

**Waste Handling Plan
for the Demolition of Building 9720-17
at the Y-12 National Security Complex,
Oak Ridge, Tennessee**



May 2024

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Date Issued—May 2024

Prepared for the
U.S. Department of Energy
Office of Environmental Management

Prepared by
Consolidated Nuclear Security, LLC
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ACRONYMS

ACM	asbestos-containing material
Alliant	Alliant Corporation
ARARs	applicable or relevant and appropriate requirements
ASA	Auditable Safety Analysis
CDS	controlled data set
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CNS	Consolidated Nuclear Security, LLC
COC	contaminants of concern
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQA	data quality assessment
DQO	data quality objective
EM	Office of Environmental Management
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
EU	enriched uranium
ft ²	square feet
FFA	Federal Facility Agreement
HEU	highly enriched uranium
IH	industrial hygiene
LDR	Land Disposal Restrictions
lf	linear feet
LLW	low-level waste
mg/L	milligrams per liter
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
NSC	National Security Complex
OREM	Oak Ridge Office of Environmental Management
ORR	Oak Ridge Reservation
ORRLF	Oak Ridge Reservation Landfill
PA	Protected Area
PCB	Polychlorinated Biphenyl
PCCR	Phased Construction Completion Report
PK	process knowledge
PPE	personal protective equipment
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act of 1976
RSI	RSI Services, LLC
SAP	Sampling and Analysis Plan
SOF	sum of fractions
SRCs	site-related contaminants
SVOC	semivolatile organic compounds
TCLP	toxicity characteristic leaching procedure
TDEC	Tennessee Department of Environment and Conservation
TSCA	Toxic Substances Control Act of 1976
TSDF	treatment, storage, and disposal facility
UEFPC	Upper East Fork Poplar Creek

VOC	volatile organic compounds
VSP	Visual Sample Plan
WAC	waste acceptance criteria
WGF	Waste Generation Forecast
WHP	Waste Handling Plan
WPC	Waste Package Certifier
WL	Waste Lot
yd ³	cubic yards

1. INTRODUCTION

The *Federal Facility Agreement (FFA) for the Oak Ridge Reservation (ORR)* (U.S. Department of Energy [DOE]/OR-1014) requires the development of a Waste Handling Plan (WHP) that describes the sampling and characterization methodologies to be used in support of the development of waste profiles and disposition plans for response action waste disposal at the Environmental Management Waste Management Facility (EMWMF). This WHP presents the approach for managing low-level debris waste (LLW), polychlorinated biphenyl (PCB) bulk product, and asbestos waste generated from the demolition of Building 9720-17, at the Y-12 National Security Complex (NSC).

All data quality objectives (DQO), field sampling, laboratory analysis, data verification/validation, data quality assessment (DQA), and identification of disposition alternatives have been completed. The DQO, DQA, and planning associated with sampling and analysis and quality assurance were approved by the Consolidated Nuclear Security, LLC (CNS) Project Team, and the U.S. Environmental Protection Agency (EPA). Tennessee Department of Environment and Conservation (TDEC) representatives reserved concurrence pending submittal of the Waste Handling Plan.

Sampling and analysis were performed in accordance with Appendix A Sampling and Analysis Plan (SAP) which contains the Quality Assurance Project Plan (QAPP) and DQOs as appendices. A formal presentation for the 9720-17 DQOs was presented to the EPA and TDEC in July 2022. A formal data sharing session, including the DQA presentation, was held with the EPA and TDEC in July 2023. Approval of the 9720-17 waste lot (WL) planned for EMWMF disposal will be obtained in accordance with the *Attainment Plan for Risk/Toxicity-Based Waste Acceptance Criteria at the Oak Ridge Reservation, Oak Ridge, Tennessee* (DOE/OR/01-1909&D3).

Demolition of 9720-17 will be performed in accordance with an addendum to the Y-12 Facilities Deactivation/Demolition Removal Action Work Plan to be developed following Waste Handling Plan approval. A Phased Construction Completion Report (PCCR) will be developed at the conclusion of the 9720-17 demolition project in accordance with FFA protocol to document the removal action activities.

Management and disposition of generated radioactive waste at the EMWMF requires approval of this WHP by the FFA parties as a prerequisite.

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2. SCOPE

The scope of this removal action is to demolish the 9720-17 facility to the slab and dispose of the waste. Included in the project scope is the main 9720-17 building, the walls and roof of the east side loading dock, the walkway between buildings 9206 and 9720-17, the interior storage racks, miscellaneous utilities, and the ventilation/exhaust system. The concrete slab, exterior building 9744 exterior hoppers, fans and ductwork are not within the scope of this removal action. Further, internal hazardous waste (e.g., circuit boards, lead items, mercury switches, etc.), universal waste, heavy-duty safes, safe bottle carriers, safe bottle carrier storage rack, pallets and pallet cart are considered anomalous waste and are not part of the waste for onsite disposal. This demolition project is a Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) response action to mitigate potential risks associated with hazardous substance releases from historical operations that have resulted in contamination of the 9720-17 facility. This work is being performed as a non-time-critical removal action under the *Action Memorandum for the Y-12 Facilities Non-Time-Critical Removal Action Deactivation/Demolition Project, Oak Ridge, Tennessee* (DOE/OR/01-2462&D2).

Construction of Building 9720-17 was completed in November 1956 (Figure 1). Originally Building 9720-17 served as a storage facility for highly enriched uranium (HEU) and was later modified to store Resource Conservation and Recovery Act of 1976 (RCRA) materials.

Building 9720-17 is a one-story, 4,314 square feet rectangular building. The building is of steel frame construction and is set on a poured concrete foundation. The building has a gable roof of corrugated asbestos-cement panels and is clad in corrugated asbestos-cement panel siding.

Extending along the east is a poured concrete loading dock accessed by a set of metal steps lined with a metal handrail. The loading dock addition in the center of the east elevation was made in the 1980s, with a concrete block, flat-roof enclosure featuring a single bay filled by a sectional metal door on an overhead track.

The south elevation features four large vent openings filled with framed louvers, and an attached mechanical system of hoppers, fans, and ductwork at the southwest corner associated with Building 9744. This mechanical system at the southwest corner (and exterior) of Building 9720-17 was not part of the characterization scope. The north elevation has similar louvered vents.

The west elevation features a central window filled by a six-light awning window with a three-light fixed sash, flanked by louvered vents. Along the roof ridgeline is a series of four circular metal vent stacks.

At the northwest corner of the building is an enclosed passageway to Building 9206, with a shed roof and metal-panel siding; a double-leaf entry filled by a metal door accesses this passageway from Building 9720-17. The walkway from 9206 to 9720-17 was included in the characterization scope.

The interior of 9720-17 is considered empty minus four (4) heavy-duty storage safes, safe bottle carriers, safe bottle carrier storage rack, pallets, a pallet cart, and the HEU storage racks. Metal mesh panels line the walls and ceiling. Per historical radiological surveys of the facility, the walls and roof were expected to have removable radiological contamination. Due to this radiological survey data, considering the historical mission of the facility, and utilizing the waste hierarchy, it was expected the 9720-17 facility waste would require disposal at EMWMF.



Figure 1. Plan View of Building 9720-17



Figure 2. Building 9720-17 facility structure looking northwest (Master Site Planning)

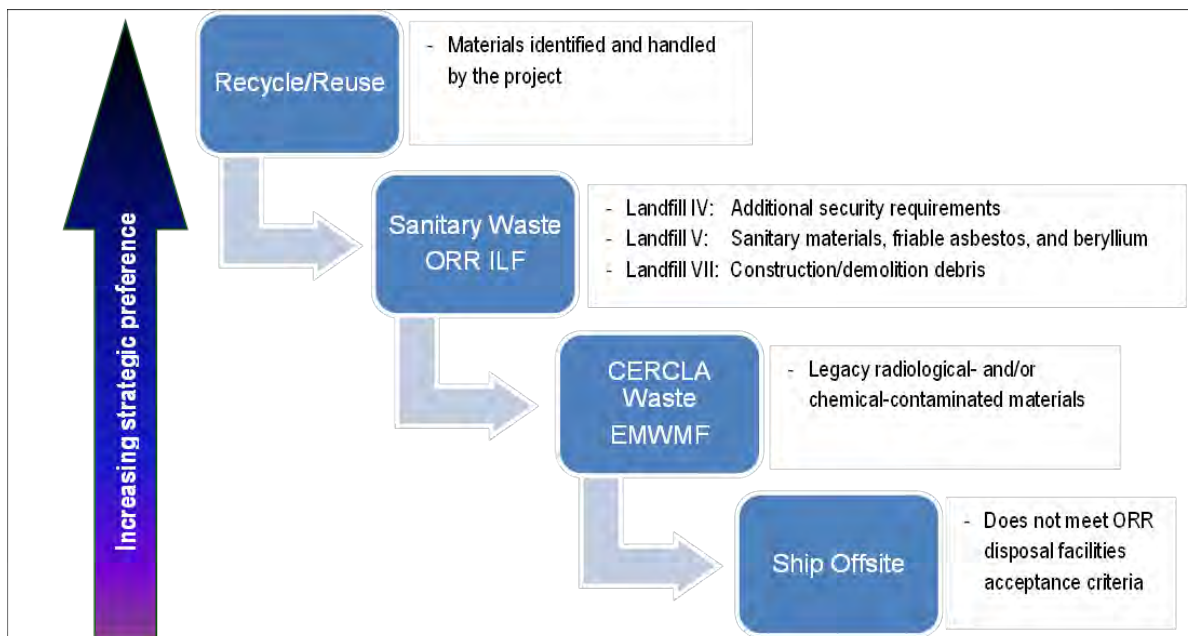
Waste was characterized for disposal in accordance with the waste hierarchy shown in Figure 3. Based on the DQA, the expected 9720-17 waste types include:

- facility structural materials (e.g., heavy structural steel, steel supports, light gauge metal, mesh panels, columns, beams, supports, miscellaneous metal, etc.)
- concrete blocks (from the east loading dock walls and roof)
- miscellaneous items (e.g., electrical components, vents, piping, heaters, fans, HEU storage racks, etc.)
- minimal wood structural material
- asbestos containing material (e.g., caulk, gaskets, paint, pipe fittings, pipe insulation), and transite siding and roofing.

The 9720-17 facility demolition debris generated by the project is expected to meet the Waste Acceptance Criteria (WAC) for the EMWMF. The debris waste was not compliant with the Oak Ridge Reservation Sanitary and Industrial Landfill (ORRLF) WAC due to elevated detections in various radionuclides. Anomalous waste will require disposal at the Nevada National Security Site (NNSS) or another approved offsite treatment, storage, and disposal facility (TSDF) using project characterization data, or additional data collected under a separate DQO.

2.1 ESTIMATED VOLUMES

The current waste generation forecast (WGF) for 9720-17 includes an estimated total volume of 379 cubic yards (yd³) to be generated and disposed. The estimated volumes by waste type and disposition outlet are provided in Table 1.



ORR ILF = Oak Ridge Reservation Landfill

Figure 3. Waste Hierarchy

Table 1. Waste Generation Estimates for 9720-17 Demolition

Waste Type	Waste Description	Destination Facility	Amount	Units
LLW, PCB Bulk Product, ACM	Structural and utility system metal debris, Transite roof/walls, concrete, wood, miscellaneous ventilation system metal, paint, caulk, pipe insulation, secondary waste (e.g., PPE)	EMWMF	275	yd ³
Anomalous Items	Storage safes, safe bottle carriers, storage racks, pallets, pallet cart	NNSS or other CERCLA Off-Site Rule Approved Facility	100	yd ³
Anomalous Items	Hazardous and universal waste items	CERCLA Off-Site Rule Approved Facility	<3.6	yd ³

ACM = asbestos -containing material
 EMWMF = Environmental Management Waste Management Facility
 LLW = low-level waste
 NNSS = Nevada National Security Site
 PCB = polychlorinated biphenyl
 yd³ = cubic yards

The Toxic Substances Control Act of 1976 (TSCA) regulated wastes such as polychlorinated biphenyl (PCB) bulk product are anticipated to be generated during demolition. These TSCA-regulated streams are allowed at the EMWMF for disposal. It should be noted that PCB light ballasts are acceptable for disposal at EMWMF as PCB bulk product waste or PCB remediation waste, provided they do not contain Aroclor¹ 1221 and/or 1232. Neither of these Aroclors were predominantly used at Y-12, and historical sampling has confirmed their absence. These two Aroclors will be considered non-site-related contaminants (SRCs) per historical process knowledge (PK) at the Y-12 NSC.

Approval of this WHP will facilitate disposition of contaminated demolition waste to the EMWMF. This WHP describes the waste characterization process and the existing information that was used to qualify waste for acceptance at the EMWMF. Specific approval of the 9720-17 WL for EMWMF disposal will fall under the process described in the *Attainment Plan for Risk/Toxicity-Based Waste Acceptance Criteria at the Oak Ridge Reservation, Oak Ridge, Tennessee* (DOE/OR/01-1909&D3). The demolition approach will be described in an addendum to the Removal Action Work Plan for Building 9720-17.

2.2 SCHEDULE

The planning schedule for demolition of 9720-17 includes, but is not limited to, the activities in Table 2.

¹ Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof or its contractors or subcontractors.

Table 2. Planned Project Schedule

Activity	Estimated Date
Submit WHP D1	06/2024
Obtain approved EMWMF waste profile	08/2024
Submit addendum to the Removal Action Work Plan	11/2024
Initiate demolition	06/2025
Submit Phased Construction Completion Report D1	06/2026

EMWMF = Environmental Management Waste Management Facility
WHP = Waste Handling Plan

2.3 ORGANIZATION—ROLES AND RESPONSIBILITIES

The National Nuclear Security Administration (NNSA) is responsible for the demolition of the 9720-17 facility. The associated CERCLA documents will be prepared by NNSA and submitted to the Oak Ridge Office of Environmental Management (OREM) for inclusion in the Administrative Record and transmittal to the Project Team for review and approval, as required by FFA document protocol. CNS, the Y-12 management, and operating contractor for NNSA, will perform planning activities, project oversight, and procuring services for specialty subcontractors as necessary, including facility characterization, demolition, mitigation of radioactive materials and universal waste, abatement of asbestos-containing material (ACM), and waste transportation for treatment, storage, disposal, or recycling. All waste will be managed in compliance with applicable Federal and State regulations, DOE Orders, and the applicable or relevant and appropriate requirements (ARARs) contained in DOE/OR/01-2462&D2. Key contacts for this project are shown in Table 3.

Table 3. Project Roles

Project Role	Name
DOE EM Y-12 Federal Project Director	Brian Henry
DOE NNSA Y-12 Field Office Project Manager	Mark Shirley
U.S. Environmental Protection Agency	Jon Richards
Tennessee Department of Environment and Conservation	Cody Juneau
CNS Project Manager	Barry Parsons
UCOR Waste Acceptance Criteria Manager	Doug Hanahan

CNS = Consolidated Nuclear Security, LLC
DOE = U.S. Department of Energy
EM = Office of Environmental Management
FFA = Federal Facility Agreement
NNSA = National Nuclear Security Administration
UCOR = United Cleanup Oak Ridge LLC

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3. SITE BACKGROUND AND PHYSICAL SETTING

3.1 PHYSICAL SETTING

The 34,516-acre DOE ORR is located within and adjacent to the corporate limits of the city of Oak Ridge, Tennessee, in Roane and Anderson counties. The ORR is bounded on the east, south, and west by the Clinch River, and on the north by the developed portion of the city of Oak Ridge. The ORR hosts three major industrial research and production facilities originally constructed as part of the World War II-era Manhattan Project, including the East Tennessee Technology Park (formerly the K-25 Site), Oak Ridge National Laboratory (formerly X-10), and the Y-12 NSC.

The Y-12 NSC is an active manufacturing and developmental engineering facility. It occupies approximately 600 acres within Bear Creek Valley near the northeast corner of the ORR, adjacent to the city of Oak Ridge. Built in 1943 by the U.S. Army Corps of Engineers as part of the World War II era Manhattan Project, the original mission of Y-12 was to separate fissile U-235 from U-238 using an electromagnetic separation process (calutron process) and manufacture weapon components for the national effort to produce the atomic bomb. As other uranium enrichment processes were developed and implemented at other installations, the role of Y-12 expanded to include weapon components manufacturing and precision machining, research and development, lithium isotope separation, and special nuclear material storage and management. Historical process, programs, and waste management practices associated with the Y-12 mission have contaminated buildings and environmental media. Some of these processes include the following:

- Isotope separation techniques
- Weapons manufacturing
- Research and development
- Waste storage, management, and disposal
- Physical plant maintenance activities

The current mission of the installation is multifaceted and includes the following NNSA assignments: manufacturing and reworking nuclear weapons components, dismantling nuclear weapons components, serving as the nation's stockpile for special nuclear material, and providing special production support to other programs. More than 50% of the facilities in use at Y-12 were constructed before 1953, making them more than 70 years old. Many of the facilities were designed and built as temporary structures and were expected to be used until the end of World War II. Consequently, a significant recapitalization and rehabilitation program is necessary to ensure Y-12 meets its national security mission.

The NNSA is embarking on a significant facility and infrastructure modernization program at Y-12. Objectives of the program include the following:

- Consolidate operations to reduce footprint and maintenance costs
- Reuse and upgrade facilities and site infrastructure systems to be used in the future
- Replace facilities when it is the most cost-effective alternative
- Disposition of surplus facilities and materials (infrastructure reduction)

3.2 BUILDING 9720-17

A portion of the site infrastructure reduction involves the demolition of the 9720-17 Building. Contamination of 9720-17 likely resulted from the following historical uses.

Construction of Building 9720-17 was completed in November 1956 (Table 4). Building 9720-17 is connected by an enclosed walkway/vestibule to Building 9206, which was constructed in 1944 as a uranium processing and production facility for the Manhattan Project. Originally Building 9720-17 served as a storage facility for HEU. It was later used to store RCRA materials.

The following excerpts from EC-NP-004 provide information about changes to Building 9720 17.

- In the late 1970s several changes were planned for the building, including covering windows and louvered vents with security screens, and enclosing the passageway between Buildings 9720-17 and 9206 (Black & Veatch Consulting Engineers, “Oak Ridge Y-12 Plant, Building 9720-17: Closure & Control,” 1978).
- In the 1980s, a single-bay concrete block loading dock addition was made to the east elevation (Black & Veatch, “MAA Docks and Vestibules: Plans, Elevations, Sections, and Details,” 1987). A drawing dated 1995 shows the building’s planned use for storing containers of hazardous waste per RCRA, in the form of solutions and residues, in bottles and canisters (Martin Marietta, “RCRA Part B Permit: Building 9720-17, Floor Plan,” 1995).

Table 4. Summary Information for 9720-17 Demolition

Facility Number	Description	Gross ft ²	No. of Floors	Year Built
9720-17	Storage Building	4,314	1	1956

ft² = Square feet

No. = number

In addition to EC-NP-004, historical documentation consisted of a PK and Characterization Summary form completed for Building 9720-17 in 2020, historical radiological survey data, and historical asbestos survey data available on various building materials. The PK and Characterization Summary form included the following excerpts:

- The facility was used to store enriched uranium (EU) and RCRA materials in support of uranium recovery operations in adjacent Building 9206.
- The facility has radiological contamination and potential for both RCRA/TSCA and RCRA/TSCA mixed waste based on historical use.
- Asbestos surveys and building drawings have indicated asbestos transite siding associated with the corridor and with the roofing, as well as caulk, gaskets, paint, and pipe insulation. Additional surveys will be required prior to decontamination and decommissioning (D&D). No PCB or lead PK information has been located. However, based on the age of the building, PCB ballasts and potential PCB oils may be present and lead based materials/components may also exist.

4. DATA QUALITY ASSESSMENT AND WASTE ACCEPTANCE CRITERIA

4.1 SUMMARY OF REGULATOR MEETINGS

On July 27, 2023, a formal DQA meeting was held with OREM, CNS, TDEC, EPA, RSI Services, LLC (RSI), and Alliant Corporation (Alliant) personnel. A review of the building 9720-17 DQO was completed, and specifics of the 9720-17 project, the DQA process, the characterization data summary, and the path forward and project schedule were presented. The DQA meeting summary is provided in Appendix B of this WHP. The following sections summarize the DQA meeting.

4.2 DQA CHARACTERIZATION SUMMARY

Assessment and characterization of potential hazardous substances is required as part of the process to prepare 9720-17 for demolition. This characterization process included performing due diligence to assemble PK, perform facility walk-downs, and to compare contaminant nature and extent to similar buildings at Y-12 that have been characterized and demolished. The evaluation of available characterization information has been used to determine the likely disposition route for different waste streams, and to ensure that proper work controls are implemented for the sampling/characterization team, asbestos abatement workers, and demolition workers.

Building 9720-17 resides within the Y-12 Complex Protected Area (PA) and is adjacent to Building 9206. In order to demolish and dispose of 9720-17, the facility required individual characterization and the resulting data would need assessment for disposal decisions. The SAP documented all DQO decisions such as material types, the sample target population, statistical confidence and coverage, laboratory analyses lists, sampling methodology, logbook requirements, etc.

Building 9720-17 was considered one large and homogenous population, with a sample target population that included: interior structural material (e.g., walls and ceiling metal mesh, structural metal columns, beams and supports, metal HEU storage racks (Figure 4)), exterior transite facility walls and roof, concrete (i.e., the east loading dock walls and roof), minimal wood material in the breezeway walls (Figure 5), and minimal interior ventilation system metal. Due to PK that was collected and reviewed, radiological (e.g., specifically uranium and thorium) was expected to be the main contaminants, with heavy metals and various potential chemicals as secondary contaminants. A random, statistical based sampling strategy that included all waste types within the facility was chosen to characterize the 9720-17 facility. Biased samples would be collected as necessary depending on other waste discovered in the facility. The concrete slab, exterior building 9744 hoppers, fans, and ductwork, as well as the interior heavy-duty storage safes (Figure 6), safe bottle carriers, safe bottle carrier storage rack, pallets and pallet cart (Figure 7) were not part of the characterization scope. Further, hazardous waste such as circuit boards and switches, as well as universal waste were not sampled. These items will be removed prior to demolition and sent for disposal in an appropriate facility.



Figure 4. HEU storage racks (YPH-24-1150967)



Figure 5. Breezeway (YPH-24-1150958)



Figure 6. Storage safes (YPH-24-1150974)



Figure 7. Safe bottle carriers and storage rack, pallets, and pallet cart (YPH-18-810989)

A non-parametric, hypergeometric model with a statistical 95% confidence and 90% coverage (95/90) was utilized (note the EMWMF requirement is 95/80). Twenty-nine (29) randomly selected statistical samples were planned to be collected from the target population, with a weighted number of samples per waste type and determined by the total volume of the waste material (i.e., larger volume waste types had more sample representation, lesser volume waste types had less sample representation). All expected waste types were represented in the sample campaign presented. The random locations were selected using Visual Sample Plan (VSP). The following is a summary of the 29-sample statistical based campaign:

- Structural Material: 55% volume and 16 total samples
 - Interior mesh walls – 4 samples
 - Interior mesh ceiling – 4 samples
 - Structural columns, beams and supports – 4 samples
 - HEU storage racks – 4 samples
- Transite Material: 25% volume and 7 total samples
 - Exterior Walls – 4 samples
 - Exterior Roof – 3 samples
- Concrete Material: 10% volume and 3 total samples
 - Loading dock walls – 2 samples
 - Loading dock roof – 1 sample
- Wood Material: 7% volume and 2 total samples
 - Framing in walls – 1 sample
 - Walkway roof between 9206 and 9720-17 – 1 sample
- Miscellaneous Material: <3% volume and 1 total sample
 - Ventilation System – 1 sample
- Additional biased samples were planned to be collected as necessary (e.g., different colored paint, wall insulation, etc.).

The DQA was consistent with current DQA methodology and summarized the DQO plans, all field characterization activities, the resulting data, data conditioning, statistical evaluations, proposed waste decisions, and data summaries. All sampling for the 9720-17 facility was performed in accordance with the project SAP (included as Appendix A). The data collected was in accordance with the DQO agreements and was verified and validated per the SAP requirements. A controlled data set (CDS) was generated and placed under project configuration control. The CDS was compared to the sampler's logbook summary, and all twenty-nine (29) statistical-based samples were collected as planned. Two (2) additional biased paint samples were collected to represent all paint colors in the 9720-17 facility. One (1) additional biased sample of wall insulation was collected inside the walkway wall between Buildings 9206 and 9720-17 to represent all waste types in the 9720-17 facility. RSI collected a total of thirty-two (32) characterization samples and there were no issues noted with the field sampling event.

The final CDS was reviewed for all analysis types (e.g., radionuclides, total metals, toxicity characteristic leaching procedure (TCLP) metals, Total/TCLP volatile and semivolatile organics, Total/TCLP herbicides and pesticides). The CDS was summarized, and all individual parameters were reviewed such as detections, detection locations, estimated values, (i.e., J-flags), non-detects (i.e., U-flags), etc. Potential contaminants of concern (COC) and/or potential SRCs were flagged and further investigated. Maximum detections were noted and compared to the potential disposal facility (e.g., ORRLF and EMWMF) WAC. For each COC/SRC, the sampler's logbook was consulted to see where the maximum detections were located, what type of waste it represented, and for any other relevant information about the sample. It was hypothesized during the initial data evaluation that the maximum radionuclide detections were too elevated for ORRLF disposal. The radiological data was compared to the ORRLF S-040 criteria and due to many elevated

detections, the 9720-17 waste was rendered non-compliant with the ORRLF WAC. At this stage of the project, the focus for debris waste disposal became the EMWMF and identifying potential SRCs.

The following subsections present the DQA results, and SRCs as identified in the DQA.

4.2.1 Asbestos Summary

An accredited CNS asbestos inspector inspected the 9720-17 facility/structure to identify potential ACM. Historical asbestos reports were reviewed during the PK collection phase of the project. Asbestos was known to be present based on historical surveys and therefore, characterization to identify/quantify ACM was not included in the SAP or performed. However, additional characterization of asbestos waste types for other potential contaminants (e.g., radionuclides, metals, VOC/SVOC, etc.) was included in the SAP to meet the EMWMF WAC. Statistical based samples were taken from the transite exterior walls and exterior roof. Additionally, a biased sample was taken from wall insulation discovered in the walkway wall between Buildings 9206 and 9720-17. The CNS asbestos inspector verified the walkway wall insulation was not suspected of ACM (i.e., it was commonly found yellow roll-type insulation). The 9720-17 facility also contains ACM items such as caulk, paint, and pipe insulation previously identified by the CNS asbestos inspector. Regulated Asbestos Containing Material and Category II non-friable asbestos-containing transite panels will be removed prior to demolition as shown in Table 5 below. All ACM items will be packaged and transported in accordance with the EMWMF Physical WAC.

Table 5. Summary Asbestos Information for 9720-17 Demolition

ACM Category	Description	Amount	Unit	Remove Prior to Demo	Will not Remove	Requires Management During Demo
RACM	Pipe Insulation	195	lf	X		
Category II	Transite Panels	8000	ft ²	X		
Category II	Caulk	12	ft ²		X	
Category II	Paint	950	ft ²		X	

RACM = Regulated Asbestos-Containing Material
lf = linear feet
ft² = square feet

4.2.2 Radiological SRC Summary

As PK indicated, and presented in the original DQO, uranium isotopes were the primary source of radiological contamination, while other isotopes had minimal detections. Uranium isotopes U-233/234, U-235/236, and U-238 are the primary radiological SRCs, with Cesium-137 (5 detections), Technetium-99 (1 detection), various Thorium isotopes, and other radionuclide isotopes in very lower concentrations. The radiological contamination confirmed with analytical characterization data was within the PK-based expectations for the 9720-17 facility. The radiological contamination from 9720-17 was too elevated for onsite ORRLF disposal but is anticipated to produce a low sum of fraction (SOF) WL for EMWMF disposal.

4.2.3 Metals SRC Summary

As expected, heavy metals such as, but not limited to, antimony, beryllium, chromium, lead, manganese, and strontium were identified as SRCs. Chromium, lead, and manganese are anticipated to be the primary metal SRCs. The metals identified in the DQA are typically found in construction materials of this type and

age and were not in concentrations that were unexpected. All TCLP metal maximum detections were under the regulatory limits except chromium. Chromium had six (6) results over the regulatory limit of 5.0 milligrams per liter [mg/L] in a range of 5.86-16.1 mg/L. All elevated TCLP chromium results were from grey painted metal throughout the 9720-17 facility. The chromium TCLP data were assessed using EPA ProUCL version 5.2, and the UCL-90 result was 4.561 mg/L, which is under the 5.0 mg/L limit. The waste is considered RCRA Land Disposal Restrictions (LDR) compliant, and the decision will be documented in the EMWMF WL profile.

4.2.4 Volatile organic compounds/Semivolatile organic compounds

As expected in a mainly metal debris waste population, only one (1) volatile organic compound (VOC) or semivolatile organic compound (SVOC) was detected (e.g., Di-n-butyl-phthalate, with three (3) total detections). All other VOCs/SVOCs were 100% non-detected. Di-n-butyl-phthalate is the only anticipated SRC contributor with VOC/SVOC contamination and with very low results. All other VOC/SVOCs with any suspected detections were J-flag (i.e., estimated) detections and will be eliminated as SRCs.

All TCLP VOC/SVOCs were 100% non-detected.

4.2.5 Herbicides and Pesticides

TCLP and Total Herbicides and Pesticides were 100% non-detected.

4.3 IDENTIFICATION OF DATA GAPS FOR WAC ATTAINMENT

The DQO process described in DOE/OR/01-1909&D3, which directly incorporates EPA DQO guidance, was used to guide the development of the SAP. The DQOs, which provide the detailed approach used to characterize Building 9720-17 for disposal, and the QAPP, which contains the laboratory direction and quality aspects, are contained in the SAP which is included as Appendix A in this WHP.

PK and project analytical data will be used to identify or eliminate potential EMWMF SRCs that have been evaluated under this WHP and, if necessary, in subsequent waste profiles. The waste characterization was determined to be adequate to develop a waste profile of the appropriate form and format to meet EMWMF disposal facility WAC. The 32 total samples collected from the 9720-17 facility have filled 100% of previously identified data gaps and were included in the EMWMF WAC analysis. The minimal SRCs identified in the DQA were, as expected, radionuclides, heavy metals and one (1) SVOC. The data collected in accordance with the approved DQO and SAP filled all the 9720-17 facility data gaps. No additional data gaps were identified during the DQA development. The data gathered in the 9720-17 characterization event confirmed the PK-based data expectations. Based on the data collected, and the resulting DQA, the EMWMF is the appropriate option for disposition of the 9720-17 demolition waste.

5. CHARACTERIZATION APPROACH

5.1 SAMPLING APPROACH

The characterization approach comprised developing and implementing a SAP and QAPP to implement the DQOs. The SAP, which contains the QAPP and DQOs as appendices, is included as Appendix A to this WHP. The SAP and QAPP were approved by the EPA and TDEC. The field characterization sampling was completed in February 2023. Samples were analyzed at GEL laboratory. All data was verified to be contract compliant, and 10% of the data was validated at Validation Support Level IV (full validation) per the DQO agreement.

5.2 DATA QUALITY ASSESSMENT

A DQA was performed for the 9720-17 structure demolition waste for anticipated disposal in the EMWMF. A formal presentation and data sharing session, including the DQA, was provided to the OREM, EPA, TDEC, and the EMWMF WAC Attainment team in July 2023 (see Appendix B). EPA guidance (EPA/240/B-06/002, EPA 240/B-06/003) was followed in developing the DQA.

