Brookhaven National Laboratory

Building 197 High Bay Section Demolition and Mercury Removal Plan

Upton, NY 11973

January 2025 (Rev1)

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Demolition and Mercury Removal Work Plan

Brookhaven National Laboratory

Building 197 High Bay Section

Upton, NY 11973

January 2025
Revision 1

Enviroscience Project No. 24522

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LIST OF ACRONYMS

ACL	Administrative Control Level
ALARA	As Low as Reasonably Achievable
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
CAMP	Community Air Monitoring Plan
C&D	Construction & Demolition
D&D	Decontamination & Dismantlement
DOE	Department of Energy
ECL	Enviroscience Consultants, LLC
EPD	Environmental Protection Division
ES&H	Environmental Safety & Health
F&O	Facilities & Operations
FUA	Facility Use Agreement
HAZWOPER	Hazardous Waste Operations and Emergency Response
HP	Health Physics
JHA	Job Hazard Analysis
LLRW	Low-Level Radioactive Waste
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
NYCRR	New York Codes Rules and Regulations
OSHA	Occupational, Safety and Health Association
PCB	Polychlorinated biphenyl
RCD	Radiological Control Division
RWP	Radiological Work Permit
SBMS	Standards Based Management System
SCO	Soil Cleanup Objective
sf	square feet
SHSD	Safety and Health Services Division
TLD	Thermoluminescent Dosimeters
WAC	Waste Acceptance Criteria
WMP	Waste Management Plan

1.0 INTRODUCTION

In conjunction with Brookhaven National Laboratory (BNL), Enviroscience Consultants, LLC (ECL) developed this Demolition and Mercury Removal Work Plan. The scope of this plan includes details on the means and methods for the demolition and removal of the Building 197 High Bay Section over mercury contaminated soils in the crawl space, as well as the methodology for the removal, staging, loading, and final post-excavation confirmatory sampling of any mercury contaminated soil areas in accordance with (NYSDEC) requirements and agreed upon cleanup goals. This plan was developed in close coordination with BNL project personnel who will perform and supervise this work. This Remedial Plan will also dovetail into the Community Air Monitoring Plan (CAMP) as air monitoring will be needed during demolition activities and mercury contaminated soil removals.

This demolition work plan consists of the following major elements:

- Facility Description and Operating History
- Demolition objectives and approach
- Site preparation activities
- Environment, Health and Safety
- Waste Management
- Pre-demolition activities
- Demolition activities
- Post-demolition activities

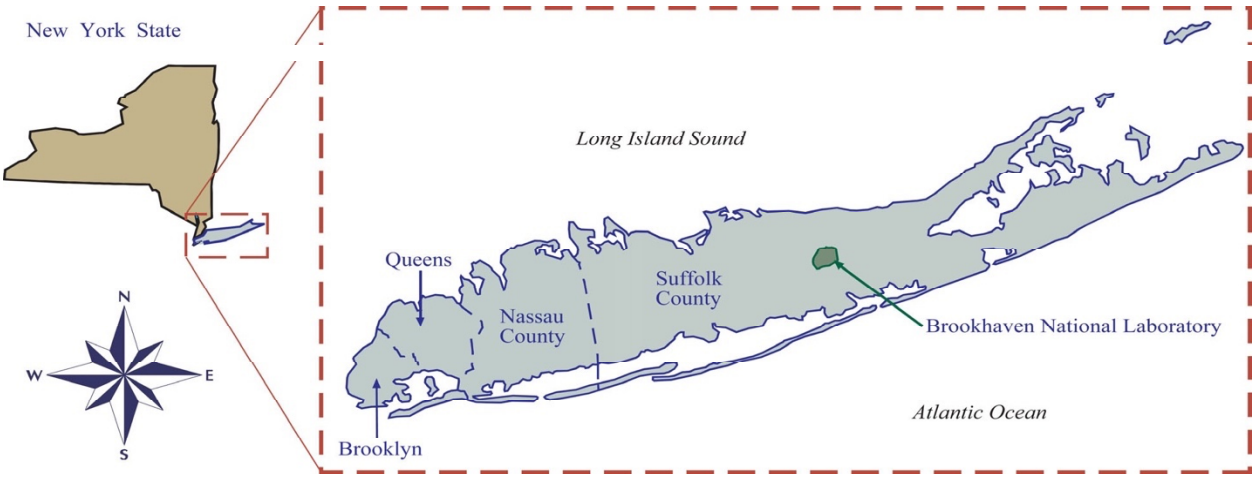
1.1 Site Background

BNL is owned by the U.S. Department of Energy (DOE), one of the 17 DOE national laboratories. BNL conducts research in the physical, biomedical, and environmental sciences, as well as in energy technologies and national security. The Laboratory also builds and operates major scientific facilities available to university, industry, and government researchers.

BNL is located in Suffolk County on Long Island, about 60 miles east of New York City. Approximately 1.4 million people reside in Suffolk County and approximately 450,000 reside in Brookhaven Township, within which BNL is situated. BNL has operated since 1947 as a research

facility for national science and technology programs and is expected to continue this mission for the foreseeable future. The location of BNL with respect to New York State and Long Island is shown in Figure 1-1.

Figure 1-1: BNL Site Location



Building 197 is located on BNL's Central Campus, on Cornell Avenue between Upton Road and Center Street (Figure 1-2 Building 197 Site Plan).

Except for the High Bay section, the balance of the building was demolished using standard Construction & Demolition (C&D) methods. The High Bay Section was left to be demolished under additional controls, followed by the controlled removal of mercury contaminated soils in the crawl space below the remaining High Bay Section. Photographs of the existing remaining High Bay Section of Building 197 are in Appendix A.

1.2 Scope

The scope of work for the remedial activities associated with the Building 197 High Bay Section Demolition and Mercury Removal Project is summarized below:

The Building 197 High Bay Section (Building 197), including the exterior structure, roof, wood floor, interior pilings and utilities, will be dismantled and removed to the concrete block foundation. Based on initial subsurface investigation, the soil beneath the wood floor will be

excavated to a depth between 1 foot and 4 feet below grade. The depth below grade for soil removal is to be determined by soil testing for mercury.

Much of the exterior hardscape has been removed. Any asphalt, curbing, concrete walkways, and any road base material immediately surrounding Building 197 will be also removed at the end of the remediation project.

All Waste materials will be characterized, packaged, transported, and properly disposed in accordance with the project Waste Management Plan (WMP), which is provided as Appendix D.

The site will be restored, including backfilling, grading, and seeding.

