CHPRC-03948
Revision 0

Response Action Report for Research Technology Laboratory Complex

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

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
Richland, Washington 99352

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APPROVED
By Julia Raymer at 4:20 pm, Jul 18, 2019

Release Approval | Date

Executive Summary

This response action report summarizes the completion of the non-time-critical removal action conducted for the Pacific Northwest National Laboratory (PNNL) Research Technology Laboratory (RTL) complex facilities in Richland, Washington. The *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*[1] removal action was authorized by and is described in DOE/RL-2010-22, *Action Memorandum for General Hanford Site Decommissioning Activities*[2]. The removal action alternative, which was proposed in DOE/RL-2010-14, *Engineering Evaluation/Cost Analysis for General Hanford Site Decommissioning Activities*,[3] and selected in DOE/RL-2010-22, *Action Memorandum for General Hanford Site Decommissioning Activities*, was deactivation, decontamination, decommissioning, and demolition.

The RTL complex operated from 1966 until 2017. Hazardous materials and chemicals (e.g., radionuclides, hazardous chemicals, beryllium, and asbestos) were used in portions of the RTL complex to support U.S. Department of Energy-funded and other historical activities. Removal of these structures minimizes the potential for a release of hazardous substances from the facilities that could adversely impact human health and the environment.

The removal action (i.e., deactivation, decontamination, decommissioning, and demolition of the RTL complex structures and removal of underlying soil) was completed in December 2018. This report documents the successful completion of the removal action, outlines the removal action objectives, and demonstrates that the removal action objectives were met.

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[1] *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* and *Superfund Amendments and Reauthorization Act of 1986*, Pub. L. 107-377, as amended, 42 USC 9601 et seq., December 31, 2002. Available at: https://www.gpo.gov/fdsys/pkg/USCODE-2011-title42/pdf/USCODE-2011-title42-chap103.pdf.

[2] DOE/RL-2010-22, 2013, *Action Memorandum for General Hanford Site Decommissioning Activities*, Rev. 1, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/pdf.cfm?accession=0087977.

[3] DOE/RL-2010-14, 2010, *Engineering Evaluation/Cost Analysis for General Hanford Site Decommissioning Activities*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084795.

Another component of the removal action was an evaluation of the soils remaining following removal action completion. The objective was to determine if the soils required further response action based on established release limits. This evaluation was completed in January 2019. This report summarizes the soil evaluation, which demonstrated that the remaining soils do not require further response action and that the land is eligible to be released for unrestricted use.

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Terms

BMI	Battelle Memorial Institute
COPC	contaminants of potential concern
D4	deactivation, decontamination, decommissioning, and demolition
DOE	U.S. Department of Energy
EE/CA	engineering evaluation/cost analysis
HEIS	Hanford Environmental Information System
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MTCA	Model Toxics Control Act
PNNL	Pacific Northwest National Laboratory
RAO	removal action objective
RAWP	removal action work plan
RTL	Research Technology Laboratory
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*

1 Introduction

This report documents the successful completion of a non-time-critical removal action conducted at the Pacific Northwest National Laboratory (PNNL) Research Technology Laboratory (RTL) complex. This report demonstrates that the applicable removal action objectives (RAOs) have been met for Alternative 3, Deactivation, Decontamination, Decommissioning, and Demolition (D4), which was the selected alternative proposed in DOE/RL-2010-14, *Engineering Evaluation/Cost Analysis for General Hanford Site Decommissioning Activities* (hereinafter referred to as the engineering evaluation/cost analysis [EE/CA]), and authorized by DOE/RL-2010-22, *Action Memorandum for General Hanford Site Decommissioning Activities* (hereinafter referred to as the action memorandum). This report has been prepared in accordance with U.S. Environmental Protection Agency guidance (EPA 540-R-98-016, *Close Out Procedures for National Priorities List Sites*).

Statutory authority for the action is in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*, as amended by the *Superfund Amendments and Reauthorization Act of 1986*; Ecology et al., 1989a, *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement); and 40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan."

The non-time-critical removal action for the RTL complex was completed in January 2019 in accordance with DOE/RL-2010-34, *Removal Action Work Plan for River Corridor General Decommissioning Activities* (hereinafter referred to as the removal action work plan [RAWP]), as amended by Tri-Party Agreement change notice TPA-CN-0738, *Tri-Party Agreement Change Notice Form: DOE/RL-2010-34, Rev 2, Removal Action Work Plan for River Corridor General Decommissioning Activities*. This report provides the following information relative to the completion of the response action:

- Background, historical information, and regulatory enforcement history pertinent to this response action
- A summary of the completed actions and a comparison of the maximum concentrations of contaminants of potential concern (COPCs) to their respective action levels and release limits
- Demonstration that applicable RAOs have been met and the basis that the land areas associated with the RTL complex is eligible to be released for unrestricted use

Post-demolition activities included evaluating the soils remaining after removal action completion. The evaluation demonstrated that the areas affected by the removal action require no further response action because they meet release limits delineated in Golovich et al., 2019a, *Research Technology Laboratory (RTL) Disposition Program Final Status Survey Report* (S740277-RPT-05) (hereinafter referred to as the survey report); and Golovich et al., 2019b, *Research Technology Laboratory (RTL) Disposition Program Final Verification Sampling Report for Non-radiological Analytes* (S740277-RPT-06) (hereinafter referred to as the sampling report).

1.1 Site Description

The RTL complex (Figures 1 and 2) was located within the Richland city limits and within the urban expansion area identified by Benton County, Washington. This parcel is currently identified as "business research park" and "general commercial" by the city of Richland and Benton County, respectively. The RTL complex was bounded to the south by 3rd Street, to the north by 4th Street, to the west by Innovation Boulevard, and to the east by George Washington Way.

Figure 1. Layout of the RTL Complex

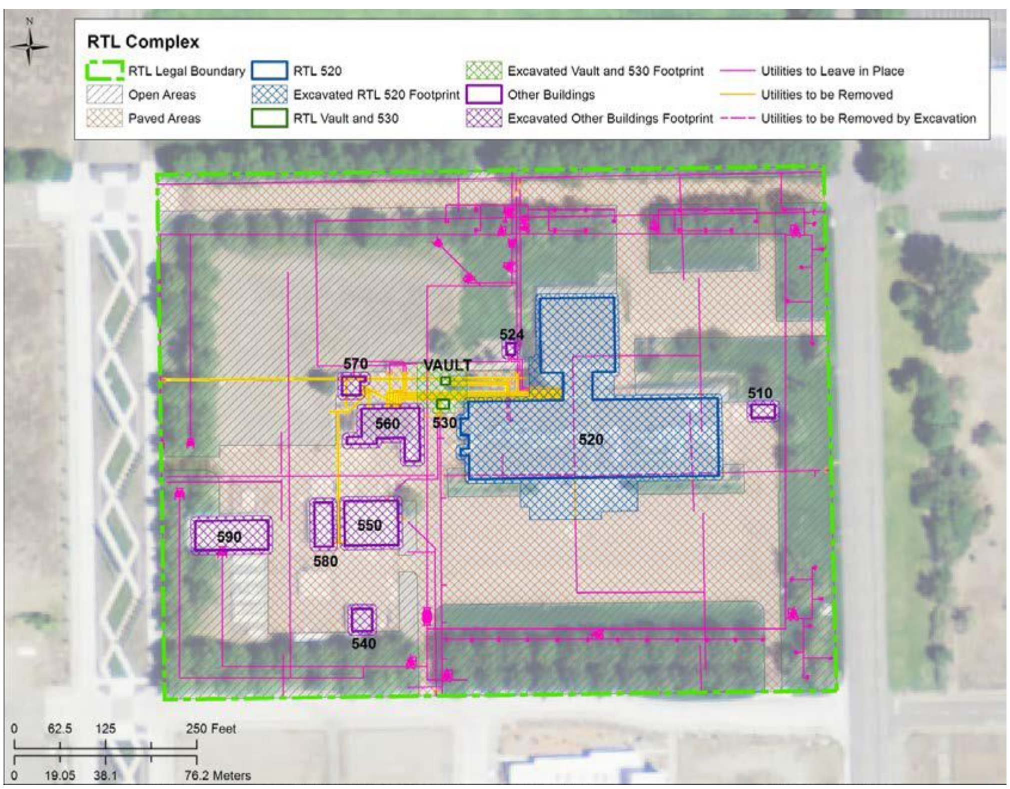

Figure 2. RTL Complex, with Legal Property Line

1.2 Regulatory and Enforcement History

Table 1 lists the regulatory inspections that have occurred at the RTL complex and the outcomes. The list is primarily focused on hazardous waste inspections. The RTL complex was typically inspected annually by the city of Richland for liquid effluent permit compliance, but unless noted, no findings resulted.