5.2.1 EMWMF Administrative WAC

CERCLA documentation:

- DOE/OR/01-2462&D2, *Action Memorandum for the Y-12 Facilities Non-Time-Critical Removal Action Deactivation/Demolition Project, Oak Ridge, Tennessee.*

RCRA LDR Compliant:

- Chromium had six (6) maximum detections over the regulatory limit (e.g., 5.86, 6.7, 6.83, 8.6, 11.4, and 16.1 mg/L)
- The UCL-90 for all TCLP Chromium results was 4.561 mg/L and the waste is considered compliant with the RCRA LDRs
- No other TCLP maximums above the corresponding TCLP limit
- TCLP VOC/SVOC 100% non-detected
- TCLP herbicides and pesticides 100% non-detected

TSCA Compliant:

- PK indicates due to the age of the facility, there is the potential for PCB contamination due to painted surfaces, ballasts, and caulk
- The WL will be considered bulk product PCB waste
- Documented PK for absence of Aroclor 1221 & 1232 on the Y-12 NSC site

LLW only:

- No transuranic waste, high-level waste, 11(e)2 byproduct waste, or spent fuel rod waste

5.2.2 EMWMF Analytical and ASA WAC

Minimal anticipated SRCs were identified, and all were in low concentrations. The expected radionuclides, total metals, and one (1) SVOC were confirmed. No SRCs were identified without an established Analytic WAC. All the SRCs contributing to the SOFs were expected/anticipated in accordance with the PK gathered for the facility and subsequently presented in the project DQO and DQA. The Carcinogenic (CA) SOF main was calculated at 0.06, and the Hazard Index (HI) SOF was calculated at 0.16. The main Hazard

Index contributors are antimony (71%), molybdenum (13%), manganese (5%), lead (4%), vanadium (2%), boron (2%), chromium (2), barium (1%) and Uranium-238 (1%), with additional minor contributions from strontium and tin, as well as Uranium-233, Uranium-234, Uranium-233/234, Uranium-235, Uranium-236, and di-n-butyl phthalate. The main Carcinogenic contributors are Tc-99 (71%), Uranium-233/234 (21%), Uranium-235 (3%), Uranium-236 (3%), Uranium-238 (2%), with additional minor contributions from Uranium-233 and Uranium-234.

5.2.3 EMWMF Physical WAC

The waste will consist of structural metal (e.g., steel supports, sheet metal, mesh walls, mesh ceiling, storage racks, etc.), transite exterior wall and roof, concrete debris, minimal wood framing, and minimal miscellaneous metal from the ventilation system, and other ACM items (e.g., caulk, gaskets, paint, pipe fittings and pipe insulation). The waste volume is 275 yd³. Established physical WAC blanket variances will be utilized; however, no new physical WAC variances are expected. Compliance with the EMWMF Physical WAC will be performed following completion of WL profile Readiness to Ship Checklist(s).

5.3 ANOMALY DETECTION AND VERIFICATION

A formal anomaly detection plan will be submitted with the WL waste profile, and it will be used for all waste management activities discussed in this WHP. Anomaly detection plans describe project personnel responsibilities and training requirements and will identify what actions will be conducted to ensure no anomalous waste is sent to the EMWMF. This plan also will describe the process that will be followed if anomalous waste is shipped to the EMWMF for disposal. Only waste identified and characterized as part of an approved profile will be packaged and shipped. Any suspect or identified anomalous waste will be segregated and managed separately after review by trained project personnel and disposal facility representatives.

Anomalous waste is planned to be removed prior to facility demolition. Examples of anomalous materials include the four (4) heavy-duty storage safes, safe bottle carriers, safe bottle carrier storage racks, pallets, pallet cart, universal waste, hazardous waste (e.g., lead items, circuit boards, switches, etc.), liquids, and any other waste not included in the approved waste profile(s). Detection of anomalous materials will require further review by project personnel in collaboration with disposal facility experts and may require preparation of a new waste profile or modification of an existing profile.

All project personnel will take particular care to ensure no unacceptable levels of free liquids exist in the waste form and/or within the waste package or conveyance. Liberal use of absorbents is encouraged.

5.3.1 Radiological Anomaly Detection Process

Waste destined for EMWMF will be characterized and will have an approved EMWMF WL profile. Limited radiological surveys will be performed for U.S. Department of Transportation (DOT) and Price Anderson Amendment Acts of 1988 compliance purposes on waste destined for EMWMF.

6. WASTE MANAGEMENT

This section summarizes anticipated waste management activities that will occur during demolition of the 9720-17 facility.

6.1 TYPES/FORMS OF WASTE TO BE GENERATED

This demolition project anticipates that approximately two waste types/forms will be generated during the 9720-17 demolition project. The waste types/forms to be generated include the following:

1) Demolition debris and secondary waste (e.g., Personal Protective Equipment [PPE] and decontamination waste)

The waste to be generated is solid waste that will require disposal at the EMWMF due to radiological contamination that exceeds the ORRLF WAC. The waste will be low-level, PCB bulk product, and asbestos waste comprising building material demolition debris, structural metal (e.g., steel supports, metal mesh walls/ceiling, storage racks), transite walls and roof, ACM items (e.g., caulk, gaskets, paint, pipe fittings and pipe insulation), concrete from the east loading dock walls and roof, wood framing, miscellaneous material (e.g., ventilation system metal), and secondary waste (e.g., PPE and demolition decontamination wastes). All ACM waste will be packaged per EMWMF specifications.

2) Anomalous waste

The heavy-duty storage safes, safe bottle carriers, safe bottle carrier storage rack, pallets, and pallet carts will be removed and segregated prior to demolition. Hazardous waste items such as lead flashing and transite bolt covers, and circuit boards, as well as all universal waste such as mercury switches and lamps will be removed prior to demolition. Any other anomalous waste identified during demolition or during container packaging will be segregated and managed for alternate disposal.

6.2 NUMBER OF WASTE STREAMS/LOTS AND WASTE QUANTITIES PER WASTE STREAM/LOT

Based on analytical data obtained from implementation of the DQO, SAP, and DQA, the 9720-17 demolition project debris designated for EMWMF is expected to be grouped into one (1) WL for disposal. The 275 yd³ of general building demolition debris, asbestos insulation, exterior transite, and secondary waste will be included in WL 302.5.

6.3 WASTE CONTAINERS

Typical containers (e.g., drums, boxes) are not anticipated for use during waste shipments to EMWMF. Demolition debris and secondary waste will be shipped to EMWMF in bulk using dump trucks. Transite panels will be wrapped in plastic and shipped on flatbed trucks per the EMWMF Physical WAC criteria.

6.4 WASTE PACKAGING, INSPECTION, AND CERTIFICATION

Waste packaging, inspection, screening, and certification activities will be implemented using a graded approach based on the risk to workers, the environment, and the public. All waste generation activities and

loading of each container/shipment will be conducted under the supervision of a qualified Waste Package Certifier (WPC) or equivalently trained individual. The WPC will ensure packaging requirements (e.g., minimization of void space, weight limits, containers are lined [as required], etc.) are met and that no anomalous waste is present in the container. If necessary, an absorbent material will be added to waste items and/or bulk shipment loads to prevent the buildup of free liquids during subsequent staging and/or transport.

Field verification screening methods that will be used to detect anomalies include, but are not limited to, the following:

Visual inspection-Waste items will be inspected for free liquids, physical WAC compliance, suspect RCRA or TSCA items not already included within the approved profile, and any other prohibited items. Small quantities of liquid residual may be solidified in the waste item or container during onsite preparation for disposal. Any recoverable free liquids will be collected, characterized, and disposed of appropriately. LLW destined for EMWMF will be verified during packaging to contain < 1 percent free liquid in accordance with the WAC.

Radiation and contamination surveys-Surveys will be performed in accordance with the demolition contractor's Radiological Protection Program to ensure worker protection and DOT compliance.

Industrial hygiene (IH) monitoring-acid, putrid, or organic smelling wastes/items and anomalous fumes and/or vapors which are encountered will be evaluated using field IH monitoring techniques, evaluations by IH technical personnel, and sampling/analyses as appropriate.

Anomalous waste items will be segregated from the primary waste, evaluated, and dispositioned or staged accordingly. If an anomalous item is identified after packaging and during loading of a conveyance, waste packaging operations will be suspended, and the anomalous item will be removed and set aside for further evaluation by the Project Manager. An anomaly detection checklist will be completed for each shipment to EMWMF, certifying that all the waste is in compliance with the applicable waste profile. The WPC will sign the checklist prior to each shipment leaving the generator site.

6.5 STORAGE/STAGING

Short-term staging of waste on the CERCLA site for temporary accumulation may occur prior to long-term storage or treatment, and eventual disposal on- or off-site. The staging and storage of wastes will be done in compliance with the ARARs identified in the Action Memorandum. The ARARs apply to storage of hazardous, solid, radioactive, toxic, PCB, and other types of wastes and include requirements that serve to isolate the waste from the environment and identify the waste hazards for the personnel working with it. Based on lessons learned from previous ORR demolition projects, the quantity of debris generated during demolition will be constrained to the amount necessary to support waste shipments, as feasible; this will minimize the time the debris is exposed to the environment.

Due to the large volume of waste to be generated and the physical nature of the waste comprising sharp and unstable objects resulting from the demolition of the building, it is not practical to install a liner and cover for staged debris piles as stated in ARAR 40 *CFR* 761.65(c)(9). In accordance with ARAR 40 *CFR* 761.61(c), the risk-based temporary accumulation of non-leaching PCB bulk product demolition debris in piles will occur on-site on the building's concrete slab, which will serve as the liner, and covers or fixative will be used where feasible while the debris is awaiting loading and transport. Every effort will be made to downsize and load the debris for disposal as it is generated to minimize accumulation time. Storm water

pollution prevention control measures will include passive berms or filter socks around the pile(s) and catch basin plugging or protection to minimize environmental impacts.

Staging and storage of radioactive waste is also subject to certain substantive requirements in DOE Orders that are identified as to-be-considered guidance under the CERCLA process. The majority of these requirements currently come from DOE Order 435.1, *Radioactive Waste Management*. These to-be-considered requirements, like ARARs, include only substantive, not administrative, requirements, and are also included in the ARARs table in the Action Memorandum.

6.6 TRANSPORTATION

Transportation from the 9720-17 location to the EMWMF will be performed by the selected subcontractors along with oversight by transportation subject matter experts. Shipping and transportation activities will follow ARARs, contractor procedures, and applicable DOT and DOE transportation requirements.

Project personnel will properly package, label, mark, placard, and transport waste in accordance with regulations identified in ARARs governing this project. In addition, subcontractor personnel will use either bulk shipment conveyances, and secure wastes in waste containers until final disposition. Waste containers/conveyances used for storage and/or shipment will not leak and will be roadworthy. Transportation personnel will also be responsible for ensuring that containers do not contain unacceptable amounts of excess water, moisture, and/or condensation. Waste containers will meet the requirements established by the receiving waste disposal facility.

The Haul Road between Y-12 and EMWMF will be the preferred route for waste transport to EMWMF. Haul-truck roads, entrances, and exits from the demolition area will be located outside the contamination areas to prevent cross-contamination from debris and heavy equipment, prevent damage to storm water controls, and minimize sediment transport.

6.7 OPTIONS FOR WASTE DISPOSITION

Characterization efforts were planned to demonstrate attainment of EMWMF WAC, which is the most restrictive. The DQA demonstrated the EMWMF as the preferred option for disposition of 9720-17 structure waste. Anomalous waste not eligible for disposal in the EMWMF will be sent for disposal in appropriate alternate facilities. There are no other options currently being planned.

There will be only one WL for the 9720-17 project (i.e., WL 302.5) that includes all building structure debris, ACM, and secondary waste. This profile will be submitted to the EMWMF WAC Attainment Team for approval and WL information will be calculated and summarized. Any updates to the individual profile will trigger an update to the WL Profile for approval.

6.8 COMINGLED WASTE-LOTS

There are no commingled waste lots.

6.9 CHANGES TO THE WASTE HANDLING PLAN

The approach for changing this WHP or the proposed EMWMF WL is described below.

1. Changes to the WHP that will require approval by EPA and TDEC include the following:
 - Change in the quantity of WLs.
 - Change in the description of a WL that results in a change to the WAC Forecasting Analysis Capability System based on:
 - Increase in volume to > 95% upper confidence limit.
 - Identification of new SRCs.
 - Increase in maximum concentration of an SRC.
 - Changes will be approved by the CNS Project Team. Changes will be requested and approved via email or a meeting and will be documented in an addendum prepared and distributed by DOE so that the project will not be delayed.
2. The Project Team will be notified of the following changes to this WHP:
 - Change in disposal location.
 - Significant increase in volume being disposed at the EMWMF.

7. SUMMARY

Demolition of the 9720-17 facility is being managed by CNS for NNSA and is planned for waste disposition at the EMWMF.

The waste to be generated is solid waste that will require disposal at the EMWMF due to radiological contamination that exceeds the ORRLF WAC. The waste will be low-level, PCB bulk product, and asbestos waste comprising building material demolition debris, structural metal (e.g., steel supports, metal mesh walls/ceiling, storage racks), transite walls and roof, other ACM items (e.g., caulk, gaskets, paint, pipe fittings and pipe insulation), concrete from the east loading dock walls and roof, wood framing, miscellaneous material (e.g., ventilation system metal), and secondary waste (e.g., PPE). All ACM waste will be packaged per EMWMF specifications.

A DQA was performed for the 9720-17 structure demolition waste for proposed disposal in the EMWMF. The results were presented to the OREM, EPA, TDEC, and EMWMF WAC Attainment Team in July 2023. EPA guidance was followed (EPA/240/B-06/002, EPA/240/B-06/003). Building 9720-17 characterization data was evaluated, summarized, presented, and confirmed anticipated compliance with the EMWMF WAC. The resulting EMWMF WL profile is anticipated to be a low volume, low SOF profile comprised of building debris and secondary waste from the demolition of Building 9720-17.

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**APPENDIX A.
SAMPLING AND ANALYSIS PLAN FOR BUILDING 9720-17
AT THE Y-12 NATIONAL SECURITY COMPLEX
OAK RIDGE, TENNESSEE**

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Sampling and Characterization of Building 9720-17

**Excess Facilities Disposition Program
Consolidated Nuclear Security, LLC**

SAMPLING AND ANALYSIS PLAN FOR
BUILDING 9720-17 AT THE
Y-12 NATIONAL SECURITY COMPLEX,
OAK RIDGE, TENNESSEE

**Task Order 02
Contract # 4300162865
Submittal C7CH-SC-0008-00
Document # BOA1119TO2-008**

REVISION LOG

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0	August 2022	Initial release	All
1	August 2022	Incorporate CNS comments	12, 15, 16, 19, 20, 22
2	November 2022	Incorporate EMWMF staff comments, add U-232 analysis	16, 20, 22, 23, 40, 47

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ACRONYMS

Acronym	Definition
ACM	asbestos-containing material
Alliant	Alliant Corporation
APM	Analytical Project Manager
ASA	Auditable Safety Analysis
ASL	Analytical Support Level
ASTM	American Society for Testing and Materials
CCV	contract compliance verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cm ²	square centimeter
CNS	Consolidated Nuclear Security, LLC
COA	Certificate of Analysis
COC	chain of custody
COPC	contaminant of potential concern
DOE	U.S. Department of Energy
DOECAP-AP	DOE Consolidated Audit Program – Accreditation Program
DQA	Data Quality Assessment
DQO	data quality objective
dpm	disintegrations per minute
EDD	electronic data deliverable
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
HEU	highly enriched uranium
LLW	low-level waste
LCS	laboratory control sample
M&O	Management and Operating
MS	matrix spike
MSD	matrix spike duplicate
NNSA	National Nuclear Security Administration
NNSS	Nevada National Security Site
ORRL	Oak Ridge Reservation Sanitary and Industrial Landfill
PA	Protected Area
PCB	polychlorinated biphenyl
PEMS	Project Environmental Measurements System
PIDAS	Perimeter Intrusion Detection and Assessment System
PK	process knowledge
PNNL	Pacific Northwest National Laboratory

Acronym	Definition
ppm	part per million
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCRA	Resource Conservation and Recovery Act of 1976
RP	Radiological Protection
RPD	relative percent difference
RSI	RSI Services, LLC
SAP	sampling and analysis plan
SOF	sum of fractions
SOP	standard operating procedure
SOW	statement of work
SVOC	semivolatile organic compound
TCLP	Toxicity Characteristic Leaching Procedure
TDEC	Tennessee Department of Environment and Conservation
TSDF	Treatment, Storage, and Disposal Facility
TSCA	Toxic Substances Control Act of 1976
UCL	upper confidence limit
UCOR	URS CH2M Oak Ridge LLC
UTL	upper tolerance limit
VOA	volatile organic analysis
VOC	volatile organic compound
VSL	validation support level
WAC	waste acceptance criteria
WHP	Waste Handling Plan
WP	work plan/package
Y-12	Y-12 National Security Complex

1 INTRODUCTION

This Sampling and Analysis Plan (SAP) describes the objectives and requirements to characterize the structural components (i.e., roof and walls) and the remaining equipment associated with Building 9720-17 at the Y-12 National Security Complex (Y-12) in Oak Ridge, Tennessee. Building 9720-17 is located adjacent to and south of Building 9206 in the south-central section of Y-12 as shown in Figure 1. Figure 2 is an aerial view of Building 9720-17.

Sampling activities, laboratory analysis, documentation, and records resulting from sampling activities will be performed in accordance with this SAP, the Quality Assurance Project Plan (QAPP) (Appendix A to this SAP), and applicable standard operating procedures. If the Data Quality Assessment (DQA) supports waste disposal at the Environmental Management Waste Management Facility (EMWMF), the SAP will be an appendix to the Waste Handling Plan (WHP) prepared for the characterization and disposition of Building 9720-17. The safety concerns associated with collecting the samples identified in this SAP are not addressed in this document; they are addressed in the project-specific work plans/packages (WP).

This SAP identifies methods and data required to decide on the appropriate treatment/disposal options for the waste streams. Characterization will be performed by a qualified contractor managed by the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) Management and Operating (M&O) Contractor for Y-12, Consolidated Nuclear Security, LLC (CNS). The characterization contractor, RSI Services, LLC (RSI), and subcontractors will meet all technical, operational, procedural, and quality assurance (QA) requirements as defined by the SAP and the QAPP.

This SAP is based on project-specific data quality objectives (DQOs) and provides the strategy to collect a sufficient number of samples to adequately characterize waste generated by Building 9720-17 demolition for disposition. Waste will be dispositioned following the waste hierarchy shown in Figure 3. Recycling and disposal of demolition waste at the Oak Ridge Reservation Sanitary and Industrial Landfill (ORRL) are not expected to be options due to radiological surface contamination levels. The demolition waste is expected to be disposed at the EMWMF. The sampling strategy and analytical plan will provide data of sufficient quantity and quality to supplement existing data and process knowledge (PK) to satisfy the EMWMF waste acceptance criteria (WAC).

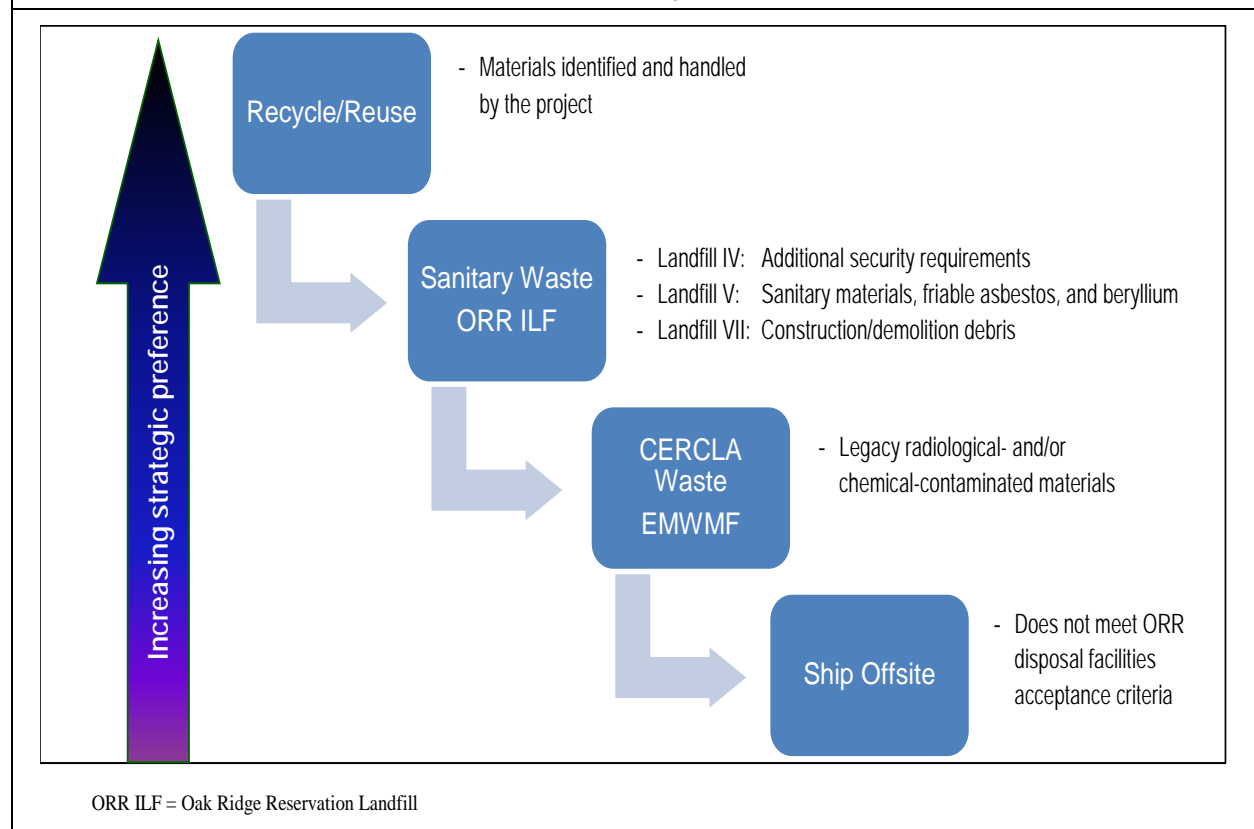
1.1 SUMMARY OF BUILDING 9720-17 HISTORY

Construction of Building 9720-17 was completed in November 1956 (EC-NP-004). Building 9720-17 is connected by an enclosed walkway/vestibule to Building 9206, which was constructed in 1944 as a uranium processing and production facility for the Manhattan Project. Originally Building 9720-17 served as a storage facility for highly enriched uranium (HEU). It was later used to store Resource Conservation and Recovery Act of 1976 (RCRA) hazardous and mixed waste.

Figure 2. Aerial View of Building 9720-17



Figure 3. Building 9720-17 Disposition Strategy will Follow the Waste Hierarchy Process



2 PROJECT SCOPE AND OBJECTIVES

2.1 PROJECT SCOPE

The scope of the Building 9720-17 characterization project is to characterize the building structures and remaining equipment for future demolition. The demolition is being implemented under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) in accordance with the Federal Facility Agreement (FFA) (DOE/OR-1014). The *Action Memorandum for the Y-12 Facilities Non-Time-Critical Removal Action Deactivation/ Demolition Project* (DOE/OR/01-2462&D2) is the CERCLA decision document for building demolition.

Characterization will be completed using sampling and analysis methods described in this SAP. Building 9720-17 is known to be radiologically contaminated based on PK and radiological surveys. Sampling and analysis will be performed to collect additional characterization data to quantify chemical and radiological constituent concentrations and demonstrate compliance with the EMWMF WAC. The demolition approach will be determined after characterization is completed.

2.2 PROJECT OBJECTIVES

The objectives of this SAP are to:

- Specify sampling and analysis requirements to ensure facilities, structures, and equipment are properly characterized prior to building demolition and waste is properly segregated upon removal from the building. Waste streams will be identified based on the similarity of physical, chemical, and radiological characteristics and planned disposition.
- Properly and adequately characterize all materials and waste such that it may be profiled for disposition at the EMWMF.

2.3 PROJECT BOUNDARIES

Building 9720-17 as defined for the purpose of this SAP includes the facility structure, loading dock, roof and walls, enclosed walkway between Buildings 9206 and 9720-17, interior metal mesh panels, HEU storage racks, utility piping, and ventilation system. The ventilation system is passive and does not include fans or filters.

Out of scope areas/items include:

- The concrete slab (i.e., floor)
- The 9744 exterior mechanical system with hoppers, fans, and ductwork
- The storage safes, safe bottle carriers, safe bottle carrier storage rack, pallets, and pallet cart are anomalous for EMWMF disposal and will be characterized separately to meet CERCLA-approved off-site facility WAC.

No samples will be collected from items that will be removed from the facility prior to demolition such as circuit boards, ballasts, switches, lamps, batteries, or other items considered anomalous for disposal at the EMWMF.

2.4 SITE CONCEPTUAL MODEL

The characterization project scope is to characterize Building 9720-17 to determine the waste streams and disposition prior to demolition. Building 9720-17 is located inside the Y-12 Protected Area (PA). Therefore, immediate access to the facility is limited. The facility is also adjacent to the Perimeter Intrusion Detection and Assessment System (PIDAS), requiring coordination with Security prior to any sampling or disposition activities. The facility is inactive.

In 2019, a report was completed for several Y-12 buildings slated for demolition, including 9720-17 (EC-NP-004). The report included historical information, photos, and drawings that are used herein.

2.4.1 Building Description

Building 9720-17 is a one-story, 4,314 square feet rectangular building. The building is of steel frame construction and is set on a poured concrete foundation. There are no floor drains. The building has a gable roof of corrugated asbestos-cement panels (transite) and is clad in corrugated asbestos-cement panel siding (Figures 4 and 5).

Extending along the east side of the building is a poured concrete loading dock accessed by a set of metal steps lined with a metal handrail (Figure 4). The loading dock addition was made in the 1980s, with a concrete block, flat-roof enclosure featuring a single bay filled by a sectional metal door on an overhead track.

Figure 4. Photos of Building 9720-17 Exterior – East and South Sides



View of east side of building looking west



View of south side of building looking north

Figure 5. Photos of Building 9720-17 Exterior – North and West Sides



View of north side of building looking south



View of west side of building looking east

The south side of the building features four large vent openings filled with framed louvers and an attached mechanical system of hoppers, fans, and ductwork at the southwest corner associated with Building 9744 (Figure 4). As noted in Section 2.3, this attached mechanical system at the southwest corner of, and exterior to, Building 9720-17 is not part of the characterization scope of this SAP.

The north side of the building has similar louvered vents. Along the roof ridgeline is a series of four circular metal vent stacks (Figure 5). The west side of the building features a central window filled by a six-light awning window with a three-light fixed sash, flanked by louvered vents (Figure 5).

At the northwest corner of the building is an enclosed passageway to Building 9206, with a shed roof and metal-panel siding. A double-leaf entry filled by a metal door accesses this passageway from Building 9720-17. This walkway (enclosed passageway) from 9206 to 9720-17 is included in the characterization scope of this SAP.

The interior of 9720-17 is considered empty except for storage safes, metal mesh panels on the walls, metal HEU storage racks, metal pallets, and metal safe bottle carriers. Figure 6 shows the metal mesh panels, pallets, and safe bottle carriers.

2.4.2 Changes to Building 9720-17

A timeline of Building 9720-17 changes is provided below:

- 1956 – Building constructed
- 1970s – Added screens to windows and vents and added walkway to Building 9206
- 1980s – Constructed concrete loading dock addition on the east side of the building
- 1995 – Asbestos inspection and sample collection
- 2014 – RCRA clean closure of permitted storage area (Y/TS-2573)
- 2019 – Included in Section 106 National Historic Preservation Act recordation report (EC-NP-004) and authorized for demolition
- 2020 – Radiological surveys conducted

The following excerpts from EC-NP-004 provide further information about changes to Building 9720-17 (the drawings referenced are included as Figures 7 and 8):

- In the late 1970s several changes were planned for the building, including covering windows and louvered vents with security screens, and enclosing the passageway between Buildings 9720-17 and 9206 (Black & Veatch Consulting Engineers, “Oak Ridge Y-12 Plant, Building 9720-17: Closure & Control,” 1978).
- A drawing dated 1995 shows the building’s planned use for storing containers of hazardous waste per RCRA in the form of solutions and residues in bottles and canisters (Martin Marietta, “RCRA Part B Permit: Building 9720-17, Floor Plan,” 1995).

Figure 6. Photo of Building 9720-17 Interior

View showing metal mesh panels, pallets, and safe bottle carriers

2.4.3 Process Knowledge and Existing Data

PK and existing data for the facility include a PK form, historical asbestos survey and characterization data, and recent radiological survey data (CNS 2022a, 2022b, CNS 2022c). Other than asbestos data and radiological surveys, there is no known existing data for the facility. The historic report (EC-NP-004) and the RCRA clean closure report (Y/TS-2573) also provide PK information about the facility. A walkdown of Building 9720-17 was conducted on June 1, 2022, by representatives of CNS and RSI.

The facility was used for storage (did not have process systems or operations) and is basically empty except for a few metal heavy-duty safes, metal HEU storage racks, metal safe bottle carriers, and metal pallets. As noted above, the storage safes, safe bottle carriers, safe bottle carrier storage rack, pallets, and pallet cart are anomalous for EMWMF disposal and will be characterized separately to meet CERCLA-approved off-site facility WAC.

Waste was previously stored in closed containers. There are no known spills in the facility, and it is not known how radiological contamination present at the facility occurred. It is assumed contamination is a result of long-term historic use of the facility, during which practices did not meet current standards for contamination control and documentation of spills.

Radionuclides are expected to be the primary contaminant with asbestos, metals, and polychlorinated biphenyls (PCBs) as secondary contaminants.

Figure 7. Drawing Dated 1978 Shows Changes to Building 9720-17

A small key plan at lower right shows the relationship between Building 9720-17 and Building 9206.