2.0 FACILITY OPERATING HISTORY

2.1 Operational History of Building 197

Building 197 consisted of a High Bay concrete block, steel, and wood building constructed in 1941 by the U.S. Army and used as a recreation/dance hall until 1947. The building was then occupied by the Nuclear Engineering Department (NED) as an engineering laboratory. Several additions were built over time for offices, design studios, photography development rooms, and storage areas. These additions have all been demolished. The remaining High Bay Section of the building contained the actual laboratory section based on a 1956 plan. NED conducted reactor research projects in the early fifties that led to work on liquid metals, including mercury (Hg). Significant work was done in the building between 1952-1977 that led to some minor spills in certain areas of Building 197. In 1977, most of the experimental work was concluded or moved elsewhere at BNL. From 1977 till today, there have been no experiments carried out in the building that involved mercury or radioactive materials. Since then, the High Bay portion of the building has been divided into several spaces used for storage, offices, and training. The building was used for this purpose until it was decommissioned, and demolition plans were developed.

2.2 Prior Remedial Activities Associated with Building 197

2.2.1 Original Mercury Remediation

In 1997, the northern section of the High Bay crawl space was the subject of a remedial investigation and cleanup of the soil/sand as part of a BNL and Suffolk County Department of Health Services (SCDHS)-initiated Facility Review and Disposition Project (FRDP). Only a partial remedial cleanup was completed. Remediation was halted prior to achieving clean endpoint results due to concerns with undermining the foundation and concrete pilings supporting the floor. A complete set of post-excavation, confirmatory verification samples could not be obtained at that time due to safety concerns.

In 2022 and 2023, soil/sand sampling was performed as per the NYSDEC-approved Sampling and Analysis Plan. The building was uninhabited and targeted for complete superstructure demolition (not including the crawl space area). Now that the building is being demolished, undermining is no longer a concern allowing for the complete remediation of the mercury impacted soils.

Figure 2-1 includes the crawl space layout, sample locations, and results from the 2022/2023 investigation.

2.2.2 Asbestos

Asbestos materials were identified in an asbestos survey prepared by Enviroscience Consultants, LLC, dated May 2021, ECL Project #20678. Prior to demolition activities all asbestos was remediated from the entire building and associated modulars. Asbestos remediation was also conducted within the high bay space and consisted of pipe wrap below the floor, floor tiles, and pipe insulation within the ceiling and upper mezzanine. Boyle Services was the certified and licensed asbestos abatement contractor. Project monitoring for the abatement was performed by ECL - Project #23711. Reference the ECL Final Clearance letter for the remaining High Bay dated July 17, 2023 and PCM Air Sample Results #35736. The only part of the structure that is still standing at Building 197 is the High Bay and all remaining building materials are either non-suspect or tested negative for asbestos.

2.2.3 Demolition

All parts of Building 197 have been demolished with the exception of the High Bay. Care was taken during the demolition process to not impact the High Bay section. Building sections attached to the High Bay were manually separated to create an "air gap" to protect the contaminated area from damage prior to demolition of the balance of the structure. All air gaped sections were closed up with plywood and wrap to prevent birds and bats from entering the building.

All demolition activities were conducted by BNL with support from Eastern Environmental Solution as the carting company. A total of 120 dumpsters were filled and removed from the site and transported to the local landfill as general Construction and Demolition (C&D) debris. All recyclable metals were picked from the demolition materials and segregated into separate recycling containers supplied and transported by Arrow Recycling.

2.2.4 Radiation

Historically within the B197 High Bay there was an area of radiological concern identified within one area in room 1-5A. The area consisted of a small floor area (approximately three square feet) and a single floor joist that supported the floor in the room. All materials were completely removed and processed via the Waste Management Division. Post survey radiological surveys were performed following the removals, and they met the DOE O 458.1 Radiation Protection of the Public and Environment free release criteria.

3.0 FACILITY DESCRIPTION

3.1 General Building Construction Characteristics

The remaining section of Building 197 is a high bay concrete block, and steel, two-story high building with a partial walk-out basement on the north side. Inside is a high bay clear to the roof area with a mezzanine, and a small second floor. The floors and the roof are wood. A crawl space with a sandy-dirt floor makes up most of the below grade area. The crawl space is enclosed in a concrete masonry unit (CMU) block foundation and is covered by a wooden first floor. The wood floor is supported by wooden beams on CMU pilings. The depth of the piling footings is estimated to be 3-6 feet below grade based on their locations. Soil in the crawl space is

contaminated from the legacy mercury spill discussed in section 2.1 that occurred in the northern section of the High Bay. The small walk-out basement, approximately 10-feet wide north to south, spans the 56-foot width of the building on the north side. The basement has a concrete slab floor and CMU block walls. A CMU block wall separates the basement from the crawl space. The basement floor is approximately 4-feet below the crawl space soil surface grade. Photographs of the exterior taken on February 5, 2024 are in Appendix A.

3.2 Building Utilities

All utilities that serviced Building 197 during its period of operation have been isolated and disconnected. The following services have been disconnected:

- Steam and Condensate
- Potable water
- Sanitary
- Telephone
- Network Fiber Optic
- Electrical
- Fire Alarm

4.0 PLANNED BUILDING DEMOLITION ACTIVITIES

This section presents the plan for how the demolition activities will be conducted for the remaining building structure. Demolition of the above structure is not anticipated to impact the mercury soil which will be removed separately and is detailed in Section 5.0. Demolition activities will be evaluated daily and modifications to this plan will be made as necessary based on situations that arise.

4.1 General Approach and Technical Approach

4.1.1 General Approach

Prior to soil remediation, demolition activities associated with Building 197 will include the removal of the structure and associated materials described in Section 1.2 (Scope). This demolition of the High Bay structure, excluding the CMU foundation, will be done prior to

beginning the removal of contaminated soil. The below grade foundation may remain after the contaminated soil has been removed and confirmatory post-excavation samples are collected. As further specified in Section 4.1.2, the Building 197 Demolition and Remediation Project will be completed by BNL Facilities and Operations (F&O) with support from the Environmental, Safety, and Health Directorate. The goals for the Building 197 Project are:

- Control, minimize, or eliminate the potential for exposure to silica and other particulates during demolition.
- Control, minimize, or eliminate all routes of human and/or environmental exposure to mercury contaminated soils during demolition.
- Control, minimize, or eliminate the future potential for mercury contaminated soils to impact groundwater.
- Prevent the spread of mercury contaminated soil during the project.
- Perform proper characterization, removal, packaging, transportation, and disposal of C&D debris and impacted soil using safe and efficient methods.
- Complete the project with no reportable incidents under Occupational, Safety, and Health Association (OSHA) or United States Department of Energy (DOE) regulations.

The demolition sequence for Building 197 was selected based on: the locations of load bearing walls, beams, and columns; concrete block wall structure; roofing structure and roofing materials; floor structure and materials; and containment of mercury contaminated soil within the crawl space. The building will be demolished methodically in a sequence to preserve the wood floor for as long as possible. The wood floor structure will remain in-place until contaminated soil removal activities are set to begin.

