed in 40 CFR 264.554, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," "Staging Piles," paragraphs (d) through (k) as follows:

- Staging piles will be used only as part of this removal action for temporary storage at a facility and must be located within the contiguous property where the waste to be managed in the staging piles is oriented.
- The staging pile will be designed to prevent or minimize releases of hazardous wastes and hazardous constituents into the environment and minimize or adequately control cross-media transfer. To protect human health and the environment, this activity may include installation of berms, dust control practices, or using plastic liners or covers, as appropriate.
- The staging pile must not operate more than 2 years (measured from the first time remediation waste is placed in the pile), except when EPA grants an operating term extension. A record of the date when remediation waste was first placed in the staging pile must be maintained until final closeout of the site is achieved.
- Ignitable or reactive waste will not be placed in a staging pile unless it has been treated or mixed before being placed in the pile so that the waste no longer meets the definition of ignitable or reactive waste, or the waste is managed to protect it from exposure to any material or condition that may cause it to ignite.
- Incompatible wastes will not be placed in the same staging pile, unless the requirements in 40 CFR 264.17(b), "General Requirements for Ignitable, Reactive, or Incompatible Wastes," have been met. The incompatible materials will be separated, or the waste will not be piled on the same base where incompatible wastes or materials were previously piled, unless the base has been decontaminated sufficiently to comply with 40 CFR 264.17(b).

Specific staging pile locations will be identified in project drawings. Field operations of staging piles will be accomplished as described in the preceding list.

Once the waste has been removed, to close out the staging pile characterization of the residual soil will be performed as appropriate. In cases where staging piles for industrial waste sites are located in an uncontaminated area, the observational approach may be used. In situations where sampling is appropriate and results indicate the presence of residual contamination, efforts will be made to remove such contamination.

4.2.3.1 Waste Profile

Waste profiling to establish values for the waste tracking form may take place concurrently with removal action activities. Field screening measurements may be used to adjust the waste tracking form. The waste profile may be adjusted (as necessary) through a combination of in-process field screening data and analytical laboratory analyses.

4.2.3.2 Final Waste Disposal

Dangerous, mixed, and radioactive wastes generated through the removal action will be disposed at ERDF. ERDF is the preferred disposal location for waste meeting the facility waste acceptance criteria (ERDF-00011) because it is engineered to meet appropriate RCRA technological requirements for landfills, as described in EPA, 1995, *Record of Decision, U.S. DOE Hanford Environmental Restoration Disposal Facility, Hanford Site, Benton County, Washington*. If waste cannot be disposed at ERDF, it may be transferred to an EPA-approved disposal facility.

TRU/TRUM waste generated as part of this removal action will be sent to the CWC or other EPA-approved facility. TRU/TRUM waste will be treated, as necessary, certified, and disposed at WIPP.

4.2.3.3 Waste Disposal Records

Original sample reports and a copy of the shipping papers for each waste container will be retained and forwarded to the assigned waste specialist for inclusion in the project file following final waste disposal.

4.2.4 Waste Treatment

Treatment of waste generated from the removal action (e.g., grouting, macroencapsulation, solidification, separation, and size reduction) will be performed, if needed. If treatment is deemed necessary to provide safe transport, such treatment may be conducted at the generating site. If treatment is deemed necessary to meet the disposal facility waste acceptance criteria and/or address land disposal restriction requirements, such treatment may be conducted at the generating site or the receiving site. Treatment will be performed at an EPA-approved facility in accordance with 40 CFR 300.400, "General." Residuals from waste treatment originating from the removal action can be disposed at ERDF if they meet ERDF waste acceptance criteria (ERDF-00011).

4.2.5 Waste Minimization and Recycling

Waste minimization practices will be followed to the extent technically and economically feasible during waste management. Introducing clean materials into a contamination area, as well as contaminating clean materials, will be minimized to the extent practicable. Emphasis will be placed on source reduction to eliminate or minimize the volume of waste generated.

4.3 Standards Controlling Releases to the Environment

Airborne emissions associated with the removal action, including S&M activities, will be minimized through appropriate work controls in accordance with DOE radiation control and substantive air pollution control standards, to keep Hanford Site air pollutant emissions at ALARA levels.

4.3.1 Radiological Air Emissions

Radionuclide contamination may be encountered during activities under this NTCRA. Federal and state regulations and requirements for radiological air emissions are identified in Appendix A of the REDOX AM (DOE/RL-2016-52). Substantive requirements of these standards are applicable to activities that will involve fugitive, diffuse, and/or point source emissions of radionuclides to the ambient air, such as demolition and excavation of radioactively contaminated structures and/or soils, performed during this NTCRA.

Radiological contaminants of concern will be identified and quantified in either the REDOX SAP (DOE/RL-2017-05) structure or area-specific appendices or in the subsequent implementing work packages. The potential-to-emit (PTE) is determined through calculation or modeling prior to work initiation. Per the agreed upon language within the Hanford Site Air Operating Permit, *Statement of Basis for Standard Terms and General Conditions*, transitioning to CERCLA involves following a predetermined process. This includes, among other things, identification of ARARs through documents such as RAWPs and air monitoring plans (AMPs) to meet the substantive, relevant, and applicable portions of radiological air emissions regulations. The PTE calculations are needed to determine the abatement technology required to control the potential for contamination release during the work activitities. They are based on prespective calculations that delineate the total effective dose equivalent (TEDE) to the maximally exposed individual (MEI) who abides or resides in an unrestricted area.

For the REDOX Complex, the estimated holdup in the structures is used to calculate the PTE and TEDE to the MEI. Hypothetical offsite and onsite Hanford MEIs are then evaluated. The TEDEs to the MEIs are calculated using the CAP-88 PC[7] software (Version 4.0). The calculation parameters and the assumptions used to derive the PTE and TEDEs to the MEIs are presented in ECF-Hanford-17-0128, *Radiological and Toxic Air Emissions for the REDOX Complex*. The unabated PTE is estimated at 1.61 mrem/yr to the offsite MEI. In accordance with the 2001 agreement reached between DOE-RL,Washington Department of Health and EPA, the PTE for a second MEI location, termed the onsite MEI, was calculated. The onsite MEI unabated PTE is estimated at 3.60 mrem/yr located at the Laser Interferometer Gravitational-Wave Observatory.

Airborne emissions control and monitoring requirements for radiological air emissions will be identified, as needed, based on the calculated/modeled value of the potential emissions and resultant public exposure. This information will be provided in subsequent implementing documents (i.e., AMP) or work packages.

Near-facility ambient air monitoring stations will be used to augment work place monitoring during the removal activities. There are four existing near-facility ambient air monitoring stations surrounding the REDOX Complex: N441, N442, N956, and N963 (Figure 4-1). The Hanford Site protocol established for the Near-Facility Monitoring Program ambient air stations will be followed for station repairs, retirement,

[7] The CAP-88 (which stands for *Clean Air Act Assessment Package-1988*) computer model is a set of computer programs, databases, and associated utility programs for estimation of dose and risk from radionuclide emissions to air. CAP-88 is a regulatory compliance tool under NESHAP (40 CFR 61). CAP-88 PC (Version 4.0) allows modeling on a personal computer and is a recent version of the code.

data collection, sampling frequencies, sample analysis, and data reporting (DOE/RL-91-50, *Hanford Site Environmental Monitoring Plan*).

4.3.2 Nonradioactive Air Emissions

The primary source of emissions resulting from the removal action will be fugitive particulate matter. In accordance with the substantive requirements of WAC 173-400-040(3) and (8), "General Regulations for Air Pollution Sources," "General Standards for Maximum Emissions," reasonable precautions will be taken to prevent the release of air contaminants associated with fugitive emissions due to demolition, materials handling, or other operations and prevent fugitive dust from becoming airborne from fugitive emission sources.

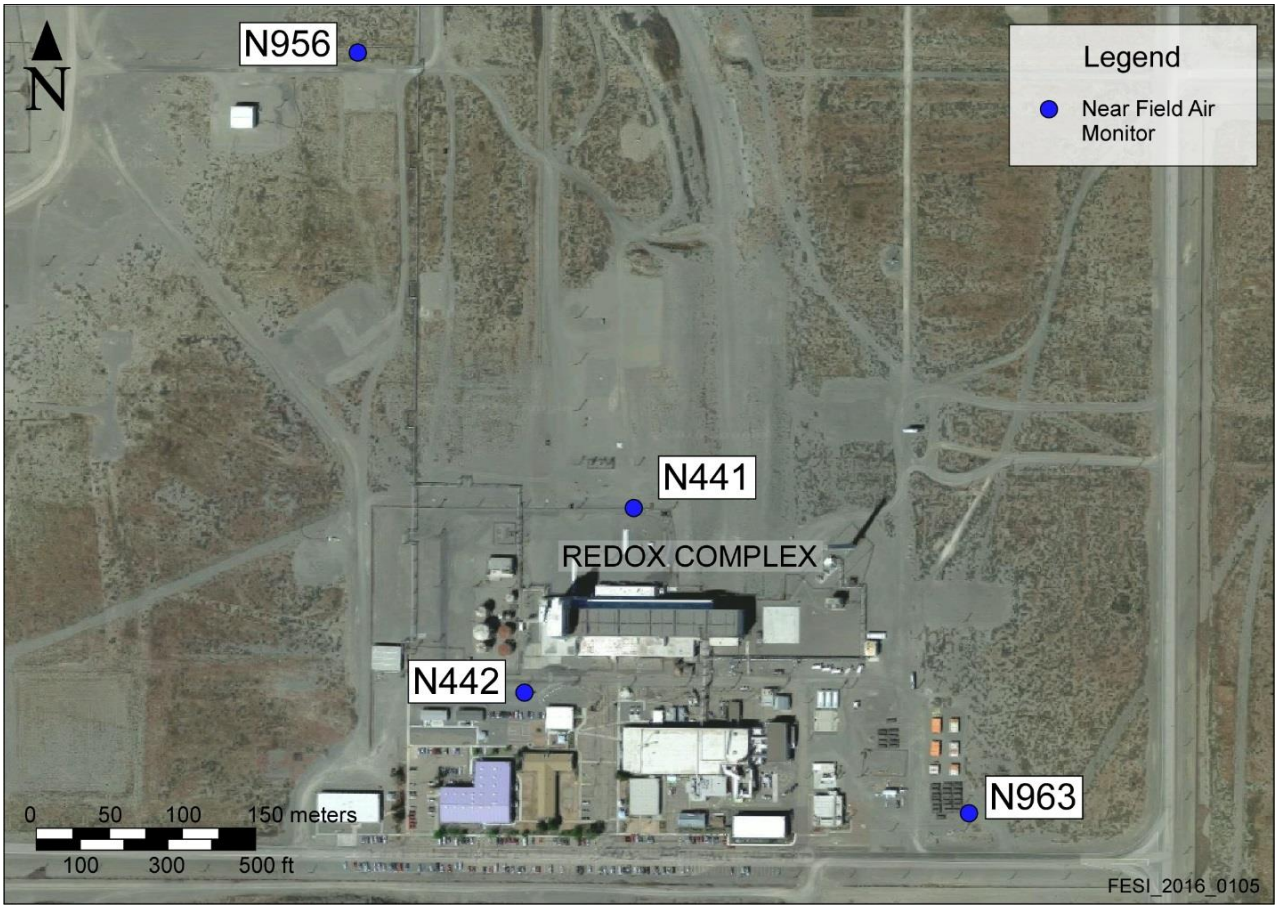

Figure 4-1. REDOX Complex Near-Field Monitoring Locations

Operating trucks and other diesel-powered equipment during the removal activities would be expected, in the short term, to introduce quantities of sulfur dioxide, nitrogen dioxide, particulates, and other pollutants to the atmosphere, typical of similar-sized construction projects. These releases would not be expected to exceed air quality standards. Dust generated during removal activities would be minimized by applying water or other dust control measures (e.g., fixatives). Vehicular and equipment emissions will be controlled and mitigated in compliance with the substantive standards for air quality protection that apply to the Hanford Site. These techniques are considered reasonable precautions to control fugitive emissions as required by the substantive requirements.