Table 1. Regulatory Inspections

Date	Agency	Scope	Result
9/30/1996	Ecology	Hazardous waste	Notice of correction; one finding at RTL (failed to remove satellite accumulation area waste within 3 days)
10/20/1997	Ecology	Hazardous waste	Notice of correction; no findings at RTL
4/26/1999	Ecology	Hazardous waste	No findings
4/22/2004	Ecology	Hazardous waste	Notice of correction; no findings at RTL
7/19/2005	EPA/Ecology	Performance track member visit	No findings
2/25/2009	Ecology	Hazardous waste	Notice of correction; two findings at RTL (antifreeze label and battery collection in yard)
7/11/2012	City of Richland	Liquid effluents	Warning letter regarding spill at RTL 560; corrective actions tracked to completion
5/28/2015	Ecology	Hazardous waste	Notice of correction; no findings at RTL
8/5/2015	Health	Radioactive air emissions	No findings

Health = Washington State Department of Health
Ecology = Washington State Department of Ecology
EPA = U.S. Environmental Protection Agency
RTL = Research Technology Laboratory

2 Facility Background and Removal Action Description

This chapter provides information on the background and the physical and process history for the RTL complex buildings pertaining to the RAOs. A description of the removal action and the RAOs applicable to this response action are also discussed.

2.1 Facility Description and Background

The RTL complex is 6.2 ha (15.2 ac) and consisted of 10 buildings (510, 520, 524, 530, 540, 550, 560, 570, 580, and 590) located south of the main PNNL campus on the southeastern corner of property owned by Battelle Memorial Institute (BMI) in Richland, Washington. In addition to the listed buildings, the RTL complex consisted of a vault (along the northwest wing of RTL 520), underground piping (asbestos pipe, hot/chilled water pipeline chaseway, and sewer line), parking lots, and open areas. Sections 2.1.1 through 2.1.10 provide descriptions of the buildings within the RTL complex and their construction and uses.

The RTL complex was bounded by properties owned by the city of Richland, Washington State University, and other commercial and private entities. Hazardous materials and chemicals (e.g., radionuclides, hazardous chemicals, beryllium, and asbestos) were historically used in portions of the RTL complex to support U.S. Department of Energy (DOE)-funded and other historical activities. As discussed in the survey report (Golovich et al., 2019a) and the sampling report (Golovich et al., 2019b), previous land use on RTL complex property included agriculture, residential, and industrial activities. Former land use is important to consider when evaluating the types of contamination potentially present in the soil.

The RTL complex was built in 1966 by the Douglas Aircraft Company as the company's diversification commitment to the Atomic Energy Commission. The RTL complex was a branch of the research and development section of Douglas Laboratories' Missile and Space Systems Division. Operations involved using plutonium-238, plutonium-239, uranium-233, and uranium-235 to fabricate prototype reactor fuels. Douglas Laboratories was also involved in developing batteries using promethium-147. The promethium-147 was obtained during isotopic separations associated with Hanford Site plutonium production during the 1960s, when operations at Hanford and Oak Ridge developed the necessary technologies for large-scale production at Hanford (Golovich et al., 2019a and 2019b).

Douglas Laboratories operated the facility until 1975, when it passed custodianship of the complex to Exxon Nuclear Company (hereinafter referred to as Exxon). Internal Exxon documents indicate that significant surface decontamination was performed in Hot Labs 134 and 136 (within RTL 520), and residual nonsmearable promethium-147 and plutonium-238 contamination remained in the ductwork prior to building acquisition in 1975. Exxon used the facility to develop processes and techniques supporting fabrication of Sphere-PAC nuclear fuels developed at Oak Ridge National Laboratory and transitioned to RTL for pilot-scale production (Golovich et al., 2019a and 2019b).

BMI purchased the facility in 1981 and allowed Exxon to operate under a lease agreement until Exxon vacated the facility in 1983. After the facility was vacated, RTL 520 was occupied by PNNL staff from the Energy and Environment Directorate and Fundamental and Computational Sciences Directorate (Golovich et al., 2019a and 2019b).

During the RTL complex operational history, incidents have occurred involving radioactive materials. PNNL historical records (from 1982 through 1995) and information from the DOE Occurrence Reporting and Processing System database (from 1996 to present) show a combined 11 documented radiological events that occurred in the RTL complex between 1982 and 2004, while under BMI ownership. Since 2004, there have been no reported radiological occurrences. Table 2 presents a summary of the radiological events.

Table 2. Summary of Radiological Events at the RTL Complex

Date	Location(s)	Description
2/2/1982	RTL Stack	A few high air samples were reported with maximum concentration of 1.0×10^{-11} µCi/cc. Further analysis indicated depleted uranium-238.
11/8/1982	218 226B 228 232	Smearable contamination of ductwork, walls, shelving, light fixtures, and miscellaneous equipment was found in RTL laboratories and Sphere-PAC building. Direct and smearable contamination ranged from 400 cpm/100 cm^2 to 50,000 cpm/100 cm^2.

Table 2. Summary of Radiological Events at the RTL Complex

Date	Location(s)	Description
9/4/1986	136	Following an annual instrument testing source inventory, three sources (each containing 8 µCi of cesium-137 sealed in a plastic disk) were noted as missing. Sources may have been transported to the Engineering Services Building, but there is no record. A physical search of the RTL, Engineering Services Building, and transport vehicles was completed, but the sources were not recovered. The sources were considered exempt and not a general public hazard, no further action was taken to locate the samples.
4/21/1987	226 218 237 200 Hall	A researcher failed to perform a personal survey upon exiting Lab 226. During a personal survey later in the day, the researcher detected contamination from a dropped lid of a container with carbon-14. The researcher had also been working with zinc-65 in room 218. The floors of each of the areas and the hood ledge in 226 were found to have upwards of 5,000 cpm/100 cm^2 beta-gamma and <200 dpm/100 cm^2 alpha contamination.
1/19/1990	148	A radiological protection technician discovered contamination areas in uncontrolled areas, during a routine survey, including the south end of the countertop and several tools on the east side of the room and a metal table at the north end of the room. Sealed sources are considered leaking and surveys revealed a 26 µCi strontium-90 and a 50 µCi TL-204 with maximum 20,000 dpm/100 cm^2 beta-gamma smearable contamination. Countertops were decontaminated and contaminated equipment was bagged and disposed for disposal. There was a concern of offsite contamination, but no contamination was found in the researcher's car. The contamination event was thought to have occurred 2 months prior.
11/13/1990	218	A staff member was working in a fume hood with carbon-14 in a liquid solution. The solution was in a glass beaker on top of an electric stirrer. The beaker fell out of the hood onto the floor and broke when the staff member bumped it with his arm.
12/1/1992	RTL Vault Tanks	Contamination was detected in RTL tanks, including uranium-238 (4.28E-03 µCi/g) and uranium-235 (1.10E-04 µCi/g).