The northern most portion of the building with the basement will be demolished to the slab as this portion of the building is not over the impacted crawl space. Removing this portion of the building, which includes the floor structure over the basement, the northern exterior basement concrete block wall, and the basement side (east and west) CMU walls to the extent safely possible, will allow for better access for soil removal equipment during remediation activities.

The northern basement wall containing the crawl space will remain until the contaminated soil is removed.

4.1.2 Technical Approach

The building foundation will be left in place to contain the mercury impacted soil.

Since the greatest demolition height is approximately 23 feet, standard excavators will be used for demolition, which greatly reduces the need for demolition personnel to work at elevated heights, increases the efficiency of the demolition process, and allows a more controlled operation than conventional crane and ball wrecking procedures. The building will be demolished by breaking the roof and walls outward allowing the bulk of debris to fall towards the exterior of the building. The demolition will be performed in this manner to prevent large construction debris from damaging the wood floor. The wood floor is currently acting as a cap for mercury vapors and the goal is to maintain this structure until remediation of soils is to begin.

As demolition progresses, debris will be cleared with excavators and loaded into roll-off containers. As C&D roll-off containers are filled, representative samples will be collected and analyzed for total mercury to ensure proper disposal. This process will occur for the southern half and northern half of the building. Furthermore, all recycled metals will be separated from the C&D debris and scanned with an X-ray fluorescence (XRF) analyzer for mercury to determine if they can be recycled in accordance with recycling contractors waste acceptance criteria.

Structural demolition will use standard equipment, including, but not limited to, excavators with demolition attachments (i.e., grapples, shears, and breakers), a front-end loader, backhoe, dozer, crane, and roll-off containers. Dust control will be maintained through the use of water from the local hydrant. All water usage will be used sparingly to avoid surface runoff; however, erosion control devices will be installed around the project site and will be inspected on a weekly basis (or more frequently depending on precipitation events) by a NYSDEC-certified Erosion & Sediment Control Specialist. Rubble removal will be conducted using machines to load roll-off containers.

After the roof, support beams, and exterior walls are removed, the final portion of demolition will be to remove the wooden floor structure and concrete support pilings. With the wooden floor removal, mercury vapors will be able to enter the work area, therefore appropriate personal

protective equipment (PPE) and air monitoring activities will be applied at this time. The floor structure will be removed by section in sequence progressing from the least contaminated area to the more contaminated areas, along with contaminated soil removal. Removal of the floor is further covered in Section 5.0 Contaminated Soil Removal.

Perimeter air monitoring will be performed throughout the entirety of the demolition process as outlined in the CAMP document.

4.2 Facility Preparation Activities/Prerequisites

The intent of the facility preparation activities is to prepare the buildings for demolition. The following subsections specify the items that have been or will be completed prior to beginning demolition work.

4.2.1 Bat Survey

BNL EPD personnel will perform a survey of Building 197 less then 24-hours before demolition to verify the absence of bats, including the Northern Long-eared Bat which is federally endangered, and any other nesting animals.

4.2.2 Asbestos Abatement

An Asbestos Survey was performed by Enviroscience Consultants, LLC, and subsequent asbestos abatement of the High Bay has been completed. No asbestos issues remain in the High Bay and it may be demolished using standard demolition methods.

4.2.3 Hazardous Materials Removal

Materials that contain or are suspected to contain lead (e.g., roof flashings, gutters, lead-acid batteries), PCBs (e.g., light ballasts, electrical equipment), mercury (e.g., bulbs, electrical equipment) and cadmium were removed from the building, and any liquids (e.g., oils, etc.) have been drained or removed from the entire building including the High Bay Section. Hazardous materials were packaged and disposed of in accordance with the Standards Based Management System (SBMS) Waste Subject Area and in accordance with federal, state, and local regulations.

4.2.4 Utility Isolation Confirmation

All utilities serving the building and those that will be affected by demolition have been, or will be, disconnected and isolated or sealed in accordance with BNL standard procedures. As discussed in Section 3.2, all utilities that serviced Building 197 during its period of operation were previously isolated. The utilities that serviced the building included steam and condensate, potable water, sanitary, telephone, network fiber optic and electric. BNL F&O personnel will confirm that these utilities have been isolated and will sign on to the utility isolation plan that exists for the building demolition and documents all utilities and methods of isolation.

4.2.5 Establish Work Zones

Currently the area around Building 197 is enclosed with perimeter fencing, and portions of this fencing may need to be removed to provide ease of access for heavy equipment. Temporary construction fencing affixed with appropriate work zone signage will be installed by BNL F&O personnel to augment the High Bay exterior fence so that the entirety of the work area is enclosed. A contamination zone will be established around Building 197 once the demolition is complete and remediation starts. PPE will be required within this zone for all BNL and other site personnel. The demolition and contamination work areas will be controlled by BNL F&O in a manner to limit personnel and vehicle access to only those required for demolition activities.

4.2.6 Staging of Equipment

Upon notice to proceed, all necessary equipment to commence the demolition activities will be mobilized and staged by BNL F&O. Any heavy equipment brought on-site site (e.g., C&D and scrap metal roll-off containers) will pass through the BNL Vehicle Radiation Monitor prior to entry into the work site. Equipment shall be inspected by the BNL Equipment Inspector prior to use.

4.2.7 Establish Work Access

Routine access to the work area will be via the existing asphalt parking lot and gate located on the south portion of the work area along Cornell Avenue (see Figure 4-1 Demolition Site Layout).

4.2.8 Establish Waste Staging Area

The initial temporary staging area for waste containers will be the paved area directly south of Building 197. This area is easily accessible to the driveway and gate described above. This location is illustrated on Figure 4-1 Demolition Site Layout. Once building demolition is complete the associated demolition waste will be removed from the worksite to allow for the staging of the mercury soil waste containers.

5.0 CONTAMINATED SOIL REMOVAL

5.1 General Approach

Analytical results and field observations from the subsurface investigation (March 2024 Final Subsurface Investigation Report of the Building 197 North-Central Crawl Space) performed to characterize and help determine the extent of mercury contamination within the crawl space support the following conclusions:

- Locations closest to the original spill site remain elevated with mercury contamination in the areas sampled and extend to a depth of at least thirty-six (36) inches below crawl space ground level.
- Within the building foundation boundary, the mercury contamination has extended beyond the original source/spill area. This is most likely due to volatilization and condensation contaminant transfer cycles that occurred over 50 plus years; however, mercury concentrations and depth of contamination are lower in areas further away from the source. There is no evidence that the mercury contamination has spread outside the building foundation.