Toxic air emissions may be subject to the substantive applicable requirements of WAC 173-460, "Controls for New Sources of Toxic Air Pollutants." ECF-Hanford-17-0128 provides details on the nonradiological air emissions for the removal action at the REDOX Complex. New emissions above de minimis values from demolition of the 276S HSTF and demolition and grouting of the 293S Building are not anticipated due to the previous deactivation activities (e.g., semi-solid nature of tank residuals and grouting of 276S tanks, 293S vessels and piping drained and blown with air). Activities within the 202S Building involve removal of residual materials upstream of the 291S001 stack emissions and not considered new emissions.

Some waste encountered during the removal action may require treatment to meet ERDF waste acceptance criteria (ERDF-00011). In most cases, the type of treatment anticipated will consist of solidification or stabilization techniques, such as macroencapsulation or grouting, and WAC 173-460 will not be considered an ARAR because the work will not result in toxic air pollutant emissions at regulated levels. If more aggressive treatment is required that would result in regulated air pollutant emissions above the de minimis values in WAC 173-460-150, "Table of ASIL, SQER and de Minimis Emission Values," the substantive requirements of WAC 173-400-113(2), "Requirements for New Sources in Attainment or Unclassifiable Areas," and WAC 173-460-060, "Control Technology Requirements," will be evaluated to determine their applicability in satisfying the substantive requirements determined to be ARARs.

4.3.3 Asbestos Emissions

Removal and disposal of asbestos and ACM are regulated under the CAA. The substantive provisions of these regulations provide for special precautions to prevent environmental releases or personnel exposure to airborne emissions of asbestos fibers during the removal action.

4.3.4 Emission Controls

Based on an analysis of the potential emissions and available control technologies, the following controls have been selected for use during the removal action:

- Water will be applied as needed during excavation and backfilling/recontouring activities to suppress fugitive emissions, including dust.
- Fixatives will be applied to contaminated soil and/or debris and equipment per manufacturer instructions as needed to minimize airborne contamination during the NTCRA activities for fugitive emissions and dust. Fixative application techniques may include spraying, brushing, pouring, or another method, as necessary. Due to their high tack and soil binding nature, fixatives provide greater suppression of the soil matrix and reduce the amount of particle movement when exposed to wind forces. Fixatives, water, covers, containment tents, windscreens, or other controls during cessation of work activities will be applied to the extent practicable based on the work environment (i.e., weather conditions and predicted wind speeds above 32 km/hr [20 mi/hr]).
- Fixatives or cover material (e.g., soil and gravel) will be applied to disturbed contaminated soils, when field activities will be inactive more than 24 hours (except as noted in the next bullet).
- If the overnight sustained wind speed is predicted to be greater that 32 km/hr (20 mi/hr) based on the Hanford Meteorological Station forecast for the 200 West Area, fixative or cover material will be applied to contaminated soil or demolition debris, as practicable. If a fixative has already been applied and the fixed contaminated items will remain undisturbed, further use of fixatives will be evaluated individually. Fixatives or other controls will not be applied when contaminated items are frozen or when it is raining, snowing, or other precipitation is falling.

- Field activities will be temporarily ceased, and the area will be placed in a safe configuration if contamination control measures are not expected to be adequate, based on site conditions (e.g., excessive wind). Additionally, fixatives will be applied to demolition sites and debris piles, as needed, to help control dust and radiological or nonradiological contaminants.
- Waste packages will remain closed, except during packaging and waste inspection activities.
- Operational limits for removable or transferable radioactive contamination levels will be established in work packages and associated radiation work procedures. Fixatives or other physical controls will be employed if removable or transferable contamination levels above 100,000 disintegrations/min per 100 cm^2 beta/gamma or exceeding 2,000 disintegrations/min per 100 cm^2 alpha are measured or expected.
- Items inside of the ventilated space may be internally and externally stabilized and handled to minimize any potential release prior to being removed from ventilated space or securing ventilation.
- Radiological surveys (e.g., swipes/smears) will be taken from demolition equipment, leaving any areas where there is the potential for removeable contaimination above 2,000 disintegrations/min per 100 cm^2 alpha or 100,000 disintegrations/min per100 cm^2 beta/gamma following any demolition action.
- Measures such as decontamination solutions, expandable foam, or encasement in grout, fixatives, or glovebags will also be used in a graded approach to help minimize the spread of contamination.
- During open-air demolition, stabilized items identified as requiring special handling will be managed in a manner to minimize disturbance of the contamination. Stabilization methods will be implemented prior to demolition to address void space issues and eliminate the need for excessive crushing, size reduction, or other actions that could lead to potential airborne releases.
- Any vacuum cleaners and portable exhausters used for demolition activities will be equipped with approrpriately tested HEPA filters.

In addition to the controls listed above, a detailed discussion of the emissions controls is in the AMP. Best available radionuclide control technology and ALARA control technology controls will be applied based on the PTE using a graded approach. The radiological control and environmental organizations are responsible for selecting and ensuring that appropriate controls are implemented to maintain both worker exposure and environmental releases ALARA.

4.3.5 Monitoring Requirements

As the calculated unabated PTE for the removal action is greater than 0.1 mrem/yr (Section 4.3.1), continuous emissions monitoring is required by the substantive requirements of WAC 246-247-075, "Radiation Protection—Air Emissions," "Monitoring, Testing, and Quality Assurance." Worksite air monitoring for personnel protection and process monitoring will be the primary indicator of effectiveness of abatement and ALARA control methods during removal activities. Worksite monitoring includes using temporary ambient air monitors (e.g., continuous air monitors with alarms, personnel samplers, ambient air samples). In addition, existing near-facility ambient air monitoring stations surrounding the work areas will be utilized to augment the workplace monitoring (Figure 4-1).

Periodic confirmatory measurement (PCM) will also be provided, as required by the substantive requirements of WAC-246-247-075(3) and (8) for all buildings/structures. Ambient air monitoring and radiological surveys will be provided to meet the PCM requirement. The primary PCM will be provided through the use of work space monitoring and radiological surveys performed in accordance with the

current radiological control manual. Air monitoring will consist of portable air samplers placed in the prevailing downwind locations in the immediate work area. The samplers will be operated during work activities that have a potential for radionuclide air emissions. Results are utilized for verifying acceptable occupational conditions and to help confirm effectiveness of contamination controls. Hand-held survey instruments will be used for alpha and beta-gamma contamination surveys. In addition, existing near-facility ambient air monitoring stations surrounding the work areas will be utilized to augment the workplace monitoring (Section 4.3.1).

Detailed discussion of the monitoring requirements is in the AMP.

4.3.6 Liquid Effluents

Liquid effluents may be generated during the removal activities (e.g., decontamination solutions, water sprays for dust suppression). Although CERCLA removal actions are exempt from Hanford Site SWDP, liquid effluents will be discharged if they meet the substantive provisions of existing Hanford Site SWDP. If the liquid effluents do not meet Hanford Site SWDP, effluents may need to be contained, sampled, and as necessary, transported and discharged into the ETF, or solidified for disposal at ERDF or another EPA-approved facility. Water spray for dust suppression will be used in a manner that minimizes the potential for ponding or runoff that could result in the spread of contamination.

4.4 Reporting Requirements for Nonroutine Releases

The following reporting requirements apply for hazardous substances that could be released during removal activities:

- 40 CFR 302, "Designation, Reportable Quantities, and Notification," requires immediate notification to the NRC on discovery of a release of a hazardous substance into the environment in excess of a reportable quantity.
- 40 CFR 355, "Emergency Planning and Notification," requires immediate notification to the community emergency coordinator for the local emergency planning committee and to the State Emergency Response Commission for a release of a reportable quantity of an extremely hazardous substance, a comprehensive release of a reportable quantity of an extremely hazardous substance, or a CERCLA hazardous substance.
- Emergency response for this project will include required notification to the NRC for reportable quantity releases and On-Scene Coordinator notification for other emergency situations. Notification to the NRC only applies for hazardous substances discovered or released that were not evaluated as part of this CERCLA removal action. Hazardous substances that are subject to this CERCLA removal action are not subject to this reporting requirement because such substances are already subject to CERCLA cleanup authority. Such hazardous substances will be addressed, as required, by the REDOX AM (DOE/RL-2016-52).

4.5 Cultural/Ecological Resources

Cultural and ecological resource reviews will be performed, as appropriate, before starting removal activities. These reviews will be conducted in accordance with DOE requirements. If potential impacts are identified, mitigation action plans will be developed and implemented. The following subsections provide further detail for these reviews.

4.5.1 Cultural

A cultural resource review has been completed following the requirements of the *National Historic Preservation Act of 1966*, Section 106. The removal activities would be performed in areas that have been extensively disturbed by past construction activities.

A cultural resources assessment of the project was conducted on December 20, 2018. Facilities within the project area have been previously identified and evaluated for National Register of Historic Places eligibility per DOE/RL-96-77, *Programmatic Agreement Among the U.S. Department of Energy, Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, Washington*.

Of the 12 facilities affected by the project, five structures contribute to the Hanford Site Manhattan Project and Cold War Era Historic District. The REDOX facility (202S) was recommended for individual documentation, while the Exhaust Fan Control House (291S), Main Stack (29S0001), the Jet Pit House (292S), and Acid Recovery and Off Gas Treatment Building (293S) are contributing elements but require no additional documentation. The remaining seven facilities are either noncontributing or exempt from evaluation.

Documentation has been completed as represented by the Expanded Historic Property Inventory Form for REDOX and Chapter 2, Section 4, "Chemical Separations" of DOE/RL-97-1047, *History of the Plutonium Production Facilities at the Hanford Site Historic District, 1943-1990*, which describes the contribution that REDOX made to the Cold War.

Mitigation for the removal of these facilities is complete per DOE/RL-97-56, *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (hereinafter referred to as the Treatment Plan). Walkthroughs of these Hanford facilities have been conducted and historical objects representing the chemical separations process at Hanford have been tagged for inclusion in the historic Hanford Collection. These items are slated for storage and public access. To meet the requirements of the Treatment Plan, prior to facility demolition, coordination with Curation Services is to be accomplished as specified in the clearance letter.

Impacts on cultural resources near the removal action have been mitigated in accordance with DOE/RL-98-10, *Hanford Cultural Resources Management Plan*.

4.5.2 Ecological

Ecological reviews will be completed before work begins in areas where there is potential for adverse effects to sensitive or rare biological resources, consistent with existing routine procedures (DOE/RL-95-11, *Ecological Compliance Assessment Management Plan*). Project engineers will consult with the ecological compliance staff in advance of planned activities to allow for sufficient ecological surveys.

If any nesting birds (if not a nest, a pair of birds of the same species or a single bird that will not leave the area when disturbed) are encountered or suspected, removal activities shall be evaluated before continued work. Prior to commencing removal activities for a structure, a facility walkdown/survey will be performed during daylight hours to document any evidence that could indicate high numbers of bats that could suggest possible roosting site(s). In the event such evidence is discovered, DOE will be consulted for further recommendations.

No plants or animals listed as threatened, endangered, or candidate species under the federal *Endangered Species Act of 1973* are known to be near the structures slated to undergo removal activities. Very little native or natural habitat is present near the structures slated to undergo removal activities. However, care

will be taken to avoid or minimize damage to any vegetation, especially shrubs that are near the structures.

Workers will avoid wildlife that may be found in and around the buildings/structures. Appropriate ecological surveys of debris cleanup sites also will be conducted before field activities begin. Procedures to avoid or mitigate damage to sensitive areas identified during ecological reviews will be established before work begins.

Impacts on ecological resources near the removal action will continue to be mitigated in accordance with DOE/RL-96-32, *Hanford Site Biological Resources Management Plan*.