Table 2. Summary of Radiological Events at the RTL Complex

Date	Location(s)	Description
12/11/1995	126 128 132 146 148 218 224 228 232 236 246 248	Fixed contamination areas were discovered on the walls and floors under paint and coverings based on historical information of the buildings.
8/17/1999	438	During a routine survey, transferable radioactive contamination readings of 6,000 dpm/100 cm^2 beta-gamma and 140 dpm/100 cm^2 alpha were discovered on the inner portion of a fume hood glass sash. The fume hood was not posted adequately for transferable radioactive contamination control purposes. This was possibly related to an event that took place October 22, 1996.
12/19/2000	226 228	A routine whole body survey detected contamination on a staff member's shoe. Contamination was also found on the floor inside the radiological buffer area in 226 and on the floor in 228. Surveys detected contamination up to 10,000 dpm/100 cm^2 beta-gamma on the floor. Technical smears within the fume hood also detected upwards of 80,000 dpm/100 cm^2 beta-gamma on the hood deck lead bricks.
11/1/2004	226	A staff member discovered a spill in a radiological buffer area. A survey detected 1,500 dpm/100 cm^2 beta-gamma contamination on the staff member's shoe. The spill had spread to the sink, but detailed investigation determined that the contamination was confined in the sink trap, and there was no discharge to the city of Richland sewer system. The event was classified as a near miss.

NOTE: All locations are rooms/areas inside building 520 unless noted otherwise.

cpm = counts per minute

dpm = disintegrations per minute

RTL = Research Technology Laboratory

The RTL complex buildings had the following missions:

- RTL 510 – Support Building
- RTL 520 – Research Technology Laboratory
- RTL 524 – Fire Riser Building
- RTL 530 – Radioactive Storage
- RTL 540 – Paper Shredder Facility
- RTL 550 – Technical Services
- RTL 560 – Utility Building
- RTL 570 – Autoclave Center
- RTL 580 – Craft Shop Building
- RTL 590 – Warehouse

2.1.1 RTL 510 – Support Building

RTL 510 provided chemical and flammable gas storage. The building was a one-story, flat-roofed, concrete block structure erected on a short, concrete foundation wall containing a concrete above-grade floor (Figure 3). There were two unequally sized rooms, one of which contained a round concrete pipe and a below-grade storage pit.

Figure 3. RTL 510 – Support Building

2.1.2 RTL 520 – Main Building

RTL 520 was the main building within the RTL complex, constructed in 1966 by Douglas Aircraft Company to make nuclear fuel rods. Battelle purchased the complex and land in 1982 from Exxon, the subsequent owner. RTL 520 housed 95 offices comprising 1,235 m^2 (13,290 ft^2), 33 laboratories comprising 1,460 m^2 (15,710 ft^2), and common space of 2,439 m^2 (26,250 ft^2) for a total area of 5,134 m^2 (55,250 ft^2). The main laboratory/administration building was constructed of reinforced concrete (including the roof), with outside curtain walls of concrete block faced with red brick. The outside windows were heavy, double-paned, and had aluminum frames (Figure 4). There was also a partial basement of approximately 650 m^2 (7,000 ft^2) constructed of concrete foundation walls.

Figure 4. RTL 520 – Main Building

2.1.3 RTL 524 – Fire Riser Building

RTL 524 was a 3.7 m by 4.6 m (12 ft by 15 ft) pre-engineered metal building on a concrete slab and foundation (Figure 5) that was built to protect the fire sprinkler riser installed as part of an RTL complex fire system upgrade in approximately 2004.

Figure 5. RTL 524 – Fire Riser Building

2.1.4 RTL 530 – Radioactive Material Storage Building

RTL 530 provided space for the temporary storage of experimental radioactive materials and was attached to the 520 Building (Figure 6). The perimeter was 3.7 m by 4.3 m (12 ft by 14 ft). The building was constructed of reinforced concrete with outside concrete curtain walls and a flat built-up roof (felt, asphalt, and gravel). The floor was concrete and contained a pit with a lead cover for storing highly radioactive materials. The facility was used for radioactive waste storage. The building was modified in 2000 to add a high-efficiency particulate air filter exhaust system.

Figure 6. RTL 530 – Radioactive Material Storage Building

2.1.5 RTL 540 – Paper Shredder Facility

RTL 540 was a metal structure with concrete foundation, and it previously served as a paper shredding facility (Figure 7). It recently consisted primarily of storage areas.

Figure 7. RTL 540 – Paper Shredder Facility

2.1.6 RTL 550 – Technical Services Building

RTL 550 was a one-story, prefabricated, insulated metal structure erected on a concrete foundation and a concrete slab-on-grade floor (Figure 8). It consisted of three metal buildings that had been tied into one unit. Rooms consisted primarily of offices, maintenance shops, and storage.

Figure 8. RTL 550 – Technical Services Building

2.1.7 RTL 560 – Utility Building

RTL 560 (Figure 9) provided space for mechanical equipment such as boilers, chillers, and a cooling tower, all of which provided heating and cooling for RTL 520. The perimeter was 14.6 m by 24.4 m (48 ft by 80 ft). This concrete block building was erected on concrete footings with a concrete slab floor. The roof was constructed with a steel girder, wood purlins, and rafters, and was covered with plywood decking, rigid insulation, and built-up roofing. Two roll-up doors were installed on the south side of the building. The building contained two 200-horsepower, natural-gas-fired boilers and two 150-ton chillers. A cooling tower, which was used as a circulating water heat dump, was located adjacent to RTL 560. A small (37.2 m^2 [400 ft^2]), insulated steel building was attached to the southwest corner of RTL 560 and was used as a storage/stockroom.

Figure 9. RTL 560 – Utility Building

2.1.8 RTL 570 – Autoclave Center

RTL 570 served as an autoclave center (Figure 10). The building was made with prefabricated, insulated steel erected on concrete foundation and had a concrete slab floor and a flat, insulated metal roof.

Figure 10. RTL 570 – Autoclave Center

2.1.9 RTL 580 – Craft Shop Building

RTL 580 served as the craft shop (Figure 11). The building was a one-story, prefabricated, insulated metal structure erected on a concrete foundation and a concrete slab-on-grade floor.

Figure 11. RTL 580 – Craft Shop Building

2.1.10 RTL 590 – Hazardous Waste Chemical Storage/Warehouse

RTL 590 was primarily useda for storage (Figure 12), including a chemical waste storage area with an in-service fume hood. The building was a one-story, prefabricated, insulated metal structure erected on a concrete foundation and a concrete slab-on-grade floor.

Figure 12. RTL 590 – Hazardous Waste Chemical Storage/Warehouse

2.2 Description of the Removal Action

As stated in the EE/CA (DOE/RL-2010-14) and action memorandum (DOE/RL-2010-22), the selected alternative for the RTL complex facilities was Alternative 3: D4. Alternative 3 met the proposed RAOs regarding long-term risk, minimized short-term worker risk and radiation exposure, was cost effective, met applicable or relevant and appropriate requirements, and provided a safe and stable configuration that is environmentally sound.

Activities involved in the removal action set forth in the RAWP (DOE/RL-2010-34), include facility, infrastructure, and soil removal with verification sampling to demonstrate that COPC concentrations in remaining soil are less than or equal to established release limits, and that no additional response action is required.

2.2.1 Removal Action Objectives

The applicable RAOs, as documented in the action memorandum (DOE/RL-2010-22), are as follows:

- **RAO #1:** Protect human and ecological receptors from exposure to soils and/or debris contaminated with hazardous substances above acceptable exposure levels.
- **RAO #2:** Control the migration of contaminants from the buildings/structures and debris into the environment.
- **RAO #3:** Safely treat, as appropriate, and dispose of waste streams generated by the removal action.
- **RAO #4:** Reduce or eliminate the need for future surveillance, maintenance or periodic inspection activities.

- **RAO #5:** Prevent adverse impacts to cultural and natural resources and threatened or endangered species, and minimize wildlife habitat disruption.

2.2.2 Removal Action Design Summary

Key functions of this removal action, as discussed in the RAWP (DOE/RL-2010-34), include utility isolations, characterization sampling, hazardous material removal, decontamination, structure demolition, disposition of waste materials, verification sampling and analysis, and site stabilization. The removal design is relatively simple for this action and includes RAWP-compliant internal decontamination, demolition, and disposal of wastes for the RTL complex facilities (including equipment, systems, and materials left in the facilities), removal of ground level slabs and the RTL 520 basement, and RAWP-compliant excavation and disposal of potentially contaminated soils under and around the RTL complex facilities.

2.3 Record of Decision Amendments, Significant Differences, or Waivers

No amendments to the EE/CA (DOE/RL-2010-14) or action memorandum (DOE/RL-2010-22) or technical impracticability were associated with this removal action. A Tri-Party Agreement change notice (TPA-CN-0738) was approved for the RAWP (DOE/RL-2010-34) to add the RTL complex facilities, as authorized by Section 1 of the action memorandum.