The full vertical and lateral extent of mercury contamination could not be confidently determined due to challenges associated with collecting samples from the first-floor level and extremely dry conditions making it difficult to collect representative samples at depth with equipment available and able to be used. Therefore, the general approach for this remedial effort is to divide the total area of the crawl space into three sections from the least contaminated area to the highest. To the extent practicable, analytical results from the investigation were used to determine the dividing lines between the sections - see Figure 2-1. Ultimately, endpoint samples will be compared to established 6 NYCRR Part 375 Soil Cleanup Objectives (SCOs) and, if those levels are

not met, cleanup will continue, or a decision will be made with NYSDEC consultation to develop a Site Management Plan for any areas where SCOs above Protection of Groundwater are not met.

Once the building superstructure demolition is completed removal of the wood floor and concrete support pilings will begin. The floor will be removed and placed into roll-off containers for disposal while the concrete footings and any metal will be placed to the side for further sampling. Metal will be screened with a XRF analyzer and concrete will be sampled to confirm proper disposal pathways. Once this work is complete the removal of the mercury impacted soils will begin. As indicated above, the crawl space area within the concrete block foundation will be divided into thirds from south to north. The soil will be removed from the least contaminated area (Area A1 - ~2,970 ft.^{2}) first, then the middle third (Area B1 - ~1,820 ft.^{2}), and finally the north third (Area C1 - ~725 ft.^{2}).

Soil will be removed by an excavator and placed directly into Flexible Intermediate Bulk Containers (FIBC) (super sacks). Each Super Sack holds about nine cubic yards of soil and approximately 90 Supers Sacks are needed. The super sack containers will be placed in close vicinity to the excavator. The excavator will work from a location along the outside of the foundation reaching into the foundation area to access the impacted soils. See Figure 5-1 for a general layout of where the mercury soil waste containers will be placed during remediation efforts and staged once filled.

The waste containers will be properly sealed and labeled and stored in the staging area. The sacks will be regularly removed from the staging area by truck and transferred on-site to the BNL railroad spur where they will be placed on a geotextile base and covered with tarps for temporary storage (See Figure 5-2 for the truck route). After the mercury impacted soil has been removed from Building 197, arrangements will be made to have the waste containers placed into lined, high sided gondola rail cars and transported to Veolia's Treatment Storage and Disposal Facility (TSDF) in Gum Springs, Arkansas for disposal.

Due to the potential exposure to mercury vapors, access to the area within the building foundation will be limited and hand digging will be avoided to the extent possible. Additionally, the excavation equipment will be used from outside the excavation as much as possible to limit cross-contamination concerns and cleaning of equipment.

5.2 Technical Approach

The depth of the excavation for each section will be determined by the collection of final endpoint samples to confirm that the SCO has been attained. Prior to excavation of the mercury soils plastic sheeting will be laid across the excavation areas and allowed to sit for 10-20 minutes to allow time for any vapors to equilibrate. Workers will then use a Lumex® Mercury Vapor Analyzer (MVA) in transects to check for local "hot spots" under the plastic to aid in the remediation effort.

The first section of soils to be removed will be the south third of the foundation area (Area A1). This area is the least contaminated section of the crawl space. It is estimated that only a foot or less of material will need to be removed from this section. The excavator will carefully remove soils to the estimated depth. After excavation workers will place plastic down over the area and use an MVA to check for the presence of mercury. Should any be found, additional soil removal will be performed. Following this effort, four endpoint soil samples will be collected to determine mercury concentrations (See Figure 5-3 for proposed endpoint sample locations). To prevent delays while waiting for sample results, excavation will proceed to the middle third section, Area B1. If any of the endpoint sample results indicate additional soil needs to be removed, then excavation will resume in Area A1.

Contamination in the Area B1 is expected to be deeper, and excavation may reach depths between one and two feet below the existing grade. After initial excavation is completed, workers will place plastic down over the area and use an MVA to check for the presence of mercury. Should any be found, additional soil removal will be performed. Following this effort, three soil samples will be collected. Results of those samples will determine if additional soil needs to be removed from this section.

The northern third of the area (Area C1) is the location of the original mercury release. As discussed in Section 2.2.1, this area was the subject of a remedial investigation and cleanup in 1997 that was halted prior to achieving clean endpoint results due to concerns of undermining the foundation and concrete pilings supporting the floor. An additional two to three feet of soil is expected to be removed from this section. An attempt will be made to perform a similar approach to excavation and mercury vapor monitoring using plastic as stated above for Areas

A1 and B1; however, excavation safety will be of primary concern. As with Area B1, three endpoint soil samples will be collected to determine if additional soil needs to be removed.

Throughout the excavation process the excavator will be kept out of the foundation area unless absolutely necessary to reach impacted soils. This will be done to prevent cross contamination across the three sections (A1, B1, & C1) of the building. The excavator will be staged along the sides of the foundation and will not enter the removal area. Care will be taken throughout the excavation process to delineate the completed sections and prevent soils from an unfinished area impacting the completed areas. If the excavator is required to enter the foundation area to reach a specific areas of soils, it will remain outside of the area where contaminated soils remain. The excavator will make limited movements and remain only in clean areas.

Once the super sacks are filled with soil they will be closed in accordance with manufacturer's instructions. They will then be removed from the loading frame (a loading frame will be used to facilitate loading of waste into the 9 cubic yard (CY) super sacks), weighed, and transported to the on-site rail spur by truck. The truck will follow a predetermined route through BNL to reach the rail spur (Figure 5-2). The waste packages will be stored at the railyard until the completion of the project. The waste packages will be placed on geotextile and covered with polyethylene sheeting during the storage period.

All waste characterization samples collected of soil and C&D material to date has indicated that the waste is non-RCRA Hazardous based on analytical testing (TCLP). The soil will be transported to Veolia's Gum Springs, Arkansas TSDF and contaminated, non-RCRA Hazardous C&D debris (i.e., flooring material) will be transported to Veolia's Lancaster, Pennsylvania TSDF. Additional waste characterization sampling will be performed while loading the waste containers and prior to off-site transport to ensure proper disposal.

Once all removals have been completed and appropriate post-excavation endpoint results have been achieved, a final report will be generated to document the remediation.

5.2.1 Elemental Mercury Contingency

Visible (macroscopic) reservoirs of elemental mercury are not expected to be encountered during this project. However, should areas with elemental mercury be encountered, the excavation work will stop immediately, area will be stabilized, marked and covered (as necessary) to prevent

stormwater from moving through contaminated area. Depending on the amount and visual indications from the area, a small HEPA mercury vacuum will be used to capture local pockets of mercury. If a larger area is anticipated, the existing disposal contract has a clause for rental/use of a Vacuum/Vactor Truck that is better suited for this type of elemental mercury and contaminated soil removal. This waste stream would be managed as RCRA Hazardous Waste and will be disposed of separately at a permitted Veolia TSDF that can process mercury waste to applicable Land Disposal Restriction standards.