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5 Project Administration

The following sections describe the management approach for implementing the removal action, including cost and schedule summary information, project team descriptions, change management, training and qualifications, quality assurance (QA), and post-removal activities.

5.1 Cost Summary

Table 5-1 presents the costs of the removal action within the scope of this RAWP. The expected accuracy range of the cost estimate is -30 to +50 percent. The cost estimate is based on the best available information regarding the anticipated scope of the removal action.

Table 5-1. Projected Costs in Present Value

Identification	Structure Name	Present Value Cost Estimate
202S	REDOX (including canyon, silo, and annex)	$74,700,000
276S	Hexone Storage and Treatment Facility	$6,200,000
293S	Nitric Acid and Iodine Recovery Building	$3,500,000
REDOX Complex	General costs such as site preparation, S&M, and support facilities	$96,200,000
	Total Cost	**$180,600,000**

Reference: DOE/RL-2016-16, *Engineering Evaluation/Cost Analysis for the REDOX Complex*.

REDOX = Reduction-Oxidation (Complex)

S&M = surveillance and maintenance

5.2 Schedule

This removal action began following issuance of this RAWP in 2019. Removal activities for the REDOX Complex will be executed using a phased approach based on emergent facility conditions, funding availability, craft/engineering resources availability, and overall interactive site priorities. The removal action work will continue until the issuance of a remedial action record of decision in the 2032 time frame.

Near-term removal activities (2019 to 2020) planned for the 202S Silo Service Area and the North and South Sample Galleries in the 202S Canyon have begun. Specific removal activities and sequencing will be determined by the removal action project team.

5.3 Project Team

The project team includes the individuals working to accomplish the removal action. Accordingly, the project team includes the lead regulatory agency (EPA), lead agency (DOE), DOE-RL Removal Action Manager, contractor removal action organization, site project organization, QA organization, radiological control organization, health and safety organization, sample and data management organization, environmental compliance officer, waste management lead, and other contractor and subcontractor staff. The HASP lists the key project team member names, their roles and responsibilities, and their respective organizations.

5.4 Change Management

If a fundamental change to the selected removal action that is not within the scope of work is identified, another engineering evaluation/cost analysis or an engineering evaluation/cost analysis addendum and supporting documentation will be prepared to allow DOE to consider a revised removal action.

Established configuration/change control processes ensure that proposed changes are reviewed in relation to the specified commitments. If a breach of these commitments is discovered, work will cease so that stabilization and/or recovery actions may be identified and implemented. Change management will comply with appropriate contractor procedures.

Determining the significance of the change is the responsibility of DOE. Contractor management is responsible for tracking changes and obtaining appropriate reviews by contractor staff. Contractor management will discuss the change with DOE, and DOE will then discuss the type of change that is necessary with EPA. Appropriate documentation will follow.

5.5 Personnel Training and Qualifications

Staff experience and capabilities are important in maintaining worker and environmental safety. Knowledge of ongoing operations, understanding of conditions encountered, and lessons learned will ensure continued safe operations.

Training requirements will ensure that personnel are able to work safely in and around radiological areas and maintain ALARA radiation exposures. Safety courses, training materials, site-specific information, and available technologies will be presented to provide adequate training for workers. Records of required training will be maintained in accessible personnel files.

Health physics workers are required to be current in HPT qualification training. These courses require passing examinations to demonstrate their understanding of theoretical and applied classroom materials.

Specialized training will be provided, as needed, to instruct workers in the use of nonstandard equipment, performance of abnormal operations, and hazards of specific activities. Specialized training could be provided through on-the-job activities, classroom instruction and testing, or prejob briefings. The depth of training in any discipline will be commensurate with the degree of the hazard(s) involved and the knowledge required for task performance. Some activities will require using expert services as opposed to project staff training.

The contractor training program will provide workers with the knowledge and skills necessary to execute assigned duties safely. A graded approach will be used to ensure that workers receive a level of training commensurate with their responsibility that complies with applicable requirements. Specialized employee training will include prejob safety briefings, plan-of-the-day meetings, and facility/work site orientations. Training and qualifications will be determined, as required by job assignment for specific work activities.

The SAP, HASP, RWP, and activity hazards analysis will include specific requirements for project activities conducted, which will include PPE and required training for project personnel.

5.6 Quality Assurance Program

Overall QA for the RAWP will be planned and implemented in accordance with 10 CFR 830, "Nuclear Safety Management," Subpart A, "Quality Assurance Requirements"; EPA/240/B-01/003, *EPA Requirements for Quality Assurance Project Plans*; and SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, Third Edition; Final Update V*. The QA activities will use a graded

approach based on potential environmental, safety, health, reliability, and continuity of operation impacts. Other specific activities will include QA implementation, responsibilities and authority, document control, QA records, and audits.

5.7 Post-Removal Action Activities

Following the removal action, the soil and remaining slabs will be visually inspected and surveyed. Although the scope of this removal action does not include soil contamination found under the buildings/structures, if evidence of contamination to surrounding soils is encountered during D4 activities, those soils will be excavated and disposed at ERDF or other EPA-approved facilities. Alternately, if the soil contamination is extensive or unusually complex or if contamination is encountered on remaining slabs or underground structures, DOE will consult with the lead regulatory agency (EPA). The parties will determine whether to address the residual contamination within the scope of this NTCRA, or implement temporary measures as part of this action and defer final action to the remedial investigation and remedy selection process by adding the site to the Tri-Party Agreement Action Plan (Ecology et al., 1989b), Appendix C, in accordance with RL-TPA-90-0001.

Potential post-removal activities are summarized in the following subsections.

5.7.1 Post-Removal Action Sample Collection

Field investigations (e.g., visual inspections and radiological and/or chemical field screening) will be conducted throughout the removal action process to assess potentially contaminated areas. A walkdown is also conducted following backfilling to ensure the absence of asbestos. If soil contamination surrounding structures is detected, post-removal contaminated soil excavation or stabilization may be performed. Alternatively, post-removal contaminated soil sites may be identified by DOE as new WIDS sites under the Tri-Party Agreement (Ecology et al., 1989a) with concurrence from Ecology and EPA.

5.7.2 CERCLA Cleanup Documentation

Removal activities completed as part of this removal action will be documented on a Facility Status Change Form. The form will provide a summary of the actions taken, the “as-left” condition of the area, the characterization data collected during the removal action, and an assessment of the underlying soil as applicable. DOE will approve the form to document completion of the removal action. This form will support the future remediation action at the REDOX Complex and the eventual disposition of the entire 200 West Area of the Hanford Site.

5.7.3 RCRA Cleanup Documentation

Closure activities for the 276S HSTF, including notification of closure, will be pursuant to an approved closure plan.

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Assistant Secretary for Environmental Management

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Terms

AMP	air monitoring plan
AOP	Air Operating Permit
APQ	annual possession quantity
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
HEPA	high-efficiency particulate air (filter)
HSTF	Hexone Storage and Treatment Facility
MEI	maximally exposed individual
NFM	near-facility monitor
NTCRA	non-time-critical removal action
PTE	potential-to-emit
REDOX	Reduction-Oxidation
S&M	surveillance and maintenance
TEDE	total effective dose equivalent

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1 Introduction

This air monitoring plan (AMP) supports DOE/RL-2017-06, *Removal Action Work Plan for the REDOX Complex*, for a non-time-critical removal action (NTCRA) for the Reduction-Oxidation (REDOX) Complex. The REDOX structures addressed in this NTCRA are the 202S Building (including the Canyon, Silo, and Annex); the 293S Nitric Acid and Iodine Recovery Building (293S Building); as well as waste management from closure of the *Resource Conservation and Recovery Act of 1976* 276S Hexone Storage and Treatment Facility (276S HSTF). The structures addressed by this NTCRA are chemically and/or radiologically contaminated.

The selected NTCRA scope for the REDOX Complex structures includes the following activities:

- Continued surveillance and maintenance (S&M) of the REDOX Complex
- Hazard abatement of the 202S Canyon Galleries
- Demo preparation of the 202S Silo Service Area, 202S Annex, and abovegrade areas of the 202S Canyon
- Demolition of the 293S Building, the 276S HSTF, and the 202S Annex
- Grouting of belowgrade areas of the 293S Building
- Disposal of wastes generated during removal activities
- Cleanup of miscellaneous debris
- Equipment decontamination
- Stabilization of the affected structures and immediately adjacent areas
- Increasing the stack effluent and sample flows using an alternative engineering analysis, ECF-HANFORD-19-0133, *Mathematical Engineering Analysis for Increasing the Flows at the Reduction-Oxidation (REDOX) Facility*, to ensure true, accurate, and complete sampling methodology/results, hereinafter referred to as the REDOX Mathematical Engineering Analysis. Details provided in the below sections.

Included in this NTCRA are characterization activities of remaining hazardous substances to facilitate demolition and waste disposal as well as to document post-removal conditions for future remedial action.

Historically, the 202S Building was licensed under the Hanford Site Air Operating Permit, Permit Number 00-05-006 (AOP) as Emission Unit 332 within the radiological air emissions license number FF-01 (WDOH, 2017, *Radioactive Air Emissions For the Department of Energy Richland Office Hanford Site License*) for radiological air emissions associated with S&M activities. The original implementation of the NTCRA required that the 202S Building be transitioned from the AOP into the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) as part of DOE/RL-2017-06. The result was a change in the operational scope from S&M to decommissioning requiring a re-evaluation of the potential-to-emit (PTE) to determine if the existing control and monitoring technology would continue to meet the regulatory requirements of WAC 246-247, "Radiation Protection—Air Emissions." The revised PTE value of 1.60 mrem/yr required a change from annual periodic confirmatory measurement to continuous monitoring. Additional quality assurance requirements from Appendix B, "Test Methods" to 40 CFR 61, "National Emission Standards for Hazardous Air Pollutants," Method 114 - Table 2 were, and remain to be, performed due to the increase in PTE.

This AMP updates the abatement and monitoring methods required to meet the substantive requirements of the WAC 246-247 regulation for radioactive emissions; the WAC 173-400, "General Regulations for Air Pollution Sources," regulation for criteria emissions; and the WAC 173-460, "Controls for New Sources of Toxic Air Pollutants," regulation for toxic emissions. Collectively, these regulations allow for CERCLA authority of the 202S Building through development of work documents that provide compliance with the substantive provisions of the regulations during the NTCRA. All substantive portions of each of these regulations will be identified in the following chapters, which also provide for the abatement and monitoring methods associated with the demolition of the 293S Building and 276S HSTF that are included in the NTCRA.

2 Radiological Air Emissions

WAC 173-480, "Ambient Air Quality Standards and Emission Limits for Radionuclides," sets State standards that are as stringent (or more so) as the federal standards under the *Clean Air Act Ammendments of 1990* and subsequent amendments and under the federal implementing regulation, 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides Other than Radon from Department of Energy Facilities." U.S. Environmental Protection Agency (EPA) partial delegation of the 40 CFR 61 authority to the State of Washington includes all substantive emissions monitoring, abatement, and reporting aspects of the federal regulation. The state standards protect the public by conservatively establishing exposure standards applicable to a maximally exposed individual, be that individual real or hypothetical. Therefore, the standards address any member of the public, at the point of maximum annual air concentration in an unrestricted area where any member of the public may be. All combined radionuclide airborne emissions from the U.S. Department of Energy (DOE) Hanford Site "facility" are not to exceed amounts that would cause an exposure to any member of the public of greater than 10 mrem/yr effective dose equivalent, per the WAC 173-480-040, "Ambient Standard," requirement. Adopting the specific substantive standards of WAC 173-480 and the 40 CFR 61, Subpart H, WAC 246-247 requires verification of compliance with the 10 mrem/yr standard and is applicable or relevant and appropriate to this NTCRA.

WAC 246-247-075, "Monitoring, Testing, and Quality Assurance," addresses sources emitting fugitive or diffuse radioactive airborne emissions by requiring monitoring of such sources. Such monitoring requires physical measurement of the effluent or ambient air, and quality assurance of environmental measures to assure precision, accuracy, and completeness. The substantive provisions of WAC 246-247 that require monitoring of radioactive airborne emissions are applicable or relevant and appropriate to this NTCRA.