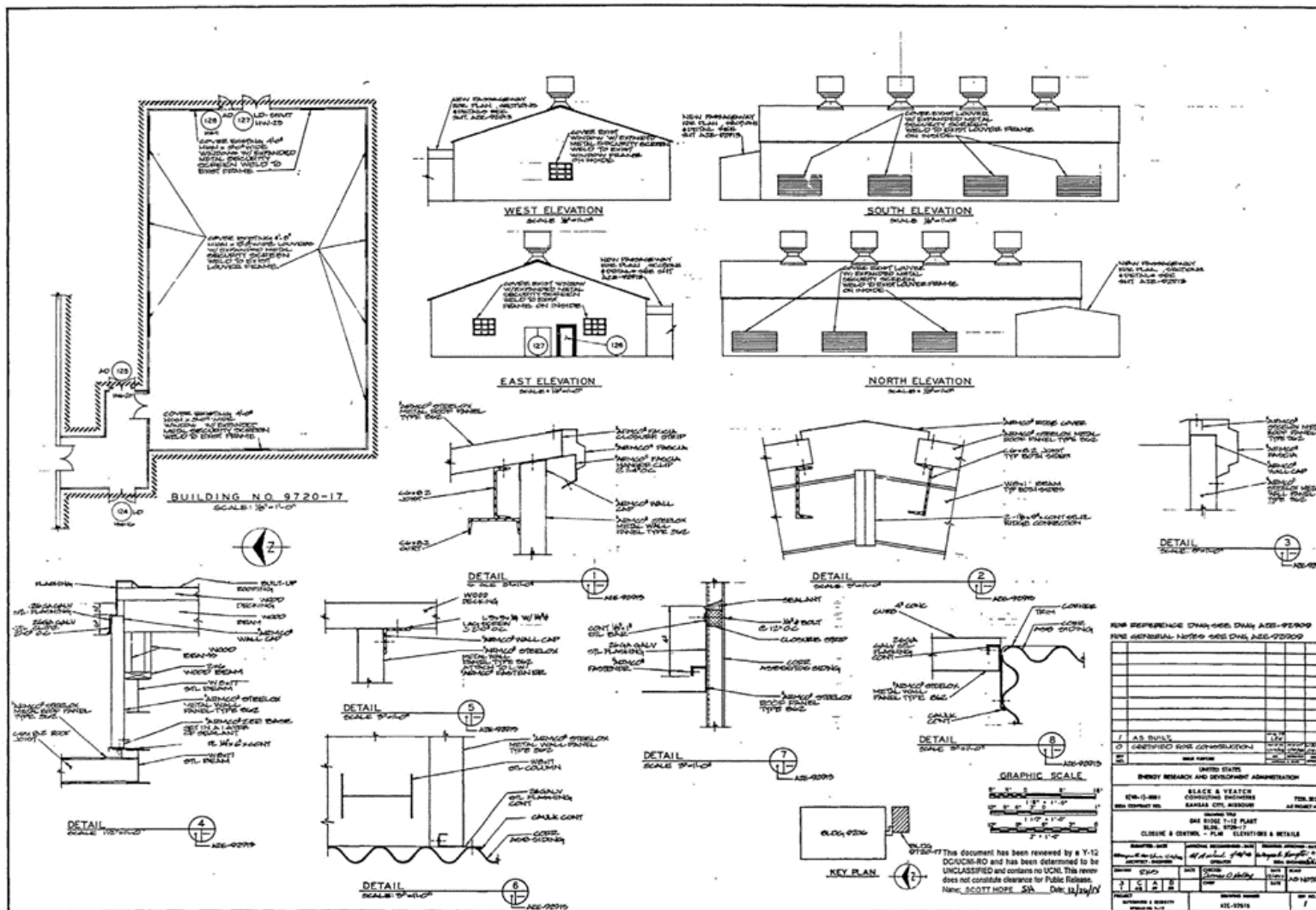
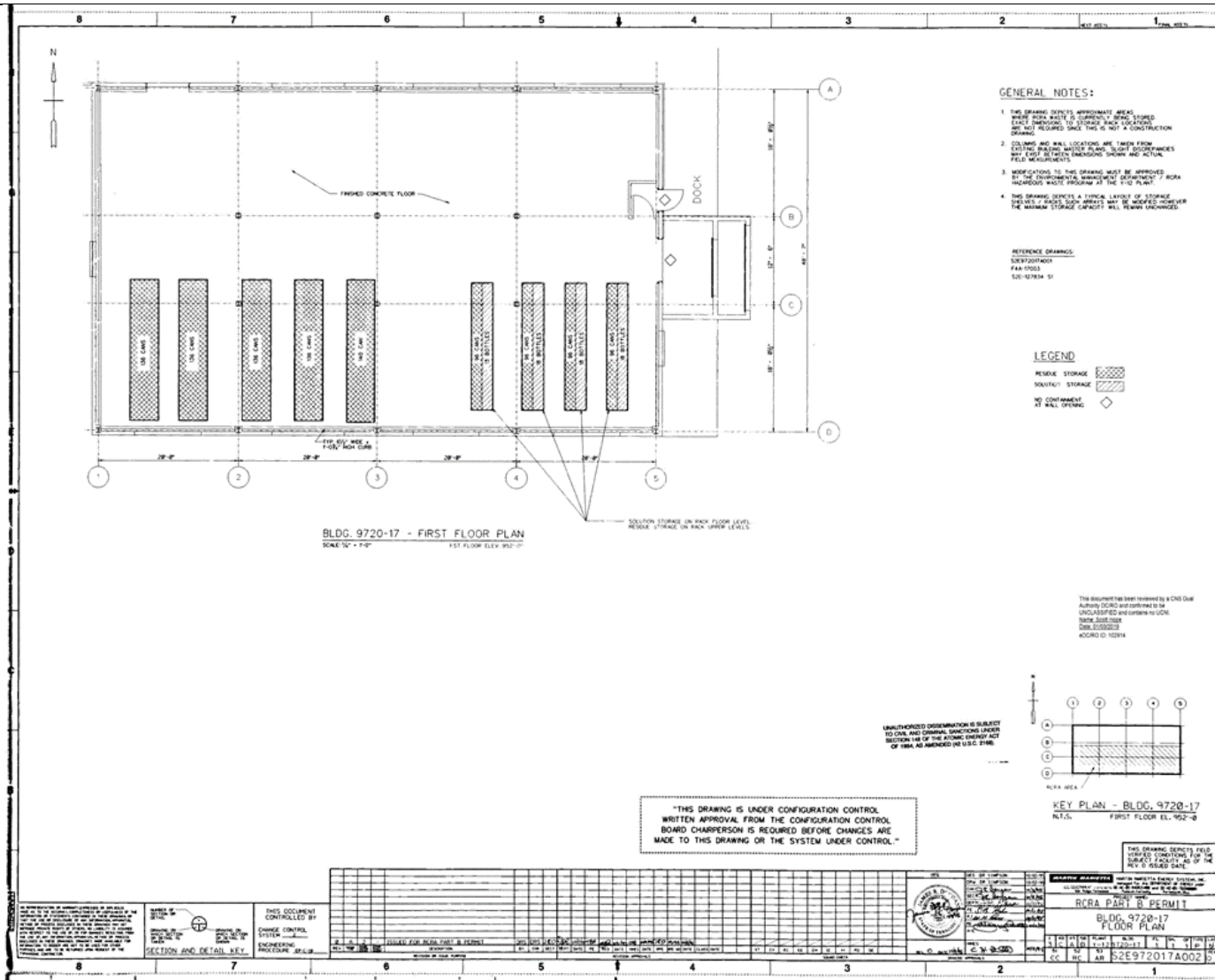


Figure 8. Drawing Dated 1995 Shows use of Building 9720-17 for RCRA Storage



Source: EC-NP-004.

2.4.3.1 Radiological

A radiological survey conducted in February 2020 indicated surface contamination on walls, ceiling/roof and floor:

- The floor had the highest fixed and removable contamination (floor is out of scope)
- The ceiling had the second highest fixed alpha results, and these were located near the ceiling edges
- Walls had the highest beta/gamma results and removable alpha results, and these were spread across the facility
- Ceiling fixed alpha maximum: 24,304 dpm/100 cm²
- Walls fixed beta/gamma maximum: 11,158 dpm/100 cm²
- Walls removable alpha maximum: 1,848 dpm/100 cm²
- Walls removable beta/gamma maximum: 2,324 dpm/100 cm²

Due to this radiological survey data, and based on the waste hierarchy (Figure 3), it is expected the Building 9720-17 demolition waste will require disposal at the EMWMF.

2.4.3.2 Chemical

Due to the age of the facility, there is the potential for other contaminants associated with materials of construction:

- Lead (e.g., transite bolt covers, flashing). Known lead items will be removed prior to demolition and disposed at an appropriate offsite disposal facility.
- PCBs (e.g., paint, caulk, fluorescent light ballasts).
 - The potential exists for PCBs to be present in building materials (e.g., paint and caulk) manufactured prior to 1979 at concentrations ≥ 50 ppm, the criterion established for PCB bulk product waste (40 CFR Sect. 761.3, *Polychlorinated Biphenyls [PCBs] Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions, "Definitions"*). Demolition waste from Building 9720-17 to be disposed at the EMWMF will be assumed to be PCB bulk product based on the age of the facility; therefore, no additional sampling for the PCB bulk product waste determination is necessary.
 - There are no visible oil spills and no known previous oil spills per PK. PCB and other analyses will be performed on oil (e.g., oil may be found in oil reservoirs) for disposition at an appropriate offsite disposal facility.
- Asbestos (e.g., transite, insulation, paint, and caulk) will be removed and packaged accordingly for disposal. Data are available from a historical asbestos survey of Building 9720-17 conducted in 1995 that identified various potential asbestos containing materials (ACM) such as caulk, gaskets, paint, pipe fittings, pipe insulation, transite siding, and transite roofing. Further characterization to identify ACM is not needed for planned disposition at EMWMF; however, this SAP includes sampling and analysis of asbestos material to characterize for other potential contaminants.

2.4.3.3 Material Types and Waste Types

Building 9720-17 consists of various material types:

- Structural material and metal (e.g., metal columns, beams, and supports, metal mesh, HEU storage racks, etc.)

- ACM (e.g., transite roof and walls, caulk, paint, pipe insulation, etc.)
- Concrete/cinder block
- Minimal miscellaneous equipment (e.g., vents, etc.)
- Minimal structural wood material

Most pre-demolition and demolition debris waste is expected to be low-level waste (LLW), PCB bulk product, and/or asbestos waste. Building 9720-17 facility demolition debris generated by the project is expected to meet the WAC for the EMWMF. Anomalous waste may require disposal at the Nevada National Security Site (NNSS) or another CERCLA-approved offsite treatment, storage, and disposal facility (TSDF) using project characterization data, or additional data collected under separate DQOs.

2.5 CONTAMINANTS OF POTENTIAL CONCERN

Radiological contamination is expected to be the primary contamination. The radiological contaminants of potential concern (COPCs) are primarily uranium and thorium, however, to assess EMWMF WAC compliance, the list of radiological analytes includes other radionuclides. Chemical COPCs are heavy metals, including lead in the form of lead-based paint, PCBs, asbestos, and organics. Building 9720-17 is located outside the West End Mercury area and mercury is not a COPC, however, to assess EMWMF WAC compliance, the list of chemical analytes includes mercury.

Asbestos is known to be present based on historical surveys and characterization to identify ACM is not needed. However, as noted previously, additional characterization of asbestos for other potential contaminants is needed to meet the EMWMF WAC. PCBs are also anticipated due to the age of the facility. However, no PCB analysis is required for demolition debris based on the PK-based determination that it is PCB bulk product waste. Characterization for organics will be performed but will be limited to porous materials (wood, concrete, asbestos).

See Section 4 for further details about the analytical approach and the comprehensive list of analytes.

2.6 DATA QUALITY OBJECTIVES

A project-level DQO Planning Session was conducted on July 21, 2022. Representatives from the following organizations made up the top-level planning team:

- Tennessee Department of Environment and Conservation (TDEC)
- U.S. Environmental Protection Agency (EPA)
- DOE NNSA
- Characterization Contractor RSI and their subcontractor, Alliant Corporation (Alliant)
- URS | CH2M Oak Ridge LLC (UCOR) EMWMF and ORRL WAC Attainment Team

Based on this meeting, the DQOs were finalized. Appendix B to this SAP contains the DQO presentation with final DQOs.

The DQO process was conducted in accordance with *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4). The process was used to determine that the type, quantity, and quality of environmental data being collected would be appropriate and sufficient for regulatory determination, characterization, and disposition of the waste streams.

3 SAMPLING APPROACH

The scope of this SAP includes demolition waste from Building 9720-17. Out of scope items are detailed in Section 2.3. Demolition waste and loose material in the facility need to be evaluated to determine the appropriate disposal facility and characterized to meet the associated WAC.

PK was assembled to determine the remaining data gaps and complete the DQOs (Appendix B). Insufficient data exist for characterization of Building 9720-17; therefore, sampling and analysis are required to collect radiological and chemical characterization data. The sampling approach outlined in this section is designed to obtain representative samples that yield results of consistent quality. The use of proper sampling techniques, sampling equipment, strict sampling controls in the field, and appropriate chain of custody (COC) procedures will reduce the potential for unreliable analytical data.

The 95% upper confidence limit (UCL) on the mean concentration of each COPC (referred to herein as 95% confidence), and the analytic and auditable-safety-analysis-derived WAC limits are necessary for sum of fractions (SOF) calculations for EMWMF. The characterization is designed to meet the requirements for the EMWMF WAC. Statistical sampling (primarily) and limited biased sampling will be used for characterization.

It is assumed that the Building 9720-17 demolition waste will be a single waste lot for EMWMF.

3.1 TARGET POPULATION AND STATISTICAL SAMPLING

Based on available PK:

- Building 9720-17 is expected to have radiological contamination as the main contributing contaminant
- Heavy metals and other chemicals are expected to be secondary contaminants
- Building 9720-17 is considered a large and homogeneous population per the expected radiological contamination

Therefore, a random selected statistical sampling strategy will be implemented to characterize the facility that includes all expected material types from the facility, with biased samples collected as necessary.

The target population for intrusive sampling consists of the following Building 9720-17 material types:

- Interior structural material – wall and ceiling metal mesh panels, structural metal columns, beams, supports, and HEU storage racks
- Exterior facility walls and roof – transite panels on both
- Loading dock walls and roof – concrete block walls and metal sheeting roof
- Wood framing material – located in wall framing (around louvers) and on walkway roof
- Ventilation system

It is assumed that no samples will be collected from anomalous items to be removed prior to demolition (e.g., circuit boards, ballasts, switches, lamps, batteries).

Twenty-nine (29) samples will be collected from the above identified target population. Utilizing the non-parametric hypergeometric model, 29 samples provide a 95% confidence and 90% coverage (i.e., 95/90). This approach exceeds the EMWMF WAC requirement of 95% confidence and 80% coverage (i.e., 95/80). The random statistical strategy includes all material

types identified and has been weighted to represent the estimated volumes of material to provide characterization data, as shown in Table 1.

For the samples of transite material to be collected from the exterior roof, a stratified random sampling design was used to identify locations near the roof edges where high readings were obtained in the radiological survey. Selection of locations near the roof edges also enables easier access for sample collection.

Table 1. Samples Weighted to Represent Estimated Volume of Material			
Material Type	Estimated Volume	Number of Samples	Specific Item to be Sampled/ Number of Samples
Structural material (metal)	55%	16	<ul style="list-style-type: none"> • Interior mesh walls/4 samples • Interior mesh ceiling/4 samples • Structural columns, beams and supports/ 4 samples • HEU storage racks/4 samples
Transite material (ACM)	25%	7	<ul style="list-style-type: none"> • Exterior walls/4 samples • Exterior roof/3 samples
Concrete material	10%	3	<ul style="list-style-type: none"> • Loading dock walls/2 samples • Loading dock ceiling/1 sample
Wood material	7%	2	<ul style="list-style-type: none"> • Framing in walls/1 sample • Walkway roof between Building 9206 and Building 9720-17/1 sample
Miscellaneous material	3%	1	<ul style="list-style-type: none"> • Ventilation system/1 sample
Total	100%	29	

3.2 BIASED SAMPLING

Specific biased samples to be collected will be determined in the field. Biased samples will be collected, as necessary, from:

- Paint samples – It is assumed that facility radiological data from statistical samples will bound the radiological contamination for paint samples, therefore, no radiological analysis of paint samples is required. When determining which biased paint samples to collect in the field, consideration will be given to sample different types of paint (e.g., color) that were not otherwise sampled during statistical sampling. Metals concentrations in the paint will be verified by laboratory analysis. A mass balance may be performed based on analytical results.
- Filters – The ventilation is passive and does not include fans or filters. However, samples will be collected as appropriate from any identified filters.
- Dust/dirt piles (e.g., floor sweepings)
- Animal waste
- Wall insulation
- Oil reservoirs – Oil that is identified will be sampled and analyzed as needed for disposition at an appropriate offsite disposal facility.

3.3 SAMPLING DESIGN

Sample location maps and coordinates are provided in Figures 9 through 18. Sample locations were randomly selected using Visual Sample Plan software (Pacific Northwest National Laboratory [PNNL] 2022).

Note: The origin, x-axis, and y-axis are as marked on each figure. The red dot always indicates the origin, the x-axis is along the bottom of the figure, and the y-axis is vertical. The origin changes with the viewpoint, and the perspective is indicated on each figure (e.g., North Wall Top, Inside View Towards Wall).

Figure 9. Sample Locations – Interior Metal Mesh Walls

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-INWL001	65.5	4.5	North Wall (Inside)
2	REG	S-INWL002	10.5	1.5	South Wall (Inside)
3	REG	S-INWL003	60.5	7.5	South Wall (Inside)
4	REG	S-INWL004	42.5	6.5	West Wall (Inside)

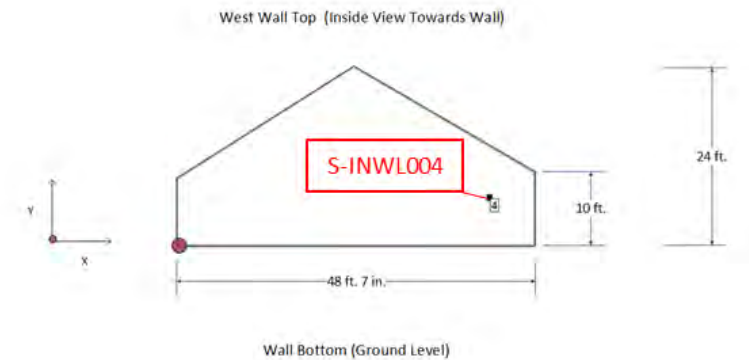
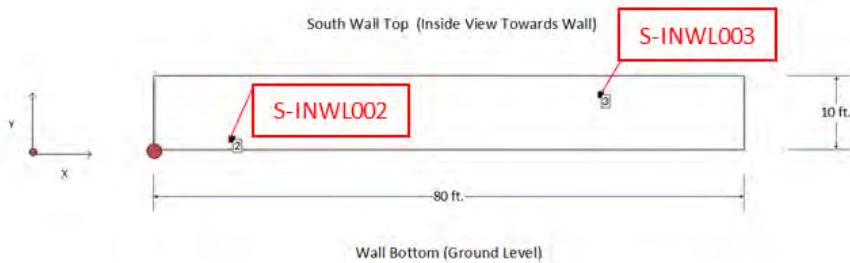
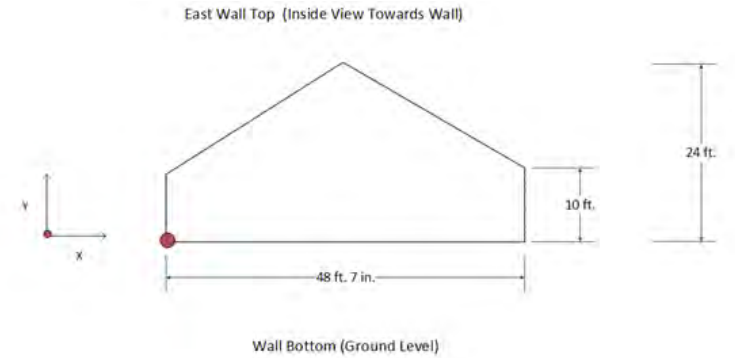
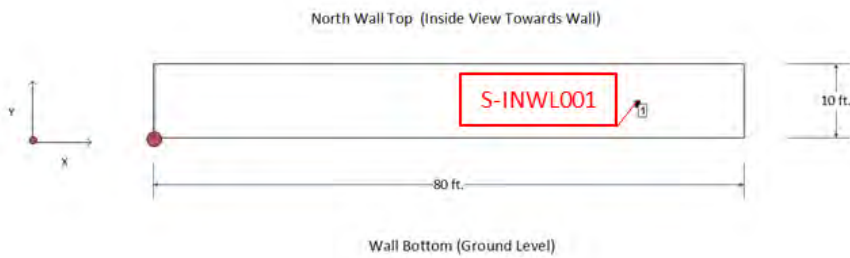
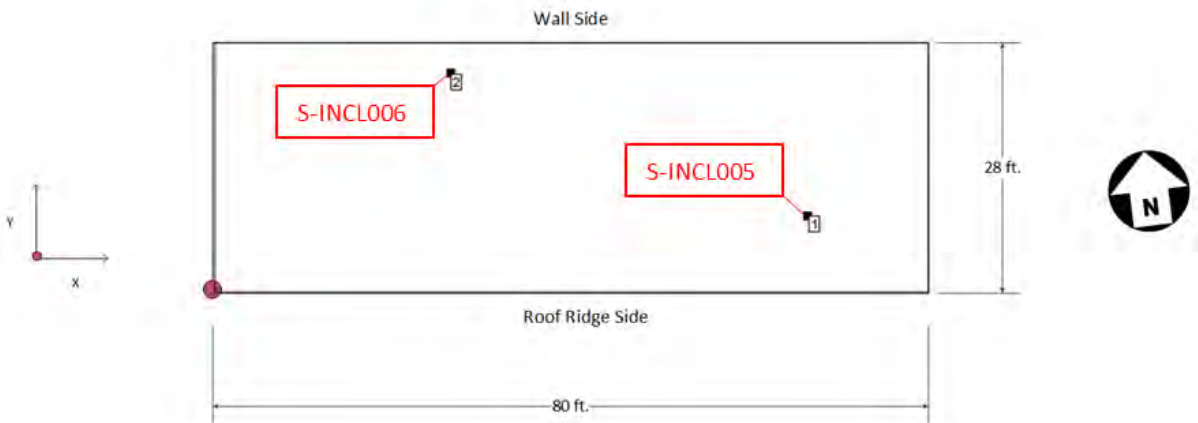


Figure 10. Sample Locations – Interior Metal Mesh Ceiling

View looking up at the ceiling. Roof Ridge Side is in the middle of the building. Wall Side is where the ceiling connects to the wall.

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-INCL005	66.5	8.5	Ceiling North Side (Inside)
2	REG	S-INCL006	26.5	24.5	Ceiling North Side (Inside)
3	REG	S-INCL007	36.5	0.5	Ceiling South Side (Inside)
4	REG	S-INCL008	76.5	10.5	Ceiling South Side (Inside)
4	DUP	S-INCL008D	76.5	10.5	Ceiling South Side (Inside)

Ceiling (Bottom View, North Side)



Ceiling (Bottom View, South Side)

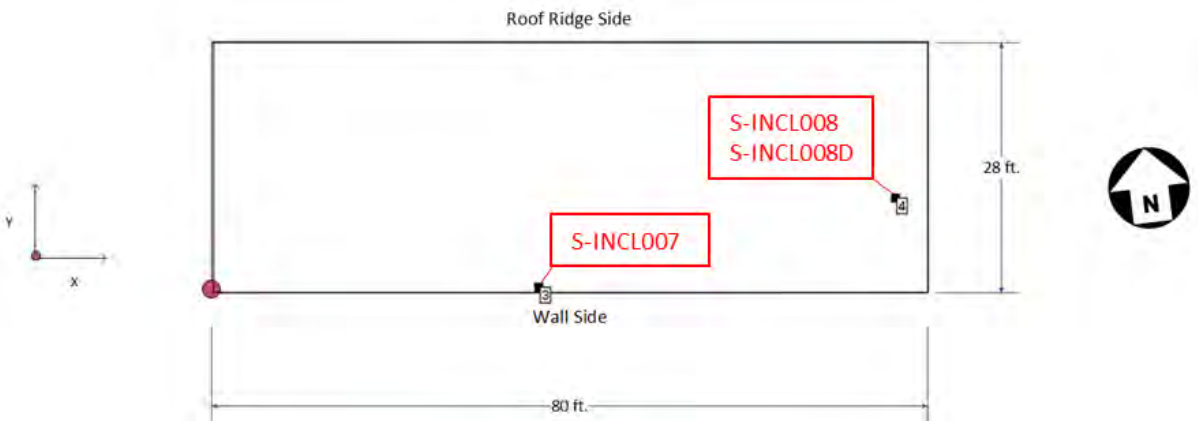


Figure 11. Sample Locations – Interior Metal Structural Columns, Beams, and Supports

View looking down on the floor. Sample height indicates how far above the floor the sample will be collected.

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Height (ft)	Sample Area
1	REG	S-INST009	10.5	43.5	10	Beam Center
2	REG	S-INST010	1.5	2.5	4	Beam Center
3	REG	S-INST011	49.5	32.5	3	Beam Center
4	REG	S-INST012	80	4.5	5	Beam Center

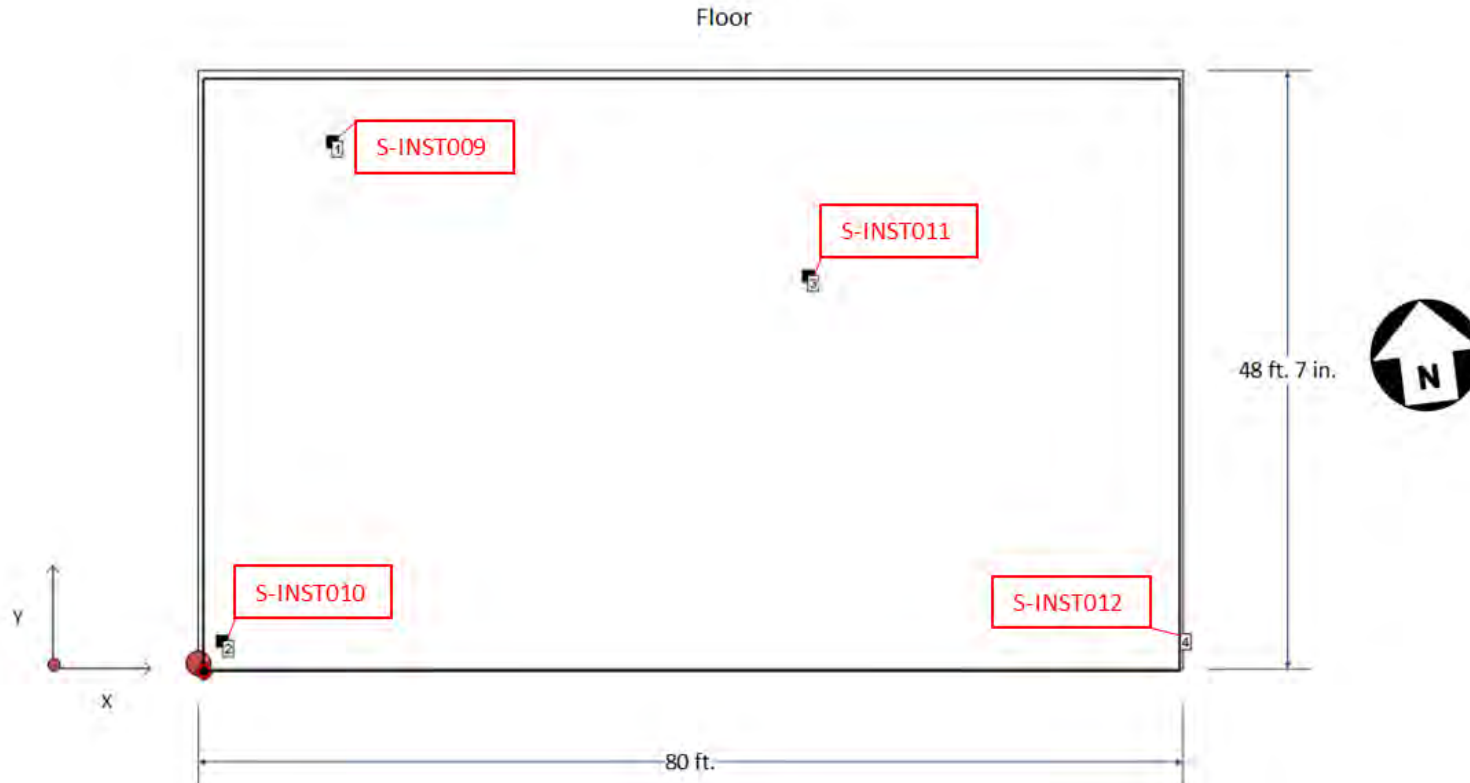


Figure 12. Sample Locations – Interior HEU Metal Storage Racks

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-INRK013	41.5	0.5	South Wall (Inside)
2	REG	S-INRK014	21.5	3.5	South Wall (Inside)
3	REG	S-INRK015	6.5	6.5	South Wall (Inside)
4	REG	S-INRK016	61.5	7.5	South Wall (Inside)

HEU - South Wall Top (Inside View Towards Wall)

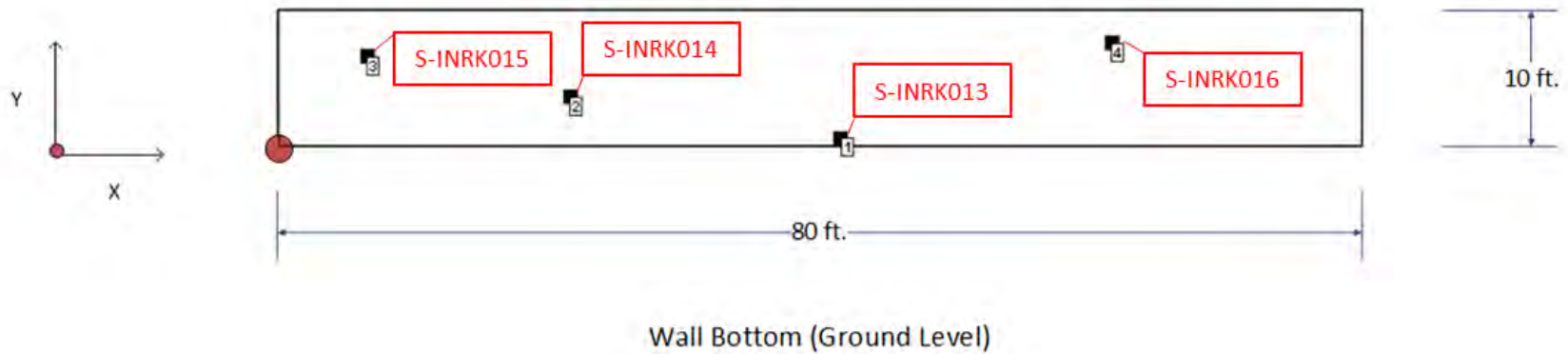


Figure 13. Sample Locations – Exterior Transite Walls

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-EXWL017	64.5	8.5	North Wall (Outside)
2	REG	S-EXWL018	42.5	1.5	South Wall (Outside)
3	REG	S-EXWL019	33.5	0.5	East Wall (Outside)
4	REG	S-EXWL020	28.5	8.5	West Wall (Outside)

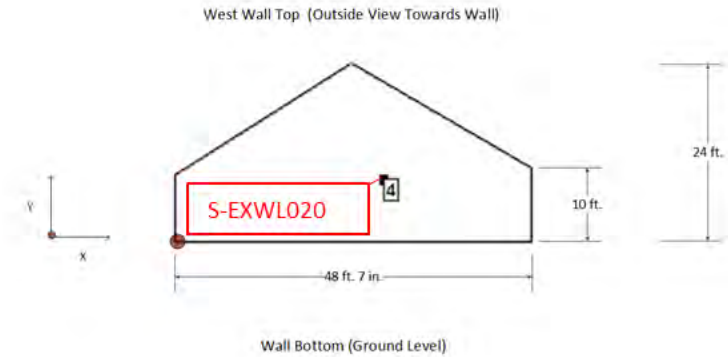
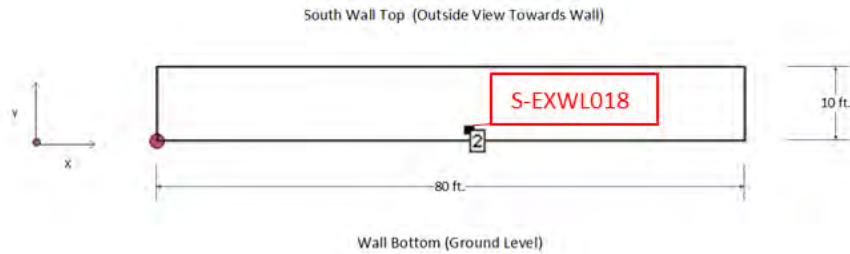
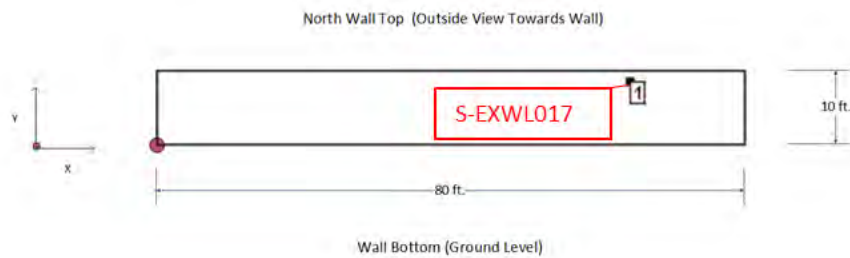
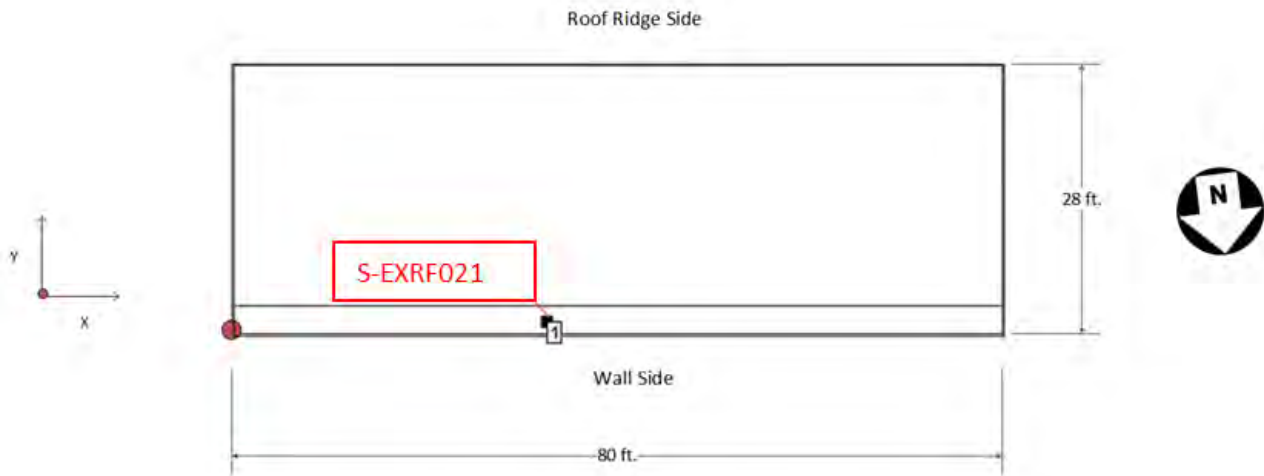


Figure 14. Sample Locations – Exterior Transite Roof

View from outside looking down at roof. Roof Ridge Side is the middle of the building where two sloped roof pieces join together. Wall Side is where the roof meets the wall.