5.2.2 Contamination Extending Under the Foundation

It is suspected that the building foundation acted as a barrier to the movement of the original mercury release and all impacted materials are within the foundation. However clean soil was never encountered vertically during the original remediation for concerns of undermining the building. If excavation extends vertically below the base of the foundation and sampling indicates mercury contamination has spread below the foundation depth, then demolition of the foundation and additional sampling or excavation may be warranted. The contaminated soil removal will be halted to address the removal of the foundation. Once the foundation has been removed then soil sampling will be performed to delineate the vertical extent of the contamination under the original foundation area. At this point conversations with the DEC will need to occur to determine the requirements of any required site management plan parameters.

5.3 Soil sampling

All soil sampling for this remediation effort will be performed by BNL Field Team or a designated-qualified vendor that will follow all applicable BNL sampling procedures. In most cases soil samples will be collected as surface endpoint samples to determine if the Soil Cleanup Objectives (SCO's) are met following soil removal activities. Soils may also be collected at post-excavation locations below grade if necessary to delineate residual contamination. All samples will be collected with sampling equipment such as decontaminated metal sampling spoons, spades, or other equipment (i.e. soil augers). Sampling equipment will be decontaminated, or new equipment will be utilized prior to sample collection and between each sample location and between depth intervals. Should areas of the remediation site be difficult to access or create a hazard to access, the excavator or other means will be used to obtain soil samples and a representative sample will be collected from the excavator bucket or other equipment.

All samples will be containerized using U.S. EPA requirements, including the use of proper sampling containers and equipment (e.g. Terra Core soil sampler), use of preserved containers as required, and cooled to 4 Degrees C. all in accordance with BNL Field Sampling Team Procedures. Then, the samples will be transported to a third-party laboratory certified by the Environmental Laboratory Accreditation Program (ELAP) for analysis of total mercury. Based on the preliminary sampling performed in 2022/2023, it is not anticipated that the endpoint samples will be analyzed for any other compounds beyond Mercury.

GEL Laboratories, LLC, 2040 Savage Road, Charleston, SC 29407, (843) 556-8171 - NY Lab Identification No: 11501 or Eurofins Environmental Testing America, 4955 Yarrow Street, Arvada, Colorado 80002 (NY Lab Identification No: 59923) and Long Island Analytical Laboratory, 110 Colin Dr., Holbrook, NY 11741 (NY Lab Identification No. 11693) will be used for sample analysis for this project. All sample results from the outside lab will be requested to provide a standard Category B deliverables QA/QC Report as required by the NYSDEC. Additionally, all results will undergo a BNL Data Validation analysis following BNL Field Sampling Team Procedures. A BNL Data Validation Summary Report will be included as per DER-10 Data Usability Summary Report requirements so as to ensure data quality.

Any tables summarizing laboratory results will conform to DER-10 requirements (e.g. use of mg/kg units). Tables will compare Total Mercury results to the three SCOs - Unrestricted Use (0.18 milligrams per kilogram), Industrial Use (5.7 mg/kg), and Protection of Groundwater (0.73 mg/kg).

All results and results tables will be included in the Final Report.

5.3.1 Periodic Sampling During Removal

Waste characterization samples will be collected from the soil being placed in the super sacks to confirm levels of mercury do not exceed the disposal facilities waste acceptance criteria (WAC). The total number of samples collected will be determined based on discussions with the chosen waste disposal facility.

5.3.2 Endpoint Soil Sampling

Once a decision is made that all the mercury impacted material has been removed from a section of the foundation area, endpoint samples will be collected to confirm that agreed upon SCOs have been achieved. A total of 10 samples will be collected throughout the removal area to

characterize the entire work area at the completion of removal activities in each Area. Four samples will be collected from Area A1, three samples will be collected from Area B1, and three samples will be collected from Area C1 as shown on Figure 5-3. Sample locations will be biased towards areas suspected of the highest concentrations. All samples will be collected with the same procedures outlined in section 5.3.

5.4 Equipment Decontamination Procedures

Decontamination of the excavation equipment as a whole is not anticipated currently as excavation is expected to occur from outside the foundation. However, at a minimum the bucket and possibly the knuckle of the excavator will require decontamination. The excavator bucket will be placed directly over a Super Sack designated for decontamination and soil will be manually removed from the bucket with shovels and brushes.

At the end of the project the final decontamination will involve the manual removal of soil directly into a Super Sack and the bucket will be scanned with a Jerome® meter. Should the screening reveal any detections above background, the area will be washed with a non-phosphate soap (i.e. Alconox) to remove any remaining contamination. The bucket will be washed over a designated decontamination area and any resultant waste managed as appropriate.

6.0 HEALTH & SAFETY

A Job Hazard Analysis (JHA) will be prepared in accordance with SBMS Subject Area *Work Planning and Control*. This document will be used to identify the potential hazards associated with each of the identified tasks and will provide mitigation methods for the hazards. All job hazards will be communicated daily to site workers via safety tailgate meetings. Demolition activities will be completed in accordance with the OSHA requirements in 29 CFR 1910/1926 and BNL SBMS requirements, specifically the SBMS Subject Area, Work Planning and Control (*Construction sub section)*, as well as applicable BNL Safety and Health Services Division (SHSD), and Waste Management (WM) procedures.

Any necessary contractor workers will be required to complete Laboratory-supplied Contractor Vendor Orientation. The Project Manager may waive training required or add other training, as

conditions dictate. Any alterations to the required training will be documented to the Project File.

6.1 Personal Protective Equipment

All PPE shall be worn as described below and may be downgraded or adjusted based on site conditions or negative exposure results from IH monitoring. At the conclusion of each day all disposable PPE will be collected and containerized in drums for disposal.

Demolition of the High Bay structure:
During physical demolition of the High Bay structure all workers will be required to wear half face respirators, at a minimum, with mercury and HEPA cartridges. This PPE will be required for all workers involved in the demolition process and the PPE will remain in place until personal air monitoring results show no exposure to workers.

Removal of the High Bay wood floor and soil excavation:
Upon initiating the floor covering removal in the high bay and subsequent soil excavation, all workers will be required to wear a full-face respirator with associated mercury and HEPA cartridges. Workers with the potential to make contact with mercury contaminated soil will wear Tyvek coveralls, booties, and gloves in addition to the full-face respirators.