The above state-implementing regulations further address control of radioactive airborne emissions where economically and technologically feasible (WAC 246-247-040 [3] and [4], "General Standards," and associated definitions). To meet the substantive aspect of these requirements, best or reasonably achieved control technology will be applied by ensuring that demonstrated emission control technologies (those successfully operated in similar applications) will be used when economically and technologically feasible (i.e., based on cost/benefit). If it is determined that there are substantive aspects of the requirement for control of radioactive airborne emissions, then controls will be administered as appropriate using reasonable and effective methods.

3 Criteria/Toxic Air Emissions

Requirements are established under WAC 173-400 and WAC 173-460 for the regulation of emissions of criteria/toxic air pollutants, or "nonradioactive" air pollutants. The primary nonradioactive emissions resulting from this NTCRA will be fugitive particulate matter. In accordance with WAC 173-400-040, "General Standards for Maximum Emissions," reasonable precautions must be taken to prevent the release of air contaminants associated with fugitive emissions resulting from excavation, materials handling, or other operations, and to prevent fugitive dust from becoming airborne from fugitive sources of emissions. The use of treatment technologies that would result in emissions of toxic air pollutants that would be subject to the substantive applicable requirements of WAC 173-460 are not anticipated to be a part of this NTCRA. Treatment of some waste encountered during this NTCRA may be required to meet Environmental Restoration Disposal Facility waste acceptance criteria (ERDF-00011, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*). In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting, which is analyzed in the Environmental Restoration Disposal Facility waste acceptance critieria, and WAC 173-460-150 "Table of ASIL, SQER and De Miniumis Emission Values," requirements would not be considered an applicable or relevant and appropriate requirement (ARAR) as all criteria and toxics emissions will be below de minimis. This, in turn, fulfills the applicable requirement of WAC 173-460-070, "Ambient Impact Requirement," and thus, WAC 173-460-060, "Control Technology Requirements." If additional treatment is deemed necessary that would result in the emission of regulated air pollutants, the substantive requirements of WAC 173-400-113(2), "New Sources in Attainment or Unclassifiable Areas–Review for Compliance with Regulations," and WAC 173-460-060 would be evaluated to determine applicability.

Emissions to the air will be minimized during implementation of this NTCRA through use of standard industry practices such as the application of water sprays, fixatives, and wind speed dependent work restrictions if work is performed in an area to be potentially impacted by the outside environment. These techniques are typically considered to be reasonable precautions to control fugitive emissions as required by regulatory standards.

4 Radiological Airborne Source Information

There is a potential for particulate radionuclide airborne emissions to result from the NTCRA activities. An estimate of potential airborne emissions from the NTCRA work was conducted using the WAC 246-247-030(21)(a), "Definitions, Abbreviations, and Acronyms" annual possession quantity (APQ) method.[1] The release fraction for gases (1.0) and liquids or particulate solids (10^{-3})[2] was applied, as appropriate, to the APQ for the 202S Building, 276S HSTF, 293S Building, and 202S Annex. The unabated total effective dose equivalent (TEDE) to the maximally exposed individual (MEI)[3] was then

[1] The APQ method looks at a given isotopic source term, multiplied by the associated release fraction provided in WAC 246-247-030(21)(a), in order to determine a dose to a hypothetical MEI.

[2] When calculating PTE, a WAC 246-247-030(21)(a) release fraction is assigned to some or all the source term based on the physical state of the media. In most cases, a 10^{-3} release fraction is assigned to the source term, assuming it to be liquids or particulate solids. For the 276S HSTF, a gaseous release fraction of 1.0 is assigned to the hydrogen-3 and carbon-14 source term.

[3] The WAC 246-247-030(15) definition for MEI is: "any member of the public (real or hypothetical) who abides or resides in an unrestricted area, and may receive the highest TEDE from the emission unit(s) under consideration, taking into account all exposure pathways affected by the radioactive air emissions." For the purposes of radiological source term, the MEI is at the Hanford Site boundary line. This excludes the land transferred to the Tri-Cities Washington Economic Development Council.

calculated using the CAP-88-PC[4] software (Verion 4.0) and documented in the calculation ECF-HANFORD-17-0128, *Radiological and Toxic Air Emissions for the REDOX Complex*. The location of the offsite MEI is 30,401 m (99,741 ft) east-southeast of the 200 West Area and east of the Energy Northwest Columbia Generating Station. The representative isotopes used for the calculation were plutonium-239 for alpha and strontium-90 for beta/gamma with both radionuclides contributing greater than 10% of the TEDE to the MEI for both point source and diffuse and fugitive emissions. These isotopes were chosen to conservatively estimate the TEDE based upon their presence in the source material and their potential dose consequence compared to the rest of radioisotopes in the source material. It is conservatively assumed all the APQ would be released within 1 year.

The unabated TEDE to the MEI for the 202S Building (point source) is 1.60 mrem/yr, and the combined unabated TEDE to the MEI for the 276S HSTF, 293S Building, and 202S Annex demolition (diffuse and fugitive source) is 6.15E-03 mrem/yr. For the 202S Building, the PTE is greater than 0.1 mrem/yr TEDE to the MEI; continuous emissions monitoring is required as discussed in Chapter 6. For the demolition activities of this NTCRA, the exposure risk will be minimized by applying soil fixative, water misting, and other fugitive dust controls previously discussed in Chapter 3.

5 Emission Controls

As a significant activity with regard to potential for airborne radionuclide emissions, this NTCRA will be subject to the substantive provisions of the WAC 246-247-040 best available radionuclide control technology standard. The 40 CFR 61.93, "Emission Monitoring and Test Procedures" requirements, adopted through WAC 246-247-035(1)(a)(i), "National Standards Adopted by Reference for Sources of Radionuclide Emissions," are also a substantive requirement within this work scope. This chapter delineates the proposed alternative to the qualification of effluent and sample flows in order to prove sampling defensibility by instituting the 40 CFR 61.93(d) requirements.

The activities performed in the 202S Building as part of the NTCRA include hazard abatement of the 202S Canyon Galleries, equipment decontamination, demolition preparation of the 202S Silo Service Area, 202S Annex, and abovegrade areas of the 202S Canyon in addition to ongoing S&M surveillances. The 202S Building abatement system consists of a sand filter and two electrically induced draft fans.

Historically (HW-32319, *Ventilation for Radiation Protection at REDOX*), both of the electrically induced draft fans had run at the same time. Since the facility had transitioned to an S&M mode, only one fan has run at a time. The REDOX Mathematical Engineering Analysis (ECF-HANFORD-19-0133) was generated to demonstrate that regardless of the increased system flow and sample effluent speeds, a near-isokinetic state can be maintained.

Through implementation of minor, non-environmental (e.g., damper adjustments, circuit adjustments, sampling pump change outs, etc.) updates to the system, it will be possible to operate both fans at the same time. Per the REDOX Mathematical Engineering Analysis, this will allow the facility to operate at system effluent speeds of up to 40,000 ft^3/min. Implementation of a testing period will ensure the integrity of the system by running the system while observing certain variables, such as vibration, component health checks, differential pressures, and fan bearing temperatures. As a part of the testing period, a vent and balance team will be on site to gather system effluent readings. Because the sample probe is cemented

[4] The CAP-88 (which stands for Clean Air Act Assessment Package-1988) computer model is a set of computer programs, databases, and associated utility programs for estimation of dose and risk from radionuclide emissions to air. CAP-88 is a regulatory compliance tool under 40 CFR 61. CAP88-PC (Version 4.0) allows modeling on a personal computer and is a recent version of the code.

in-place readings will be taken at an alternate location. Once system effluent flows are determined the REDOX Mathematical Engineering Analysis will be updated to reflect actual values.

It is important to note that after the updates have been completed to allow for both electrically induced fans to return simultaneous operation, there are various scenarios (e.g., maintenance, etc.) where only one fan may be operable.

Aerosol leak testing of the sand filter media indicates a removal efficiency of 99.998%, which is above the 99.95% standard for high-efficiency particulate air (HEPA) filtered applications. It is appropriate to consider the sand filter media an abatement control alternative to HEPA filtration for the 202S Building, Annex(s), and Silo. The following measures were selected to provide added worker protection controls:

- Planning for the special handling of stabilized items while minimizing risk of damage during handling
- Vacuum cleaners and/or portable exhausters used for demolition activities equipped with HEPA-type filters to provide point source or downdraft contamination control
- The increase of the stack effluent and sample flows as described in the REDOX Mathematical Engineering Analysis will ensure true, accurate, and complete sampling methodology and double as a means to better control contamination and radon buildup, thus, controlling dose to the worker.
- Future temporary exhausters with HEPA filters will be provided as an alternate air mover as practicable during decommissioning and preparation for final demolition

For the 293S Building, 202S Annex, and 276S HSTF demolition, it has been demonstrated through Hanford Site experience and ongoing operations that the listed available methods, systems, and techniques for the control of radionuclide particulate emissions in the bulleted list below represent the most effective control technology from among all known feasible alternatives and the required level of best available radionuclide control technology for the subject NTCRA. Recent and successful application of these controls at Hanford Site cleanup projects include the BC Cribs Characterization, 100 and 300 Areas soil cleanup, and the Transuranic Waste Retrieval Project, each demonstrating excellent radionuclide controls with no measurable impact to any member of the public, be they real or hypothetical MEIs. Although use of engineering calculations to determine a near-isokinetic sampling effort at increased effluent speeds has seemingly never been implemented, a controlled and tested implementation of those increased flows paired with use of the sand filter efficiency will help ensure contamination control.

Based on analysis of the potential emissions and evaluation of available control technologies, the following active controls of diffuse and fugitive emissions have been selected for use when practicable during this NTCRA. The radiological control and environmental organizations are responsible for selecting and ensuring that appropriate controls are implemented to maintain both worker exposure and environmental releases as low as reasonably achievable. These include, but are not limited to, the following:

- Items inside of the ventilated space may be internally and externally stabilized and handled to minimize any potential release prior to being removed from ventilated space or securing ventilation.
- Water in mists or fine sprays will be applied as practicable for suppression of fugitive emissions and dust during mechanical excavation, backfilling, and demolition activities.

- Radiological surveys (e.g., swipes/smears) will be taken from demolition equipment, leaving any areas where there is the potential for removable contamination above 2,000 dpm/100 cm^2 alpha or 100,000 dpm/100 cm^2 beta/gamma following any demolition action.
- Operational limits for removable or transferable radioactive contamination levels will be established in work packages and associated radiation work procedures. Fixatives or other physical controls will be employed if removable or transferable contamination levels above 100,000 dpm/100 cm^2 beta/gamma or 2,000 dpm/100 cm^2 alpha are measured or expected.
- Fixatives will be applied to contaminated soil and/or debris and equipment per manufacturer instructions as needed to minimize airborne contamination during the NTCRA activities for fugitive emissions and dust. Fixative application techniques may include spraying, brushing, pouring, or another method, as necessary. Due to their high tack and soil binding nature, fixatives provide greater suppression of the soil matrix and reduce the amount of particle movement when exposed to wind forces. Fixatives, water, covers, containment tents, windscreens, or other controls during cessation of work activities will be applied to the extent practicable based on the work environment (i.e., weather conditions and predicted wind speeds above 32 km/hr [20 mi/hr]).
- Fixatives or cover material (e.g., soil, gravel, and plastic) will be applied to disturbed contaminated soils and debris associated with the REDOX Complex demolition activities at any time that field activities will be idle for more than 24 hours.
- If the overnight sustained wind speed is predicted to be greater than 32 km/hr (20 mi/hr) based on the Hanford Meteorological Station forecast for the 200 West Area, fixative or cover material will be applied to contaminated soil or demolition debris, as practicable. If a fixative has already been applied and the contaminated items will remain undisturbed, further use of fixatives will be evaluated individually. The fixatives or other controls will not be applied when the contaminated soil surface is frozen or it is raining, snowing, or other freezing precipitation is falling at the end of work operations.
- Measures such as decontamination solutions, expandable foam, or encasement in grout, fixatives, or glovebags will also be used in a graded approach to help minimize the spread of contamination.
- During open-air demolition, stabilized items identified as requiring special handling will be managed in a manner to minimize disturbance of the contamination. Stabilization methods will be implemented prior to demolition to address void space issues and eliminate the need for excessive crushing, size reduction, or other actions that could lead to potential airborne releases.
- Field activities will be temporarily ceased, and the area will be placed in a safe configuration if contamination control measures are not expected to be adequate based on site conditions (e.g., excessive wind). Additionally, fixatives will be applied to demolition sites and debris piles, as needed, to help control dust and radiological or nonradiological contaminants.
- Waste containers will remain closed, except during packaging and waste inspection activities.
- Any vacuum cleaners and portable exhausters used for demolition activities will be equipped with appropriately tested HEPA filters.