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-EXRF021	32.5	1.5	Roof North Side (Outside)
2	REG	S-EXRF022	27.5	0.5	Roof South Side (Outside)
3	REG	S-EXRF023	55.5	0.5	Roof South Side (Outside)

Roof (Top View, North Side)



Roof (Top View, South Side)

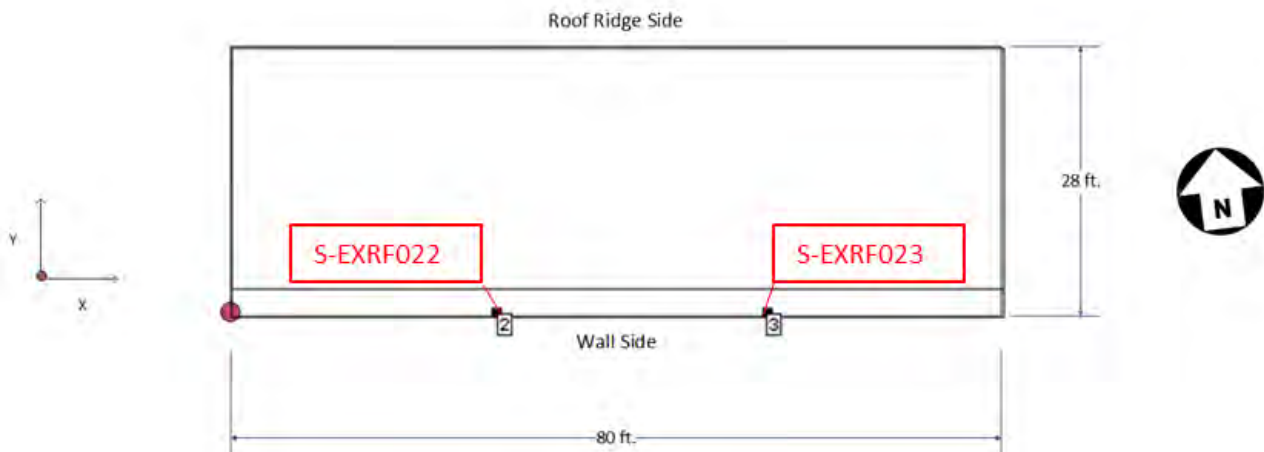
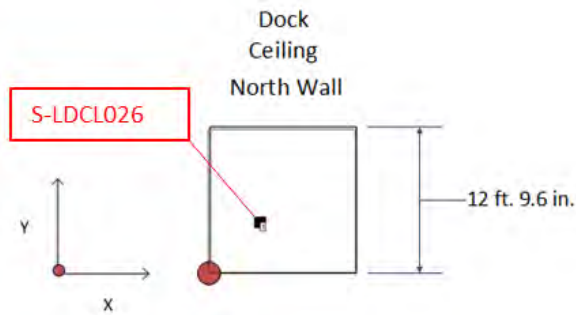


Figure 15. Sample Locations – Loading Dock Interior Concrete Walls and Ceiling

Interior view of loading dock ceiling (top view in figure below) is looking up at ceiling. The North Wall is included as a reference.

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-LDWL024	6.5	9.5	Dock South Wall (Inside)
2	REG	S-LDWL025	10.5	0.5	Dock North Wall (Inside)
1	REG	S-LDCL026	4.5	4.5	Dock Ceiling (Inside)



Dock North Wall Top (Inside View Towards Wall)

Dock South Wall Top (Inside View Towards Wall)

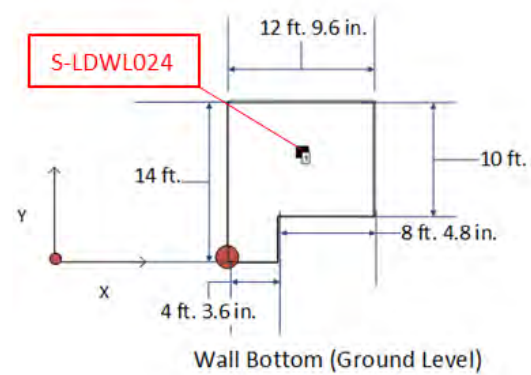
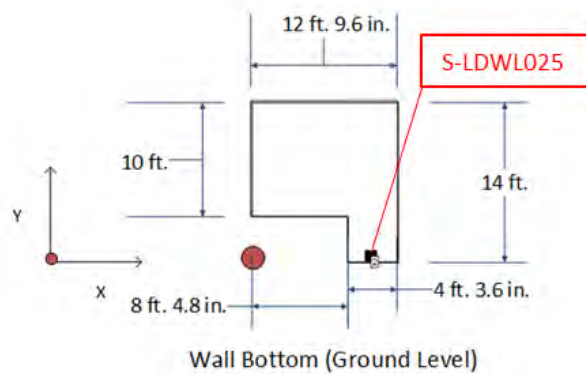


Figure 16. Sample Locations – Interior Wall Framing Wood

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-FRWL027	53.5	7.5	South Wall (Inside)

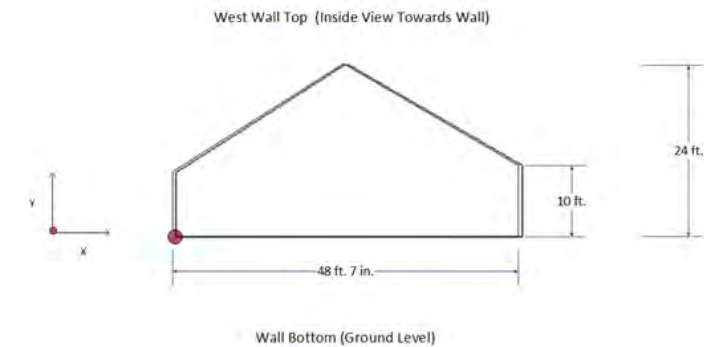
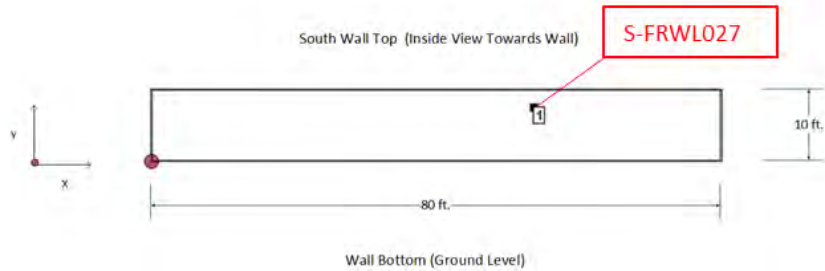
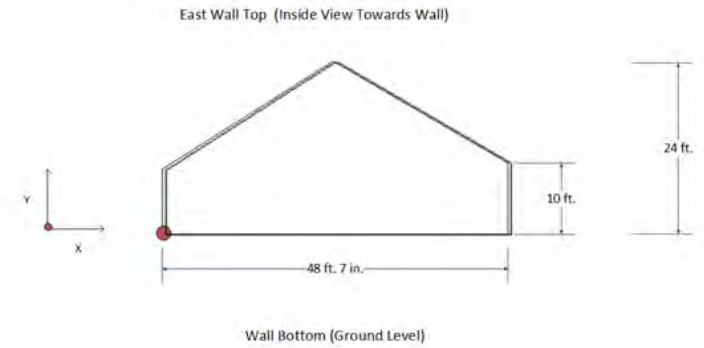
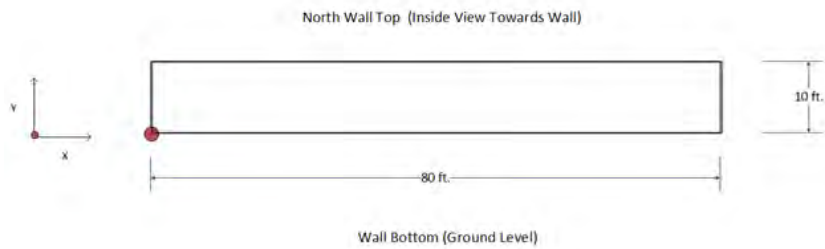


Figure 17. Sample Locations – Walkway Roof Wood

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-WWRF028	8.5	7.5	Walkway
1	DUP	S-WWRF028D	8.5	7.5	Walkway

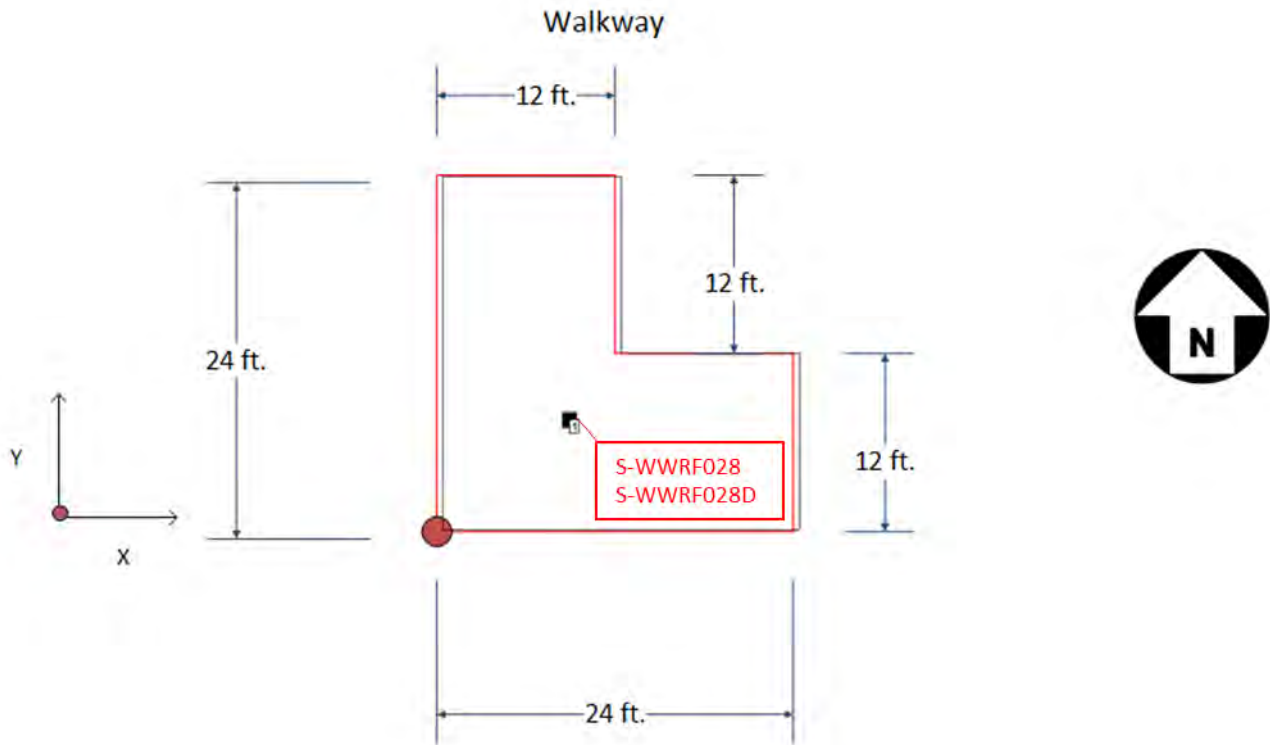
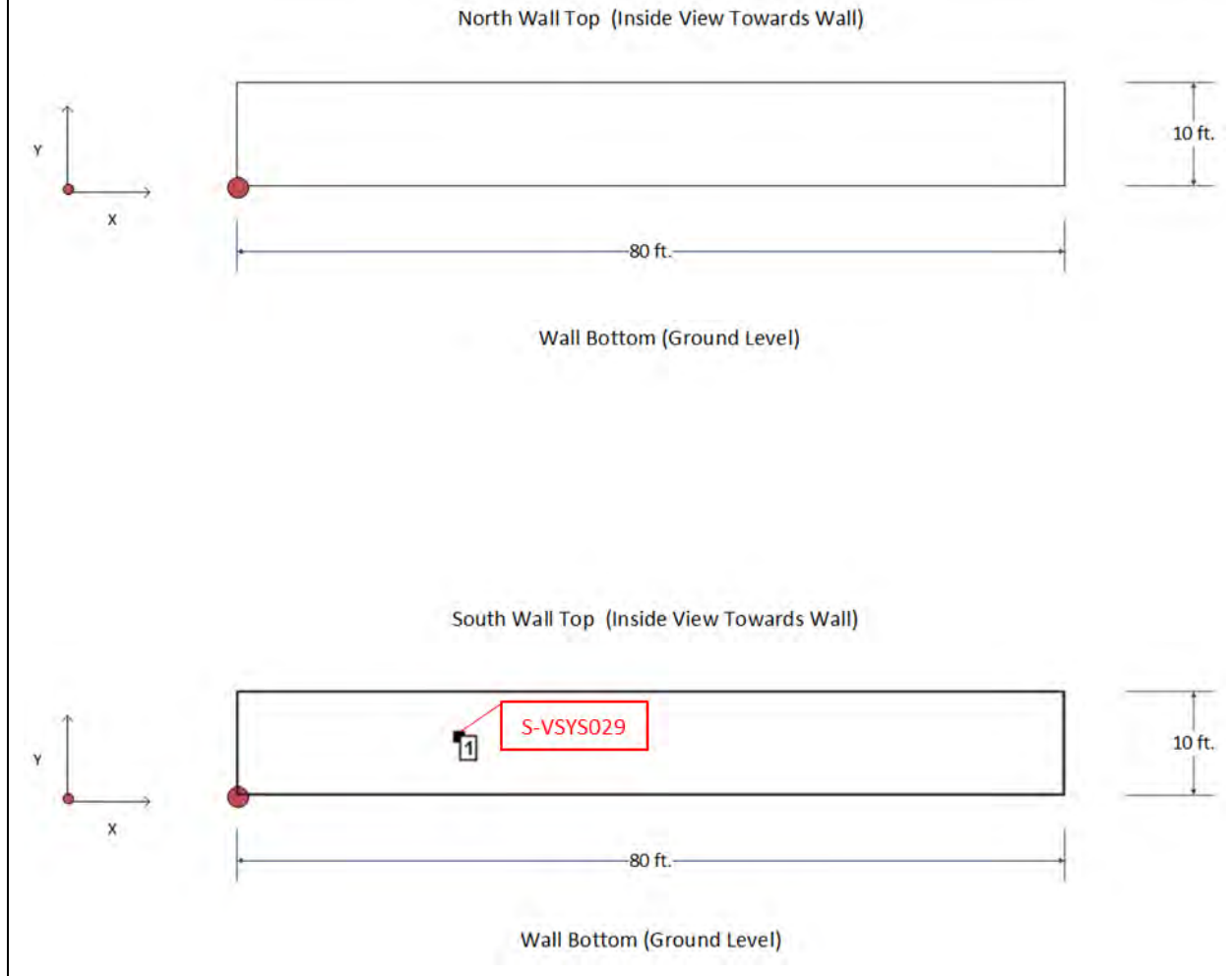


Figure 18. Sample Locations – Interior Vent System

Label	Sample Type	Sample ID	X-Coord. (ft)	Y-Coord. (ft)	Sample Area
1	REG	S-VSYS029	21.5	5.5	South Wall (Inside)



3.4 SAMPLE COLLECTION METHOD

Samples will be collected in accordance with EPA-approved methods and protocols, the project sampling WP, this SAP, and the QAPP by experienced and trained personnel. Samples will be collected using the appropriate tools for the media (e.g., snip, saw, drill, sawzall, etc.). The actual sampling equipment will be determined by the samplers based on field conditions, professional experience, and preferences; all equipment and methods will be consistent with EPA SW-846 protocols. Samples will be collected via methods used to not cross-contaminate the samples.

Samples of concrete, metal, structural material, equipment, and pipe may have to be size reduced. Sample collection and sizing shall be performed using the appropriate equipment for each matrix. Equipment may include, but is not limited to, hammer, chisel, cutting saw, and drill. For example, to collect samples for volatile organic compound (VOC) analysis from cemented material (concrete), an American Society for Testing and Materials (ASTM) International standard (ASTM D 4547, Section 8.2) indicates chiseling can be used. Caution should be used to avoid excessive heating of material being sampled, and no lubricants or cooling fluids shall be used during cutting operations to obtain sample pieces or vertical/horizontal cores. Full core cuttings or pieces should be obtained to the extent possible. The sampling method shall be recorded in the field sampling logbook. Multiple cores or pieces may be necessary at each sampling point to ensure adequate sample volume will be obtained.

Holding time is defined as the elapsed time between sample collection and initiation of sample preparation and/or analysis (Table 2). It is the sampling team’s responsibility to ship the samples in a manner that will allow the laboratory to meet the required holding time. Recommended sample container type, recommended quantity, preservation requirement, and holding time for analysis of solid samples are listed in Table 2. The laboratory statement of work (SOW) will specify the actual requirements for the project. Pre-cleaned and quality assured containers will be supplied by the subcontract laboratory designated for analytical services.

Analyte	Matrix	Container	Recommended Quantity	Preservative	Holding Time
Radiological analysis	Solid	One 16-oz glass jar with Teflon [®] lined cap	100 g minimum (500 g preferred)	None	• 180 days
	Aqueous	Four 1-L HDPE	4 L/1 gal	HNO ₃ to pH < 2	• 180 days
Total metals	Solid	One 4-oz wide-mouth HDPE	5 g	Cool ≤ 6 ^o C	• 180 days • Hg @ 28 days
	Aqueous	1-L HDPE	1 L	HNO ₃ to pH < 2 Cool ≤ 6 ^o C	• 180 days • Hg @ 28 days
VOCs	Solid	One 125-mL wide-mouth AGLS	Full, no headspace, (minimum 100 g)	Cool ≤ 6 ^o C	• 14 days
	Aqueous	Three 40-mL VOC vials	Two vials, full, no headspace (minimum volume); Three vials, full, no headspace (preferred volume)	Cool ≤ 6 ^o C	• 7 days

Table 2. Recommended Sample Containers, Quantities, Preservation, and Holding Times^a					
Analyte	Matrix	Container	Recommended Quantity	Preservative	Holding Time
SVOCs	Solid	One 4-oz AGLS jar with Teflon-lined cap	30 g (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 14 days (extraction) • 40 days (analysis)
	Aqueous	Two 1-L AGLS	1 L (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 7 days (extraction) • 40 days (analysis)
Pesticides	Solid	One 4-oz AGLS with Teflon-lined cap	30 g (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 14 days (extraction) • 40 days (analysis)
	Aqueous	Two 1-L AGLS	1 L (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 7 days (extraction) • 40 days (analysis)
Herbicides	Solid	One 4-oz AGLS Teflon-lined cap	30 g (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 14 days (extraction) • 40 days (analysis)
	Aqueous	Two 1-L AGLS	1 L (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 7 days (extraction) • 40 days (analysis)
TCLP metals	Solid	One 8-oz wide mouth AGLS	300 g (minimum 125 g)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 180 days • Hg @ 28 days
TCLP VOCs	Solid	One 4-oz AGLS with Teflon-lined cap	Full	Cool ≤ 6°C	<ul style="list-style-type: none"> • 14 days
TCLP SVOCs	Solid	One 8-oz wide mouth AGLS	125 g (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 14 days
TCLP Pesticides and Herbicides	Solid	One 8-oz wide mouth AGLS	125 g (minimum)	Cool ≤ 6°C	<ul style="list-style-type: none"> • 14 days

^aNote: SVOCs, pesticides, and herbicides can be combined into an 8-oz glass jar with a Teflon-lined cap.

°C = degrees Celsius

AGLS = amber glass

g = gram

HDPE = high-density polyethylene

Hg = mercury

L = liter

mL = milliliter

oz = ounce

PCB = polychlorinated biphenyl

SVOC = semivolatile organic compound

TCLP = Toxicity Characteristic Leaching Procedure

VOC = volatile organic compound

3.5 SAMPLE NUMBERING

Samples will be identified according to the following Sample ID format:

1. Sampling type (S- or B-, respectively, for statistical or biased)
2. Descriptive identifier (e.g., INWL = interior wall, EXRF = exterior roof, LDWL = loading dock wall, DIRT = dust/dirt pile). Note descriptive identifiers for biased samples may be modified in field based on material identified to be sampled.
3. Sequential 3-digit number (001, 002, 003...)
4. A "D" is appended to the sample ID for the field duplicate, e.g., -001D.

Thus, the sample identified as S-INWL001 represents the first statistical sample taken from the interior (mesh) wall.

Container identifiers (e.g., -A, -B, -C, etc.) will be appended as needed to reflect multiple containers used for sample collection.

For biased samples, sample ID numbering will be determined in the field and descriptive identifiers may be modified as appropriate for the sampled material.

Additional information on maintaining field logbooks, COC, and field quality control (QC) can be found in the QAPP Sections 10 and 11.

3.6 FIELD QUALITY CONTROL SAMPLES

To ensure validity/reliability of the analytical data and meet the DQOs for the project, the QC samples listed below will be obtained, when required, during sample collection. Field blank samples will not be collected. Environmental contamination at levels affecting the decision on waste disposition is not expected. Collecting more than the minimum sample mass required will provide sufficient sample material for laboratory QC. The project will not specify matrix spike (MS)/matrix spike duplicate (MSD) samples.

- **Equipment Rinsate Blank**—Equipment rinsate blanks are samples of ASTM Type II water passed over the sampling equipment. One equipment rinsate blank for every 20 samples collected shall be analyzed for the parameters associated with that sampling event. These samples will only be collected when non-disposable sampling equipment is used. Equipment rinse blanks are not required when disposable sampling equipment is used for sampling.
- **Field Duplicate Samples**—Field duplicate samples help determine sampling variance. One field duplicate for every 20 samples collected shall be analyzed for the same set of analytical parameters as the sample it is duplicating. All duplicate samples will be collected from the same component the original sample was duplicating.
- **Trip Blanks**—Trip blanks are used to detect cross contamination by VOCs during sample shipping and handling. Trip blanks will be prepared by either the laboratory or the sampling team and will consist of ASTM Type II water (or other similar characteristic water) in volatile organic analysis (VOA) bottles. Trip blank samples will not be placed in plastic bags. Trip blanks shall accompany the samples from the field to each rigid container (sample cooler) shipped to the laboratory containing samples for VOA. Trip blanks shall be analyzed for the VOC parameters associated with that sampling event only.

3.7 CHANGES AND DEVIATIONS

Field deviations will be documented in the field logbook. If a statistical sample location is not accessible, the sample will be collected at the closest accessible location and recorded in the logbook. A description and location for all biased samples will be recorded in the logbook.

Prior to initiating field-sampling activities, the RSI Analytical Project Manager (APM) will prepare the laboratory SOW that presents requirements of this SAP. After laboratory selection, a readiness review will be conducted with the laboratory representative, project personnel, and the RSI APM. SOW deviations and clarifications from the SAP will be communicated to the Project for the Project characterization records. Approvals and justifications for characterization approach changes and deviations will be documented by email and filed in the project folder. Preferably, the review and approval will be made before a change or deviation is made although initial discussion may be verbal followed by the documentation. Changes and deviations will be documented in the data quality assessment.

Review and approval of changes and deviations will be initiated by the RSI Characterization Lead and approved, at a minimum, by the Waste Management Specialist (Alliant, RSI subcontractor). Other disciplines including WAC attainment, Radiological Protection (RP), Project Management, etc., will be included in the review as applicable.

4 ANALYTICAL APPROACH

All laboratory analysis used to analyze waste characterization samples for the Building 9720-17 project will be performed by a participating DOE Consolidated Audit Program-Accreditation Program (DOECAP-AP) assessed laboratory.

The facility debris must meet the requirements of the EMWMF Administrative, Analytic, Auditable Safety Analysis (ASA)-Derived, and Physical WAC.

Samples will be analyzed for the analyses proposed and agreed to in the DQOs. Table 3 lists the Sample IDs and analyses for facility characterization by sampling type and material type. Performance of organic analyses is limited to porous materials (wood, concrete, asbestos).

Analytical methods, analytes, and target reporting limits are shown in Table 4. The EMWMF WAC Analytical and ASA WAC lists were used to develop the list of analytes, and the list was adjusted as appropriate for site-related contaminants.

Table 3. List of Sample IDs and Analyses by Sampling Type and Material Type

Sampling Type	Material Type	Description	Sample Type	Sample ID	Radiological	Total Metals	Total VOCs	Total SVOCs	Total Pest/Herb	TCLP Metals	TCLP VOCs	TCLP SVOCs	TCLP Pest/Herb	% Moisture ^a
		Walkway roof between Building 9206 and Building 9720-17	DUP	S-WWRF028D	X	X	X	X	X	X	X	X	X	X
	Miscellaneous material	Ventilation system	REG	S-VSYS029	X	X				X				^a
Biased (Miscellaneous as needed)	Paint	Paint TBD	REG	B-PAINXXX ^b		X				X				^a
	Filter	Filter TBD	REG	B-FILTXXX	X	X				X				^a
	Dust/dirt pile	Dust/dirt pile TBD	REG	B-DIRTXXX	X	X				X				^a
	Animal waste	Animal waste TBD	REG	B-ANIMXXX	X	X				X				^a
	Wall insulation	Wall insulation TBD	REG	B-WLINXXX	X	X	X	X	X	X	X	X	X	^a
	Oil	Oil TBD	REG	B-OILSXXX										^c

^aPercent (%) moisture analysis will be requested if the sampled material is not inherently dry or has been wetted during the sampling process. The sampling team will make this determination in field.

^bXXX for biased samples indicates Sample ID numbering will be determined in field.

^cBiased samples may include samples of oil that is identified in field (e.g., in oil reservoirs). Oil will be sampled and analyzed as needed for disposition at an appropriate offsite disposal facility.