6.2 Personal Air Monitoring

Personal air monitoring will be performed for personnel working within the contamination zone including equipment operators. Air samples will be collected for alkyl-mercury, inorganic mercury, respirable crystalline silica and respirable dust (PNOS) and compared to the exposure limits in Table 6.2 An IH professional shall review all results and make recommendations for additional monitoring or any changes in PPE selection.

As a best practice, the work will be sequenced so that work progresses from the least contaminated zone to the most contaminated zone. During this progression multiple rounds of personal monitoring are required to document potential mercury exposure in each work zone.

Table 6.1 Personal Air Monitoring Exposure levels

Permissible Exposure Limits	OSHA	ACGIH
Silica Dust	50 µg/m3	25 µg/m3 (TLV)
Inorganic Mercury Vapor	0.1 mg/m3	0.025 mg/m3
Alkyl Mercury	0.01 mg/m3	0.01 mg/m3
Respirable Dust (PNOCs)	5 mg/m3	NA

7.0 ENVIRONMENTAL MONITORING AND CONTROL

7.1 Perimeter Air Monitoring

A Community Air Monitoring Plan (CAMP) will be implemented to monitor the area for dust and mercury vapor. The CAMP equipment will be operating for both the building demolition and soil excavation activities. Additionally, handheld Jerome® mercury meters will be used to field screen areas as necessary. Further details outlined in the CAMP can be found in Appendix B.

7.2 Contamination Control

Every effort will be made to prevent or minimize the spread of contamination during the demolition and soil removal operations. Procedures for control of contaminants are outlined below.

- Work area and access roads will be restricted to authorized personnel during demolition operations. Signs and/or barrier tape will be used to post work areas where access is restricted.
- Silt fencing, straw bales, and/or diversion swales will be utilized around the perimeter of work areas to minimize the spread of contamination by stormwater runoff.
- The high bay foundation walls will be left in place during work to contain and prevent the spread of any mercury soil.

As a lessons-learned from other on-site projects, contaminated materials and areas must be protected prior to and during precipitation events to prevent or minimize the spread of contamination.

BNL will use methods to minimize the spread of contamination during demolition and excavation activities. These methods will mainly consist of working from the least contaminated area to the most contaminated, keeping heavy equipment outside the foundation footprint to avoid equipment tracks picking up and transporting contaminated soils, and using water to wet down soils to reduce dust.

7.3 Dust Monitoring and Control

Dust generation will be minimized during all demolition operations. Procedures for control of dust are outlined below:

- During the initial dust generation activities such as concrete breaking, real-time monitoring will be implemented for personnel and the posted work area to verify that the controls for dust are effective. Details are provided in the associated CAMP.
- During demolition and soil removal operations, the equipment and structure surfaces that are being affected will be sprayed with water prior to beginning operation and during operations as necessary to minimize dust generation.
- Vehicular and heavy equipment pathways, loading, off-loading, and waste staging areas will be sprayed with water as needed to control dust generation.

It is imperative that utilizing water for suppressing dust will not generate surface runoff.

7.4 Stormwater Runoff Control

Stormwater runoff will be controlled by silt fences, straw bales, or diversion swales erected upgrade and downgrade from the demolition area and temporary waste staging areas. All stormwater control measures shall be maintained throughout the duration of the project until it is determined that the control measures are no longer needed. Erosion control plan provided in Figure 7-1.

8.0 WASTE MANAGMENT

8.1 Planned Waste Generation

Planned waste streams resulting from the Building 197 Project include:

Table 8.1 Planned Waste Generation

Type of Material	Waste Type	Quantity	Planned Disposal Site
Soil	Non-Hazardous Waste – Mercury*	800 CY	BNL Approved Waste Disposal Facility - Veolia Gum Springs, Arkansas
PPE, disposable sampling equipment	Non-Hazardous Mercury	5 55-gallon Drums	BNL Approved Waste Disposal Facility - Veolia Gum Springs, Arkansas
Concrete, Wood Flooring (Bldg Structure from the first floor to the basement)	Non-Hazardous Waste - Mercury	200 CY	BNL Approved Waste Disposal Facility – Veolia VLS Lancaster, PA
Concrete, Brick, Wood (Bldg Structure above the first floor)	Clean C&D Debris		C&D Landfill Maggio Environmental
Steel	Clean C&D Salvage		BNL Approved Recycling Facility – Arrow Recycling

Table Notes:

** TCLP results from the 2022/2023 mercury investigation found the concentrations of mercury in the soil to be non-hazardous.*

Nitrile sample gloves, Tyvek® suits, disposable sampling equipment, respirator cartridges and wipes, will be placed into sturdy plastic bags and handled as Industrial Waste. Based on the soil

sampling results performed during the initial remedial investigation the waste is non-hazardous according to RCRA Hazardous Waste Toxicity Characteristic Leaching Procedure (TCLP) protocols.

8.2 Waste Minimization and Pollution Prevention

- During demolition, all building materials will be removed on top of the concrete foundation walls. This material will be pulled off to the side and size reduced with heavy machinery and then loaded into C&D debris containers for disposal as non-hazardous waste. During this process operators as well as laborers will also remove and separate any metal or piping that can be recycled.

These segregation activities, as well as the initial removal and disposal of all asbestos, lamp ballast, mercury-containing lamps, and mercury switches were performed in accordance with BNL Waste Minimization policies and procedures.

9.0 SITE RESTORATION

Upon completion of demolition activities, verification that debris and wastes have been removed from the work area will be performed and the following site restoration will be completed:

- Excavated areas will be backfilled with soil meeting the requirements of NYSDEC Part 375 Soil Cleanup Objectives, Table 375-6.8(b): Restricted Use Soil Cleanup Objectives. BNL will collect samples of any materials from either, onsite excess soil areas if available, or from outside vendors.
- Any overburden soil previously excavated during demolition work may be used as backfill.
- Backfilled soil will be compacted in 1-foot lifts.
- Final grade will be established by placement of topsoil and a native Long Island grass seed.

Upon completion of site restoration, all materials, equipment, and personnel will be demobilized.

Appendix A

Photographs

(Photographs are of typical conditions and
do not show all of the materials or locations that they represent)

B197 High Bay Section remains. – South Elevation (facing north).

West Elevation (facing east)

The site slopes at the rear (north) to expose the basement level (facing southeast).

Rear slope on north side, looking west.

North Elevation with walk-out basement (facing south).

East and north side (facing southwest).

East Elevation (facing west)

Surrounding grade has been leveled with RCA (facing northwest).

The one access point to the regulated work area on the south side of the site will be graded with RCA.

A paved staging area at the east side of the site will be outside of the regulated work area.