If unanticipated new sources of airborne pollutants are encountered, the potential for emissions will be reviewed and appropriate controls implemented, as required.

Best available radionuclide control technology and as low as reasonably achievable control technology controls will be applied based on the PTE using a graded approach.

6 Monitoring

There are two components associated with airborne emissions monitoring at REDOX as part of the NTCRA: point source monitoring (e.g., stacks, HEPA-filtered vacuums, portable HEPA-filtered exhausters, temporary exhausters) and diffuse and fugitive monitoring (e.g., temporary ambient air monitors used by the radiological control program, radiological surveys) coupled with monitoring effectiveness validation using the near-facility monitors (NFMs) (N441, N442, N956, and N963).

The calculated unabated annual dose (bounding) combined for all related point source (1.60 mrem/yr) and area source (6.15E-03 mrem/yr) activities during the NTCRA is 1.61 mrem/yr TEDE to the MEI. Therefore, this activity is subject to emissions monitoring of the point sources in accordance with the substantive requirements of WAC 246-247-075(2). Fugitive and diffuse emissions monitoring with applicable quality assurance will be provided, reflecting the substantive requirements of WAC 246-247-075(8).

The activities performed in the 202S Building as part of the NTCRA include hazard abatement of the 202S Canyon Galleries, equipment decontamination, demolition preparation of the 202S Silo Service Area, 202S Annex, and abovegrade areas of the 202S Canyon in addition to ongoing S&M surveillances. These activities are performed within the 202S Building, and any resultant emissions are controlled and monitored as point source(s). The existing sampling system with alternative methods will be used to measure emissions during these activities.

The REDOX monitoring system is required to meet the newer standard (ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*). According to Table 2 of ANSI/HPS N13.1-1999, the REDOX Stack is classified as a potential impact category 2 point source, requiring continuous sampling with retrospective offline analysis. The current monitoring system configuration provides an approved alternative to the ANSI/HPS N13.1-1999 methods to allow the use of the existing physical configuration of the system until such time as the abatement system is upgraded or the 202S Building demolition is completed. Concurrence of the alternative methods will be requested from the EPA.

Table 1 details the ANSI/HPS N13.1-1999 standard requirements as applied to the REDOX Stack sample collection system.

Table 1. Comparison of ANSI/HPS Requirements to REDOX Stack Sampling System

ANSI/HPS N13.1-1999 Standard Requirement	REDOX Stack Sample Collection System
Sample collection site validation (Table 4)	The sample collection location meets the 40 CFR 60, Appendix A-1, Method 1 (Method 1) location of eight duct diameters from the stack inlet and two duct diameters from the stack exhaust. No ports exist at this location to verify cyclonic flow, velocity coefficient of variation, and tracer gas concentration profiles. This location cannot be verified as meeting the ANSI/HPS N13.1-1999 standard.
Sample flow rate	The sample collection system has an adjustable flow control device to ensure near-isokinetic sampling. Testing will help in determining what the sample effluent flows need to be in order to maintain near-isokinetic flow at the increased system effluent flow rate. Once the flow rates are determined, the REDOX Mathematical Engineering calculation will be updated to document those results.

Table 1. Comparison of ANSI/HPS Requirements to REDOX Stack Sampling System

ANSI/HPS N13.1-1999 Standard Requirement	REDOX Stack Sample Collection System
Effluent flow rate	The system effluent flow rate will be based on results from the vent and balance performed during the testing period. Periodic effluent measurements are conducted as the flow rate will ultimately vary by less than 20% during the year at an alternative location to that prescribed by Method 1.
Shrouded nozzle probe	The probe is a rake with multiple nozzles and has not been aerosol tested. A quarterly review of sample results, in order to ensure results remain low, will be done in place of this requirement.
Sample collection media	The sample collection media meets the ANSI/HPS N13.1-1999 standard.
Maintenance (Table 5) and Method 114 Table 2	The probe cannot be removed for inspection without affecting the structural integrity of the stack masonry shell. The probe has been cemented into place. All other applicable inspections can be performed

References: 40 CFR 60, "Standards of Performance for New Stationary Sources."

ANSI/HPS N13.1-1999, *Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities*.

ANSI/HPS = American National Standards Institute/Health Physics Society

NESHAP = National Emission Standards for Hazardous Air Pollutants

REDOX = reduction-oxidation

The 291S-001 Ventilation System provides ventilation and abatement for the 202S Building, 202S Annex, and 202S Silo and exhausts through the 291S-001 Stack. The 291S-001 Stack is considered a "major" point source of emissions and will therefore need to meet the substantive requirements (e.g., continuous sampling) of 40 CFR 61.93(b)(2). All radionuclides that could cause an effective dose equivalent greater than 1% of the standard or contribute greater than 10% of the potential effective dose equivalent are measured as required by 40 CFR 61.93(b)(4). This sampling system will be maintained operational in accordance with the substantive requirements of 40 CFR 61, Subpart H, as long as the stack operates. Results from the 291S-001 sampling system are reported annually in the Radionuclide Air Emissions Report for the Hanford Site.

The following alternative monitoring protocols will be used due to the physical limitations of the existing design.

- Stack flow rates are not measured; instead, an alternative method of using The REDOX Mathematical Engineering Calculation (ECF-HANFORD-19-0133) will ensure that the sampling effluent flow is representative of the system effluent flow (near-isokinetic) per 40 CFR 61.93(b)(3). Upon designation of any flow values, the results will not vary by greater than 20%.
- The sampling probe is located at the 50 ft level of the stack. This location meets the 40 CFR 60, "Standards of Performance for New Stationary Sources," Appendix A-1, "Test Methods 1 through 2f," Method 1 requirement of eight duct diameters downstream of the last flow disturbance and two duct diameters upstream from any flow disturbance.
- The sample location pre-dates the ANSI/HPS N13.1-1999 standard and was established in accordance with DOE protocols. Acceptance of the sample location based on the original design criteria is proposed.

- The sampling probe is a rake-style probe approved for use at other Hanford Site facilities (e.g., T Plant, Waste Encapsulation Storage Facility, Waste Receiving and Processing Facility, Plutonium-Uranium Extraction Facility). A review of the REDOX sample results over the previous 10 years indicates consistent low-level emissions consistent with the S&M status of the facility and demonstrates the ability of the probe to collect a consistent sample over time.

- The annual 40 CFR 61, Appendix B, Method 114, Table 2 inspection of the probe is not possible for the reason listed in the table above. A quarterly evaluation of 291S-001 Stack bi-weekly record sample with comparison to interior workplace air monitoring (adjusted for the sand filter removal efficiency) and bi-weekly NFM data will be qualitatively performed as an alternative to the annual inspection.

Where the 202S Building containment ventilation is not sufficient to provide for worker safety, various types of engineering controls and containments will be used for exhausting through either temporary or portable HEPA-filtered exhausters, with portable HEPA-filtered vacuums used as needed. The portable exhausters are minor emission units that are easily set up for use and readily portable, being either hand carried or wheel mounted.

Interim localized filtration systems for alternative ventilation will be monitored as necessary. Use of temporary exhausters may be necessary to provide alternative exhaust to facilitate the work scope of the NTCRA. The monitoring of these exhausters is dependent upon the radiological control zone the exhaust discharges into.

Changes to the abatement and monitoring methods outlined above will be included as addendums to this AMP, as information becomes available. Approval of addendums will be accomplished through the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al., 1989) change process or by project manager meeting notes as decided between the lead agency (DOE) and the lead regulatory agency (EPA).

HEPA-filtered vacuums intended for use will vary in size with both large and small, portable units of the type similar to those in use on the Hanford Site (e.g., portable temporary radioactive air emissions units). To verify low emissions periodically, a contamination survey of the outlet of the vacuum will be performed at the completion of use. Vacuuming using one of these devices has no specific contamination limit, but will be controlled based on the specifics of the situation. If contamination levels over 2,000 dpm alpha/100 cm^2 or 100,000 dpm/cm^2 (i.e., high surface contamination area) are inadvertently exceeded, a separate evaluation regarding emissions measurement will be conducted.

The demolition activities of the NTCRA will generate diffuse and fugitive (non-point source) emissions from the demolition of the 293S Building, the 276S HSTF, and the 202S Annex; grouting of belowgrade areas of the 293S Building; disposal of wastes generated during removal activities; cleanup of miscellaneous debris; and stabilization of the area.

During the demolition activities at the REDOX Complex, worker protection (worksite) monitoring activities will be considered and may include the following:

- Real-time and periodic radiological monitoring using temporary ambient air monitors as prescribed by the Radiological Control organization and reviewed by the Environmental organization (primary method for evaluating compliance with the action levels and void limits)

- Radiological smear surveys (indicator – effluent air emission estimated rates are based on gross residual contamination levels)

These worksite monitoring activities verify the effectiveness of abatement and as low as reasonably achievable control methods during demolition activities. Worksite monitoring includes using temporary ambient air monitors (real-time continuous air monitors with alarms, personnel samplers, and ambient air samplers) and surveys. The worksite monitoring network will be established as directed by the Radiological Control organization, with review by the Environmental organization, and will be focused around and in the established radioactive control zones. This monitoring network provides the primary emissions data used to ensure the limits set in the Radiation Work Permit are not exceeded.

Using a graded approach, additional monitoring for diffuse and fugitive emissions may be conducted in place of using handheld instruments during excavation activities at radiologically contaminated waste sites. The additional monitoring may be a combination of radiological contamination surveys for removable alpha and beta-gamma activity and work place air monitoring. Work progress contamination surveys may be performed adjacent to contamination area boundaries during active remediation to monitor for contamination spread, as needed. Periodic contamination surveys may be performed when needed on those portions of the heavy equipment (e.g., trackhoe buckets, demolition hammers, and pipe cutting shears) working within the posted contamination areas to ensure that removable contamination levels are below the limiting conditions of the applicable Radiation Work Permit. Lapel air samplers may be worn by personnel entering areas that are monitored for occupational exposure to airborne radioactivity when workplace air samplers are determined to be non-representative of active work areas (i.e., not close enough to the workers or in the wrong position to be representative of the breathing zone air activity).

In addition to point-source and worksite monitoring, the 200 West Area Near Facility Ambient Air Program stations nearest the REDOX Complex provide validation of the effectiveness of the contamination control measures utilizing the near-field monitoring network. The four stations (N441, N442, N956, and N963) do not provide real-time data, so their bi-weekly data will be used as indicators along with the worksite monitoring data for overall trending of the effectiveness of the contamination control measures. During periods of demolition and debris removal, no more than one of these four monitors will be allowed to be inoperative for more than 24 hours. As part of the site-wide evaluation of NFM data, the electronic release summary database compares NFM 6-month composite air sample results to 10% of the 40 CFR 61, Appendix E, Table 2 values. The NFM database identifies results that exceed these values. Results from the air monitors identified in this document that are above these values will be reviewed, the adequacy of the controls evaluated as appropriate, and the DOE Richland Operations Office and EPA will be notified.