3 Response Activity Summary

The removal action for the RTL complex facilities commenced with decommissioning and internal decontamination in July 2017. Demolition and excavation activities were completed in December 2018. Post-excavation soil evaluation activities began in November 2018 and were completed in January 2019. Chapter 4 provides the chronology for the project. This chapter provides additional details and results for key elements of the removal action.

3.1 Summary of Activities

The following key activities were completed as part of the removal action:

- Performing site mobilization and preparation, which included procuring and staging materials, setting up and supplying support systems (e.g., electrical systems, temporary structures, and security fencing), and preparing the work site
- Performing characterization sampling and analysis, which included walk downs and collection of samples, as applicable
- Performing internal decontamination to include removal of fixed radiological contamination and limited asbestos abatement activities
- Performing demolition and excavation, which encompassed demolition of the building structures and removal of ground level slabs, the tank vault, associated piping, and the RTL 520 basement
- Disposing of waste
- Conducting a post-demolition soil evaluation in accordance with the process described in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b)
- Performing partial backfill and site stabilization using clean layback soils only, no fill material was imported to the RTL site

3.1.1 Demolition and Excavation

The RTL complex facilities were demolished; the slab, pipelines, and vault were removed; and soil in the area of the vault and RTL 520 was excavated in accordance with the RAWP (DOE/RL-2010-34). Figure 1 shows the RTL complex prior to demolition. Figures 13 and 14 depict the RTL complex during demolition. Figures 15 and 16 show the RTL complex after demolition and excavation.

Figure 13. RTL Complex During Demolition

Figure 14. Fixed Radiological Decontamination (Scabbling)

Figure 15. RTL Complex During Demolition

Figure 16. RTL Complex After Demolition and Excavation

3.1.2 Verification Sampling

Following the removal activities, verification sampling was conducted to confirm that COPC concentrations in the remaining soil were less than the release limits in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b). This information was used to demonstrate that the release objectives were met and that the property was ready for unrestricted use in accordance with Washington State's Model Toxics Control Act (MTCA) (WAC 173-340, "Model Toxics Control Act—Cleanup") and DOE O 458.1 Chg 3, *Radiation Protection of the Public and the Environment*.

The COPCs that were developed are listed in Section 5.1.3. The action levels and release limits for each COPC are provided in Table 3 for radiological COPCs and in Table 4 for nonradiological COPCs.

- **Action level:** A concentration in the soil of a COPC that requires further investigation before the land can be released for unrestricted use.
  - A chemical contaminant concentration that is 90% of the release limit established to meet unrestricted use, as defined in the MTCA limits (WAC 173-340) and sampling report (Golovich et al., 2019b).
  - A radiological contaminant concentration that is 75% of the authorized limit established to meet unrestricted use and as defined in DOE O 458.1 Chg 3 and survey report (Golovich et al., 2019a).

- **Release limit:** Refers to the concentration in soil of a COPC, below which the area can be released.
  - A chemical contaminant concentration that does not exceed the unrestricted use levels established to meet MTCA requirements (WAC 173-340).
  - A radiological contaminant concentration does not exceed the authorized limit established to meet the requirements of DOE O 458.1 Chg 3.

Table 3. Release Limits and Action Levels for Radiological COPCs

Radionuclide	Release Limit (pCi/g)	Action Level pCi/g)
Plutonium-238	800	600
Plutonium-239/240	740	555
Plutonium-241	30,000	22,500
Uranium-234	700	525
Uranium-235	60	45
Uranium-238	280	210
Cobalt-60	3.7	2.8

Table 4. Release Limits, Action Levels, and Background Concentrations for Nonradiological COPCs

Analyte Type	Nonradiological COPCs	Release Limit (mg/kg)[a]	Action Level (mg/kg)	Background Concentration (mg/kg)
Polychlorinated biphenyls	Aroclor 1016			[b]
	Aroclor 1254	2.0[c]	1.8	[b]
	Aroclor 1260			[b]
Total petroleum hydrocarbons	Diesel-range organics	460[d]	414	[b]
	Gasoline-range organics	100[e]	90	[b]
Pesticides	4,4’-DDD			[b]
	4,4’-D DE	1[c]	0.9	[b]
	4,4’-DDT			[b]
	Dieldrin	0.0625[f]	0.0563	[b]
Volatile organic compounds	Methylene chloride	0.02[d]	0.018	[b]
Metals	Arsenic (inorganic)	20[d]	18	6.47[g]
	Beryllium	25[c]	22.5	1.51[g]

Table 4. Release Limits, Action Levels, and Background Concentrations for Nonradiological COPCs

Analyte Type	Nonradiological COPCs	Release Limit (mg/kg)[a]	Action Level (mg/kg)	Background Concentration (mg/kg)
	Cadmium	2[d]	1.8	0.56[h]
	Chromium (total)	42[c]	37.8	18.5[g]
	Lead	220[c]	198	10.2[g]
	Mercury	2[d]	1.8	0.01[h]
	Zinc	270[c]	243	67.8[g]

a. Selected the lowest value in Ecology, 2015, Cleanup Levels and Risk Calculation Tables (CLARC) based on Method B for direct contact (exposure to hazardous substances through ingestion and/or dermal contact) (WAC 173-340-705, "Use of Method B"); Method A if Method B value is not available (WAC 173-340-704), "Model Toxics Control Act—Cleanup," "Use of Method A"); or WAC 173-340-7492. "Simplified Terrestrial Ecological Evaluation Procedures."

b. No value available for natural background concentration, so the PQL is substituted for the analyte method (WAC 173-340). The PQL is the lowest concentration that can be reliably measured within specified limits of precision, accuracy, representativeness, completeness, and comparability during routine laboratory operating conditions, using laboratory-approved methods. WAC 173-340-707, "Analytical Considerations," identifies the conditions for selecting the PQL (e.g., the PQL is not greater than 10 times the method detection limit).

c. WAC 173-340-900, "Tables," Table 749-2, "Simplified Terrestrial Ecological, Unrestricted Land Use."

d. CLARC table (Ecology, 2015), Method A, "Unrestricted Land Use." For arsenic, Ecology, 2013, "Issues Associated with Establishing Soil Cleanup Levels for Arsenic," describes the use of Method A rather than Method B as a release limit.

e. CLARC table (Ecology, 2015), "Method B, Cancer, Direct Contact."

f. CLARC table (Ecology, 2015), "Method B, Noncancer, Direct Contact."

g. DOE/RL-92-24, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*.

h. ECF-HANFORD-11-0038, *Soil Background for Interim Use at the Hanford Site*.

COPC = contaminant of potential concern
MTCA = Model Toxics Control Act
PQL = practical quantitation limit

The sampling process design includes where, when, and how samples are taken. The primary objective of the sampling design process is to obtain data that represent the environment being investigated and to meet the release objectives of the project. The survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b) describe mechanisms for planning, implementing, and approving field activities, as well as the measurement results required to meet data quality objectives.

The RTL complex was segregated into six survey units based on the recommendations for site classification provided in NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*. The six survey units within the RTL complex can be classified as either excavated areas or unexcavated areas. The excavated areas include the following:

- RTL 520 footprint
- RTL tank vault and RTL 530 footprints

- RTL 510, 524, 540, 550, 560, 570, 580, and 590 footprints
- Pipelines

The unexcavated areas include the following:

- Paved areas
- Open areas

Two soil stockpiles were created from soil removed from the RTL 520 survey unit (hereinafter referred to as layback). Layback is defined as “clean material” resulting from excavation. Layback soil was removed from the excavation of RTL 520 to create a slope upon which the soil would not fall back or collapse into the excavation pit. Criteria for the layback material is as follows:

- Included soil removed from the layback area around the RTL 520 basement and that portion of the main sewer line that lies west of a point no less than 6.1 m (20 ft) from the west side of the RTL 520 Tank Vault,
- Verified as not radioactively contaminated above the detection limits of handheld instrumentation used during routine in-process radiological surveys,
- Free of staining and other visual indicators of possible contamination, and
- Did not include soil from around the layback area of the RTL 520 Tank Vault.