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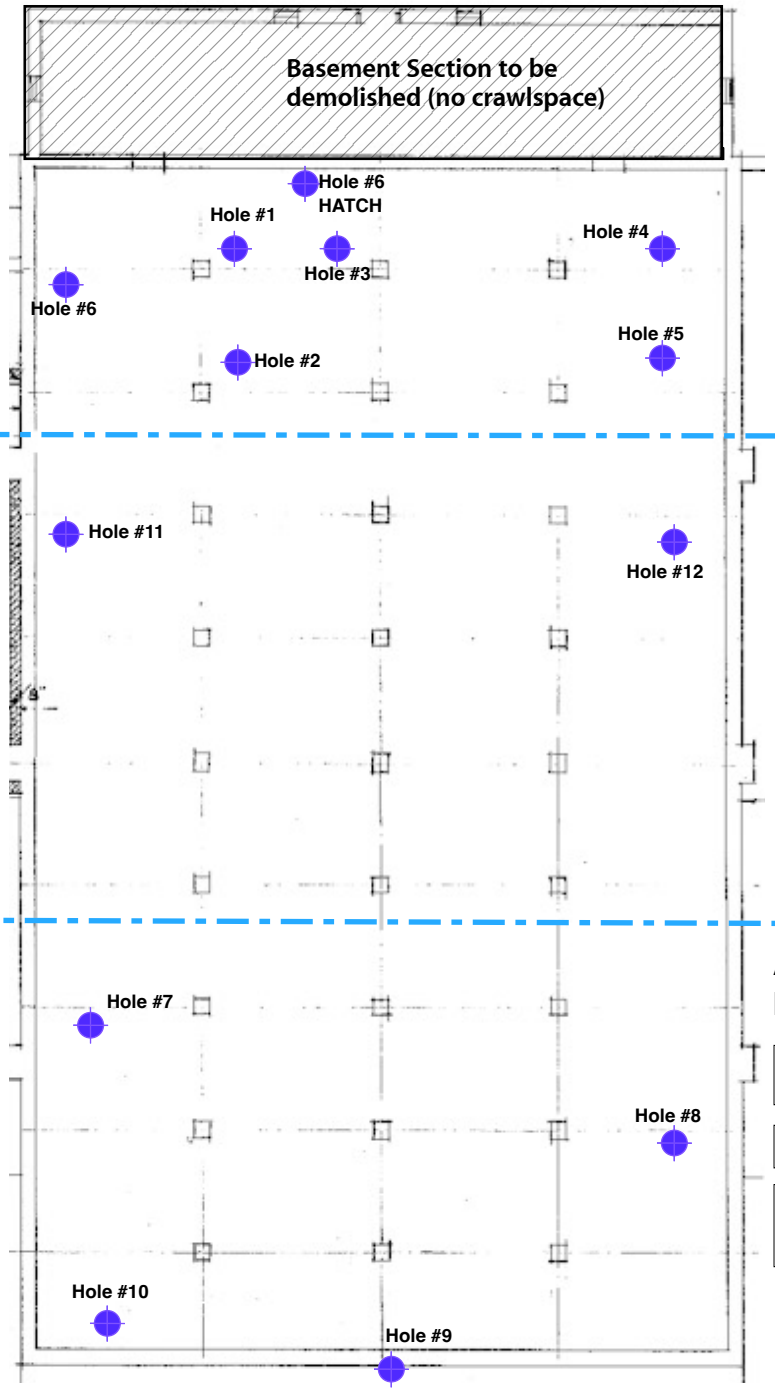
PROJECT **Building 197**
Cornell Avenue
Site Plan

CLIENT **BROOKHAVEN NATIONAL LABORATORY**

KEY PLAN
NO SCALE

PROJECT #: 24522
COMMENTS:

Figure 1-2



Excavation in this area third

Approximate Depth 4 ft

Highest Concentration of Mercury in this area

Area C1
MERCURY RESULTS BY LOCATION

Hole # 1
Hg 6" - 9,020 ug/kg
Hg 12" - 7,760

Hole # 2
Hg 6" - 19,500 ug/kg
Hg 12" - 14,700
Hg 18" - 18,800
Hg 24" - 12,000
Hg 30" - 3,210
Hg 36" - 10,400

Hole # 3
Hg 6" - 11,200 ug/kg
Hg 12" - 13,800
Hg 18" - 15,600
Hg 24" - 25,100
Hg 30" - 37,100
Hg 36" - 37,200

Hole # 5
Hg 6" - 13,700 ug/kg
Hg 12" - 8,060

Hole # 6 HATCH
Hg - 11,200 ug/kg

Hole # 6
Hg 6" - 4,190 ug/kg

Excavation in this area second

Approximate Depth 2 - 3 ft

Area B1
MERCURY RESULTS BY LOCATION

Hole # 12
Hg 6" - 1,030 ug/kg
Hg 12" - 22.9
Hg 18" - 672

Excavation in this area first

Approximate Depth 1 - 2 ft

Area A1
MERCURY RESULTS BY LOCATION

Hole # 8
Hg 6" - 6,900 ug/kg
Hg 12" - 1,450

Hole # 9
Hg 6" - 250 ug/kg

Hole # 10
Hg 6" - 4,700 ug/kg
Hg 12" - 1,650
Hg 18" - 1,990

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PROJECT: **Building 197**
Cornell Avenue
Crawl Space Layout and Previous Sample Locations