The well-established Hanford Site protocol for emission monitoring will be followed, including Hanford Site perimeter ambient air data collection, sampling frequencies, sample analysis, and data reporting (DOE/RL-91-50, *Hanford Site Environmental Monitoring Plan*). This method will address the substantive requirements of WAC 246-247-075. Perimeter monitoring is used to measure the diffuse and fugitive emissions from the Hanford Site. Demonstration of compliance with the 40 CFR 61.92, "Standard," effective dose equivalent of 10 mrem/yr limit is provided by the Radioactive Air Emissions Report for the Hanford Site (e.g., DOE/RL-2017-17, *Radionuclide Air Emissions Report for the Hanford Site, Calendar Year 2016*).

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WAC 246-247, "Radiation Protection—Air Emissions," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=246-247.

246-247-030, "Definitions."

246-247-035, "National Standards Adopted by Reference for Sources of Radionuclide Emissions."

246-247-040, "General Standards."

246-247-075, "Monitoring, Testing, and Quality Assurance."

WDOH, 2017, *Radioactive Air Emissions License For The Department of Energy Richland Office Hanford Site*, License Number RAEL-FF-01, Office of Radiation Protection, Radioactive Air Emissions, The State of Washington Department of Health, Olympia, Washington. Available at: https://ecology.wa.gov/DOE/files/87/87bfd746-5317-4b92-91ed-55a835c7c273.pdf.

Review Comment Record	U.S. Environmental Protection Agency Comments on the RAWP, SAP and AMP for the REDOX Complex, Draft Rev. 1	Date: July 23, 2020 Page 1 of 19

Document Title(s)/Number(s)
DOE/RL-2017-06, *Removal Action Work Plan for the Reduction-Oxidation Complex*, Draft Rev. 1 DOE/RL-2017-05, *Sampling and Analysis Plan for the REDOX Complex*, Draft Rev. 1 DOE/RL-2018-46, *Air Monitoring Plan for REDOX Removal Action Work Plan*, Draft Rev. 1

Document Manager	Project Manager	Facility Site ID	Cleanup Site ID
Comments on the REDOX RAWP, SAP, and AMP, Draft Rev. 1	Craig Cameron, EPA Crystal Mathey, WDOH		

Item No.	Pg. # Sec. # Para./Sent.	Comment or Question	U.S. D.O.E. Response	EPA/DOH Response	Open/ Close	Reviewer Initials
REDOX Removal Action Work Plan						
1	Page 4-7, Section 4.2	Consider revising section 4.2 that says currently "…list of laws and regulations in which the ARARS have been developed." I think it means to say "…from which…" rather than "in which."	The last sentence of the first paragraph will be modified, as follows: "The following is a list of laws and regulations ~~in~~ from which the ~~ARARS~~ ARARs have been developed:"	N/A	Closed	Connie Smith (CS) – DOE

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2	Section 4.3.4	The air plan, page 5, 3rd bullet from the bottom refers to stabilizing soils open with rad contaminants only when the wind in projected to exceed 20 mph. That is a more lenient standard than the standard in the work plan. The two standards should be consistent, or the work plan should refer to the air plan.	Section 4.3.4 Emission Controls will be modified to ensure controls listed in the air monitoring plan are listed in the removal action work plan and vice versa, as follows: Based on an analysis of the potential emissions and available control technologies, the following active controls have been selected for use when practicable during ~~the~~ this removal action. The radiological control and environmental organizations are responsible for selecting and ensuring that appropriate controls are implemented to maintain both worker exposure and environmental releases ALARA. These include, but are not limited to, the following: • Items inside of the ventilated space may be internally and externally stabilized and handled to minimize any potential release prior to being removed from ventilated space or securing ventilation. • Water in mists or fine sprays will be applied as ~~needed~~ practicable for suppression of fugitive emissions and dust during mechanical excavation, ~~and~~ backfilling, and demolition ~~/recontouring~~ activities ~~to suppress fugitive emissions, including dust~~. • Radiological surveys (e.g., swipes/smears) will be taken from demolition equipment, leaving any areas where there is the potential for removable contamination above 2,000 disintegrations/min per 100 cm^2 alpha or 100,000 disintegrations/min per 100 cm^2 beta/gamma following any demolition action. • Operational limits for removable or transferable radioactive contamination levels will be established in work packages and associated radiation work procedures. Fixatives or other physical controls will be employed if removable or transferable contamination levels above 100,000 disintegrations/min per 100 cm^2 beta/gamma or exceeding 2,000 disintegrations/min per 100 cm^2 alpha are measured or expected. • Fixatives will be applied to contaminated soil and/or debris and equipment per manufacturer instructions as needed to minimize airborne contamination during the NTCRA activities for fugitive emissions and dust. Fixative application techniques may include spraying, brushing, pouring, or another	N/A	Closed	CS – DOE

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			method, as necessary. Due to their high tack and soil binding nature, fixatives provide greater suppression of the soil matrix and reduce the amount of particle movement when exposed to wind forces. Fixatives, water, covers, containment tents, windscreens, or other controls during cessation of work activities will be applied to the extent practicable based on the work environment (i.e., weather conditions and predicted wind speeds above 32 km/hr [20 mi/hr]). • ~~Fixatives will be applied to structural materials, debris and equipment, and/or contaminated soil to minimize airborne contamination during the removal action activities for fugitive emissions and dust. Fixative application techniques may include spraying, fogging, brushing on, pouring, or other methods, as necessary.~~ • Fixatives or cover material (e.g., soil, ~~and~~ gravel, and plastic) will be applied to disturbed contaminated soils and debris associated with the REDOX Complex demolition at any time that field activities will be ~~inactive~~ idle for more than 24 hours ~~(except as noted in the next bullet)~~. • If the overnight sustained wind speed is predicted to be greater than 32 km/hr (20 mi/hr) based on the Hanford Meteorological Station forecast for the 200 West Area, fixative or cover material will be applied to contaminated soil or demolition debris, as practicable. If a fixative has already been applied and the ~~fixed~~ contaminated items will remain undisturbed, further use of fixatives will ~~not~~ be ~~needed~~ evaluated individually. Fixatives or other controls will not be applied when contaminated items are frozen or when it is raining, snowing, or other precipitation is falling at the end of work operations. • Measures such as decontamination solutions, expandable foam, or encasement in grout, fixatives, or glovebags will also be used in a graded approach to help minimize the spread of contamination. • During open-air demolition, stabilized items identified as requiring special handling will be managed in a manner to minimize disturbance of the contamination. Stabilization methods will be implemented prior to demolition to address void space issues and eliminate the need for excessive			

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			crushing, size reduction, or other actions that could lead to potential airborne releases. • Field activities will be temporarily ceased, and the area will be placed in a safe configuration if ~~airborne~~ contamination control measures are not expected to be adequate, based on site conditions (e.g., excessive wind). Additionally, fixatives will be applied to demolition sites and debris piles, as needed, to help control dust and radiological or nonradiological contaminants. • Waste ~~packages~~ containers will remain closed ~~once they are staged~~, except ~~as necessary due to~~ during packaging and waste inspection ~~or repackaging~~ activities. • Any vacuum cleaners and portable exhausters used for demolition activities will be equipped with appropriately tested HEPA filters. In addition to the controls listed above, a detailed discussion of the emissions controls is in the AMP. Best available radionuclide control technology and ALARA control technology controls will be applied based on the PTE using a graded approach. ~~These controls will be selected and agreed upon in a project manager meeting.~~			
3	Page 5-1, Section 5.2	The dates on p. 5-1 referring to work in 2019 could be updated.	The first sentence in section 5.2 will be updated, as follows: "This removal action ~~is expected to begin~~ began following issuance of this RAWP~~, which is anticipated~~ in 2019." The first sentence of the second paragraph in section 5.2 will be updated, as follows: "Near-term removal activities (2019 to 2020) ~~are~~ planned for the 202S Silo Service Area and the North and South Sample Galleries in the 202S Canyon have begun."	N/A	Closed	CS – DOE

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4	Section 4.5.1	Updated the entire section	Section 4.5.1 will be updated, as follows: "A ~~Cultural~~ cultural resource review~~s~~ ~~will~~ has been completed following the ~~substantive~~ requirements of the National Historic Preservation Act of 1966, Section 106. The removal activities would be performed in areas that have been extensively disturbed by past construction activities. A Cultural Resources assessment of the project was conducted on December 20, 2018. Facilities within the project area have been previously identified and evaluated for National Register of Historic Places (NRHP) eligibility per the Programmatic Agreement Among the US Department of Energy, Richland Operations Office, the Advisory Council on Historic Preservation, and the Washington State Historic Preservation Office for the Maintenance, Deactivation, Alteration, and Demolition of the Built Environment on the Hanford Site, WA, (Programmatic Agreement) (DOE-RL 1996). Of the 12 facilities affected by the project, five structures contribute to the Hanford Site Manhattan Project and Cold War Era Historic District. The REDOX facility (202S) was recommended for individual documentation, while the Exhaust Fan Control House (291S), Main Stack (29S0001), the Jet Pit House (292S), and Acid Recovery and Off Gas Treatment Building (293S) are contributing elements but require no additional documentation. The remaining seven facilities are either non-contributing or exempt from evaluation. Documentation has been completed as represented by the Expanded Historic Property Inventory Form for REDOX (DOE-RL 1997) and Chapter 2, Section 4 "Chemical Separations" of the *History of the Plutonium Production Facilities at the Hanford Site Historic District, 1943-1990* which describes the contribution that REDOX made to the Cold War (DOE-RL 2002). Mitigation for the removal of these facilities is complete per the *Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan* (Treatment Plan). Walkthroughs of these Hanford facilities have been conducted and historical objects representing the chemical separations process at Hanford have been tagged for inclusion in the historic Hanford Collection. These items are slated for storage and public access. To meet the requirements of the Treatment Plan, prior to facility demolition, coordination with Curation Services is to be accomplished as specified in the clearance letter. ~~Hanford Site structures have been evaluated for their National Register of Historic Places eligibility as part of~~	N/A	Closed	Warren Hurley (WH) – DOE

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			~~DOE/RL-97-56, Hanford Site Manhattan Project and Cold War Era Historic District Treatment Plan. Some structures have been determined to be contributing properties to the Manhattan Project/Cold War Era Historic District, and they require mitigation through documentation (e.g., completed inventory forms). DOE/RL-97-56 also requires walkthroughs to identify artifacts that are of educational and interpretive value.~~ ~~Before field activity begins, each structure requiring documentation would be evaluated for the type of documentation required (Historic Property Inventory Form or Expanded Historic Property Inventory Form) and the status of that documentation. Walkthroughs of the structures would be conducted before demolition to finalize all mitigation requirements. Cultural resource review documentation for any specific structure would be finalized before removal activities begin. If able to be removed, tagged artifacts would be collected for long-term curation. At the time of removal, assessments would be made regarding options and the feasibility of long-term curation of tagged artifacts. Tagged artifacts that cannot be removed would be photographed or documented.~~ Impacts on cultural resources near the removal action ~~will be~~ have been mitigated in accordance with DOE/RL-98-10, Hanford Cultural Resources Management Plan."			
REDOX Sampling and Analysis Plan						
		None				
REDOX Air Monitoring Plan						