- ACM = asbestos-containing material
- DUP = duplicate (field replicate)
- HEU = highly enriched uranium
- ID = identification
- Pest/Herb = Pesticides/Herbicides
- REG = regular
- SVOC = semivolatile organic compound
- TBD = to be determined
- TCLP = Toxicity Characteristic Leaching Procedure
- VOC = volatile organic compound

Table 4. Analytical methods, analytes, and target reporting limits

Analytical Method	Analyte	Reference Level	Reference Source	Target Reporting Limit ^a	Units
Radiological					
GPC	Gross alpha	NA	NA	5	pCi/g
	Gross beta	NA	NA	5	pCi/g
Gamma spectroscopy	Report detects >MDA, including:				pCi/g
	Co-60	6,900,000	ASA ^b	0.2	pCi/g
	Cs-137	1,500,000	ASA	1	pCi/g
	Eu-152	4.9E+06	ASA	0.5	pCi/g
	Eu-154	4.9E+06	ASA	0.5	pCi/g
	Ra-226	300,000	ASA	0.3	pCi/g
	Ra-228	300,000	ASA	0.3	pCi/g
Beta GPC	Sr-90	400,000	ASA	3	pCi/g
Per laboratory direction	I-129	13	EMWMF	3	pCi/g
LSC	C-14	165	EMWMF	3	pCi/g
	H-3 (tritium)	150,000	EMWMF	3	pCi/g
	Tc-99	172	EMWMF ^c	3	pCi/g
Alpha spectroscopy	Th-228	25,000	ASA	0.3	pCi/g
	Th-230	15,000	ASA	0.3	pCi/g
	Th-232	2,500	ASA	0.3	pCi/g
	U-232	20,000	ASA	1	pCi/g
	U-233/U-234	1,700	EMWMF	3.5	pCi/g
	U-235/U-236	1,500	EMWMF	1	pCi/g
	U-238	1,200	EMWMF	1	pCi/g
	Total U	NA	NA	1	pCi/g
	Np-237	320	EMWMF	0.3	pCi/g
	Pu-238	15,000	ASA	0.3	pCi/g
	Pu-239/Pu-240	720	EMWMF	0.3	pCi/g
	Pu-242	15,000	ASA	0.3	pCi/g
	Am-241	13,000	ASA	0.3	pCi/g
	Cm-243/244	20,000	ASA	0.3	pCi/g
	Cm-245/246	13,000	ASA	0.3	pCi/g
Metals					
SW-846 6010 or 6020	Antimony	160	EMWMF	3	mg/kg
	Arsenic	100	20X TCLP ^d	2	mg/kg
	Barium	2,000/150,000	20X TCLP/EMWMF	0.5	mg/kg
	Beryllium	1,000	BCM ^e	0.1	mg/kg
	Boron	24,000	EMWMF	5	mg/kg
	Cadmium	20	20X TCLP	0.5	mg/kg
	Chromium (total)	100/140,000	20X TCLP/EMWMF	1	mg/kg
	Lead	100/1500	20X TCLP/EMWMF	3	mg/kg
	Manganese	360,000	EMWMF	1.5	mg/kg
	Molybdenum	3,900	EMWMF	1.0	mg/kg
	Selenium	20/1,600	20X TCLP/EMWMF	2	mg/kg
	Silver	100	20X TCLP	1	mg/kg
	Strontium	300,000	EMWMF	3	mg/kg
	Tin	2,200	EMWMF	5	mg/kg
Vanadium	25,000	EMWMF	1	mg/kg	
SW-846 7471	Mercury	4	20X TCLP	0.05	mg/kg

Table 4. Analytical methods, analytes, and target reporting limits

Analytical Method	Analyte	Reference Level	Reference Source	Target Reporting Limit ^a	Units
VOCs					
SW-846 8260	Acetone	270,000	EMWMF	10	µg/kg
	Benzene	10,000/200,000	20X TCLP/EMWMF	5	µg/kg
	Bromodichloromethane	1,000	EMWMF	5	µg/kg
	Bromoform	16,000	EMWMF	5	µg/kg
	Bromomethane	3,500	EMWMF	10	µg/kg
	Carbon disulfide	710,000	EMWMF	5	µg/kg
	Carbon tetrachloride	10,000/56,000	20X TCLP/EMWMF	5	µg/kg
	Chlorobenzene	2,000,000/330,000	20X TCLP/EMWMF	5	µg/kg
	Chloroethane	22,000	EMWMF	10	µg/kg
	Chloroform	120,000/40,000	20X TCLP/EMWMF	5	µg/kg
	Chloromethane	4,400	EMWMF	10	µg/kg
	Dibromochloromethane	1,100	EMWMF	5	µg/kg
	1,4-Dichlorobenzene	150,000/100,000	20X TCLP/EMWMF	5	µg/kg
	1,2-Dichloroethane	10,000	20X TCLP	5	µg/kg
	1,1-Dichloroethene	14,000	20X TCLP	5	µg/kg
	Cis-1,2-Dichloroethene	150,000	EMWMF	5	µg/kg
	Trans-1,2-Dichloroethene	62,000	EMWMF	5	µg/kg
	1,2-Dichloropropane	1,100	EMWMF	5	µg/kg
	Ethylbenzene	4,900,000	EMWMF	5	µg/kg
	2-Hexanone	97,000	EMWMF	10	µg/kg
	Methyl ethyl ketone	4,000,000	20X TCLP	10	µg/kg
	Methyl isobutyl ketone	170,000	EMWMF	10	µg/kg
	Methylene chloride	7,300	EMWMF	5	µg/kg
	Styrene	1.6E+07	EMWMF	5	µg/kg
	Tetrachloroethene	14,000/440,000	20X TCLP/EMWMF	5	µg/kg
	1,1,2,2-Tetrachloroethane	489	EMWMF	5	µg/kg
Toluene	4.90E+07	EMWMF	2	µg/kg	
Trichloroethene	10,000/780,000	20X TCLP/EMWMF	5	µg/kg	
Vinyl chloride	4000/290	20X TCLP/EMWMF	2	µg/kg	
Xylenes (total)	1.5E+07	EMWMF	5	µg/kg	
SVOCs					
SW-846 8270	Acenaphthene	3.90E+08	EMWMF	330	µg/kg
	Acenaphthylene	9.32E+07	EMWMF	330	µg/kg
	Acetophenone	330,000	EMWMF	330	µg/kg
	Benzidine	161	EMWMF	330	µg/kg
	Benzoic Acid	9,810,000	EMWMF	330	µg/kg
	Carbazole	1.10E+08	EMWMF	330	µg/kg
	o-Cresol	4,000,000/232,000	20X TCLP/EMWMF	330	µg/kg
	m-Cresol	4,000,000/170,000	20X TCLP/EMWMF	330	µg/kg
	p-Cresol	4,000,000/170,000	20X TCLP/EMWMF	330	µg/kg
	Cresol, total	4,000,000	20X TCLP	330	µg/kg
	Di-n-butylphthalate	190,000	EMWMF	330	µg/kg
	1,2-Dichlorobenzene	9,400,000	EMWMF	330	µg/kg
	1,3-Dichlorobenzene	5.8E+07	EMWMF	330	µg/kg
	1,4-Dichlorobenzene	150,000/100,000	20X TCLP/EMWMF	330	µg/kg
	Diethyl phthalate	6,180,000	EMWMF	330	µg/kg
	2,4-Dimethylphenol	2,150,000	EMWMF	330	µg/kg

Table 4. Analytical methods, analytes, and target reporting limits

Analytical Method	Analyte	Reference Level	Reference Source	Target Reporting Limit ^a	Units
	Dimethyl phthalate	3.07E+07	EMWMF	330	µg/kg
	2,4-Dinitrotoluene	2,600/1,000	20X TCLP/EMWMF	330	µg/kg
	2,6-Dinitrotoluene	810	EMWMF	330	µg/kg
	Hexachlorobenzene	2,600/7.73E+08	20X TCLP/EMWMF	330	µg/kg
	Hexachloro-1,3-butadiene	10,000	20X TCLP	330	µg/kg
	Hexachloroethane	60,000/500,000	20X TCLP/EMWMF	330	µg/kg
	Isophorone	6,100,000	EMWMF	330	µg/kg
	2-Methylnaphthalene	4,000,000	EMWMF	33	µg/kg
	Naphthalene	9,900,000	EMWMF	33	µg/kg
	4-Nitroaniline	8.7E+11	EMWMF	330	µg/kg
	Nitrobenzene	40,000/1,980	20X TCLP/EMWMF	330	µg/kg
	2-Nitrophenol	1,800	EMWMF	330	µg/kg
	4-Nitrophenol	850,000	EMWMF	330	µg/kg
	N-nitroso-di-n-propylamine	19	EMWMF	330	µg/kg
	N-nitrosodiphenylamine	1,100,000	EMWMF	330	µg/kg
	Pentachlorophenol	2,000,000	20X TCLP	330	µg/kg
	Phenol	3,200,000	EMWMF	330	µg/kg
	Pyridine	100,000/2,200	20X TCLP/EMWMF	330	µg/kg
	1,2,4-Trichlorobenzene	5,100,000	EMWMF	330	µg/kg
	2,4,5-Trichlorophenol	8,000,000	20X TCLP	330	µg/kg
	2,4,6-Trichlorophenol	40,000/22,000	20X TCLP/EMWMF	330	µg/kg
Pesticides					
SW-846 8081	Aldrin	6,600,000	EMWMF	1	µg/kg
	alpha-BHC	39,000	EMWMF	1	µg/kg
	beta-BHC	140,000	EMWMF	1	µg/kg
	Chlordane	600/92,000,000	20X TCLP/EMWMF	9	µg/kg
	DDD	77,000,000	EMWMF	2	µg/kg
	DDE	130,000,000	EMWMF	2	µg/kg
	DDT	NA	NA	2	µg/kg
	delta-BHC	140,000	EMWMF	1	µg/kg
	Dieldrin	7,100	EMWMF	2	µg/kg
	Endosulfan plus metabolites ^f	330,000,000	EMWMF	2	µg/kg
	Endrin	400/30,000,000	20X TCLP/EMWMF	2	µg/kg
	Endrin aldehyde	30,000,000	EMWMF	2	µg/kg
	Endrin ketone	30,000,000	EMWMF	2	µg/kg
	Heptachlor	160/2,400,000	20X TCLP/EMWMF	1	µg/kg
	Heptachlor epoxide	160/1,000,000	20X TCLP/EMWMF	1	µg/kg
	Lindane	8,000/180,000	20X TCLP/EMWMF	1	µg/kg
	Methoxychlor	200,000	20X TCLP	1	µg/kg
	Toxaphene	10,000	20X TCLP	1	µg/kg
Herbicides					
SW-846 8151	2,4-D	200,000/119,000	20X TCLP/EMWMF	5	µg/kg
	2,4,5-TP (Silvex)	20,000/330,000	20X TCLP/EMWMF	5	µg/kg

Table 4. Analytical methods, analytes, and target reporting limits

Analytical Method	Analyte	Reference Level	Reference Source	Target Reporting Limit ^a	Units
TCLP Metals					
SW-846 1311/6010 6020	Arsenic	5	TCLP ^g	0.05	mg/L
	Barium	100	TCLP	0.04	mg/L
	Cadmium	1	TCLP	0.01	mg/L
	Chromium	5	TCLP	0.01	mg/L
	Lead	5	TCLP	0.02	mg/L
	Selenium	1	TCLP	0.05	mg/L
	Silver	5	TCLP	0.01	mg/L
SW-846 1311/7470	Mercury	0.2	TCLP	0.002	mg/L
TCLP VOCs					
SW-846 1311/8260	Benzene	0.5	TCLP	0.05	mg/L
	Carbon tetrachloride	0.5	TCLP	0.05	mg/L
	Chlorobenzene	100	TCLP	10	mg/L
	Chloroform	6	TCLP	0.6	mg/L
	1,4-Dichlorobenzene	7.5	TCLP	0.75	mg/L
	1,2-Dichloroethane	0.5	TCLP	0.05	mg/L
	1,1-Dichloroethene	0.7	TCLP	0.07	mg/L
	Methyl ethyl ketone	200	TCLP	20	mg/L
	Tetrachloroethene	0.7	TCLP	0.07	mg/L
	Trichloroethene	0.5	TCLP	0.05	mg/L
Vinyl chloride	0.2	TCLP	0.02	mg/L	
TCLP SVOCs					
SW-846 1311/8270	o-Cresol	200	TCLP	0.01	mg/L
	m/p-Cresol	200	TCLP	0.01	mg/L
	Cresol, total (or o-Cresol and m/p-Cresol as shown above)	200	TCLP	0.01	mg/L
	1,4-Dichlorobenzene	7.5	TCLP	0.01	mg/L
	2,4-Dinitrotoluene	0.13	TCLP	0.01	mg/L
	Hexachlorobenzene	0.13	TCLP	0.01	mg/L
	Hexachloro-1,3-butadiene	0.5	TCLP	0.01	mg/L
	Hexachloroethane	3	TCLP	0.01	mg/L
	Nitrobenzene	2	TCLP	0.01	mg/L
	Pentachlorophenol	100	TCLP	0.025	mg/L
	Pyridine	5	TCLP	0.025	mg/L
	2,4,5-Trichlorophenol	400	TCLP	0.025	mg/L
	2,4,6-Trichlorophenol	2	TCLP	0.01	mg/L
TCLP Pesticides					
SW-846 1311/8081	Chlordane	0.03	TCLP	0.003	mg/L
	Endrin	0.02	TCLP	0.002	mg/L
	Heptachlor	0.008	TCLP	0.0008	mg/L
	Heptachlor epoxide	0.008	TCLP	0.0008	mg/L
	Lindane	0.4	TCLP	0.04	mg/L
	Methoxychlor	10	TCLP	1	mg/L
	Toxaphene	0.5	TCLP	0.05	mg/L
TCLP Herbicides					
SW-846 1311/8151	2,4-D	10	TCLP	1	mg/L
	2,4,5-TP (Silvex)	1	TCLP	0.1	mg/L

Table 4. Analytical methods, analytes, and target reporting limits

Analytical Method	Analyte	Reference Level	Reference Source	Target Reporting Limit ^a	Units
Other					
ASTM 2216-90 Modified	Percent moisture	NA	NA	0.1	%

^aExcept for TCLP results, report on a dry-weight basis

^bEMWMF ASA-derived WAC (DOE/OR-01-1909&D3, Table A.2)

^cEMWMF analytic WAC (DOE/OR-01-1909&D3, Table A.1 revised 2008). Value shown is the HI (noncarcinogenic) WAC or carcinogenic WAC, whichever is less

^dTwenty times the maximum concentration for the toxicity characteristic in a TCLP extract (40 *CFR* 261.24); the sample should be evaluated by TCLP if the total concentration exceeds this limit

^eDefinition of a beryllium-containing material (29 *CFR* 1926.1124(a)(3))

^fEndosulfan plus metabolites includes Endosulfan I, Endosulfan II, Endosulfan sulfate and other metabolites

^gMaximum concentration for the toxicity characteristic in a TCLP extract (40 *CFR* 261.24)

µg/kg = microgram(s) per kilogram

ASA = auditable safety analysis

ASTM = American Society for Testing and Materials

CFR = Code of Federal Regulations

EMWMF = Environmental Management Waste Management Facility

GPC = gas proportional counting

HI = hazard index

LSC = liquid scintillation counting

MDA = minimum detectable activity

mg/kg = milligram(s) per kilogram

mg/L = milligram(s) per liter

pCi/g = picocurie(s) per gram

NA = not applicable

SVOC = semivolatile organic compound

TCLP = toxicity characteristic leaching procedure

VOC = volatile organic compound

WAC = waste acceptance criteria

5 ANALYTICAL QUALITY ASSURANCE/QUALITY CONTROL

The minimum laboratory QC requirements are summarized in the following sections and will be performed, as needed. The laboratory shall be responsible for all QA/QC and corrective actions as defined per analytical method, SOW, and required methodology.

5.1 METHOD BLANKS

For each analytical batch of up to 20 samples, a method blank will be prepared. The blank will proceed through all of the same preparation and analyses steps as the accompanying samples.

5.2 LABORATORY CONTROL SAMPLES

A laboratory control sample (LCS) will be prepared and analyzed at a frequency of 1 per each batch of up to 20 samples. The LCS (also known as a blank spike) consists of known concentrations of analytes that are spiked into a blank matrix (i.e., analyte-free solid material) and carried through the entire preparation and analysis process.

5.3 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

A MS and MSD shall be prepared at a frequency of 1 per 20 samples or 1 per sample batch, whichever is more frequent. An MS is a sample aliquot spiked with known quantities of analytes and subjected to the entire analytical procedure. It is used to indicate appropriateness of the method for the matrix, and the degree of matrix interference, by measuring recovery or accuracy. An MSD is a second aliquot of the same sample as the MS spiked with the same quantities of analytes. The relative percent difference (RPD) between MS/MSD results is used to measure precision. MS/MSD analyses are not required for radiological analysis that employs an isotopic tracer or chemical carrier.

5.4 DUPLICATES

Laboratory duplicate samples are identical splits of individual samples that are analyzed by the laboratory to test for method and matrix reproducibility or precision. These samples are split in the laboratory during sample preparation. Duplicates will be analyzed with every batch of 20 samples or less for analyses that do not require MS/MSD analysis.

6 DATA MANAGEMENT AND EVALUATION

The Project Environmental Measurements System (PEMS) database or an equivalent database will be used for sample planning, generating COC records and sample labels, sample tracking, and as the repository for sample results. The laboratory will provide analytical results in electronic and hard-copy format.

6.1 DATA DELIVERABLES

The analytical laboratory data deliverable will consist of an Analytical Support Level (ASL) IV record copy in PDF format and an electronic data deliverable (EDD) upload to PEMS, or an equivalent database. A complete case narrative is required for all data reports. The ASL IV data packages shall contain a case narrative that describes the contents of the data package and provides an index of samples associated with the delivery order, including both the project sample identification and the laboratory sample identification. A description of problems encountered in sample receipt, login, and analysis also shall be included in the narrative. The case narrative shall describe the circumstances leading to the use of data qualifiers and list the affected samples. In addition, the type of sample size-reduction, homogenization, and digestion used shall always be clearly specified.

The analytical laboratory will load the EDD containing the analytical results into the PEMS or equivalent database and provide corresponding record copy data packages (certificates of analysis [COAs] and PDF files of ASL IV deliverables) to the RSI APM who will provide copies to the project.

6.2 DATA REVIEW AND VALIDATION

Each laboratory data deliverable will undergo 100% contract compliance verification (CCV) to ensure that basic contractual requirements have been met. Contract compliance screening will include verification that all requested analyses are reported and that hardcopy and electronic results are consistent. Discrepancies will be corrected and documented.

RSI or its subcontractor will perform 10% validation at Validation Support Level (VSL) IV. The analytical data validation will be in accordance with approved procedures. Data qualifiers will be assigned to the data based on the findings. The qualifiers will be entered into PEMS, or

equivalent database, from the validated hard copy and will serve to alert data users to uncertainties associated with the data. If data errors occur, then the percent of Level IV data validation will increase based on the type and quantity of errors found. Rejected data will not be utilized for waste disposal decisions.

6.3 DATA MANAGEMENT AND CONFIGURATION CONTROL

Prior to initiating field sampling activities, the RSI APM will prepare the laboratory SOW. After laboratory selection, a readiness review will be conducted with the laboratory representative, project personnel, and the RSI APM. The PEMS, or equivalent, database will be pre-populated with a unique identifier for each sample, location, required analyses, analytical methods, sample medium, and laboratory name. This information will be used to generate labels for each sample container. Once analytical data are received from the laboratory, it will be verified and validated as previously discussed.

Data reports and all other records, including but not limited to checklists, Field Sampling Logbooks, COC forms, calculations, verification and validation reports, and surveillance reports, shall be maintained as official project records in accordance with Section 6 of the QAPP.

6.4 DATA EVALUATION

As data are received, results and field sample information will be assessed for RCRA exceedances and other indications of potential for anomalous waste. Follow-up may include re-analysis of the existing sample (suspect error in analysis), resampling (suspect inconsistency in sampling method, sample was not representative of the waste form), marking/segregating the anomalous waste (accessible, readily removable item, area), and additional characterization (inspection, field measurements, intrusive sampling) to determine the extent of the contamination.

The data set for the expected waste lot will be compiled for statistical analysis for EMWMF. Maximum total chemical or radiochemical results above the EMWMF WAC may still result in an acceptable SOF. This will be addressed in the DQA.

When TCLP results exceed the RCRA limits, the material may be removed and disposed as hazardous or mixed waste. If the material with the sample results above the RCRA limits is integral to the waste stream (e.g., gray-painted beams), a UCL-90 calculation or mass balance will be performed.

A summary of the results, data evaluation and SAP deviations will be presented along with the proposed EMWMF waste lot definition in the final DQA for Building 9720-17 demolition.

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Appendix A

Quality Assurance Project Plan

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ACRONYMS

Acronym	Definition
APM	Analytical Project Manager
ASL	Analytical Support Level
ASTM	American Society for Testing and Materials
CA	corrective action
CCV	contract compliance verification
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CNS	Consolidated Nuclear Security, LLC
COC	chain of custody
DMC	Document Management Center
DOE	U.S. Department of Energy
DOECAP-AP	DOE Consolidated Audit Program – Accreditation Program
DOE O	DOE Order
DOT	U.S. Department of Transportation
DQA	Data Quality Assessment
DQO	data quality objective
EDD	electronic data deliverable
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
ES&H	Environment, Safety, and Health
FFA	Federal Facility Agreement
FSL	Field Sample Log
ID	identification
LCOC	laboratory chain of custody
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LOR	Letter of Receipt
M&O	management and operating
M&TE	measuring and test equipment
MDL	method detection limit
MS	matrix spike
MSD	matrix spike duplicate
NIOSH	National Institute for Occupational Safety and Health
NNSA	National Nuclear Security Administration
PEMS	Project Environmental Measurement System
PID	photoionization detector
PM	Project Manager
QAPP	Quality Assurance Project Plan

Acronym	Definition
QA	quality assurance
QC	quality control
RSI	RSI Services, LLC
S/CI	suspect/counterfeit item
SAP	sampling and analysis plan
SME	subject matter expert
SMO	Sample Management Office
SOP	standard operating procedure
SOW	statement of work
TDEC	Tennessee Department of Environment and Conservation
TSDF	Treatment, Storage, and Disposal Facility
WAC	waste acceptance criteria
WHP	Waste Handling Plan
XRF	X-ray fluorescence
Y-12	Y-12 National Security Complex

1 PURPOSE

This project-specific Quality Assurance Project Plan (QAPP) supports the characterization activities associated with demolition of Building 9720-17 at the U.S. Department of Energy (DOE) National Nuclear Security Administration (NNSA) Y-12 National Security Complex (Y-12). This QAPP is an appendix to the *Sampling and Analysis Plan for Building 9720-17 at the Y-12 National Security Complex, Oak Ridge, Tennessee*, (referred to herein as the Sampling and Analysis Plan [SAP]). If the Data Quality Assessment (DQA) supports waste disposal at the Environmental Management Waste Management Facility (EMWMF), the SAP will be an appendix to the Waste Handling Plan (WHP) prepared for the characterization and disposition of Building 9720-17.

Quality assurance (QA) requirements met by this QAPP include requirements described in:

- *EPA Requirements for Quality Assurance Project Plans* (EPA-QA/R-5)
- *Uniform Federal Policy for Quality Assurance Project Plans – Evaluating, Assessing, and Documenting Environmental Data Collection and Use Programs* (EPA-505-B-04-900A)
- DOE Order (DOE O) 414.1D, *Quality Assurance*

2 SCOPE

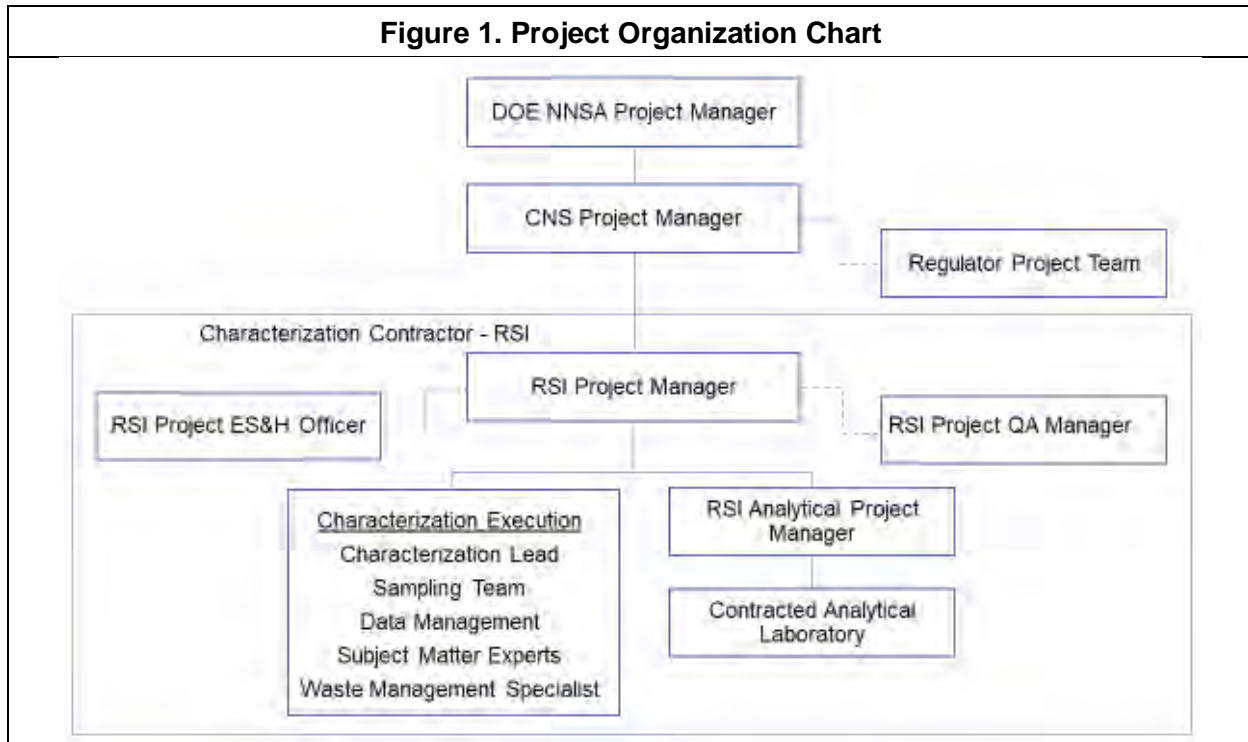
This QAPP addresses activities that generate waste characterization data to support decisions, including waste acceptance and waste determinations, for Building 9720-17 demolition. The SAP contains additional background information and specific QA requirements applicable to Building 9720-17 characterization objectives and activities.

This QAPP describes the necessary QA/Quality Control (QC) and other technical activities that must be implemented to ensure the results of the work performed will satisfy data quality objectives (DQOs), performance criteria, and requirements of the *Action Memorandum for the Y-12 Facilities Non-Time-Critical Removal Action Deactivation/Demolition Project Oak Ridge, Tennessee* (DOE/OR/01-2462&D2).

3 PROJECT ORGANIZATION AND RESPONSIBILITIES

The project organization chart for characterization, shown in Figure 1, identifies key project roles, lines of authority, and lines of communication. The project will be conducted at Y-12. The DOE NNSA Project Manager (PM) will be responsible for overall project oversight. DOE NNSA's management and operating (M&O) contractor for Y-12, Consolidated Nuclear Security, LLC (CNS), will be responsible for project execution, including development of the statement of work (SOW) for characterization.

Specific work scope is defined in the SOW and will be executed by CNS' characterization contractor, RSI Services, LLC (RSI). RSI and subcontractors will be responsible for providing sampling, analysis, and data evaluation support for waste management decisions.



The roles and responsibilities are described below.

- **DOE NNSA Project Manager**—The DOE NNSA PM provides overall project oversight for Building 9720-17 characterization. Specific responsibilities include providing necessary funding to execute the work, advising the team, managing the project’s interfaces, providing special assistance to minimize delays, and performing assessments and audits.
- **CNS Project Manager**—The CNS PM has the overall responsibility for successful execution of Building 9720-17 characterization. Specific responsibilities include characterization planning, including SOW preparation, and coordinating walkdowns and characterization activities to meet characterization objectives.
- **Regulator Project Team**—The Regulator Project Team is composed of the U.S. Environmental Protection Agency (EPA) and the Tennessee Department of Environment and Conservation (TDEC), the federal and state regulatory agencies overseeing federal facility cleanup programs, including Y-12 facility pre-demolition and demolition activities under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). These agencies are responsible for ensuring compliance with the Federal Facility Agreement (FFA) (DOE/OR-1014), overseeing project key functions, and planning, reviewing, and approving associated documents.
- **RSI Project Manager**—The RSI PM is responsible for overall performance, safety, and quality implementation of the SOW. The RSI PM coordinates, designates responsibility for, and provides oversight of specific scope elements including:
 - DQO development and preparation of the project-specific SAP and QAPP
 - Sample collection, transport to the approved analytical laboratory, sample analysis, and data management
 - Preparation of the DQA, WHP, and waste profiles

The RSI PM ensures, through the work control process, that sampling and analysis activities are conducted in accordance with the SAP, and that any deviations are documented and approved.

- **RSI QA Manager**—The RSI QA Manager functions independently and provides the RSI PM information concerning the QA aspects of the project. Specific responsibilities include:
 - Providing guidance and direction on QA program requirements and reviewing the overall quality of project plans
 - Coordinating with technical members of the project team to evaluate status, procedures, and nonconformances from a QC standpoint
 - Ensuring project execution meets requirements of the SAP/QAPP
- **RSI Environment, Safety, and Health (ES&H) Officer**—The ES&H officer functions independently and reports to the RSI PM on matters concerning ES&H. Specific responsibilities include:
 - Ensuring that all work is planned and conducted in a safe manner
 - Making periodic assessments of ES&H in practice by performing review and surveillance of field crews and other project personnel
 - Responding to worker ES&H issues
- **RSI Analytical Project Manager (APM)**—The APM is responsible for analytical project management. Specific responsibilities of the APM or designee include:
 - Assisting the project in ensuring the adequacy of sample and data collection, laboratory analysis, and reporting
 - Performing validation and verification activities
 - Assisting with sample collection plans and working with laboratories to identify cost savings opportunities with respect to batching for shipment to and reporting from the analytical laboratories
 - Scheduling, leading, and documenting SOW readiness reviews between selected laboratories and project personnel
 - Modifying laboratory SOW change orders to reflect project changes such as number of samples, sample matrices, and methods/analyte changes
 - Entering, maintaining, and verifying data associated with sample shipment, data receipt, data quality, and data package invoicing in database applications
 - Tracking sample and data progress from sample receipt by the laboratory through data reporting and laboratory invoice payment
 - Informing project personnel of any schedule and/or technical variances and assisting in resolution/prevention measures
 - Coordinating and initiating laboratory SOW closure
- **Characterization Execution**—Implementation of the SOW by RSI involves several functions:
 - The **Characterization Lead** is responsible for planning and field supervision of all sampling events and informing the RSI PM of any field deviations from the SAP.

- The **Sampling Team** is responsible for execution of the SAP and informing the Characterization Lead of any field deviations.
- **Data Management** includes personnel that perform data management functions such as data entry, storage and management of data and reports associated with sample collection, laboratory analysis, and analytical data verification and validation.
- **Subject Matter Experts (SMEs)** are personnel that provide support to implement characterization. Specific functions include preparation and review of the project schedule, SAP, QAPP, and other project documents.
- The **Waste Management Specialist** is an essential member of the project planning team. Job duties for this position include leading DQO scoping, performing a review of the analytical data to ensure the waste acceptance criteria (WAC) DQOs have been addressed, and preparing the DQA, WHP, and waste profiles.
- **RSI Contracted Analytical Laboratory**—RSI will select a laboratory to meet the SAP requirements for analysis. All laboratory methods used to analyze samples obtained in accordance with the SAP will be performed by a DOE Consolidated Audit Program – Accreditation Program (DOECAP-AP) assessed laboratory using approved procedures and methods, including the following:
 - All laboratory analyses and QC requirements, including independent validation and verification, will be performed in accordance with the SAP and QAPP requirements.
 - Any deviations from specified parameters must be approved by the RSI APM (or appointed designee) before the change is made. The APM will notify and consult with the RSI PM or authorized designee as needed.
 - The laboratory will perform the sample preparation and analysis in accordance with the requirements of the laboratory SOW, applicable Environmental Protection Agency (EPA) methods, and laboratory standard operation procedures.
 - The RSI APM implements the SOW for each applicable laboratory, monitors performance of each laboratory, and manages the analytical results reported by each laboratory. Also, each laboratory must communicate any analytical deficiencies to the APM upon submittal of the data. The APM will notify the RSI PM of the deficiency, communicate an assessment of the impact to sample and data quality, and implement corrective actions (CAs).

4 PROJECT DESCRIPTION AND PROBLEM DEFINITION

The project is to characterize the building structures and remaining equipment in Building 9720-17 for future demolition and disposition. The project is being implemented under CERCLA in accordance with the FFA. Building 9720-17 is a one-story 4,314 ft² rectangular building located at Y-12. Demolition will reduce the overall risk associated with this unoccupied and deteriorating facility and eliminate associated M&O costs.

Additional data is needed to demonstrate that demolition debris meets the WAC for the EMWMF, the onsite CERCLA disposal facility. Building 9720-17 characterization and sampling results will support the development of waste profiles and plans for disposal of demolition debris at the EMWMF.

Anomalous waste may require disposal at a CERCLA approved offsite treatment, storage, and disposal facility (TSDF) using project characterization data, or additional data collected under separate DQOs.

5 QUALIFICATIONS AND TRAINING

RSI will utilize fully qualified individuals to execute this contract. All personnel shall have appropriate education, training, and experience to perform their assigned tasks. Project personnel directly involved with waste characterization activities will receive training as part of the readiness process. Personnel training will include project-specific plans and applicable technical procedures, as appropriate. Training records will be made available for review prior to project execution and maintained in accordance with contract requirements and applicable procedures.

6 DOCUMENTATION AND RECORDS

All project records (including field logs, chain of custody [COC] forms, work packages, logbooks, analytical results raw data, Project Environmental Measurements System [PEMS] format deliverables, audit reports, QA reports, progress or status reports, analytical data reports, and data validation reports) will be maintained in accordance with DOE O 243.1C, *Records Management Program*, which includes security requirements. Original hardcopy documentation will be maintained as record copies and transferred by RSI, along with other project records, to CNS at the end of the project. Project records will be stored by CNS in accordance with applicable procedures at the Document Management Center (DMC). Hardcopy documentation will be maintained at the DMC for a minimum of three (3) years, or until project completion, after which they are sent to DOE's long-term storage.