These layback stockpiles essentially created a seventh “survey unit.” The layback soil was sampled as delineated in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b).

The sampling design included three types of locations for collecting samples: random sample, specific judgmental sample, and field judgmental sample:

- The selection of random samples, per survey unit, was in accordance with MARSSIM (NUREG-1575) for Class 3 surface areas.
- Judgmental samples were identified to be collected within a survey unit in addition to the random samples, and these locations were based on previous information and professional judgment. The two types of judgmental samples included specific judgmental samples (based on previous information) and field judgmental samples (based on field observations during demolition and excavation).

At each sample location within a survey unit, one soil sample was collected, and then the soil was divided to provide the analytical laboratories with aliquots from that soil sample for all analyses. The goal was to ensure that the soil collected was divided to represent the same material for all analyses. This effort could require homogenization of the soil in a manner that was appropriate for the analytical methods and to maintain representativeness of the sample.

Figure 17 shows the relative sample locations of all random and specific judgmental samples.

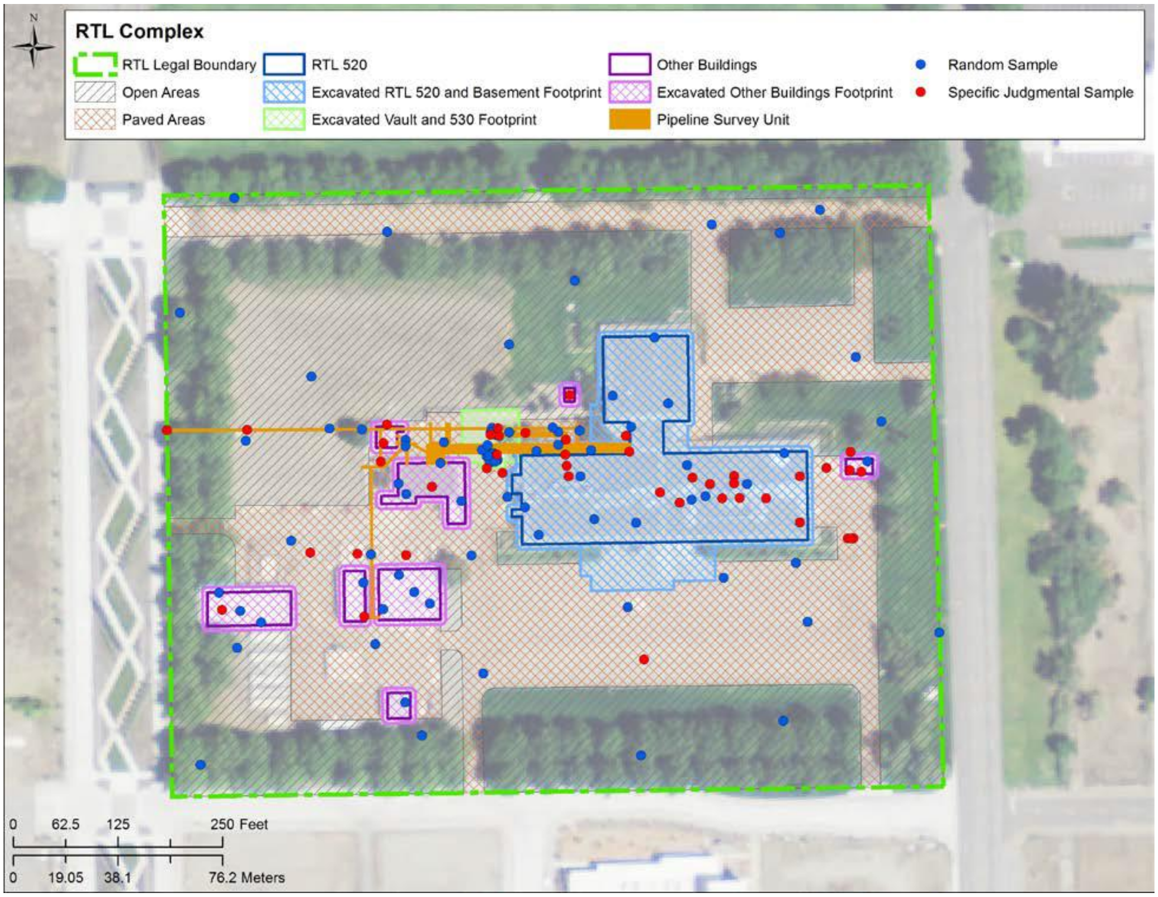

Figure 17. Summary of All Random and Specific Judgmental Samples for the RTL Complex

3.1.3 Partial Backfill and Site Stabilization

Following evaluation of the remaining soil, the site was stabilized by performing a partial backfill of the excavated areas with stockpiled soil. The stockpiled soil was sampled, analyzed, and the results compared to the release limits in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b) prior to backfill activities. All data for the soil were below the established release limits. Figure 18 depicts the partial backfill and site stabilization.

Figure 18. RTL Complex After Partial Backfill and Site Stabilization

3.1.4 Statement of Protectiveness

The remaining soil at the RTL complex has been sampled, analyzed, and evaluated, as delineated in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b). The results obtained through implementing the D4 alternative demonstrate that concentrations of COPCs in the soil at the RTL complex are less than established release limits (discussed in further detail in Chapter 5). These results also indicate that residual COPC concentrations support unrestricted land use. As summarized in Chapter 5, a review of the sampling results showed that the removal action at the RTL complex has demonstrated achievement of the applicable RAOs established in the action memorandum (DOE/RL-2010-22).

4 Chronology of Events

Table 5 presents a chronology of major events associated with D4 and verification sampling of the RTL complex. The chronology includes approval of the regulatory documents that form the basis of the removal action and key fieldwork activities associated with the removal action.

Table 5. Removal Action Chronology

Date	Event
February 2010	DOE/RL-2010-14, Rev. 0 *Engineering Evaluation/Cost Analysis for General Hanford Site Decommissioning Activities* (Approved)

Table 5. Removal Action Chronology

Date	Event
August 12, 2013	DOE/RL-2010-22, Rev. 1, *Action Memorandum for General Hanford Site Decommissioning Activities* (Approved)
April 4, 2013	DOE/RL-2010-34, Rev. 2, *Removal Action Work Plan for River Corridor General Decommissioning Activities* (Approved)
September 6, 2016	TPA-CN-0738, *Tri-Party Agreement Change Notice Form: DOE/RL-2010-34, Rev 2, Removal Action Work Plan for River Corridor General Decommissioning Activities* (Approved)
July 2017	Assessment, characterization, and removal of radiological and chemical hazards of the RTL complex commenced
November 12, 2018	D4 of the RTL complex completed
November 13, 2018	Verification sampling of the RTL site soils commenced
December 7, 2018	Verification sampling of the RTL site soils completed
January 31, 2019	Partial backfill and site stabilization completed

D4 = deactivation, decontamination, decommissioning, and demolition
RTL = Research Technology Laboratory

5 Performance Standards and Construction Quality Control

This chapter addresses the process for demonstrating achievement of performance standards, including attaining release limits and applicable RAOs and maintaining the required quality controls during removal activities.

5.1 Attainment of Performance Standards

Completion of the selected removal action alternative and soil sampling, laboratory analysis, and data evaluation conducted after removal activities confirm that the RTL complex meets the applicable RAOs identified in the action memorandum (DOE/RL-2010-22) (shown in Table 6) and that the residual COPC concentrations remaining in the soil are less than the release limits (summarized in Tables 7 and 8).

Table 6. Attainment of Applicable RAOs

RAO	Compliance Methods
RAO #1: Protect human and ecological receptors from exposure to soils and/or debris contaminated with hazardous substances above acceptable exposure levels.	Achieved through verification soil sampling performed upon completion of D4 activities, which demonstrated that all individual COPC concentrations are less than authorized release levels.