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5	Section 4	No mention of CAP-88 modeling.	The PTE for this facility was conservatively calculated using the DOE/RL-2006-29, Calculating Potential-to-Emit Radiological Releases and Doses, Revision 2. This document uses isotopic dose conversion factors to estimate radiological dose to the MEI. This PTE calculation was done as a part of the REDOX AMP, Revision 0 effort, and prior to the transition to use of CAP-88. Since that time the source term has not changed and remains bounding. Note that emphasis is added to the conservative nature of this dose conversion document as it largely produces a much higher result than CAP-88 modeling software. No change to the document. 10/26/20: CAP-88 air modeling was conducted and provided to EPA for review with DOH. DOH ran a separate CAP-88 air model and concluded that they are satisfied with the modeling. EPA provided this information to DOE in an email dated 10/26/20. Changes have been made to the document incorporating the results of the CAP-88 air model.	8/24/20: {40 CFR ¶ 61.93 (a).} It appears there is no recent EPA/WDOH approval or review of this calculation. Respective of DOE RL's authority of Hanford's CERCLA projects, they likely in effect approved the alternative method themselves. It is noted no change in the amount of radionuclide and the calculation is believed more conservative. With that, due to the respective regulation and to verify all assumptions it is recommended that EPA/WDOH review DOE RL-2006-29, *Calculating Potential-to-Emit Radiological Releases and Doses Rev. 2.* Additionally, WDOH should consider running a separate current version of CAP 88 with the same variables. Then regulators concur with it or provide comments.	Closed	Jim McAuley (JM) – EPA
6	Section 5	Will there be effluent flow testing where workers are while both fans are operating to insure optimal flow direction for their protection?	Project personnel have been working with the engineering department to look at the internal air flow within the building. As a part of that, they are looking at any potential need to make internal modifications (remove doors, put in additional ducting, etc.) to ensure that the increased negative within the facility pulls from all areas throughout REDOX. Any air flow testing done within the facility will be done directly as a part of worker safety and the radiological control organizations. No change to the document.	8/24/20: This appears to be a robust and informed way to check for air flow with respect to personal safety.	Closed	JM – EPA

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7	Section 5	Please describe sand filters and why they are used for this project.	The current configuration of the REDOX facility uses a sand filter rather than HEPA banks due to the age of the facility. REDOX was built during a time when sand filters were much more popular for nuclear air cleaning application. Phase 1 of the process to increase flows is the proposed action of testing the system with both fans running. Phase 2 of increasing the flows is to procure HEPA banks in order to blank off the sand filter and isolate that source term and use the HEPA banks that are desired for the future of the D&D effort at REDOX. No change to the document. 10/28/20: DOE sent letter 20-PFD-0045, dated 10/13/20, to EPA requesting concurrence for alternatives used as a part of increasing the effluent flows at the 291-S-1 exhaust point, which included discussion of the use of the sand filters and rationale for adequate sampling during phase 1. DOE received concurrence for this approach in a letter dated 10/28/20.	8/24/20: {ANSI 13.1, Annex G Understood, the only time the sand filters will be used is for testing. It is recommended that WDOH/EPA concur that the sampling plan for Phase 1 adequately monitors the emissions during that period, and that the age and conditions of the sand filters are also adequate. It would be helpful if DOE RL could explain the rationale for adequate sampling during this phase.	Closed	JM - EPA

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8	Section 6	In general, what is DOE's position on the parts of CFR 61.93 that are not complied with (e.g., why is there no continuous monitoring)?	The proposed AMP states that the REDOX stack has transitioned from periodic confirmatory monitoring to continuous monitoring. See the bottom of Page 1 within the "Introduction" section. Per the ANSI N.13.1-1999 standard, the REDOX stack qualifies as a Potential Impact Category 2 (PIC 2) stack. The PTE is less than 5 mrem/year to the MEI. As a result, the stack employs "continuous sampling for record of emissions, with retrospective, offline periodic analysis." REDOX uses a record sample outfitted with sample papers to perform the biweekly sampling effort on a continuous basis. No change to the document. 10/26/20: CAP-88 air modeling was conducted and provided to EPA for review with DOH. DOH ran a separate CAP-88 air model and concluded that they are satisfied with the modeling. EPA provided this information to DOE in an email dated 10/26/20. Changes have been made to the document incorporating the results of the CAP-88 air model. The stack is considered a PIC 2; however, the revised unabated TEDE to the offsite MEI (based on CAP-88 modeling) is 1.61 mrem/yr and the onsite MEI is 3.60 mrem/yr.	8/24/20: {ANSI 13.1, Table 2} The proposed REDOX AMP states: "*The revised PTE value of 4.95E+00 mrem/yr. required a change from annual periodic confirmatory measurement to continuous monitoring.*" This is revised up to 4.96E+00 mrem/yr. TEDE to MEI to account for the area source. Additionally, the AMP states: "*REDOX Stack is classified as a potential impact category 3, point source, requiring continuous sampling with retrospective offline analysis. The current monitoring system configuration provides an approved alternative to the ANSI/HPS N13.1-1999…*" From ANSI 13.1, Table 2, the correct potential impact category (PIC) for 4.96E00 mrem/yr. is PIC 2 as stated correctly on the responses here, but not on the AMP. The fraction of the allowed limit for PIC 2 (10 mrem/yr.) is up to 50% or 5 mrem/y. Based on the current calculations this puts REDOX marginally below the PIC 1 limit, which would require real time monitoring with an alarm capability. Regarding Applicable or Relevant and Appropriate Requirements (ARARs), the events from PFP and a deviations from the standards, as noted in the AMP's table 1, it is recommended to evaluate the use of a real time monitor such as continuous air monitor (CAM) with an alarm monitoring the effluent of air in phase 2.	Closed	JM – EPA

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9	Section 6, paragraph 3	"The current monitoring system configuration provides an approved alternative to the ANSI/HPS N13.1-1999 methods to allow the use of the existing physical configuration of the system until such time as the abatement system is upgraded or the 202S Building demolition is completed." Who approved it?	The referenced statement is found in the fourth paragraph. That said, revision 0 of this AMP was approved as a part of the CERCLA documentation development process, including regulator review. Revision 0 of this AMP was signed off by DOE in October 2018, after consideration of regulator comments. 10/28/20: DOE sent letter 20-PFD-0045, dated 10/13/20, to EPA requesting concurrence for alternatives used as a part of increasing the effluent flows at the 291-S-1 exhaust point, which included discussion of the use of the sand filters and rationale for adequate sampling during phase 1. DOE received concurrence for this approach in a letter dated 10/28/20.	8/24/20: Noted paragraph four was correct for this item. It is recommended a current regulatory review of the current monitoring system configuration.	Closed	JM – EPA
10	Section 6, Table 1, first line	The first line doesn't seem to match paragraph 3, first line.	Assuming this is in reference to the fourth paragraph, if so, the idea of that paragraph is to start at a high level and distill the language down to the actual proposal that DOE is asking for. We acknowledge that transition to CERCLA constitutes a modification and causes a need to upgrade to the newer 1999 standard for sampling. A couple of sentences later we state that we are asking for a proposed alternative to that. Starting with what the requirement is and then stating the proposed alternatives seems a necessary evil, if you will, in order to show full compliance and adequately demarcate what the requirements are and what the actual proposal is as a part of this removal scope. No change to the document. 10/28/20: DOE sent letter 20-PFD-0045, dated 10/13/20, to EPA requesting concurrence for alternatives used as a part of increasing the effluent flows at the 291-S-1 exhaust point, which included discussion of the use of the sand filters and rationale for adequate sampling during phase 1. DOE received concurrence for this approach in a letter dated 10/28/20.	8/24/20: Same as above, it is recommended a current regulatory review.	Closed	JM – EPA

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11	Section 6, Table 1, fourth line	The fourth line states, "the probe is a rake with multiple nozzles and has not been aerosol tested." What is the specific plan?	The third bullet in the bulleted list on Page 8 states the following: "The sampling probe is a rake-style probe approved for use at other Hanford Site facilities (e.g., T Plant, Waste Encapsulation Storage Facility, Waste Receiving and Processing Facility, Plutonium-Uranium Extraction Facility). A review of the REDOX sample results over the previous 10 years indicates consistent low-level emissions consistent with the S&M status of the facility and demonstrates the ability of the probe to collect a consistent sample over time." This is a part of the proposed alternative. Propose to add the following language to the Table 1 line item: "The probe is a rake with multiple nozzles and has not been aerosol tested. As stated in the bulleted list below a review of historical emissions indicate low level emissions. <u>It is proposed that a quarterly review of sample results, in order to ensure results remain low, will be done in place of this requirement."</u> 10/28/20: DOE sent letter 20-PFD-0045, dated 10/13/20, to EPA requesting concurrence for alternatives used as a part of increasing the effluent flows at the 291-S-1 exhaust point, which included discussion of the use of the sand filters and rationale for adequate sampling during phase 1. DOE received concurrence for this approach in a letter dated 10/28/20.	8/24/20: Same as above, it is recommended a current regulatory review.	Closed	JM – EPA

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Item No.	Pg. # Sec. # Para./Sent.	Comment or Question	U.S. D.O.E. Response	EPA/DOH Response	Open/ Close	Reviewer Initials
12	Section 6, Seventh paragraph, third bullet	Seventh paragraph, third bullet "in accordance with DOE protocols…" what are the protocols?	The idea of this statement is to indicate the age of the stack and how old it is. Indicating the exact DOE Protocols that the REDOX stack was originally built to would be difficult as information regarding the initial build was considered Top Secret information at that time. Much of it was destroyed in order to maintain the secrecy of that information. Prior to the major 1970, 1977, and 1990 Clean Air Act revisions the regulations and building standards were based more off of a risk based approach. A large portion of that was likely engineering theories and individual studies that were compiled in DOE guidance documents. Note that the construction of the REDOX stack even precedes early attempts at formulating a handbook/guidance document such as, ERDA 76-21, *Nuclear Air Cleaning Handbook*. No change to the document. 10/28/20: DOE sent letter 20-PFD-0045, dated 10/13/20, to EPA requesting concurrence for alternatives used as a part of increasing the effluent flows at the 291-S-1 exhaust point, which included discussion of the use of the sand filters and rationale for adequate sampling during phase 1. DOE received concurrence for this approach in a letter dated 10/28/20.	8/24/20: It is recommended that DOE RL provide their technical justification for the statement: "*Acceptance of the sample location based on the original design criteria is proposed.*" Recognizing that the system predates current standards. It would be good to understand the rational that allows alternative monitoring protocols being technical adequate for monitoring.	Closed	JM – EPA
13	Section 6, paragraph 9 and table 2	Will there be modelling for emissions of the portable ventilation?	In the event that portable exhausters are considered, it is understood that this would need to be brought to the attention of the regulatory agencies as additional approvals may need to be acquired prior to use (e.g. additional monitoring, addendums, controls, etc.). No change to the document. 10/28/20: Controls are provided in Chapter 5. No change to the document.	8/24/20: Just for an understanding, if there's no portable exhausters in open air demolition what are the controls for dust?	Closed	JM – EPA

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Item No.	Pg. # Sec. # Para./Sent.	Comment or Question	U.S. D.O.E. Response	EPA/DOH Response	Open/ Close	Reviewer Initials
14	AMP-Pg. 6 line 27	The AMP states; *"REDOX monitoring system is required to meet the newer ANSI/HPS N13.1-1999, Sampling and Monitoring Releases of Airborne Radioactive Substances from the Stacks and Ducts of Nuclear Facilities. According to Table 2 of ANSI/HPS N13.1-1999, the REDOX Stack is classified as a* ***potential impact category 2*** *point source, requiring continuous sampling with retrospective offline analysis."* Based on *ECF-Hanford-17-0128, Radiological and Toxic Air Emissions for the REDOX Complex* PTE to the onsite MEI of Laser Inferometer Gravitational-Wave Observatory (LIGO), an unrestricted area, is 5.75mrem/yr, which is over the 5mrem/yr & therefore categorizes the stack as a ***potential impact category (*PIC) 1** category rather than a category 2 as stated in the AMP. Also the 4.95 mrem/yr offsite PTE is essentially a PIC 1. Therefore, WDOH recommends that real time monitoring per PIC 1 graded approach should be implemented per the PTE. Justification: ARARs; WAC 173-480-070, WAC 246-247-075, "Monitoring, Testing and Quality Assurance" Recommendation: WDOH recommends REDOX utilize PIC 1: *Continuous sampling for a record of emissions and in-line,* ***realtime monitoring*** *with alarm capability; consideration of separate accident monitoring system*	10/26/20: CAP-88 air modeling was conducted and provided to EPA for review with DOH. DOH ran a separate CAP-88 air model and concluded that they are satisfied with the modeling. EPA provided this information to DOE in an email dated 10/26/20. Changes have been made to the document incorporating the results of the CAP-88 air model. The stack is considered a PIC 2; however, the revised unabated TEDE to the offsite MEI (based on CAP-88 modeling) is 1.61 mrem/yr and the onsite MEI is 3.60 mrem/yr.		Closed	Crystal Mathey (CM) – DOH