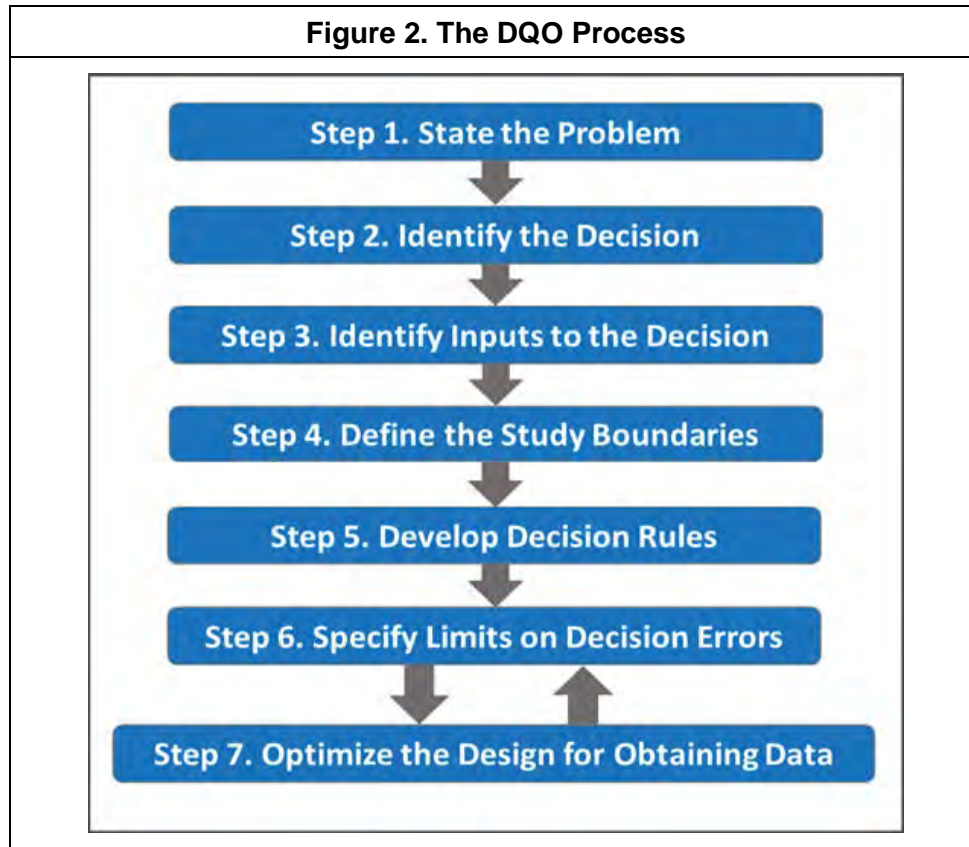
Records are retained and maintained in accordance with the length of time specified in DOE records retention schedules (i.e., 75 years after termination of the applicable FFA).

7 QUALITY OBJECTIVES AND MEASUREMENT PERFORMANCE CRITERIA

The DQO process, as defined by *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA QA/G-4, EPA/240/B-06/001), is "a strategic planning approach based on the Scientific Method that is used to prepare for a data collection activity." The DQO process is used to establish performance or acceptance criteria, which serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support the goals of the activity. The DQO process provides a systematic procedure for defining the criteria that a data collection design should satisfy, including when to collect samples, where to collect samples, how many samples to collect, and the tolerable level of decision errors.

The DQO process consists of seven iterative steps, as shown in Figure 2. While the interaction of these steps is portrayed in the figure in a sequential fashion, the iterative nature of the DQO process allows one or more of these steps to be revisited as more information on the problem is obtained.

A project-level DQO Planning Session was conducted as described in the SAP in accordance with EPA QA/G-4. The process was used to determine that the type, quantity, and quality of environmental data being collected would be appropriate and sufficient for regulatory determination, characterization, and disposition of the waste streams. Based on this session, the DQOs were finalized and are in Appendix B to the SAP.



8 SAMPLE DESIGN AND CONTROL

The sample design is a primary product resulting from the application of the DQO process. A SAP associated with the Building 9720-17 scope (appendix to the WHP) was developed concurrently with this QAPP and will be implemented to characterize the building for demolition. Results will be documented in the Building 9720-17 WHP. The SAP, QAPP, and DQOs collectively address the following information:

- DQOs
- Sampling design and handling (e.g., applicable procedures, sample count, and types)
- Analytes and reporting limits
- Analytical methods
- Laboratory requirements
- QC requirements
- Data review, evaluation, and management
- Variances or deviations
- Applicable tables and references

8.1 DATA QUALITY OBJECTIVE FLOWDOWN

Developing and refining the project's objectives are an integral part of the DQO process. The objectives shall be stated with sufficient detail so that the sample design, analytical methods, and QC requirements are consistent with the following project objectives:

- Identify the regulatory requirements (or other drivers for sampling) and DQOs.
- Define project DQOs based on intended use of the data
- Describe all the anticipated uses for analytical data

8.2 SAMPLE DESIGN AND HANDLING

The sample design incorporates all concerns related to the collection of samples. Maximum use of reference to the QAPP is encouraged and descriptions of supplemental information, site-specific details, maps, conceptual site model (if applicable), and new information shall be addressed in the DQO package. Collected samples should be representative of the media sampled and apply to the intended data use. The number and type of samples specified to be collected shall be sufficient to achieve the identified quality objectives.

8.3 QUALITY CONTROL REQUIREMENTS

Collection of field QC samples is based on the DQOs. Requirements and justification for collection of field QC samples per sampling event shall be documented. The type and frequency of QC samples along with the parameter of interest, action levels, and/or limits should be included. See Section 11 for additional discussion of QC elements and refer to the SAP for a description of project-specific QC samples.

8.4 VARIANCES AND DEVIATIONS

It should be recognized that field sampling cannot always be completed as planned. Projected sample locations may be inaccessible and, in some cases, the proposed media cannot be located.

All documentation regarding variances and deviations, and their approval, shall be placed in the project file. This will help achieve confidence in the samples collected in accordance with the SAP and the project-specific DQOs. Variances and deviations will be documented in the DQA (see Section 19).

9 SAMPLING METHODS

Sampling requirements, including the specified methods, are addressed in the SAP. Collected samples should be representative of the media sampled and apply to the intended data use. The use of statistical methods is dependent upon the WAC requirements; therefore, sampling design, methods, and objectives shall be discussed in the project DQOs. The number and type of samples specified for collection shall be sufficient to meet identified DQOs.

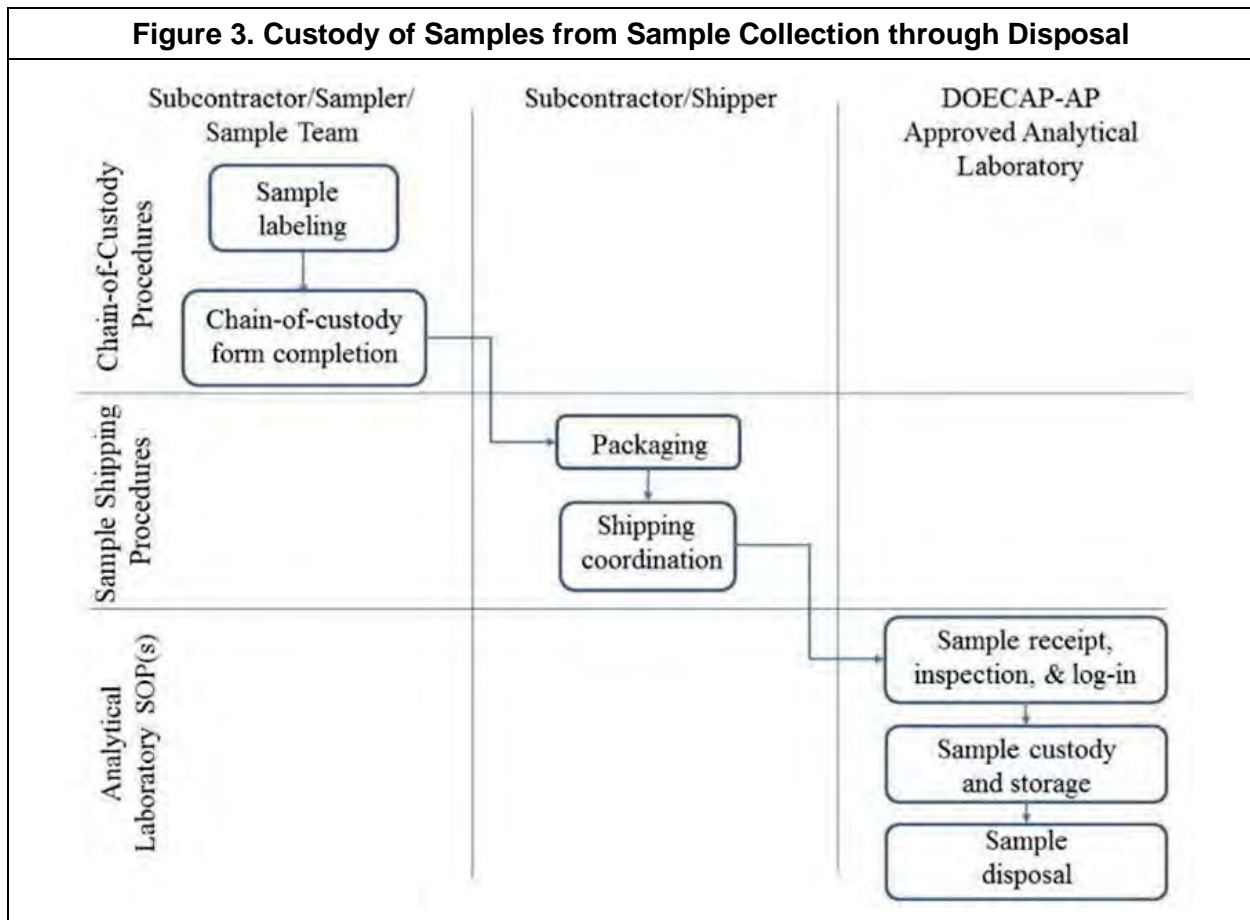
Contractor sampling procedures are designed to reduce variability between sampling events and obtain representative samples, thereby maintaining consistent quality during all sampling activities. Additional guidance and standard practices on sampling approaches and methods are available from EPA and the American Society for Testing and Materials (ASTM). The quality of the sampling operations is vitally important to the ultimate quality of the data that the laboratory will obtain by following standard analytical procedures. Alternate sampling strategies and methods must be reviewed and approved by the appropriate project and functional representatives.

10 SAMPLE HANDLING AND CUSTODY

Sample custody is a vital aspect of waste characterization because data must be defensible. The sample custody must be traceable from the time of sample collection to laboratory receipt and final disposition.

A sample is in custody if it (1) is in the actual possession of a sample team, (2) is in the view of sample team after being in their physical possession, (3) was in the physical possession of a sample team and then secured to prevent tampering, and (4) is placed in a secured area.

Figure 3 illustrates personnel responsible for maintaining custody of samples from sample collection through disposal.



10.1 FIELD CUSTODY

Adequate field custody requires that the sampling team and field sampling coordinators have overall responsibility for the care and custody of the collected samples until transfer or proper dispatch to the laboratory in accordance with RSI's COC procedures. At the end of the day, sample shipment information is recorded on the COC form that accompanies the samples to the laboratory.

10.2 SAMPLE NUMBERING SYSTEM

A sample numbering system will be developed to uniquely identify each waste characterization sample collected. Each sample group shall be assigned a project identification (ID) number. The sample number and the entire sample description will be pre-assigned prior to sample collection. The samples to be collected at each site and their designated descriptions are presented in the SAP.

If an ad hoc sample (i.e., unplanned sample) is collected in the field, all the required information shall be recorded, to the extent known, on a blank line on the COC form and in the field logbook in accordance with RSI's COC procedure and field logbook procedure.

10.3 SAMPLE COLLECTION, IDENTIFICATION, AND LABELING

Sample collection information uniquely identifies and describes a sample collected during a specific field event. The PEMS database generates COC forms (e.g., Field Sample Log [FSL]) for sampling activities and container labels for each sample location in accordance with RSI's COC procedure. The sampling information is recorded on the FSL and is later entered into the applicable database (e.g., PEMS) to produce the laboratory chain of custody (LCOC) form. All physical samples for laboratory analysis obtained shall be placed in appropriate sample containers for shipment to the laboratory. Each sample container will be identified with a separate ID label and include a custody/tamper seal.

10.3.1 Custody/Tamper Seals

Field samplers affix custody/tamper seals to all sample containers, including coolers, to detect any possible tampering of the samples between the time of sample collection and receipt of the sample by the laboratory. Custody/tamper seals must be waterproof, have adhesive backing, and are placed over each sample container lid in such a way that the container cannot be opened without breaking. For sample coolers, the custody/tamper seal will be placed on the front and back of the cooler lid to include the sides of a sample cooler for shipment to the laboratory. The application of custody/tamper seals on sample coolers may be waived if the sample team maintains sample custody from the time of collection until the samples are relinquished to the Transportation Specialist. Certain sample containers (e.g., bottles with a septum lid) may be placed in a resealable bag and have a custody seal affixed such that the seal must be broken when the bag is opened (e.g., over the bag opening).

10.3.2 Field Logbooks and Field Data Forms

A bound logbook will be used to document all field activities including, but not limited to, inspections, sampling, and testing and/or measurements. Field logbooks become part of the project record and include descriptions of daily progress of the fieldwork for the area of investigation. Guidelines for the minimum entries to be made in field logbooks are provided in RSI's field logbook procedure.

As electronic logbooks (e-logbooks) and/or electronic field data forms (e-forms) and devices are developed and approved for use, the electronic logging devices may be used in lieu of a bound logbook and hardcopy field data forms. The e-logbook, e-forms, and/or devices should be officially approved for use by the project.

Relative to sampling events, the information recorded on the field data forms may include, but is not limited to, the following:

- Sample location and sample station
- Sample collector

- Sampling event date and time
- Results of any field screening performed on the sample
- Observations during sampling
- Volume or weight of sample collected, if applicable
- COC/FSL form number(s)
- QC sample numbers and types (e.g., blanks, splits, duplicates)

10.3.3 Chain of Custody

A COC form documents the transfer of sample custody from the time of sample collection to laboratory receipt and final disposition. Sample custody is maintained and documented using COC forms in accordance with RSI's COC procedure and protocols.

The FSL is initiated at the time of sample collection and remains with the sample from the field to storage in a sample refrigerator, sample storage cooler, or secured area as applicable. The Sample Custodian/Sample Team Member completes the required sections on the form that documents sample transfer (e.g., signature, date, time) to the Transportation Specialist or Sample Shipping Manager.

Information from the FSL is transferred into a database (e.g., PEMS) and a LCOC is generated. The Transportation Specialist or Sample Shipping Manager packages the samples, completes the required sections on the LCOC (e.g., records signature, time, date, air bill number), and seals the original LCOC in a watertight bag inside the shipping container. For details regarding sample custody and tracking at the laboratory, see Section 10.9.

10.4 STORAGE AND SHIPMENT OF SAMPLES

Samples may be stored onsite if (1) they are in a secure location, and (2) samples requiring temperature preservation are monitored to ensure the temperature remains $4 \pm 2^{\circ}\text{C}$. Storage temperatures will be logged and recorded in a logbook or form.

Samples requiring analyses with short holding times will be identified and designated as such on FSLs and LCOC forms and will be shipped as soon as possible to meet the short holding times. Shipments of samples from the field to the laboratory will typically be sent within 48 hours of collection. Samples collected, packaged, and shipped to the laboratory for analyses will be tracked using the carrier's tracking system (e.g., United Parcel Service, FedEx).

Samples of material shipped from a site to a laboratory for analysis must be classified and prepared for the carrier in accordance with regulatory requirements found in the International Air Transport Association regulations and U.S. Department of Transportation (DOT) regulations at 49 *Code of Federal Regulations (CFR) Parts 100 through 180, Pipeline and Hazardous Materials Safety Administration, Department of Transportation*.

Samples that meet the definition of hazardous material or dangerous goods shipped in commerce to a laboratory must be assigned a tentative proper shipping name, hazard class, and ID number. The materials or samples shall be packaged and labeled based on a tentative determination of hazard class using the following:

- Shipper knowledge
- Information gathered while collecting the sample and/or identifying the material
- Hazard precedence

10.5 FIELD STORAGE

In the field, samples shall be kept cool, if applicable, for the required analyses and away from direct sunlight. As soon as samples requiring refrigeration are collected, filtered as necessary, and preserved, they shall be stored in sample coolers or ice chests containing ice. Care should be exercised to avoid breaking glass containers during field transport. Field personnel shall ensure that the sample container lids are secure and are custody/tamper-sealed after field sample collection. For samples not requiring refrigeration (e.g., radiological analyses and/or awaiting aliquot or compositing of specified sample interval), samples may be stored in a secured storage area with limited access until final compositing of samples are obtained. These types of aliquot samples shall be custody/tamper-sealed to protect the integrity of the samples prior to and after sampling aliquots.

10.6 SAMPLE CONTAINER PREPARATION

Pre-cleaned and quality assured containers that meet EPA *Specifications and Guidelines for Contaminant-Free Sample Containers* (EPA 540/R-931051) will be supplied by the subcontract laboratory designated for analytical services.

10.7 SAMPLE PRESERVATION

Preservation methods are intended to (1) retard biological action, (2) retard chemical reaction of chemical compounds and complexes, (3) reduce volatility of constituents, and (4) reduce absorption effects. Preservation methods are generally limited to pH control, chemical addition, refrigeration, and freezing. Some samples collected to support treatability analyses may require special onsite storage conditions (e.g., freezing, special refrigeration). Sample bottles/containers may be purchased pre-preserved or unpreserved. Sample preservation may be conducted in a controlled area or in the field during sample collection.

The required preservatives for various constituents are provided in EPA SW-846, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*. These choices are based on the accompanying references and information supplied by the APM. Required sample preservation and holding times will be adjusted to reflect new information as more data becomes available. Preservation of samples will be in accordance with SW-846 and RSI's procedures, as applicable. A list of recommended preservatives (e.g., nitric acid, hydrochloric acid) for specific analyses are provided in the SAP. The laboratory SOW will specify the actual requirements for the project. Preservative requirements are also documented on the preprinted FSL.

10.8 NOTIFICATION TO LABORATORY OF SAMPLE SHIPMENT

Prior to any sampling activity, the APM will contact the laboratory PM to review the sample quantities, types, identification, and analytical methods; specify the analysis requirements, detection levels, and target analytes; review the schedule; set up the lines of communication under nonconformance conditions; and review the deliverable requirements.

The APM will notify the laboratory when samples are to be shipped. Notifications will be made at the earliest possible time to allow the laboratory to effectively schedule the analytical work.

10.9 LABORATORY SAMPLE CUSTODY AND TRACKING

The LCOC of samples is maintained at the laboratory level. Upon laboratory receipt, the laboratory Sample Custodian examines the sample shipment to determine if damage, loss, inconsistencies, sample integrity, or tampering have occurred. The laboratory Sample Custodian will record the condition, verify the presence of each sample listed on the LCOC, and complete the final "Received by" box and associated "Date" and "Time" boxes, thereby

accepting custody of the samples.

The laboratory completes a Letter of Receipt (LOR) or equivalent and indicates sample condition, sample cooler temperature, documentation inconsistency, and any problems discovered. A copy of the LOR documentation, including completed LCOC forms, will be submitted to the APM identified in the SOW as soon as practical, but no later than 72 hours from sample receipt. The submittals may be faxed or sent electronically (typically attached to an email).

The laboratory will immediately notify the APM if problems are discovered with the sample shipment (e.g., nonconformance noted either in the sample identifications, types of analyses, or condition upon receipt).

The laboratory will maintain an internal sample tracking record that will document the date of sample removal from storage; extraction, preparation, and analysis information; and the laboratory-assigned sample number, which is affixed to each sample container upon sample receipt. These tracking records will be used to confirm compliance with the handling and holding time requirements. All sample tracking information, including the original LCOC form, are submitted to the APM or designee as part of the laboratory deliverable. The data package, including the original LCOC, will be submitted by RSI to CNS at the completion of the project.

Samples may be held for a reasonable time, such that the required extraction method and analysis holding times are not exceeded or jeopardized. Samples and sample extracts will be stored by the laboratory in appropriate containers and under environmental conditions appropriate to the specific analytes and laboratory methods. The storage time for the samples and the sample extracts is a function of the analytical method holding time for a given analysis. Storage beyond the required holding time for an analysis will depend on unusual cases where the laboratory is requested to perform additional analyses outside of the holding time.

Holding times are specified in EPA SW-846. Samples may be accumulated at the laboratory to form an analytical batch that consists of a maximum of 20 field samples from the same project and of the same matrix or of similar composition. Associated field QC samples—including trip blanks (if required), equipment rinsates/blanks, field duplicates, and project-specific matrix spike (MS)/matrix spike duplicates (MSDs) (if required)—shall be designated on the COC forms and may be included in the analytical batch. Laboratory QC samples are performed in accordance with the analytical methods employed for a specific project.

10.10 SAMPLING EQUIPMENT DECONTAMINATION

To the extent practical, sampling equipment should be single-use, disposal items. However, if reusable items are used, equipment will be decontaminated to prevent transfer of contaminants from equipment to sampled media, limit cross-contamination between sampling points, and protect worker health and safety.

Decontamination procedures are designed to maintain the integrity of collected samples and minimize the generation of hazardous waste and excessive volumes of waste solutions. The use of improperly decontaminated equipment can directly affect data quality. Non-dedicated sampling equipment shall be cleaned between each use and each sample point. Dedicated equipment shall be cleaned as necessary. Where appropriate, the use of disposable sampling equipment is preferred to prevent cross-contamination and may be decontaminated as deemed by the project.

Requirements for the decontamination of equipment are provided in RSI's procedures for decontamination of sampling equipment. Decontamination requirements shall be followed by field personnel unless variations have prior approval of the responsible PM and QA

organization. The reason for the deviation of the procedure shall be described in detail in the field logbook.

Equipment may be decontaminated in a designated decontamination area or in the field in accordance with applicable procedures.

10.11 SAMPLE DISPOSAL

It is essential to track the final disposition of each sample because of potential liabilities incurred through improper disposal of samples. Samples shall be disposed of in accordance with approved laboratory practices by the analytical laboratory performing analyses in accordance with the analytical SOW. Specific combinations of radioactivity level and hazard may preclude laboratory disposition of sample residuals and, therefore, may be returned to the project as specified by the analytical SOW. Sample returns are to be coordinated by the laboratory, RSI APM, and project personnel.

11 QUALITY CONTROL

Waste management data generated shall be of known quality and shall be traceable, technically accurate, have definable characteristics, and be legally defensible.

Traceability is a legal requirement that provides a documented trail beginning with requirements for data and ending with effective use of the data. Elements that provide traceability include defined DQOs, documented collection and measurement techniques, sample and data custody records, and original and final data used to support decisions.

Legal defensibility requires that data generated be scientifically defensible (i.e., accurate, precise, and representative). Complete files of generated data and supporting documentation sufficient to support litigation are required. Fundamental mechanisms for achieving established quality goals can be categorized as prevention, assessment, and correction that include the following:

- Prevention of errors by planning and careful selection and training of skilled, qualified personnel
- Assessment and surveillance program to supplement continual informal review
- Correction of processes to prevent recurrence of conditions adverse to quality
- Incorporation of new processes as they develop to increase quality

This QAPP has been prepared to guide the attainment of these goals by describing the QA program to be implemented and the QC elements included in the SAP to be followed.

11.1 TYPE AND FREQUENCY OF FIELD QC SAMPLES

The type and frequency of field QC samples to be collected are provided in the SAP.

11.2 TYPE AND FREQUENCY OF LABORATORY QC SAMPLES

A listing of common laboratory QC samples is provided in the SAP. Laboratory QC sample requirements, the methods used to perform analysis, and the analytical SOW are identified in the laboratory contract and the individual analytical procedures. QC requirements are specified using a graded approach depending on project needs and sample matrices.

12 MEASUREMENT PERFORMANCE CRITERIA (DATA QUALITY INDICATORS)

Measurement performance criteria are data quality indicators. Evaluation of data quality indicators is an integral part of the laboratory data review process. EPA recognizes the following primary data quality indicators, referred to collectively as Precision, Accuracy (bias), Representativeness, Comparability, Completeness, and Sensitivity. Formula and supplemental information for Precision, Accuracy (bias), Representativeness, Comparability, Completeness, and Sensitivity are contained in Chapter 1 of *Final Update V* to the Third Edition of the manual, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (EPA SW-846).

QA/QC samples and execution of the laboratory SOW are the basis to determine measurement performance. The laboratory will provide the necessary documentation that will enable the independent data validation personnel to evaluate the laboratory's compliance with analytical QA/QC requirements in the following areas:

- **Precision**—Precision is the degree to which a set of measurements of the same matrix, collected and handled under similar conditions, have similar results. Precision data indicate how consistent and reproducible field sampling and analytical procedures have been. Laboratory replicates, field duplicate samples, and duplicate analysis (such as MS/MSD and laboratory control sample [LCS]/laboratory control sample duplicate [LCSD]) are used to quantify precision. Laboratory replicates measure the analytical precision, whereas field duplicates provide a precision measurement that includes the sampling and the potential variability of the sample matrix. In addition to sample heterogeneity, other factors may negatively impact the precision, such as a different extraction efficiency of the duplicate and original aliquots during preparation, or the subsampling technique of the laboratory analysts obtaining the aliquot required for the sample preparation.
- **Accuracy/Bias**—Accuracy is the agreement between an observed value and an accepted reference value; bias is the systematic distortion associated with the measurement process. One way to determine analytical accuracy/bias is through the results of analyte surrogate, matrix, and blank spikes performed. Surrogate spikes are applied, where recommended by an approved method, to all field samples, MS aliquots, method blanks, and blank spike samples to assess the preparation and analysis efficiency for target analytes. MS samples are performed on selected samples to assess analytical accuracy for a given sample duplicate. When performed together, MS/MSDs and LCS/LCSDs provide important information that is used to determine when matrix interferences are present and to indicate a potential bias in the quantitated sample results.
- **Representativeness**—Representativeness expresses the degree to which sample data represent the matrix conditions. Statistically based sampling designs, the SAP, and procedures for sample collection and handling are designed to maximize sample representativeness. Representativeness can also be monitored by reviewing field documentation and through field QA assessments. Laboratory aliquoting practices will be evaluated to minimize factors affecting both representativeness and precision.
- **Comparability**—Comparability is the extent to which different methods or data agree and can be represented as similar. Comparability among measurements will be achieved using standard procedures and protocols.
- **Completeness**—Completeness of the data set is evaluated by comparing the data rejected (R-qualified data) to the data reported. If the completeness is less than 90%, then documentation should be provided to explain why this QA objective was not met and the

impact on the project should be evaluated.

- **Sensitivity**—Sensitivity is the ability of the method or instrument to detect the target analytes at the level required to meet project DQOs. Several limits have been established to describe sensitivity requirements (e.g., instrument detection limit, method detection limit [MDL], estimated quantitation limit, contract-required detection limit, reporting limit). MDLs have a statistical basis, while the other limits noted above may be arbitrarily set at the contractual level (an estimated level above the MDL indicated by the method or the level of the least concentrated standard).

13 ANALYTICAL METHODS

The laboratories used by the characterization contractor, RSI, must be approved by DOE through active participation in DOECAP-AP or approved as specialty laboratories by the Sample Management Office (SMO), which maintains a current list of approved laboratories. When applied properly, the DQO process identifies the action levels and associated error for the decision-making process. These parameters are used to determine the appropriate analytical methodology that will provide usable data. The APM is responsible for providing guidance to the projects on the selection of specific analytical methods, which are specified in the SAP. Methods published in international, regional, or national standards shall preferably be used. The laboratory shall ensure it uses the latest valid edition of a standard unless it is not appropriate or possible to do so. When necessary, the standard shall be supplemented with additional details to ensure consistent application.

13.1 CHEMICAL METHODS OF ANALYSIS

A variety of organic, inorganic, and various wet chemical analyses are performed for demolition waste characterization. Examples of sources for organic, inorganic, and wet chemical methods readily performed by commercial analytical laboratories include the following:

- EPA SW-846
- EPA Water Methods
- Standard Methods for the Analysis of Water and Wastewater
- ASTM
- Association of Official Analytical Chemists
- National Institute for Occupational Safety and Health (NIOSH)

13.2 RADIOCHEMICAL ANALYSES

Destructive analysis provides the most direct and, generally, a more accurate and unbiased activity determination in cases where the uniform distribution of the radionuclides is present or otherwise representative sampling can be ensured. Sample preparation by dissolution/mineralization must be applied in accordance with the physicochemical characteristics of the sample matrix and as a function of the behavior of the specific element in the dissolution media (volatilization, precipitation).

In some cases, it is possible to do a direct measurement of the radionuclide after dissolution/mineralization if the determination technique has the required resolution. Chemical separations may be required to isolate the analyte from interfering species. Chemical separation involves a chemical strategy to eliminate chemical interference (e.g., calcium in strontium determination) and radiological interference through a chemical process such as precipitation, solvent extraction, or chromatography.

Radiometric determinations are performed by instrumental analysis. Applicable methods and laboratory equipment include liquid scintillation counters that allow beta spectrometry; alpha spectrometry with semiconductor detectors; high-resolution gamma spectrometry for high- and low-energy gamma-emitting nuclides; and mass spectrometry, which gives an accurate and efficient response for the analysis of the prepared and/or separated waste samples. Radiochemical determinations have fewer standardized methods than stable chemistry. Examples of sources for radiochemical methods readily performed by commercial analytical laboratories include the following:

- Health and Safety Laboratory (HASL)-300
- Index to EPA Test Methods (EPA 900 series)
- ASTM

13.3 FIELD MEASUREMENTS

Field analytical screening instruments and techniques provide real-time or direct (or colorimetric) readings. These instruments and techniques include photoionization detectors (PIDs), colorimetric tubes, portable X-ray fluorescence (XRF) units, portable gas chromatography units, pH meters, multi-gas detector, and immunoassay tests.

Field measurements are commonly used as screening tools, for monitoring, or as qualitative indicators. Field screening measurements are often used in conjunction with confirmatory laboratory analysis. Measurements or analyses performed for worker protection under the Industrial Hygiene and Radiation Protection Programs are not included in the scope of this QAPP.

Field instrumentation and measurement equipment will be calibrated, adjusted, and maintained at a frequency or prior to use in accordance with manufacturer's instructions, EPA procedures, and/or RSI's procedures where applicable.

14 INSTRUMENT/EQUIPMENT TESTING, CALIBRATION, INSPECTION, AND MAINTENANCE

Contracted laboratories are responsible for preparation and documentation of their laboratory equipment calibration, verification, and maintenance programs. Specific individuals within the laboratories shall be designated and responsible for implementation of the programs. Qualified personnel shall be responsible for periodic surveillance to verify compliance.

Analytical laboratories approved for sample analysis are required to have standard operating procedures (SOPs) that include provisions for calibration, verification, and preventive maintenance of each measurement system, including analytical instruments and necessary support equipment (e.g., refrigerators, ovens). Laboratory QAPPs or QA manuals must describe the responsibilities of laboratory personnel with respect to instrument calibration and maintenance. Instrument logs (hardcopy or electronic) must be used by laboratories to document calibration and maintenance activities for all instrumentation. The remainder of this section applies to field equipment and instrumentation.

14.1 FIELD EQUIPMENT

Field surveying/monitoring may be performed as part of waste characterization activities. Maintenance, testing, and inspection of field instrumentation will be addressed in applicable procedures or equivalent RSI procedures (measuring and test equipment [M&TE] or equivalent). Field equipment will be inspected prior to use. The date, time, and results of all inspections will

be noted in an instrument logbook. Equipment will be identified using the manufacturer's serial number or other unique identifier.

Equipment that fails its initial checkout or becomes inoperable during use will be tagged, removed from service, and separated from serviceable equipment to prevent inadvertent use. Such equipment will be repaired and recalibrated or replaced as appropriate. Spare instruments should be maintained in the event of instrument failure. Certain weather conditions, such as high humidity, can interfere with the proper operation of field equipment. If these conditions are encountered, they should be noted in the instrument logbook and operation of the equipment should be discontinued.

Field equipment and calibration requirements of such equipment, including tables with specific instruments listed and the associated required calibration requirements, will be defined by RSI in accordance with applicable procedures.

Field equipment will be inspected and calibrated in accordance with applicable procedures or equivalent RSI procedures. Calibration standards for the instruments will be representative of the measured parameter's concentrations on site, be in good condition, and be replaced when expired. Each day an instrument is used, its calibration will be checked against at least one certified standard. The date, time, and results of all calibration and source checks will be noted in an instrument calibration log.

If an instrument is out of calibration, it will be recalibrated and noted in the instrument calibration log. Calibrated equipment will be identified using the manufacturer's serial number or other unique identifier.

Field equipment supplies and consumables will be defined by RSI in accordance with applicable procedures.