Table 6. Attainment of Applicable RAOs

RAO	Compliance Methods
RAO #2: Control the migration of contaminants from the buildings/structures and debris into the environment.	Achieved through air monitoring, decontamination, and control of D4 activities, including EPA approved demolition of non-friable asbestos, during the removal action according to the removal action elements of the RAWP (DOE/RL-2010-34). Verification soil sampling performed upon completion of D4 activities demonstrated that all individual COPC concentrations are less than authorized release levels.
RAO #3: Safely treat, as appropriate, and dispose of waste streams generated by the removal action.	Achieved through management of waste generated during the removal action according to the waste management provisions of the RAWP (DOE/RL-2010-34).
RAO #4: Reduce or eliminate the need for future surveillance, maintenance or periodic inspection activities.	Achieved through removal of the facilities, eliminating any surveillance and maintenance activities associated with the facilities. Verification soil sampling performed upon completion of D4 activities demonstrated that all individual COPC concentrations are less than authorized release levels.
RAO #5: Prevent adverse impacts to cultural and natural resources and threatened or endangered species, and minimize wildlife habitat disruption.	Achieved through cultural and ecological evaluations and implementation of considerations during removal activities to minimize wildlife habitat and cultural artifact disruption, as well as focused cultural monitoring performed during D4 activities and verification sampling.

Reference: DOE/RL-2010-34, *Removal Action Work Plan for River Corridor General Decommissioning Activities*.

COPC = contaminant of potential concern
D4 = deactivation, decontamination, decommissioning, and demolition
RAO = removal action objective
RAWP = removal action work plan

Table 7. Comparison of Verification Sample Results Against Action Levels and Release Limits for Radiological COPCs

Radionuclide	Action Level (pCi/g)	Release Limit (pCi/g)	Maximum Concentration in Soil (pCi/g)	Does the Maximum Exceed the Action Level or Release Limits?
Plutonium-238	600	800	0.238	No
Plutonium-239/240	555	740	0.032	No
Plutonium-241	22,500	30,000	5.46	No
Uranium-234	525	700	0.451	No
Uranium-235	45	60	0.0522	No
Uranium-238	210	280	0.337	No
Cobalt-60	2.8	3.7	0.109	No

Table 8. Comparison of Verification Sample Results Against Action Levels and Release Limits for Nonradiological COPCs

COPCs	Action Level (mg/kg)	Release Limit (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed the Action Level or Release Limits?
Aroclor 1016	1.8	2.0	0.012	No
Aroclor 1254	1.8	2.0	0.016	No
Aroclor 1260	1.8	2.0	0.016	No
Diesel-range organics	414	460	16.3	No
Gasoline-range organics	90	100	0.0324	No
4,4’-DDD	0.9	1	0.0024	No
4,4’-DDE	0.9	1	0.047	No
4,4’-DDT	0.9	1	0.024	No
Dieldrin	0.0563	1	0.012	No
Methylene chloride	0.018	0.02	0.00361	No
Arsenic (inorganic)	18	20	7.8	No
Beryllium	22.5	25	0.67	No
Cadmium	1.8	2	0.48	No
Chromium (total)	**37.8**	**42**	**52.6**	**Yes**

Table 8. Comparison of Verification Sample Results Against Action Levels and Release Limits for Nonradiological COPCs

COPCs	Action Level (mg/kg)	Release Limit (mg/kg)	Maximum Concentration in Soil (mg/kg)	Does the Maximum Exceed the Action Level or Release Limits?
Lead	198	220	26.4	No
Mercury	1.8	2	0.43	No
Zinc	243	270	143	No

Notes: A single chromium result from the J-4 location within the RTL 520 building survey unit exceeded the release limit (42 mg/kg) with a reported value of 52.6 mg/kg. A review of adjacent sample location results (maximum 13.2 mg/kg) and historical records found no evidence to explain the anomalous result. Therefore, a request was made for the performing laboratory to conduct a confirmatory analysis utilizing the remaining soil from sample J-4 using the same method of the initial analysis (SW-846 Method 6020B) and an alternate method (SW-846 Method 6010D). Analysis from the two methods reported values of 7.3 mg/kg and 6.9 mg/kg chromium respectively. The values reported from the rerun fall into the range of values observed throughout the four survey units.

The release limit of 42 mg/kg chromium is found in tables 749-2 and 749-3 of the Washington Administrative Code (WAC) 173-340-900 related to Priority Contaminants of Ecological Concern for Sites that Qualify for the Simplified Terrestrial Ecological Evaluation Procedure and Ecological Indicator Soil Concentrations for Protection of Terrestrial Plants and Animals. A footnote associated with the release value states that the benchmark value was replaced by the Washington State natural background concentration. Ecology Publication 94-115 described the study in which Ecology calculated natural background concentrations for 12 elements in Washington State using statewide 90th percentile values. Using the statewide background data set, the 90th percentile value for chromium was calculated to be 42 mg/kg. This means that 10% of the data set had values that exceed the 42 mg/kg with a maximum observed value of 100.3 mg/kg from the eastern region used in the study. Ecology Publication 94-115 also provides information on use and application of the background values within the report stating that no single sample concentration shall be greater than two times the 90th percentile value, if background values are used as cleanup levels. Given this statement, the anomalous chromium result of 52.6 mg/kg measured at location J-4 of the RTL 520 building survey unit was less than two times background (42 mg/kg) and should not be an adverse indicator for the overall data evaluation of COPC results toward the end state and does not pose a risk to release decision-making at the RTL complex.. (Golovich et al., 2019a) and (Golovich et al., 2019b)..

COPC = contaminant of potential concern

RTL = Research Technology Laboratory

5.1.1 Response Action Verification Objectives

Attainment of response action verification objectives involves comparing soil analytical data to the action levels and release limits identified in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b). Table 7 provides a direct comparison of the maximum analytical result for each radiological COPC against the established action levels and release limits for the RTL complex. Table 8 provides a direct comparison of the maximum analytical result for each nonradiological COPC against the established action levels and release limits for the RTL complex.

5.2 Construction Quality Assurance/Quality Control

Construction-related aspects were not implemented as part of the selected alternative for the RTL complex. Therefore, this section is not applicable.

5.3 Removal Action Verification Quality Assurance/Quality Control

A data quality assessment review was performed to compare the sampling approach and analytical data with the sampling and data requirements specified in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b). This review involves evaluation of the data to determine if they are of the right type, quality, and quantity to support the intended use. The assessment review completes the data lifecycle (i.e., planning, implementation, and assessment) that was initiated by the data quality process.

Level C data validation (as defined in the contractor's validation procedures) was performed for the entire sampling and analysis data set for the verification samples collected for the RTL complex. Level C validation is a review of the quality control data and specifically requires verification of deliverables requested analyses versus reported analyses and qualification of the results based on analytical holding times, method blank results, matrix spike/matrix spike duplicates, surrogate recoveries, duplicates, and analytical method blanks. Specific data quality objectives for the RTL complex are discussed in the survey report (Golovich et al., 2019a) and sampling report (Golovich et al., 2019b).

All of the sampling and analysis data generated from sampling at the RTL complex are tracked in the Hanford Environmental Information System (HEIS) database. Table 9 provides the HEIS sample numbers for all of the verification and quality assurance/quality control samples (sorted be survey unit). It should be noted that the equipment blanks were collected at the end of three sampling equipment cleaning events to prove the effectiveness of the cleaning process. The HEIS sample numbers for those events are also included in Table 9.