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15	AMP-Pg 3, line 20 SAP Section 1.5	The AMP states; *"release fraction for liquids or particulate solids (10-3) was applied to the APQ*" ECF-HANFORD-17-0128 states; *The MAR is multiplied by a unitless release fraction of **1.0E-03***. This is the particulate/solid release rate. SAP Setion 1.3 states; Table 1-9 includes the bounding radionuclides and chemicals for the REDOX Complex. It appears in the Rev 1 update that gaseous radionuclides such as Carbon 14 (C14) & Tritium (H3) are still in inventory. If this is the case a release fraction of 1.0 should be applied in the calculations. Justification: ARARs; WAC 173-480-070, WAC 246-247-075, "Monitoring, Testing and Quality Assurance" Recommendation: Physical form determines the release fraction (RF) so if gasses are in inventory as stated in Table 1-9 of DOE/RL-2017-05 Draft Rev. 1 a RF of 1.0 must be utilized for gas radionuclides.	10/26/20: The release fraction of 1.0 was used in the CAP-88 air modeling that was conducted and provided to EPA for review with DOH. DOH ran a separate CAP-88 air model and concluded that they are satisfied with the modeling. EPA provided this information to DOE in an email dated 10/26/20. Changes have been made to the document incorporating the results of the CAP-88 air model, including the use of the above mentioned release fraction.		Closed	CM – DOH

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Item No.	Pg. # Sec. # Para./Sent.	Comment or Question	U.S. D.O.E. Response	EPA/DOH Response	Open/ Close	Reviewer Initials
16	Pg. 7, line 6	The AMP only states; All radionuclides that could contribute greater than 10% of the potential effective dose equivalent"… However, radionuclides that may contribute .1mrem/yr. PTE TEDE to the MEI, or greater than 25% of the TEDE to the MEI after controls should also be monitored in addition to the 10% contributors. Justification: ARARs; WAC 173-480-070, WAC 246-247-075, "Monitoring, Testing and Quality Assurance" Recommendation: WDOH recommends monitoring for & adding language to Section 6 stating; "radionuclides that may contribute .1mrem/yr. PTE TEDE to the MEI, or greater than 25% of the TEDE to the MEI should also be monitored."	The fifth paragraph of chapter 6 has been modified, as follows (underline): All radionuclides that could cause an effective dose equivalent greater than 1% of the standard or contribute greater than 10% of the potential effective dose equivalent are measured as required by 40 CFR 61.93(b)(4).		Closed	CM – DOH
17	Section 5, bullet list beginning on page 5	The air plan, page 5, 3rd bullet from the bottom refers to stabilizing soils open with rad contaminants only when the wind in projected to exceed 20 mph. That is a more lenient standard than the standard in the work plan. The two standards should be consistent, or the work plan should refer to the air plan.	Section 5 Emission Controls, the tenth bullet item will be modified to ensure controls listed in the air monitoring plan are listed in the removal action work plan and vice versa, as follows: Field activities will be temporarily ceased, and the area will be placed in a safe configuration if contamination control measures are not expected to be adequate, based on site conditions (e.g., excessive wind). Additionally, fixatives will be applied to demolition sites and debris piles, as needed, to help control dust and radiological or nonradiological contaminants ~~found to not be adequate~~.	N/A	Closed	CS – DOE

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Item No.	Pg. # Sec. # Para./Sent.	Comment or Question	U.S. D.O.E. Response	EPA/DOH Response	Open/ Close	Reviewer Initials
18	Section 1, last paragraph	What is the specific citation for the substantive requirement (WAC 246-247)?	Given that this is the introduction section the discussion will be kept at a high level. Specific citations will be identified in sections 2 through 5. Additionally, qualifying language will be added to this section, as follows: "Collectively, these regulations allow for CERCLA authority of the 202S Building through development of work documents that provide compliance with the substantive provisions of the regulations during the NTCRA. All substantive portions of each of these regulations will be identified in the following chapters, …" Specificity will be added to the document, as follows: Section 2, end of 1st paragraph and beginning of 2nd paragraph will be modified, as follows: "…exposure to any member of the public of greater than 10 mrem/yr effective dose equivalent, per the WAC 173-480-040 requirement. Adopting the specific substantive standards of WAC 173-480 and the 40 CFR 61, Subpart H, WAC 246-247 requires verification of compliance with the 10 mrem/yr standard and is applicable or relevant and appropriate to this NTCRA. WAC 246-247-075 addresses sources emitting fugitive or diffuse radioactive airborne emissions by requiring monitoring of such sources."	N/A	Closed	Alex E Teimouri (AET) – DOE
19	Section 2, 1st sentence	Change "state" to "State".	Will be changed in document.	N/A	Closed	AET – DOE
20	Section 2, 2nd paragraph, 2nd sentence	Is the term "applicable" in the following sentence supposed to be relevant and appropriate? "To meet the substantive aspect of these requirements, best or reasonably achieved control technology will be applied by ensuring that applicable emission control technologies…"	No, this word will be changed to "demonstrated" to avoid confusion, as follows: "To meet the substantive aspect of these requirements, best or reasonably achieved control technology will be applied by ensuring that ~~applicable~~ demonstrated emission control technologies…"	N/A	Closed	AET – DOE

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21	Section 3, last two sentences of 1st paragraph	Please add specificity regarding the WAC 173-460 requirement in this paragraph. "In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting, and WAC 173-460 would not be considered an applicable or relevant and appropriate requirement (ARAR). If more aggressive treatment is required that would result in the emission of regulated air pollutants, the substantive requirements of WAC 173-400-113(2), "Requirements for New Sources in Attainment or Unclassifiable Areas," and WAC 173-460-060, "Control Technology Requirements," would be evaluated to determine applicability."	The paragraph will be modified, as follows: "In most cases, the type of treatment anticipated would consist of solidification/stabilization techniques such as macroencapsulation or grouting, which is analyzed in the Environmental Restoration Disposal Facility waste acceptance criteria, and WAC 173-460-150 requirements would not be considered an applicable or relevant and appropriate requirement (ARAR) as all criteria and toxics emissions will be below de minimis. This, in turn, fulfills the applicable requirement of WAC 173-460-070, and thus, WAX 173-460-060. If ~~more aggressive~~ additional treatment is ~~required~~ deemed necessary that would result in the emission of regulated air pollutants, the substantive requirements of WAC 173-400-113(2), "Requirements for New Sources in Attainment or Unclassifiable Areas," and WAC 173-460-060, "Control Technology Requirements," would be evaluated to determine applicability."	N/A	Closed	AET – DOE
22	Section 4, 1st paragraph	Please describe the APQ method in a footnote as to what it entails.	A footnote will be added, as follows: "Annual Possession Quantity (APQ) Method looks at a given isotopic source term, multiplied by the associated release fraction provided in WAC 246-247-030(21)(a), in order to determine a dose to a hypothetical Maximally Exposed Individual (MEI)."	N/A	Closed	AET – DOE
23	Section 4, 1st paragraph	Please describe the release fraction risk element in a footnote.	A footnote will be added, as follows: "When calculating Potential-to-Emit (PTE), a WAC 246-247-030(21)(a) release fraction is assigned to some or all of the source term based on the physical state of the media. In this case, a 10^{-3} release fraction is assigned to the entirety of the source term, assuming it all to be liquids or particulate solids."	N/A	Closed	AET – DOE
24	Section 4, 1st paragraph	Please describe the MEI in a footnote.	A footnote will be added, as follows: "The WAC 246-247-030(15) definition for MEI is, "any member of the public (real or hypothetical) who abides or resides in an unrestricted area, and may receive the highest TEDE from the emission unit(s) under consideration, taking into account all exposure pathways affected by the radioactive air emissions." For the purposes of radiological source term, the MEI is at the Hanford Site boundary line. This excludes the land transferred to the Tri-Cities Washington Economic Development Council (TRIDEC)."	N/A	Closed	AET – DOE

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25	Section 4, 1st paragraph, 4th sentence	Change "memorialized" to "documented".	The sentence will be modified, as follows: "… and ~~memorialized~~ documented in the calculation ECF-Hanford-17-0128…"	N/A	Closed	AET – DOE
26	Section 4, 1st sentence of last paragraph	What MEI location?	The offsite MEI is being discussed here and language will be added in section 4 to ensure clarity.	N/A	Closed	AET – DOE
27	Section 4, 1st paragraph, last sentence	Change "radionuclides" to "isotopes".	The sentence will be modified, as follows: "These ~~radionuclides~~ isotopes were chosen…"	N/A	Closed	AET – DOE
28	Section 5, 1st paragraph	What is the requirement for BARCT? Is this a DOE requirement or NRC? Is there a promulgated regulation that can be cited and not just a DOE Order?	Clarifying language will be added, as follows: "As a significant activity with regard to potential for airborne radionuclide emissions, this NTCRA will be subject to the substantive provisions of the WAC 246-247-040, Best Available Radionuclide Control Technology (BARCT) standard. The 40 CFR 61.93 requirements, adopted through WAC 246-247-035(1)(a)(i), are also a substantive requirement within this work scope. This section delineates the proposed alternative to the qualification of effluent and sample flows in order to prove sampling defensibility by instituting the 40 CFR 61.93(d) requirements.	N/A	Closed	AET – DOE
29	Section 5, 3rd paragraph, last sentence	Change to "…demonstrate that regardless of the increased system flow and sample effluent…"	The sentence will be modified, as follows: "…demonstrate that regardless of the increased system flow and sample effluent…"	N/A	Closed	AET – DOE
30	Section 5, 7th paragraph, 1st sentence	What are the "listed available methods"?	The sentence will be modified, as follows: "…ongoing operations that the listed available methods, systems, and techniques for the control of radionuclide particulate emissions in the bulleted list below represent the most effective control…"	N/A	Closed	AET – DOE
31	Section 5, 8th paragraph	Add, "these include but are not limited to the following" just before the bulleted list.	This phrase will be added.	N/A	Closed	AET – DOE
32	Section 6, 1st sentence after 1st bulleted list	Should engineering controls be added as well as containments?	The sentence will be modified, as follows: "Where the 202S Building containment ventilation is not sufficient to provide for worker safety, various types of engineering controls and containments will be used for exhausting…"	N/A	Closed	AET – DOE
33	Section 6, 7th paragraph, last sentence	Replace "To clarify" with "The".	The sentence will be modified, as follows: "~~To clarify,~~ The portable exhausters are …"	N/A	Closed	AET – DOE

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34	Section 7, 11th paragraph	Replace "portion" with "acitivites".	The sentence will be modified, as follows: "The demolition ~~portion~~ activities of the NTCRA will…" Additionally, the 1st sentence of the 12th paragraph has been modified, as follows: "During the demolition activities at the REDOX Complex, worker protection (worksite) monitoring activities will be considered and may include the following:"	N/A	Closed	AET – DOE
35	Section 7, 16th paragraph, 2nd sentence	Change the first word in the sentence to "The".	The sentence will be modified, as follows: "~~These~~ The four stations…"	N/A	Closed	AET – DOE
36	Section 6, Table 2	Remove Table 2.	Table 2 has been removed.	N/A	Closed	FC – CHPRC
37	Section 6, last sentence in 4th to last paragraph.	Remove the following sentence: At a minimum, three (one upwind and two downwind) real-time continuous air monitors with alarms will be located at each radioactive control zone boundary.	The sentence will be deleted.	N/A	Closed	FC – CHPRC

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