Equipment that fails calibration or becomes inoperable during use will be tagged, removed from service, and separated from serviceable equipment to prevent inadvertent use. Such equipment will be repaired and recalibrated or replaced as appropriate. No equipment that has failed calibration will be used until the equipment has been repaired or replaced. If an instrument has failed calibration, been repaired, recalibrated or replaced, it will be noted in the instrument calibration log. Field calibration records will be kept for all instruments used during fieldwork, and will include the following:

- Type and identification number of instrument
- Calibration frequency and acceptable tolerances
- Identification of individual(s) and/or organizations performing the calibration
- Reference standards, including sources and lot numbers used for each calibration
- Calibration data
- Certifications or statements of calibration provided by manufacturers and external agencies, and traceability of calibration standards to national standards
- Information on calibration acceptances or failure

15 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

Field supplies (e.g., reagents, sampling equipment, etc.) will be procured, inspected, and accepted in accordance with RSI's Procurement Control and QA Plan (or equivalent) procedures.

16 DATA MANAGEMENT

16.1 INTRODUCTION

Verification and validation of data are performed as components of the data operations activities, which include planning, sampling, analysis, and data review and evaluation. Validation of field and analytical data is a technical review performed by qualified personnel to compare data with established quality criteria. Samples are analyzed by laboratories that use analysis and reporting methods assessed by the DOECAP-AP.

16.2 PROJECT ENVIRONMENTAL MEASUREMENT SYSTEM

PEMS is the data management system used to support waste characterization. It provides organization, integrity, security, traceability, and consistency of the environmental measurements data generated during a waste characterization project. The system supports sample analysis planning, laboratory SOWs, field planning, sample collection and shipment, field measurement collection, analytical laboratory results (electronic data deliverables [EDDs] and screening), sample tracking, and data assessment. PEMS can be accessed by project staff throughout the life cycle of the project

17 ASSESSMENTS AND RESPONSE ACTIONS

Self-assessments and independent assessments of work processes and operations shall be undertaken to ensure quality of performance. Such assessments may include, but are not limited to, surveillances, inspections, management assessments, tests, data verification and validation, and peer reviews. Assessments shall evaluate compliance with both technical and procedural requirements and may be conducted at any point in the life of a project. Audit personnel shall be independent of the work being audited. Project personnel may perform or assist with management assessments. Assessments should include a description of the scope, staffing qualifications and training, instrumentation, applicable procedures, methods, sample collection, and sample and data management. Management self-assessments will be performed by the project responsible for conducting waste characterization sampling and analysis in accordance with RSI's assessment procedures. The SMO or DOECAP-AP assessment teams shall conduct assessments of subcontractor laboratories.

18 DATA REVIEW, VERIFICATION, AND VALIDATION

18.1 LABORATORY DATA REDUCTION, REVIEW, AND REPORTING

Data provided by contracted laboratories are reviewed internally and judged with respect to compliance to the QA/QC requirements discussed in this section. Review of the data by the laboratory will be of sufficient quality to ensure the validity of the reported data. The laboratory is responsible for complying with internal SOPs during the review process, including data generation, data reduction, data review, and data reporting. Data reduction involves calculating analyte concentration from instrument outputs. The equations used to calculate analyte concentrations should be clearly detailed in the laboratory SOP for each method. Applicable units and term definitions should also be specified. All software used to generate analytical results should be validated by the manufacturer or by following procedures established in a laboratory SOP.

The data review process consists of at least three levels of review. Each stage of the review process should be documented with an appropriate checklist form that is signed and dated by the reviewer. The following subsections describe required elements of the laboratory's data

review process.

18.1.1 Laboratory Review Level 1

One hundred percent (100%) of all generated data must be reviewed by the analyst (Level 1 Analyst review). All analysts review their work based on established guidelines for each method. The review shall, at a minimum, ensure the following:

- Sample preparation information is correct and complete.
- Analysis information is correct and complete.
- Appropriate SOPs have been followed.
- Analytical results are correct and complete.
- Raw data, including all manual integrations, have been correctly interpreted.
- QC samples are within established control limits or nonconformances are noted.
- Blanks and LCSs are within appropriate QC limits or nonconformances are noted.
- Special sample preparation and analytical requirements have been met.
- Documentation is complete (all anomalies have been documented, all required forms have been completed, all holding time violations have been documented, etc.).

This Level 1 Analyst review must be documented by including the signatures or initials of the reviewer and the date of the review.

18.1.2 Laboratory Review Level 2

A laboratory supervisor or data review specialist reviews 100% of the generated data to provide a peer review of the data package. This Level 2 peer review shall also be based on established guidelines and shall ensure the following:

- All appropriate laboratory SOPs have been followed.
- Calibration data are scientifically sound, appropriate to the method, and completely documented.
- QC samples are within established guidelines or nonconformances are noted.
- Qualitative identification of sample components is correct.
- Quantitative results are correct, including calculations and any associated flags.
- Raw data, including manual integrations, have been correctly interpreted.
- Documentation is complete and accurate (e.g., anomalies have been documented, nonconformance forms are complete, holding times are documented).
- Data are ready for incorporation into the final report.

Level 2 peer reviews must be documented by including the signatures or initials of the reviewer and the date of the review.

18.1.3 Laboratory Review Level 3

Level 3 administrative review is performed by the laboratory QA representative or the laboratory

PM who is ultimately responsible for the issued report. The Level 3 administrative review should include the elements of a Level 2 peer review and provide a total overview of the data package to ensure consistency and compliance with project-specific SOWs. Level 3 administrative reviews should be documented on a checklist and must include the signature of the reviewer and date of the review.

18.1.4 Laboratory QA Review

The Laboratory QC Coordinator is responsible for periodically reviewing analytical data packages, as specified in the corporate SOP, to ensure that the total review process complies with internal guidelines. It is the QC Coordinator's responsibility to investigate any failures to follow protocol and to take corrective action (CA).

18.2 LABORATORY REPORTING AND DELIVERABLES

A standard data-reporting format will be required for all laboratory reports. Site-specific SOWs will address the need for data package deliverables. EDDs in the specified format will be uploaded to PEMS.

The laboratory should maintain all raw data necessary to produce a comprehensive data package, including raw quantitation reports, chromatographs, spectra, regions of interest, integrations, and all results reproduced from raw data. The laboratory must provide all documentation necessary for the level of validation requested by RSI.

Detailed deliverable requirements are specified in the technical requirements of the contract with the analytical laboratories. In general, the analytical laboratory data package deliverables fall into the following two categories:

- Analytical Support Level (ASL) III
 - Sample receipt documentation noting condition of samples
 - A case narrative that describes the contents of the data package and provides an index of samples associated with the delivery order (including both the project sample IDs and the laboratory sample IDs). A description of any problems encountered in sample receipt, login, and analysis shall also be included in the narrative. The case narrative shall describe the circumstances leading to the use of data qualifiers and list the affected samples. All case narratives shall include a signed statement affirming that the analytical work and data package have been reviewed and are in compliance with requirements.
 - Analytical data report form (certificate of analysis or more detailed report format)
 - QC summary report forms
 - Signed and dated COC forms
 - EDDs of the analytical data and QC results
- ASL IV
 - All materials required in ASL III deliverables
 - Shipping and login documents
 - Analyst worksheets
 - Instrument run logs
 - Instrument printouts

- Standard preparation logs
- Digestion and extraction logs
- Other forms of raw data, as necessary, to support data defensibility

18.3 ANALYTICAL DATA REVIEW

The primary objective of the laboratory data review process is to provide adequate assurance that DQOs for the data have been met prior to their use and subsequent decision-making. Data review activities begin with the COC and laboratory analyses, resulting in the assignment of laboratory data qualifiers, as appropriate. The laboratory also confirms that all required method controls were performed. Project data verification and validation activities are performed independently from the laboratory, either by RSI or by a subcontractor under the data validation personnel direction. The comprehensive DQA process that evaluates the overall usability of the data is outlined in Section 19.

18.3.1 Data Verification

Initial review of analytical data is performed by RSI's data management personnel. Data verification is performed on 100% of the data. If serious deficiencies are identified during review, some or all of the suspect data may be submitted for validation to determine overall acceptability for use. Alternately, if deficiencies are deemed serious enough to affect data use, reanalysis by the laboratory may be requested. A verification report is prepared and includes a summary of data acceptability, recommended changes, and any problems associated with the actual analyses that might impact sample integrity and/or data usability.

18.3.2 Preliminary Data Assessment

Project personnel may perform preliminary analyses of newly received analytical data simultaneously with data processing. Analyses may include various statistical and numerical algorithms. Preliminary inspection will identify any analyte concentrations that exceed expected values (e.g., background and/or existing concentrations) for chemicals and radionuclides for which tests were performed, identify potential outliers and extreme values in data sets, and determine whether data sets are significantly different from background or some of the results of preliminary data assessment. Data assessment will be performed by data management and technical management personnel. In extreme cases, resampling and/or reanalysis by the analytical laboratory may be necessary.

18.3.3 Data Validation

Data validation results in data that are of known quality. Individual data results that cannot be validated as useable under established criteria such as *National Functional Guidelines for Inorganic Superfund Methods Data Review* (EPA-542-R-20-006), *National Functional Guidelines for Organic Superfund Methods Data Review* (EPA-540-R-20-005), and *U.S. Nuclear Regulatory Commission, Multi-Agency Radiological Laboratory Analytical Protocols Manual* (EPA 402-B-04-001A, NIST PB 2004-105421, NUREG-1576) are flagged to indicate that the results are unusable. The data are qualified with an "R" to indicate they are Rejected.

Validation is performed in accordance with RSI's procedures for data validation. A validation report is produced for each batch of sample results that is validated. See Section 18.5.2 for details on data validation qualifiers and reason codes.

Data are validated according to recognized national standards and project DQOs. Higher validation levels and more frequent validation may be warranted based on intended use of the data or higher risk of data quality problems in the data set (e.g., new laboratory, unusual

sampling technique or matrix, use of multiple laboratories). The level and frequency of validation is specified in the SAP or project-specific DQOs.

18.4 REPORTING LIMITS

Project reporting limits will be reviewed during data verification and validation to determine if the objectives of the project are being met. If project objectives are not being met, the RSI PM will be notified and an appropriate course of action will be determined. Possible CAs include reanalysis by the original method, addition of sample cleanup steps prior to reanalysis, resampling and analysis, or analysis by an alternative method.

Quantitation limits should not be lower than the lowest calibration or verification standard associated with the sample analyses. Results will be reported to MDLs, which are routinely lower than the lowest associated standards. Results below the MDL will be reported with the MDL value and a “U” laboratory qualifier. The MDL value will be reported in the detection limit field for the EDD. Results reported between the MDL and quantitation limit will be qualified by the laboratory using their qualifier protocol and will be qualified as estimated (Section 18.5.2) during the validation process.

18.5 ANALYTICAL DATA QUALIFIERS

Analytical data review results in the assignment of qualifiers or “flags” to individual test results. Qualifiers are assigned both by laboratory analysts and data validators and indicate specific information about the associated data. Both types of qualifiers are explained and tracked in project records and electronically in PEMS.

18.5.1 Laboratory Qualifiers

The laboratory uses qualifiers to flag analyses for a variety of reasons. Laboratory qualifiers are specified in the case narrative along with an explanation of their meaning, and they indicate a noncompliance of some sort to the QC criteria established for each method. The laboratory also uses data qualifiers to indicate non-detects, trace amounts, and dilutions.

18.5.2 Validation Qualifiers

Validation qualifiers are appended to the analytical results during data validation activities (Table 1). The addition of validation qualifiers does not indicate that data are unusable for any purpose, unless they are rejected. They do, however, identify the level of confidence that can be placed in the data when using them to establish the presence or absence of a compound or to quantify the result. Thus, data validation is a mechanism for indicating the limits on use of the data, if limits must be applied.

Qualifier	Description
=	The result is valid as reported; no qualifier was necessary.
J	Analyte was identified; the result is estimated.
R	The sample result is unusable.
U	The analyte was analyzed for but was not detected.
UJ	Analyte was not detected, but the limit is estimated.

18.6 FIELD DATA EVALUATION/REVIEW

Upon receipt, the field data package will be reviewed by the project data management and technical management groups for completeness and accuracy. The field data package includes all of the field records and measurements developed by the sampling team personnel. The field data package verification procedure will consist of the following:

- Reviewing field data contained in sampling lots for accuracy and completeness
- Verifying sample coordinates, if applicable
- Verifying that field samples and field QC samples were properly prepared, preserved, and identified
- Checking field measurement equipment calibration and instrument condition
- Reviewing COC records for proper completion, including sampling dates/times and signatures of field personnel

18.7 NON-DIRECT MEASUREMENTS

The term existing data is used interchangeably with “secondary data” and “non-direct measurements.” When using non-direct measurements (e.g., gathered from literature searches or database queries), it is important to use reliable, documented sources. Once the source of the data is identified and verified as reliable, a reference to this source document should be cited in all data summaries and reports. Whenever possible, verification from multiple, independent sources that yield comparable data should be obtained and documented. This should then be noted in the associated data summaries and reports (see Section 21 for detailed guidance).

18.8 RECORDKEEPING

Record copies will be stored in accordance with applicable procedures, and copies will be retained by the laboratory and field personnel, as necessary. General requirements for records management are provided in Section 6.

18.9 ELECTRONIC DATA MANAGEMENT

Data collected for the projects will require either manual entry or electronic data submittals to PEMS. Laboratory data will be provided to RSI according to turnaround time and deliverable specifications in the analytical SOWs. Record copy data packages will be submitted simultaneously with electronic PEMS submittals of sample analytical results (EDDs).

RSI will be responsible for recording field and laboratory data into a computerized format in accordance with applicable procedures.

For analytical data, the record copy data packages provided to RSI, which are generated and internally reviewed by the contracted laboratory, are considered the original versions. Similarly, electronic reproductions of the hardcopy originals, or faithful electronic copies of source records used to generate the hardcopy originals, are considered equivalent to the record copy originals provided they are similarly generated and internally reviewed by the contracted laboratory prior to delivery to RSI. Electronic summaries simply establish the form of transaction of the key elements of the generated database that will provide the end-user data with the raw sample and QC data necessary to evaluate compliance with the project objectives.

Numerous electronic records are generated during waste characterization activities. These electronic records include, but are not limited to, analytical laboratory data packages, contract

compliance verification (CCV) reports, analytical data validation reports, and email communications. Electronic records are maintained in accordance with RSI's records management procedure.

18.10 SOFTWARE QUALITY ASSURANCE

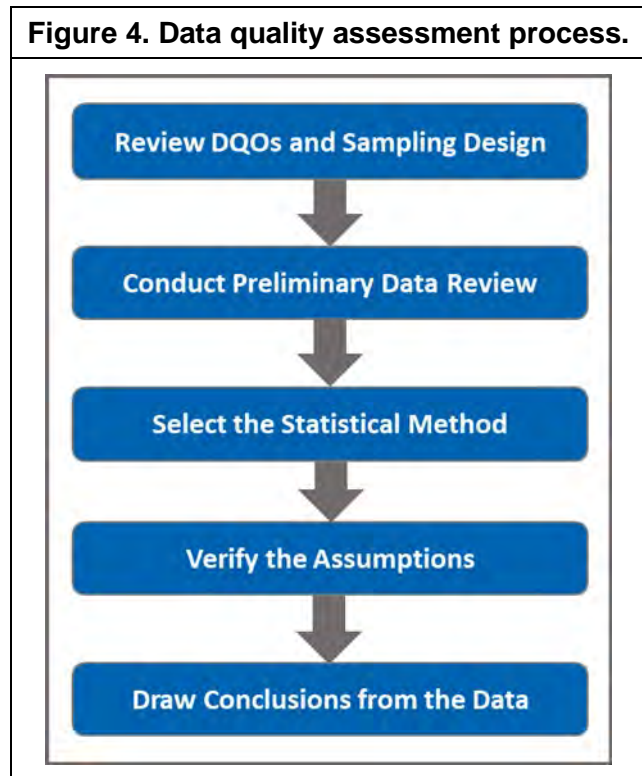
Software QA activities and requirements shall be completed in accordance with RSI's procedures. Software QA shall be performed using a graded approach and shall apply the necessary consistent with the application and potential impact on safety, design, and/or analysis.

19 DATA QUALITY ASSESSMENT

DQA is the scientific and statistical evaluation of data to determine if the data meet the planning objectives of the project. Analytical results are evaluated relative to DQOs through the DQA process. The DQA examines the outcome of sample collection, analysis, and reporting in conjunction with the pre-defined needs (as expressed in DQOs) to determine whether the appropriate type, quality, and quantity of data have been collected. The DQA also documents variances and deviations. The DQA process steps are shown in Figure 4. Applicable aspects of the DQA will be completed in accordance with EPA guidance, *Data Quality Assessment: Statistical Methods for Practitioners* (EPA QA/G-9S, EPA/240/B-06/003). The output of the DQA process should provide the answers to the following basic questions:

- Are the samples collected representative?
- Are the analytical data of the type, quality, and quantity to support their use?
- Can a defensible decision be made using the data?

Figure 4. Data quality assessment process.



20 QA MANAGEMENT REPORTS

The RSI QA Manager or designee will notify the RSI PM of field audit and surveillance results, performance of measurement systems, data quality, results of QA activities, and, if applicable, repetitive and significant QA problems through routine distribution of, as appropriate, surveillance and audit reports, deviation reports, CA reports, and weekly and monthly activity reports. Records of QA activities within the project shall become part of project files.

QA reports shall be distributed to applicable project personnel.

21 SECONDARY DATA EVALUATION

Secondary data may include data generated for or by external independent parties that are then transmitted to the current user. Secondary data may also include data collected in other investigations designed to answer different questions than those posed in the current investigation. Using data and information that are not generated for the same quality objectives as the current investigation may result in erroneous decisions; therefore, it is essential to identify use limitations for secondary data.

The project should identify sources of previously collected data and other information that will be used to make project decisions. Sources of secondary data and information include, but are not limited to, the following:

- Historical data (e.g., records pertaining to previous monitoring events, site assessments, investigations, or waste characterization sampling) that may be used to describe the site/facility history and define the waste streams, background information and data pertaining to site-specific processes, process byproducts, past and current chemical uses, raw material and finished product testing, waste characterization, disposal practices, and potential chemical breakdown products
- Data generated from computer databases (such as manufacturers' process and product information, or waste management information)

The project team should evaluate how well the quality of the data meets the project quality objectives as well as the completeness of its documentation.

22 SUSPECT/COUNTERFEIT ITEMS

RSI will implement a suspect/counterfeit item (S/CI) Program as part of their QA Program as directed by DOE O 414.1D, *Quality Assurance*.

A graded approach shall be implemented to guard against suspect or counterfeit items. Suspect and/or counterfeit parts can be prevented through sound engineering, well-developed design specifications and controls, stringent review and approval of purchase documents, QA review and input to purchase specifications, and a rigorous receipt inspection program.

23 REFERENCES

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- DOE/OR/01-2462&D2. *Action Memorandum for the Y-12 Facilities Non-Time-Critical Deactivation/Demolition Project*, Oak Ridge, Tennessee, U.S. Department of Energy, Oak Ridge, TN, September 2010.
- EPA 402-B-04-001A. NIST PB 2004-105421, NUREG-1576, U.S. Nuclear Regulatory Commission, Multi-Agency Radiological Laboratory Analytical Protocols, July 2004.
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- EPA SW-846. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods*, U.S. Environmental Protection Agency, Washington, D.C., latest revision.

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28th Edition, February 1997.

Appendix B
Building 9720-17
Data Quality Objectives



Building 9720-17
Data Quality Objectives
July 2022

Jamie Raymer

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Moderator

This document has been reviewed by a DC/RO and confirmed to be UNCLASSIFIED.

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Date: 06/23/2022

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DQO Agenda

Welcome and Introductions

Project Scope

Building 9720-17 Overview

Process Knowledge

Data Quality Objectives Steps 1-7

Path Forward

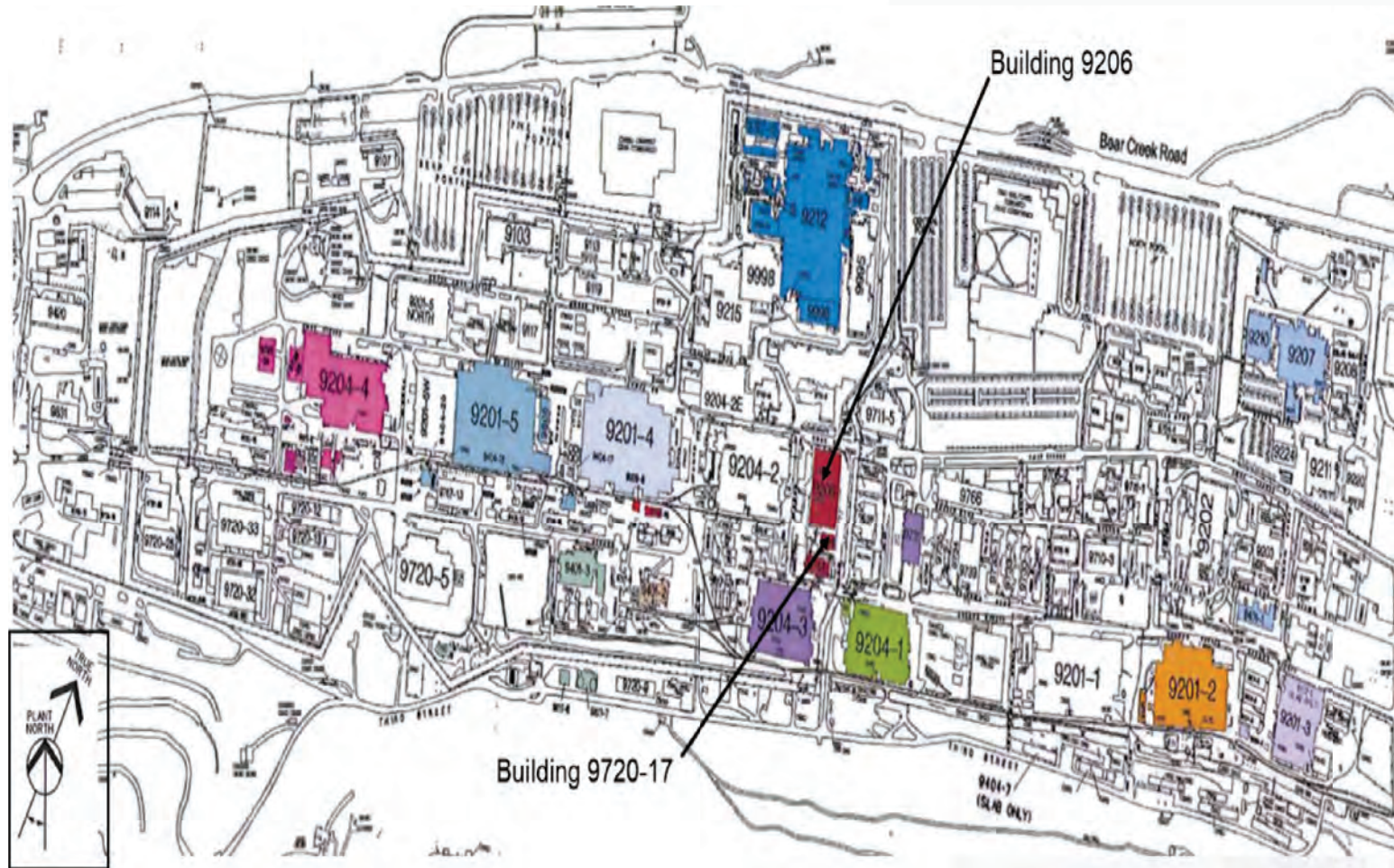
Project Scope

- Scope of the project:
 - Prepare the planning documents necessary to characterize facility “Building 9720-17 Warehouse/Industrial” for future demolition & disposal
- CERCLA documentation:
 - Federal Facility Agreement, Appendix C
 - *Action Memorandum for the Y-12 Facilities Non-Time-Critical Removal Action Deactivation/ Demolition Project (DOE/OR/01-2462&D2)*

Building 9720-17 Overview

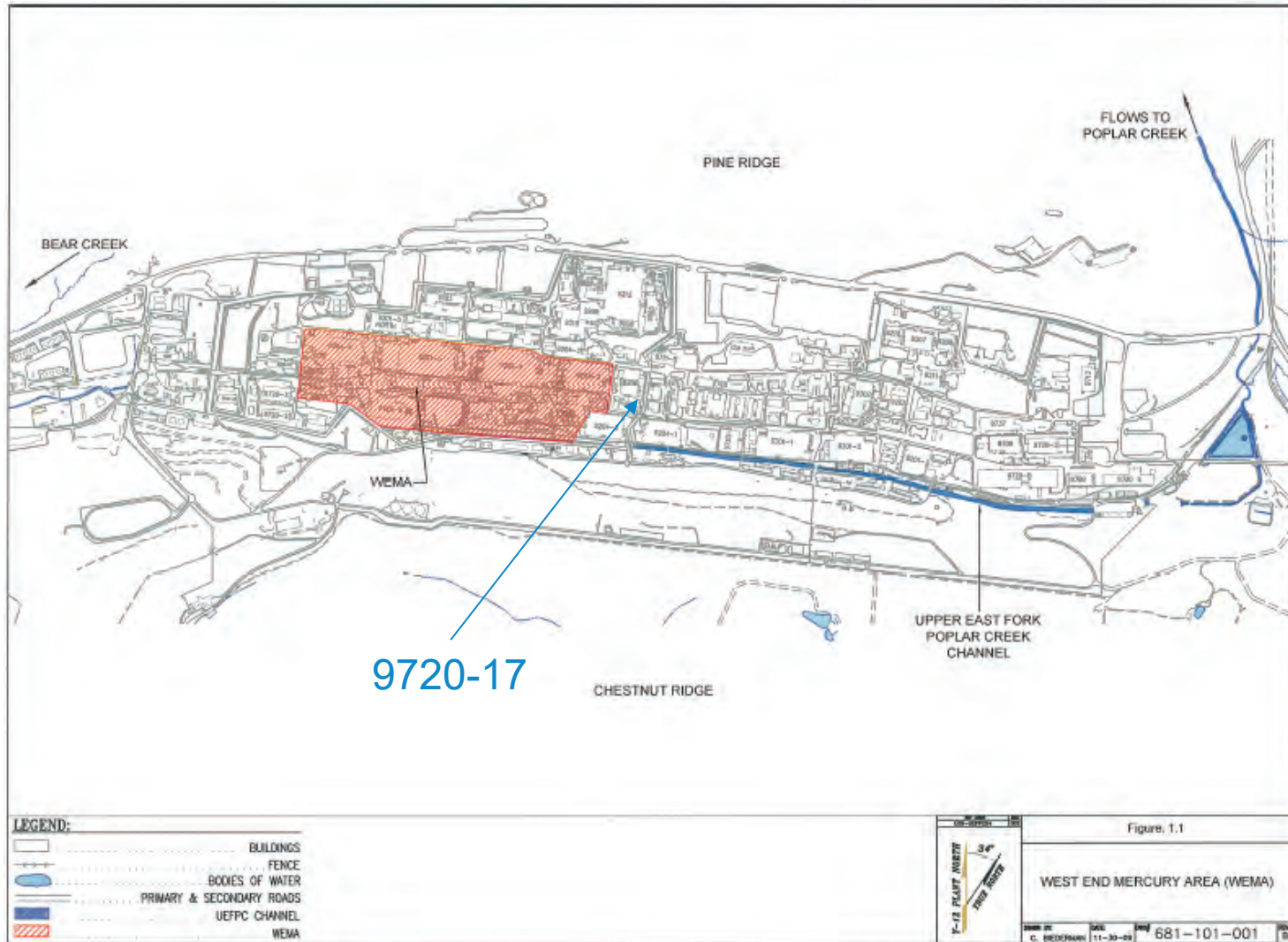
- Located inside the Y-12 National Security Complex Protected Area (PA)
- Outside the West End Mercury Area
- Non-mercury use facility
- Adjacent to Building 9206
- Facility was used to store highly enriched uranium (HEU) and hazardous and mixed waste
- Exterior Construction
 - Completed in 1956
 - One-story with gross footprint of 4,314 square feet
 - Steel frame on poured concrete foundation
 - Corrugated asbestos-cement panel (transite) roof with corrugated asbestos-cement panel siding
- Includes a loading dock build-out on East side

Building 9720-17 Overview (cont.)



Building 9720-17 Location

Building 9720-17 Overview (cont.)



Building 9720-17 Location

Building 9720-17 Overview (cont.)



Building 9720-17 Aerial View

Building 9720-17 Overview (cont.)

- Timeline
 - 1956: Building constructed
 - 1970s: Added screens to windows and vents; added walkway to Building 9206
 - 1980s: Loading dock constructed
 - 1995: Asbestos inspection and sample collection
 - 2014: RCRA clean closure of permitted storage area
 - *Resource Conservation and Recovery Act Closure Certification Report for Two Permitted Container Storage Areas of Building 9206 at the Y-12 National Security Complex, Y/TS-2573*
 - 2019: Included in Section 106 National Historic Preservation Act recordation report and authorized for demolition
 - 2020: Radiological surveys conducted

Building 9720-17 Overview (cont.)