Table 9. HEIS Sample Numbers

520	Vault/530	Pipelines	Other Buildings	Outer Areas	Paved Areas	Layback Soil	Equipment Blanks
B3KF69	B3KL20	B3L1C3	B3L258	B3L2D4	B3L2V9	B3M413	B3MMP4
B3KF71	B3KL21	B3L1C4	B3L259	B3L2D5	B3L2W0	B3M414	B3MMP5
B3KF73	B3KL22	B3L1C5	B3L260	B3L2D6	B3L2W1	B3M415	B3MMP5A
B3KF75	B3KL23	B3L1C6	B3L261	B3L2D7	B3L2W2	B3M416	B3MMP6
B3KF77	B3KL24	B3L1C7	B3L262	B3L2D8	B3L2W3	B3M417	B3MMP7
B3KF79	B3KL25	B3L1C8	B3L263	B3L2D9	B3L2W4	B3M418	B3MMP8
B3KF81	B3KL26	B3L1C9	B3L264	B3L2F0	B3L2W5	B3M419	B3MMP9
B3KF83	B3KL27	B3L1D0	B3L265	B3L2F1	B3L2W6	B3M420	B3MMR0
B3KF85	B3KL28	B3L1D1	B3L266	B3L2F2	B3L2W7	B3M421	B3MMR1
B3KF87	B3KL29	B3L1D2	B3L267	B3L2F3	B3L2W8	B3M422	B3MMR2
B3KF89	B3KL30	B3L1D3	B3L268	B3L2F4	B3L2W9	B3M423	B3MMR3
B3KF91	B3KL31	B3L1D4	B3L269	B3L2F5	B3L2X0	B3M424	B3MMR4
B3KF93	B3KL32	B3L1D5	B3L270	B3L2F6	B3L2X1	B3M425	B3MMR5
B3KF95	B3KL33	B3L1D6	B3L271	B3L2F7	B3L2X2	B3M426	B3MMT1

Table 9. HEIS Sample Numbers

520	Vault/530	Pipelines	Other Buildings	Outer Areas	Paved Areas	Layback Soil	Equipment Blanks
B3KF97	B3KL34	B3L1D7	B3L272	B3L2F8	B3L2X3	B3M427	B3MMT2
B3KF99	B3KL35	B3L1D8	B3L273	B3L2F9	B3L2X4	B3M428	B3MMT3
B3KFB1	B3KL36	B3L1D9	B3L274	B3L2H0	B3L2X5	B3M429	—
B3KFB3	B3KL37	B3L1F0	B3L275	B3L2H1	B3L2Y0	B3M430	—
B3KFB5	B3KL38	B3L1F1	B3L276	B3L2H2	B3L2Y1	B3M431	—
B3KFB7	B3KL43	B3L1F2	B3L277	B3L2H3	B3L2Y2	B3M432	—
B3KFB9	B3KL44	B3L1F3	B3L278	B3L2H4	B3L2Y3	B3M433	—
B3KFC1	B3KL45	B3L1F4	B3L279	B3L2H5	B3L2Y4	B3M434	—
B3KFC3	B3KL48	B3L1F5	B3L280	B3L2H6	B3L2Y5	B3M435	—
B3KFC5	B3KL49	B3L1F6	B3L1T7	B3L2H7	B3L2Y6	B3M436	—
B3KFC7	B3KL50	B3L1F7	B3L1T8	B3L2J3	B3L2Y7	B3M437	—
B3KFC9	B3KL51	B3L1F8	B3L1T9	B3L2J4	B3L2Y8	B3M438	—
B3KFD1	B3KL52	B3L1H3	B3L1V0	B3L2J5	B3L2Y9	B3M439	—
B3KFD3	B3KL53	B3L1H4	B3L1V1	B3L2J6	B3L300	B3M440	—
B3KFF1	B3KL54	B3L1H5	B3L1V2	B3L2J7	B3L301	B3M441	—
B3KFF2	B3KL55	B3L1H6	B3L1V3	B3L2J8	B3L302	B3M442	—
B3KFF3	B3KL56	B3L1H7	B3L1V4	B3L2J9	B3L303	B3M443	—
B3KFF4	B3KL57	B3L1H8	B3L1V5	B3L2K0	B3L304	B3M444	—
B3KFF5	B3KL58	B3L1H9	B3L1V6	B3L2K1	B3L305	B3M445	—
B3KFF6	B3KL59	B3L1J0	B3L1V7	B3L2K2	B3L306	B3M446	—
B3KFF7	B3KL60	B3L1J1	B3L1V8	B3L2K3	B3L307	B3M447	—
B3KFF8	B3KL61	B3L1J2	B3L1V9	B3L2K4	B3L308	B3M448	—
B3KFF9	B3KL62	B3L1J3	B3L1W0	B3L2K5	B3L309	B3M449	—
B3KFH0	B3KL63	B3L1J4	B3L1W1	B3L2K6	B3L310	B3M450	—
B3KFH1	B3KL65	B3L1J5	B3L1W2	B3L2K7	B3L311	B3M451	—
B3KFH2	B3KL65A	B3L1J6	B3L1W3	B3L2K8	B3L312	B3M452	—
B3KFH3	B3KL66	B3L1J7	B3L1W4	B3L2K9	B3L313	B3M453	—
B3KFH4	B3KL66A	B3L1J8	B3L1W5	B3L2L0	B3L314	B3M454	—
B3KFH5	B3KL67	B3L1J9	B3L1W6	B3L2L1	B3L315	B3M455	—

Table 9. HEIS Sample Numbers

520	Vault/530	Pipelines	Other Buildings	Outer Areas	Paved Areas	Layback Soil	Equipment Blanks
B3KFH6	B3KL67A	B3L1K0	B3L1W7	B3L2L2	B3L316	B3M456	—
B3KFH7	B3KL70	B3L1K1	B3L1W8	B3L2L3	B3L317	B3M457	—
B3KFH8	B3KL70A	B3L1K2	B3L1W9	B3L2L4	B3L318	B3M458	—
B3KFH9	B3KL71	B3L1K3	B3L1X0	B3L2L5	B3L319	B3M459	—
B3KFJ0	B3KL71A	B3L1K4	B3L1X1	B3L2L6	B3L320	B3M460	—
B3KFJ1	B3KL72	B3L1K5	B3L1X2	B3L2L7	B3L321	B3M461	—
B3KFJ2	B3KL72A	B3L1K6	B3L1X3	B3L2L8	B3L322	B3M462	—
B3KFJ3	B3KL73	B3L1K7	B3L1X4	B3L2L9	B3L323	B3M463	—
B3KFJ4	B3KL73A	B3L1K8	B3L1X5	B3L2M0	B3L324	B3M464	—
B3KFJ5	B3KL74	B3L1K9	B3L1X6	B3L2M1	B3L325	B3M465	—
B3KFJ6	B3KL74A	B3L1L0	B3L1X7	B3L2M2	B3L326	B3M466	—
B3KFJ7	B3KL75	B3L1L1	B3L1X8	B3L2M3	B3L327	B3M467	—
B3KFJ8	B3KL75A	B3L1L2	B3L1X9	B3L2M4	B3L328	B3M468	—
B3KFJ9	B3KL76	B3L1L3	B3L1Y0	B3L2M5	B3L329	B3M469	—
B3KFK0	B3KL76A	B3L1L4	B3L1Y1	B3L2M6	B3L330	B3M470	—
B3KFK1	B3KL77	B3L1L5	B3L1Y2	B3L2M7	B3L331	B3M471	—
B3KFK2	B3KL77A	B3L1L6	B3L1Y3	B3L2M8	B3L332	B3M472	—
B3KFK3	B3KL78	B3L1L7	B3L1Y4	B3L2M9	B3L333	B3M478	—
B3KFK4	B3KL78A	B3L1L8	B3L1Y5	B3L2N0	B3L334	B3M480	—
B3KFK5	B3KL79	B3L1L9	B3L1Y6	B3L2N1	B3L336	B3MNB7	—
B3KFK6	B3KL79A	B3L1M0	B3L1Y7	B3L2N2	B3L337	B3MNB8	—
B3KFK7	B3KL80	B3L1M1	B3L1Y8	B3L2N3	B3L338	B3MNB9	—
B3KFK8	B3KL80A	B3L1M2	B3L1Y9	B3L2N4	B3L339	B3MNC0	—
B3KFK9	B3KL81	B3L1M3	B3L200	B3L2N5	B3L340	B3MNC1	—
B3KFL0	B3KL81A	B3L1M4	B3L201	B3L2N6	B3L344	B3MNC2	—
B3KFL1	B3KL82	B3L1M5	B3L202	B3L2N7	B3MN19	B3MNC3	—
B3KFL2	B3KL82A	B3L1M6	B3L203	B3L2N8	B3MN20	B3MNC4	—
B3KFL3	B3KL83	B3L1M7	B3L204	B3L2N9	B3MN21	B3MNC5	—
B3KFL4	B3KL83A	B3L1M8	B3L205	B3L2P0	B3MN22	B3MNC6	—