- Interior features
 - Structural steel columns, beams, and supports
 - Ventilation ductwork and vents
 - Insulated non-process utility piping and conduit
 - Electrical components (standard)
 - Metal mesh panels (i.e., grating) on walls and ceiling
 - Metal highly enriched uranium (HEU) storage racks
 - Metal storage safes (considered ACM and will be packaged accordingly)
 - Metal safe bottle carriers
 - Metal pallets
 - Minimal wood framing material
- Facility is excess and inactive
- RWP indicates the facility is a Radiological Area (RA), Contamination Area (CA), High Contamination Area (HCA) & Airborne Radiological Area (ARA)

Building 9720-17 Photo



Looking North

Building 9720-17 Photo



Looking West

Building 9720-17 Photo



Looking South

Building 9720-17 Photo



Looking East

Building 9720-17 Photo



Metal Mesh Panels, Pallets, and Safe Bottle Carriers

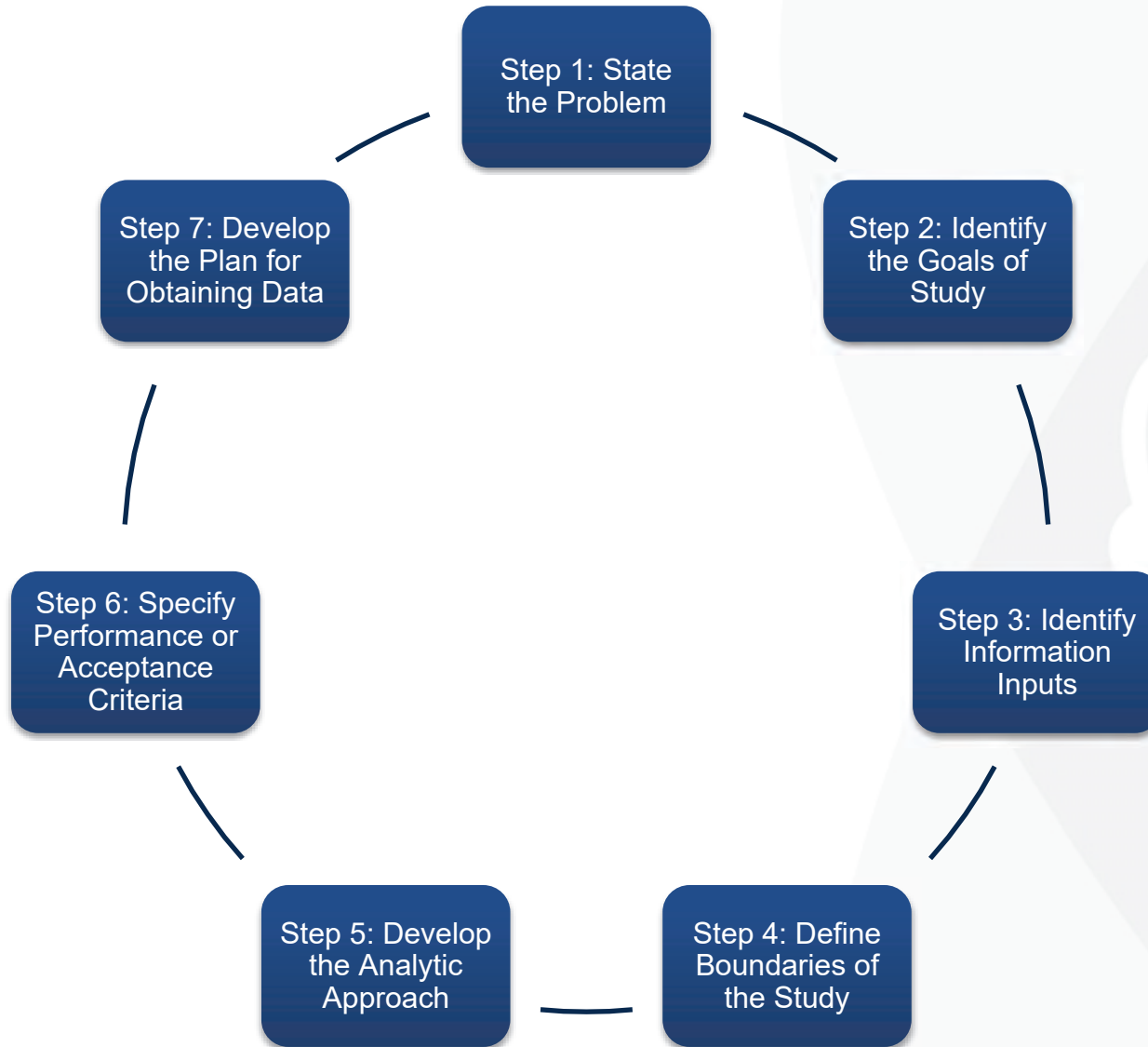
Process Knowledge

- The facility was used for storage (did not have process systems/operations) and is basically empty except for a few heavy-duty safes, storage racks, safe bottle carriers, and metal pallets
- Waste was previously stored in closed containers
- No known spills in the facility per PK
- Previous facility radiological surveys indicate surface contamination on walls, ceiling/roof and floor
 - The floor had the highest fixed & removable contamination (floor is out of scope)
 - Ceiling had the second highest fixed Alpha results, and these were located near the ceiling edges
 - Walls had the highest Beta/Gamma results and removable Alpha results, and these were spread across the facility
 - Ceiling Fixed Alpha max: 24,304 dpm/100cm²
 - Walls Fixed Beta/Gamma max: 11,158 dpm/100cm²
 - Walls Removable Alpha max: 1848 dpm/100cm²
 - Walls Removable Beta/Gamma max: 2324 dpm/100cm²

Process Knowledge (cont.)

- Due to the age of the facility, there is the potential for other contaminants associated with materials of construction:
 - Lead (e.g., transite bolt covers, flashing, paint)
 - Known Lead items will be removed prior to demolition & disposed appropriately
 - PCBs (e.g., paint, caulk, fluorescent light ballasts)
 - No visible oil spills and no known previous oil spills per PK
 - Asbestos (e.g., transite, insulation, paint, and caulk)
 - Will be removed and packaged accordingly for disposal
- Other than asbestos and radiological survey reports, there is no other historical data for the facility
- RCRA Closure report – March 2014, document Y/TS-2573
- Radionuclides are expected to be the primary contaminant with asbestos, metals, and PCBs as secondary contaminants

DQO Process – Steps 1-7



DQO Process Step 1

State the Problem

- Describe the problem:
 - The 9720-17 facility must be characterized prior to demolition and disposal
- Describe the project characterization scope:
 - 9720-17 facility structure, loading dock, roof and walls
 - The walkway between buildings 9206 and 9720-17
 - Interior metal grating, storage racks, safes, tube-like containers, metal pallets, utility piping, and ventilation system
 - Ventilation system is passive and does not include fans or filters
 - Does not include concrete slab or 9744 exterior hoppers, fans, and ductwork
 - Final waste disposal options will be determined with data generated from the characterization sampling
- Establish the planning team:
 - NNSA/NPO and CNS
 - EPA and TDEC
 - Environmental Management Waste Management Facility (EMWMF) and Oak Ridge Reservation (ORR) Landfill (LF) WAC Attainment team
 - RSI Services LLC and subcontractors

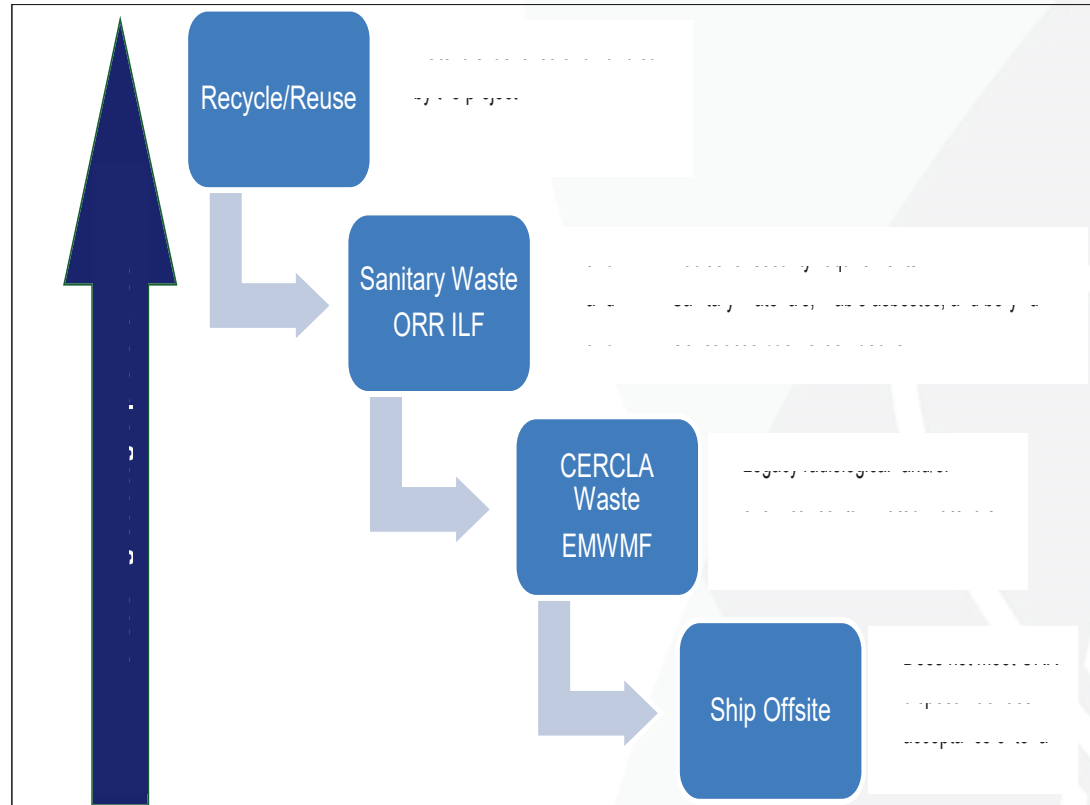
DQO Process Step 2

Identify Goals of the Study

- Principle study questions:
 1. Does the data support recycle of the material?
 - If yes, prepare for recycle
 - If no, go to 2
 2. Does the data support the waste going to ORR LF?
 - If yes, prepare for ORR LF disposal
 - If no, go to 3
 3. Does the data support the waste going to EMWMF?
 - If yes, prepare for EMWMF disposal
 - If no, go to 4
 4. Does the data support the waste being disposed offsite?
 - If yes, prepare for disposal offsite

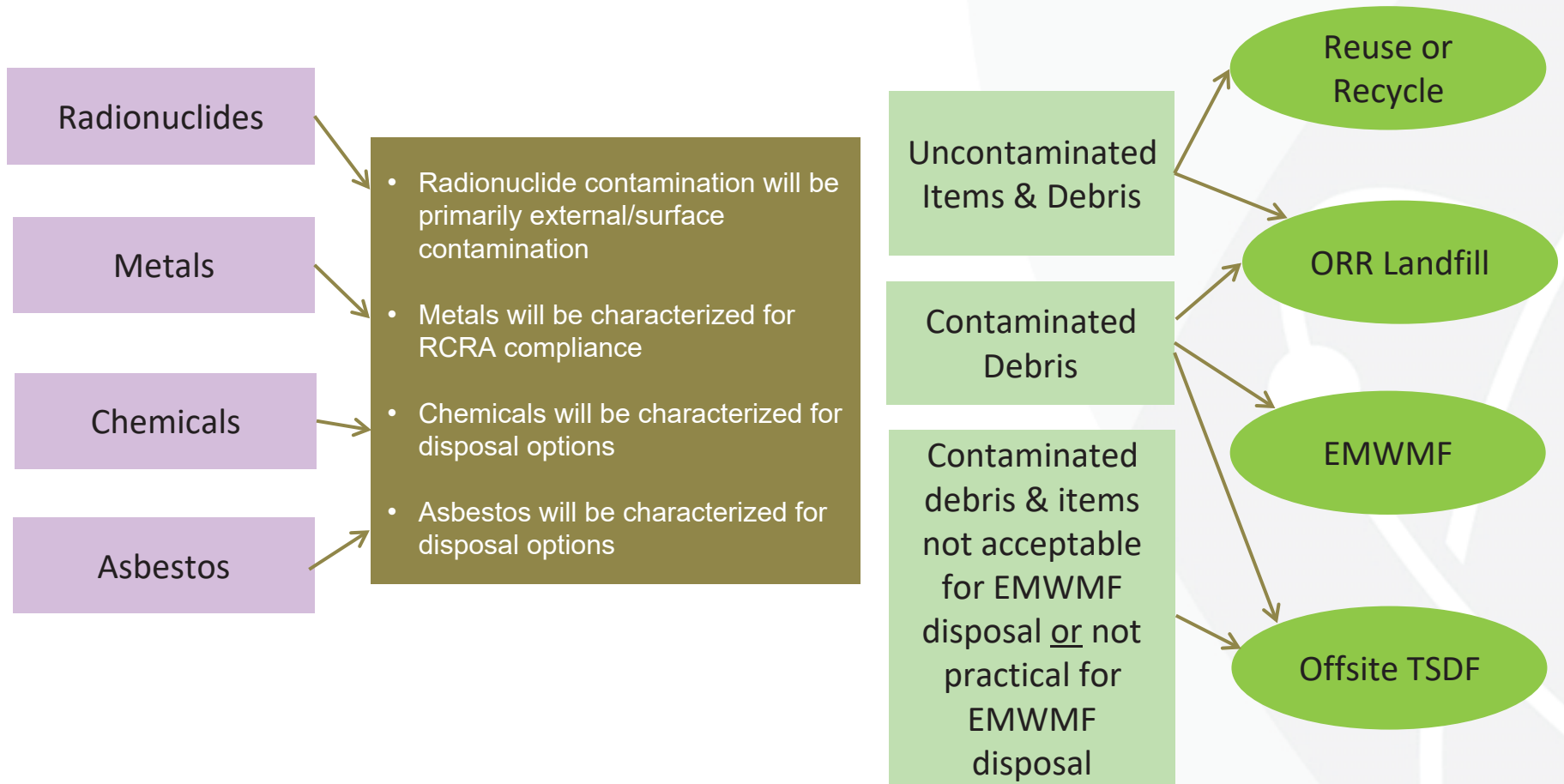
DQO Process Step 2 Identify Goals of the Study (cont.)

The 9720-17 disposition strategy will follow the waste hierarchy process



ORR ILF = Oak Ridge Reservation Landfill

Building 9720-17 Site Conceptual Model



DQO Process Step 3

Identify Information Inputs

- Identify the primary types/sources of information needed:
 - Radiological characterization data
 - Chemical characterization data
- Supporting information may include:
 - Material of Construction calculations
 - Mass Balance calculations
 - May be necessary for items that pose intrusive sampling problems
 - Safes
- Sources of information:
 - Process knowledge was gathered and assessed
 - Historical facility documentation
 - Radiological survey reports
 - Asbestos reports
 - Facility walk-downs

DQO Process Step 4

Define the Boundaries

- Intrusive samples needed for 9720-17 facility characterization, demolition, and waste disposal
- Sample target population is the 9720-17 facility and minimal contents
- The facility consists of various material types:
 - Structural material and metal (e.g., metal columns, beams, and supports, metal mesh, HEU storage racks, etc.)
 - ACM (e.g., transite roof and walls, caulk, paint, pipe insulation, etc.)
 - Concrete/cinder block
 - Minimal miscellaneous equipment (e.g., safes, vents, etc.)
 - Minimal structural wood material
- Target populations for intrusive characterization:
 - Interior structural material - wall and ceiling metal mesh panels, structural metal columns, beams, and supports, HEU racks
 - Exterior facility walls & roof - transite on both
 - Loading dock walls & roof - concrete block walls & metal sheeting roof
 - Wood framing material - located in walls
 - Ventilation system

DQO Process Step 4

Define the Boundaries (cont.)

- Items not in scope = concrete slab (i.e., floor) and 9744 exterior hoppers, fans, and ductwork
- 9720-17 Facility Potential Waste Types:
 - Low Level Waste, PCB Bulk Product, Asbestos
 - Majority of pre-demo and demolition debris waste
 - Pre-demo
 - LLW & Asbestos
 - Pipe insulation and transite roof & walls
 - Anomalous Mixed LLW or Hazardous Waste (small volume)
 - Circuit boards, lead bolt covers
 - Anomalous Mixed LLW or Universal Waste (small volume)
 - Lamps, batteries, mercury switches
 - Demo
 - LLW & PCB Bulk Product
 - Painted materials, caulk, non-leaking ballasts
 - Structural material

DQO Process Step 5

Develop the Analytical Approach

Define the population parameters within the waste

- Potential Primary Contaminants of Concern (COC)
 - Radiological:
 - Uranium
 - Thorium
 - Chemical:
 - Heavy metals
 - Organics
 - PCBs
 - Asbestos

DQO Process Step 5

Develop the Analytical Approach (cont.)

Define the population parameters for decision

- Disposal expectations - based on current knowledge
- Recycle
 - Not expected to be an option due to historical radiological surface contamination levels
- ORR LF
 - Must meet the requirements of DOE Order 458.1 and Master Profile, S-040 Special Waste
 - Not expected to be an option due to historical radiological surface contamination levels
- EMWMF
 - Must meet the requirements of Appendix C of the EMWMF *Attainment Plan for Risk/Toxicity-Based Waste Acceptance Criteria at the Oak Ridge Reservation, Oak Ridge, Tennessee* (DOE 2001), denoted as the EMWMF WAC Attainment Plan
 - EMWMF is the expected disposal facility for the facility (based on available PK)
- Offsite Disposal
 - Anomalous wastes

DQO Process Step 6

Specify Performance or Acceptance Criteria

- Criteria:
 - Ensure the random statistical strategy adequately characterizes the building.
 - Ensure any additional biased samples adequately characterize the selected items.
 - Ensure the selected laboratory analyses are appropriate for the expected contamination.
- Limits:
 - Assume the radiological samples will represent homogeneous radiological contamination.
 - Utilize the EMWMF Analytical and Auditable Safety Analysis (ASA) WAC list for analyses lists (most comprehensive). Adjust as appropriate for site-related contaminants.
 - Limited organics analyses due to mainly non-porous material (e.g., structural metal, transite, metal mesh, metal racks, etc.).
 - No PCB analyses due to PK-based determination the waste debris is PCB Bulk Product waste.
 - 100% verification and 10% Level IV validation.

DQO Process Step 7

Develop the Plan for Obtaining Data

- Sampling Design
 - The 9720-17 facility, based on available PK, is expected to have radiological contamination as the main contributing COC
 - Heavy metals & various chemicals are expected to be secondary COCs
 - The 9720-17 facility, based on available PK, is considered a large & homogenous population per the expected radiological contamination
 - A random selected, statistical sampling strategy is to be implemented to characterize the facility with biased samples collected as necessary
 - Includes all expected waste types (i.e., the target population) from the facility
 - The target population includes:
 - Interior structural material: wall & ceiling metal mesh panels, structural metal columns, beams, supports & HEU racks
 - Exterior facility walls & roof: transite panels on both
 - Loading dock walls & roof: concrete block walls & metal sheeting roof
 - Wood framing material: located in wall framing (around louvers) and on walkway roof
 - Ventilation system
 - Assumed that no samples to be collected from anomalous items to be removed, only radiological surveys (e.g., circuit boards, ballasts, switches, lamps, batteries)

DQO Process Step 7

Develop the Plan for Obtaining Data (cont.)

- Non-parametric hypergeometric model is proposed
- Provides a 95% confidence and 90% coverage (95/90)
 - EMWMF requirement is 95/80
- 29 samples will be collected from the target population
- Number of samples per waste type will be weighted and determined by the total volume of the material
 - Larger volume will have more sample representation
 - Lesser volumes with less sample representation
 - All expected waste types will be represented
- Randomly selected sample locations for each target population will be provided via Visual Sample Plan (VSP)

DQO Process Step 7

Develop the Plan for Obtaining Data (cont.)

- Structural Material: 55% volume & 16 total samples
 - Interior mesh walls – 4 samples
 - Interior mesh ceiling – 4 samples
 - Structural columns, beams & supports – 4 samples
 - HEU storage racks – 4 samples
- Transite Material: 25% volume & 7 total samples
 - Exterior Walls – 4 samples
 - Exterior Roof – 3 samples
- Concrete Material: 10% volume & 3 total samples
 - Loading dock walls – 2 samples
 - Loading dock roof – 1 sample
- Wood Material: 7% volume & 2 total samples
 - Framing in walls – 1 sample
 - Walkway roof between 9206 & 9720-17 – 1 sample
- Miscellaneous Material: <3% volume & 1 total sample
 - Ventilation System – 1 sample

DQO Process Step 7

Develop the Plan for Obtaining Data (cont.)

- Additional biased samples will be collected, as necessary from:
 - Items that are difficult to intrusively sample (e.g., storage safes)
 - Oil reservoirs
 - Paint samples
 - Filters
 - Dust/dirt piles
 - Animal waste
 - Wall insulation
- Paint samples assume:
 - Facility radiological data will bound the radiological contamination
 - Main COC for the items is the paint
 - Verify metals concentrations via laboratory analyses
 - Potential mass balance based on analytical results

DQO Process Step 7

Develop the Plan for Obtaining Data (cont.)

- Sample Analyses per Material Type
 - Structural metal sample material analyses list:
 - EMWMF Total Metals and TCLP metals
 - Full suite radiological (EMWMF WAC list)
 - Wood sample material analyses list:
 - EMWMF Total Metals and TCLP metals
 - Full suite radiological (EMWMF WAC list)
 - TCLP organics
 - VOCs/SVOCs (EMWMF WAC list)
 - RCRA Pesticides/Herbicides (EMWMF WAC list)
 - Concrete/cinder block sample material analyses list:
 - EMWMF Total Metals and TCLP metals
 - Full suite radiological (EMWMF WAC list)
 - TCLP organics
 - VOCs/SVOCs (EMWMF WAC list)
 - RCRA Pesticides/Herbicides (EMWMF WAC list)

DQO Process Step 7

Develop the Plan for Obtaining Data (cont.)

- Sample Analyses per Material Type
 - ACM sample material analyses list:
 - Including caulk, gaskets, paint, pipe fittings, pipe insulation, and transite siding and roofing
 - EMWMF Total Metals & TCLP metals
 - Full suite radiological (EMWMF WAC list)
 - TCLP organics
 - VOCs/SVOCs (EMWMF WAC list)
 - RCRA Pesticides/Herbicides (EMWMF WAC list)
 - Paint sample material analyses list:
 - EMWMF Total Metals and TCLP metals

DQO Process Step 7

Develop the Plan for Obtaining Data (cont.)

- Sampling Methods & Collection
 - All samples collected in accordance with standard RSI procedures
 - Samples collected per project specific SAP/QAPP and Work Plan
 - Intrusive sampling via snips, saws, drills, etc.
 - Appropriate tools to be determined by the samplers and based on field conditions, professional experience & preferences
 - SW-846, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, will be utilized
 - Sample size reduction using appropriate equipment
 - Sample method to be recorded in the project logbook
 - If random location is unavailable – sample at closest location accessible
 - Record all additional biased samples and/or deviations in logbook
 - Sample documentation, labeling, control, and transfer shall be maintained and documented in accordance with the QAPP
 - QC samples will be collected via the QAPP specifications
 - A DOE-Consolidated Audit Program (DOECAP) approved laboratory will be utilized for sample analyses

Path Forward

- Planned Project Schedule:
 - July 2022: DQO
 - August/September 2022: SAP/QAPP
 - September/October 2022: Complete sampling
 - October/November 2022: Data V&V
 - November/December 2022: DQA presentation
- Questions/Comments
- Agreement

APPENDIX B.
DATA QUALITY ASSESSMENT FOR BUILDING 9720-17

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Managed and Operated by
Consolidated Nuclear Security, LLC

Building 9720-17
Data Quality Assessment

July 2023

RSI Services, LLC
Alliant Corporation

This document has been reviewed by a DC/RO and confirmed to be UNCLASSIFIED.

Name: Howell Estes

Date: 06/28/2023

CNS eDC/RO ID: 621975

Objectives

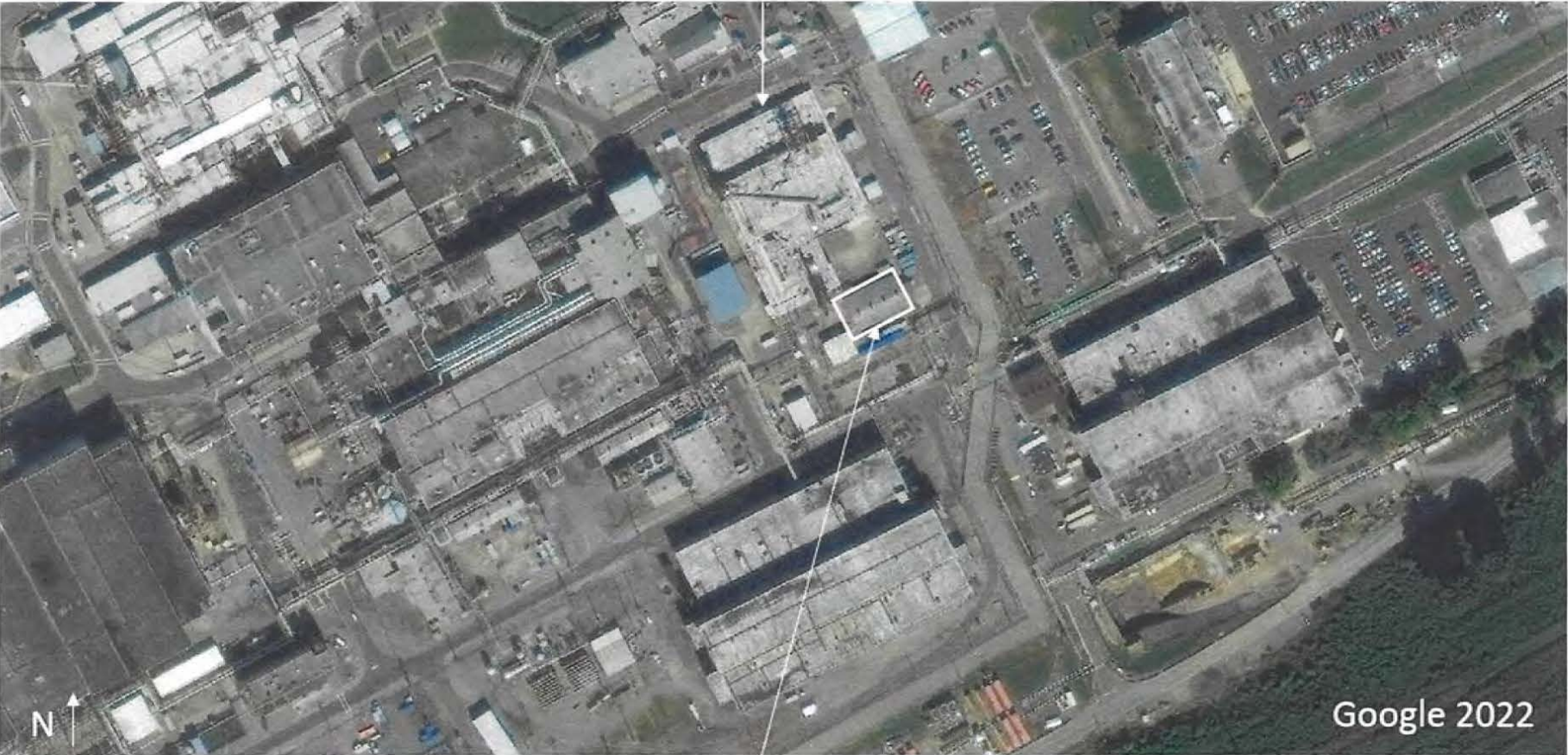
- Review Building 9720-17 project summary:
 - Project overview
 - Project location & background
 - Project Data Quality Objectives (DQO) overview
- 9720-17 Data Quality Assessment (DQA)
 - DQA Objectives
 - DQA Summary
 - DQA Decisions
- Path Forward & Project Schedule

9720-17 Project Summary & Facility Overview

- Prepare the planning documents necessary to characterize 9720-17 for future demolition and disposal
- Located inside the Y-12 National Security Complex Protected Area (PA) – Southern area
- Adjacent to Building 9206
- CERCLA facility
 - *Action Memorandum for the Y-12 Facilities Non-Time-Critical Removal Action Deactivation/ Demolition Project (DOE/OR/01-2462&D2)*

Building 9720-17 Aerial View

Building 9206



Building 9720-17

Building 9720-17 Aerial View

Building 9720-17 Photo



Looking North (ID YPH-18-810972)

Building 9720-17 Photo



Looking East (ID: YPH-18-810976)

Building 9720-17 Process Knowledge (PK) Overview

- Facility initially used to store highly enriched uranium (HEU) and hazardous and mixed waste
- Facility later repurposed for storage (did not have process systems/operations)
- Facility is empty except for a few heavy-duty safes, storage racks, safe bottle carriers, and metal pallets
- RCRA Closure report – March 2014
 - Document Y/TS-2573
- Facility is excess and inactive

9720-17 Project DQO Overview

- Process knowledge (PK) was collected for the facility via UCN-21395 form
- Facility walkdowns conducted on 12/12/22 (exterior) and 12/20/22 (interior)
- DQOs developed based on Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA/240/B-06/001)
- DQOs presented to project team July 2022
- Project Sampling and Analysis Plan (SAP) documented the DQO decisions
- Samples collected and data V&V completed

9720-17 Project DQO Overview (cont.)

- PK indicated building debris waste (primarily) expected for Environmental Management Waste Management Facility (EMWMF) disposal
- PK also indicated smaller portions of the waste for alternate disposal (e.g., offsite)
 - Heavy duty safes, safe bottle carriers, safe bottle carrier storage rack, pallets, and pallet cart
- Sampling design based on:
 - PK for the facility
 - Need for intrusive characterization data
 - Size of the facility and material types
 - Potential for radiological and chemical contamination
 - Visual indicators (e.g., reservoirs, ACM, filters, etc.)

9720-17 Project DQO Overview (cont.)

➤ Sample Design:

- Radiological contamination expected as the main contributing COC
- Heavy metals and various chemicals are expected to be secondary COCs
- The 9720-17 facility considered a large and homogenous population per the expected radiological contamination
- A randomly selected, statistical sampling strategy chosen to characterize the facility with biased samples collected as necessary
 - Includes all expected waste types from the facility
- No samples to be collected from anomalous items to be removed (e.g., safes, circuit boards, ballasts, switches, lamps, batteries, etc.)

9720-17 Project DQO Overview (cont.)

- 29 total stats-based samples to be collected
- Structural Material: 55% volume and 16 total samples
 - Interior mesh walls – 4 samples
 - Interior mesh ceiling – 4 samples
 - Structural columns, beams and supports – 4 samples
 - HEU storage racks – 4 samples
- Transite Material: 25% volume and 7 total samples
 - Exterior Walls – 4 samples
 - Exterior Roof – 3 samples

9720-17 Project DQO Overview (cont.)



Data Quality Assessment (cont.)

➤ DQA methodology

- Final CDS reviewed for all analyses types:
 - Radiological
 - Total and TCLP Metals
 - Total and TCLP VOA and SVOA
 - Total and TCLP Herbicides and Pesticides

➤ All applicable parameters were reviewed

- Analyses type
- Analyses methods
- Detections
- Frequency of Detections (detects / total samples)
- J-flagged detections (i.e., estimated)
- Noting of Expected Site Related Contaminants (SRCs) / Contaminants of Concern (COCs)

Data Quality Assessment (cont.)

➤ Radionuclides

- As PK indicated, Uranium isotopes were majority of detections
 - U-233/234:
 - 113 pCi/g max biased sample, breezeway wall insulation
 - 88.8 pCi/g stats sample, west wall transite
 - 47.3 pCi/g stats sample, gray painted storage rack
 - U-235/236:
 - 17.5 pCi/g max biased sample, breezeway wall insulation
 - 11.8 pCi/g stats sample, gray painted storage rack
 - U-238:
 - 16.4 pCi/g max stats sample, transite east wall
 - 6.52 pCi/g stats sample, transite west wall
 - 3.56 pCi/g biased sample, breezeway wall insulation
 - Technetium-99:
 - Only 1 detection: 9.72 pCi/g from wood beam in breezeway
 - Minimal detections & results from: Cesium-137, Curium-245/246, Lead-212, Lead-214, Plutonium-238 (2 detections), Potassium-40, Radium-226, Radium-228, Thorium-228, Thorium-230, Thorium-232 & Thorium-234, and Tritium (only 1 detection)

Data Quality Assessment (cont.)

➤ TCLP Chromium Exceedances

- 5.86 mg/L – Gray painted interior metal vent intake (1 sample: 1 fail)
- 6.7 mg/L - Gray painted metal mesh ceiling (4 samples: 3 pass/1 fail)
- 6.83 and 11.4 mg/L - Gray painted metal storage rack (4 samples: 2 pass/2 fail)
- 8.6 mg/L - Gray painted mesh wall (4 samples: 3 pass/1 fail)
- 16.1 mg/L - Gray/green painted steel beam (4 samples: 3 pass/1 fail)

➤ Chromium exceedances are distributed throughout the facility.

➤ Chromium UCL-90 results are 4.561 mg/L (calculated per EPA ProUCL version 5.2) and are below the 5 mg/L RCRA characteristic level.

Data Quality Assessment (cont.)

➤ DQA Summary

- Data was collected in accordance with approved DQO's and SAP
- Data obtained filled all DQO identified data gaps
- No additional Data Gaps identified post-sampling
- Data confirmed PK expectations

➤ Specific Data Observations

- Radiological contamination identified (as expected)
 - U-233/234, U-235/236 & U-238 main contributors
 - Tc-99 also a minor contributor
- Total Metals identified (as expected)
 - Chromium, Lead, Manganese & Strontium main contributors
- No significant VOA/SVOA contamination (as expected)
 - Di-n-butyl-phthalate the only contributor (very low detections)
- Only real data surprise was the TCLP Chromium exceedances

Data Quality Assessment (cont.)

➤ EMWWMF Profile:

■ **Analytic WAC:**

- Expectation is a low Sum of Fractions (SOF) and Low Volume profile

■ **Administrative WAC:**

- Analytical data indicates RCRA & TSCA compliance
- TCLP Chromium RCRA compliance via UCL-90 approach
- No other anticipated issues

■ **ASA WAC:**

- Low radiological detections for ASA isotopes, no issues anticipated

■ **Physical WAC:**

- No liquids, oils, containerized liquids, or waste waters observed during facility walkdowns or sample events
- Debris waste, no other issues anticipated



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