Table 9. HEIS Sample Numbers

520	Vault/530	Pipelines	Other Buildings	Outer Areas	Paved Areas	Layback Soil	Equipment Blanks
B3KFL5	B3KL84	B3L1M9	B3L206	B3L2P1	B3MN23	B3MNC7	—
B3KFL6	B3KL84A	B3L1N0	B3L207	B3L2P2	B3MN24	B3MNC8	—
B3KFL7	B3KL85	B3L1N1	B3L208	B3L2P3	B3MN25	B3MNC9	—
B3KFL8	B3KL85A	B3L1N2	B3L209	B3L2P4	B3MN26	B3MND0	—
B3KFL9	B3KL87	B3L1N3	B3L210	B3L2P5	B3MN27	B3MND1	—
B3KFM0	B3KL88	B3L1N4	B3L211	B3L2P6	B3MN28	—	—
B3KFM1	B3KL89	B3L1N5	B3L212	B3L2P7	B3MN29	—	—
B3KFM2	B3KL92	B3L1N6	B3L213	B3L2P8	B3MN30	—	—
B3KFM3	B3KL93	B3L1N7	B3L214	B3L2P9	B3MN31	—	—
B3KFM4	B3KL94	B3L1N8	B3L215	B3L2R0	B3MN32	—	—
B3KFM5	B3KL95	B3L1N9	B3L216	B3L2R1	B3MN33	—	—
B3KFM6	B3KL96	B3L1P0	B3L217	B3L2R2	B3MN35	—	—
B3KFM7	B3KL97	B3L1P1	B3L218	B3L2R3	—	—	—
B3KFM8	B3KL98	B3L1P2	B3L219	B3L2R4	—	—	—
B3KFM9	B3KL99	B3L1P3	B3L220	B3L2R5	—	—	—
B3KFN0	B3KLB0	B3L1P4	B3L221	B3L2R6	—	—	—
B3KFN1	B3KLB1	B3L1P5	B3L222	B3L2R7	—	—	—
B3KFN2	B3KLB2	B3L1P6	B3L223	B3L2R8	—	—	—
B3KFN3	B3KLB3	B3L1P7	B3L224	B3L2R9	—	—	—
B3KFN4	B3KLB4	B3L1P8	B3L225	B3L2T0	—	—	—
B3KFN5	B3KLB5	B3L1P9	B3L229	B3L2T1	—	—	—
B3KFN6	B3KLB6	B3L1R0	B3L230	B3L2T2	—	—	—
B3KFN7	B3KLB7	B3L1R1	B3MN37	B3L2T3	—	—	—
B3KFN8	B3KLC2	B3L1R2	B3MN38	B3L2T4	—	—	—
B3KFN9	B3KLC3	B3L1R3	B3MN39	B3L2V1	—	—	—
B3KFP0	B3KLC4	B3L1R4	B3MN40	B3MN81	—	—	—
B3KFP1	B3KLC5	B3L1R5	B3MN41	B3MN82	—	—	—
B3KFP2	—	B3L1R6	B3MN42	B3MN83	—	—	—
B3KFP3	—	B3L1R7	B3MN43	B3MN84	—	—	—

Table 9. HEIS Sample Numbers

520	Vault/530	Pipelines	Other Buildings	Outer Areas	Paved Areas	Layback Soil	Equipment Blanks
B3KFP4	—	B3L1R8	B3MN44	B3MN85	—	—	—
B3KFP5	—	B3L1R9	B3MN45	B3MN86	—	—	—
B3KFP6	—	B3L1T0	B3MN46	B3MN87	—	—	—
B3KFP7	—	B3L1T5	B3MN47	B3MN88	—	—	—
B3KFP8	—	B3MMT6	B3MN48	B3MN89	—	—	—
B3KFP9	—	B3MMT7	B3MN49	B3MN90	—	—	—
B3KFR0	—	B3MMT8	B3MN50	B3MN91	—	—	—
B3KFR1	—	B3MMT9	B3MN51	B3MN92	—	—	—
B3KFR2	—	B3MMV0	B3MN52	B3MN93	—	—	—
B3KFR3	—	B3MMV1	B3MN53	B3MN94	—	—	—
B3KFR4	—	B3MMV2	B3MN54	B3MN95	—	—	—
B3L185	—	B3MMV3	B3MN55	B3MN96	—	—	—
B3L187	—	B3MMV4	B3MN56	B3MN97	—	—	—
B3L191	—	B3MMV5	B3MN57	B3MN98	—	—	—
B3L192	—	B3MMV6	B3MN58	B3MN99	—	—	—
B3L193	—	B3MMV7	B3MN59	B3MNB0	—	—	—
B3L194	—	B3MMV8	—	B3MNB1	—	—	—
B3L195	—	B3MMV9	—	B3MNB2	—	—	—
B3L196	—	B3MMW0	—	B3MNB3	—	—	—
B3L1B0	—	B3MMW1	—	B3MNB4	—	—	—
B3L1B1	—	B3MMW2	—	—	—	—	—
B3MMX3	—	B3MMW3	—	—	—	—	—
B3MMX4	—	B3MMW4	—	—	—	—	—
B3MMX5	—	B3MMW5	—	—	—	—	—
B3MMX6	—	B3MMW6	—	—	—	—	—
B3MMX7	—	B3MMW7	—	—	—	—	—
B3MMX8	—	B3MMW8	—	—	—	—	—
B3MMX9	—	B3MMW9	—	—	—	—	—
B3MMY0	—	B3MMX0	—	—	—	—	—

Table 9. HEIS Sample Numbers

520	Vault/530	Pipelines	Other Buildings	Outer Areas	Paved Areas	Layback Soil	Equipment Blanks
B3MMY1	—	B3MMX1	—	—	—	—	—
B3MMY2	—	—	—	—	—	—	—
B3MMY3	—	—	—	—	—	—	—
B3MMY4	—	—	—	—	—	—	—
B3MMY5	—	—	—	—	—	—	—
B3MMY6	—	—	—	—	—	—	—
B3MMY7	—	—	—	—	—	—	—
B3MMY8	—	—	—	—	—	—	—
B3MMY9	—	—	—	—	—	—	—
B3MN00	—	—	—	—	—	—	—
B3MN01	—	—	—	—	—	—	—
B3MN02	—	—	—	—	—	—	—
B3MN03	—	—	—	—	—	—	—
B3MN04	—	—	—	—	—	—	—
B3MN05	—	—	—	—	—	—	—
B3MN06	—	—	—	—	—	—	—
B3MN07	—	—	—	—	—	—	—
B3MN08	—	—	—	—	—	—	—
B3MN09	—	—	—	—	—	—	—
B3MN10	—	—	—	—	—	—	—
B3MN11	—	—	—	—	—	—	—
B3MN12	—	—	—	—	—	—	—

5.4 Regulatory Oversight

While regulatory oversight was not required by the regulatory documents, EPA was kept appraised of the progress at the RTL Complex through each phase of the project. EPA also reviewed and approved the chemical sampling and analysis plan, the radiological survey plan (as described in the sampling report (Golovich et al., 2019b) and survey report (Golovich et al., 2019a), respectively), and the approach for demolition of non-friable asbestos containing materials.

6 Final Inspection and Certifications

No final inspection or certifications are required by the regulatory documents authorizing this removal action. Therefore, this chapter is not applicable.

7 Operation and Maintenance Activities

There are no operation and maintenance activities or monitoring requirements for the RTL complex. Therefore, this chapter is not applicable.

8 Summary of Project Costs

Table 10 presents the project costs for the RTL complex removal action, by fiscal year and in total cost, for the project.

Table 10. RTL Complex Removal Action Project Cost Summary

Cost Item	Actual Cost, Fiscal Year 2018	Actual Cost Fiscal Year 2019	Actual Total Cost
Removal action capital (construction) costs	$0	$0	$0
Removal action operating costs	$15,977,100	$1,996,900	$17,974,000
Total removal action cost	$15,977,100	$1,996,000	$17,974,000
Projected yearly operations and maintenance cost	$0	$0	$0

9 Observations and Lessons Learned

There were no observations or lessons learned applicable for inclusion in this report.

10 Contact Information

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