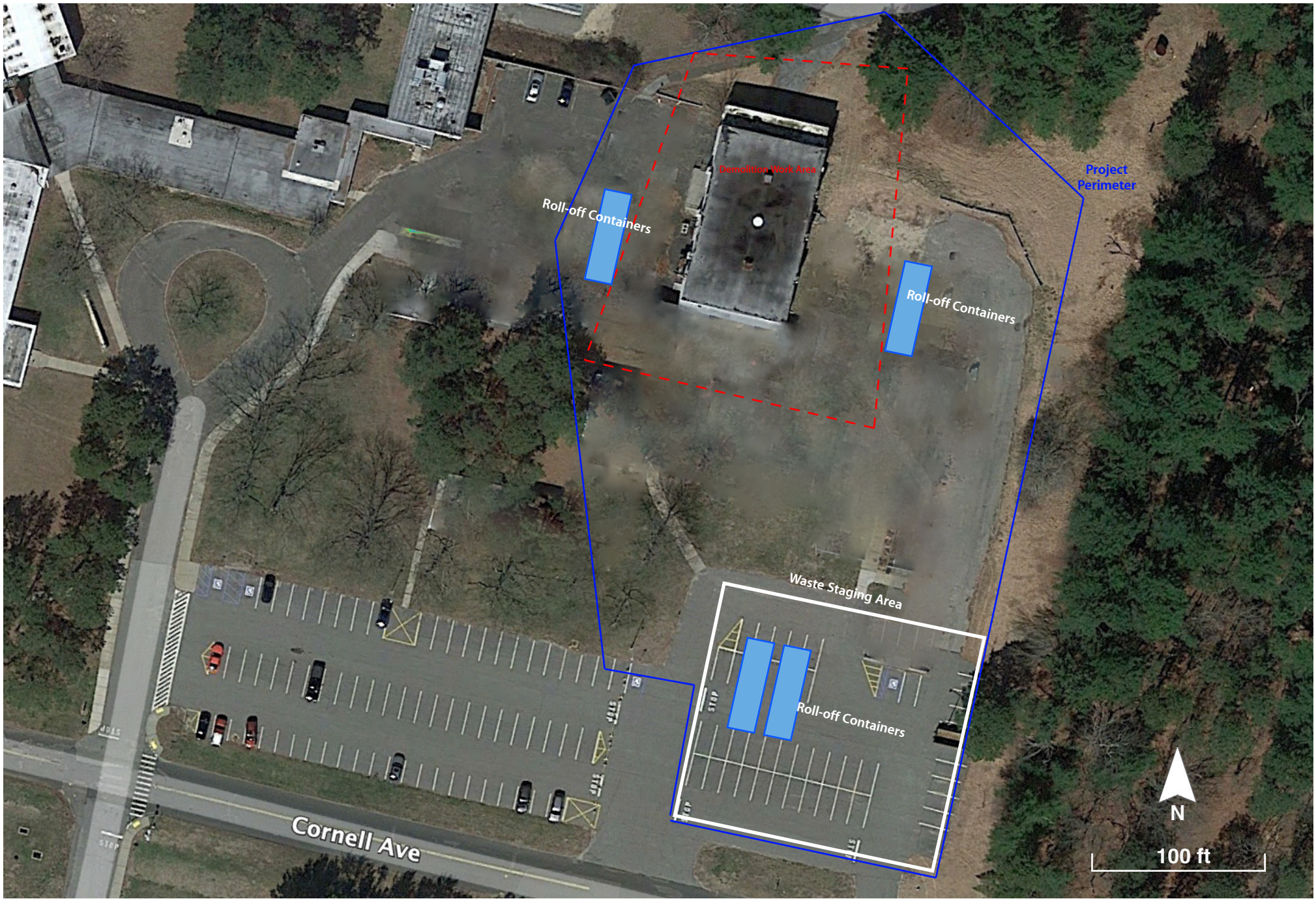
CLIENT: BROOKHAVEN NATIONAL LABORATORY

KEY PLAN
NO SCALE

PROJECT #: 24522
COMMENTS:
Sampling occured on 12/15/2022, 1/17/2023 and 3/10/2023

NOT TO SCALE

Figure 2-1



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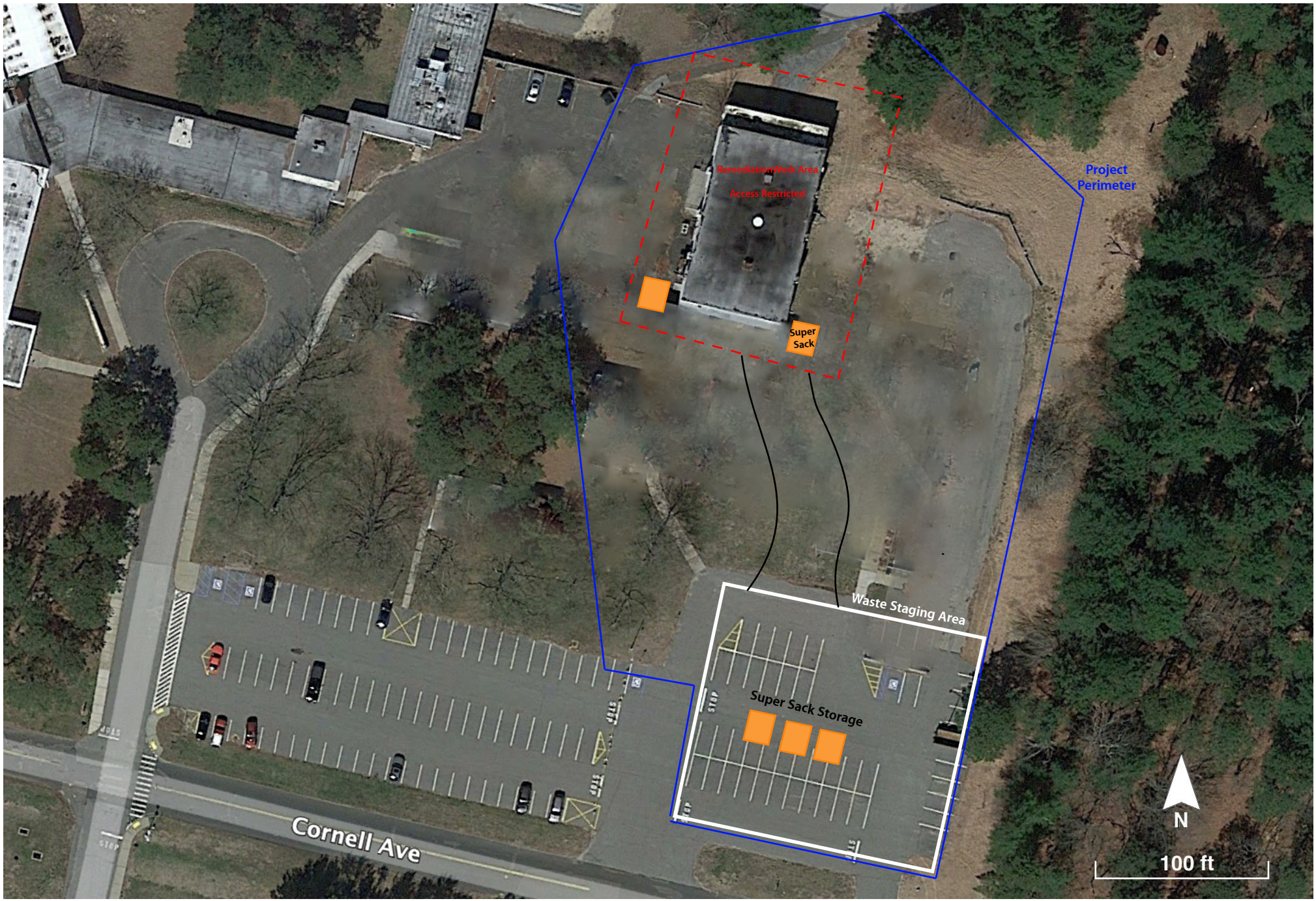
PROJECT **Building 197**
Cornell Avenue
Demolition Site Layout

CLIENT **BROOKHAVEN NATIONAL LABORATORY**

KEY PLAN
NO SCALE

PROJECT #: 24522
COMMENTS:

Figure 4-1



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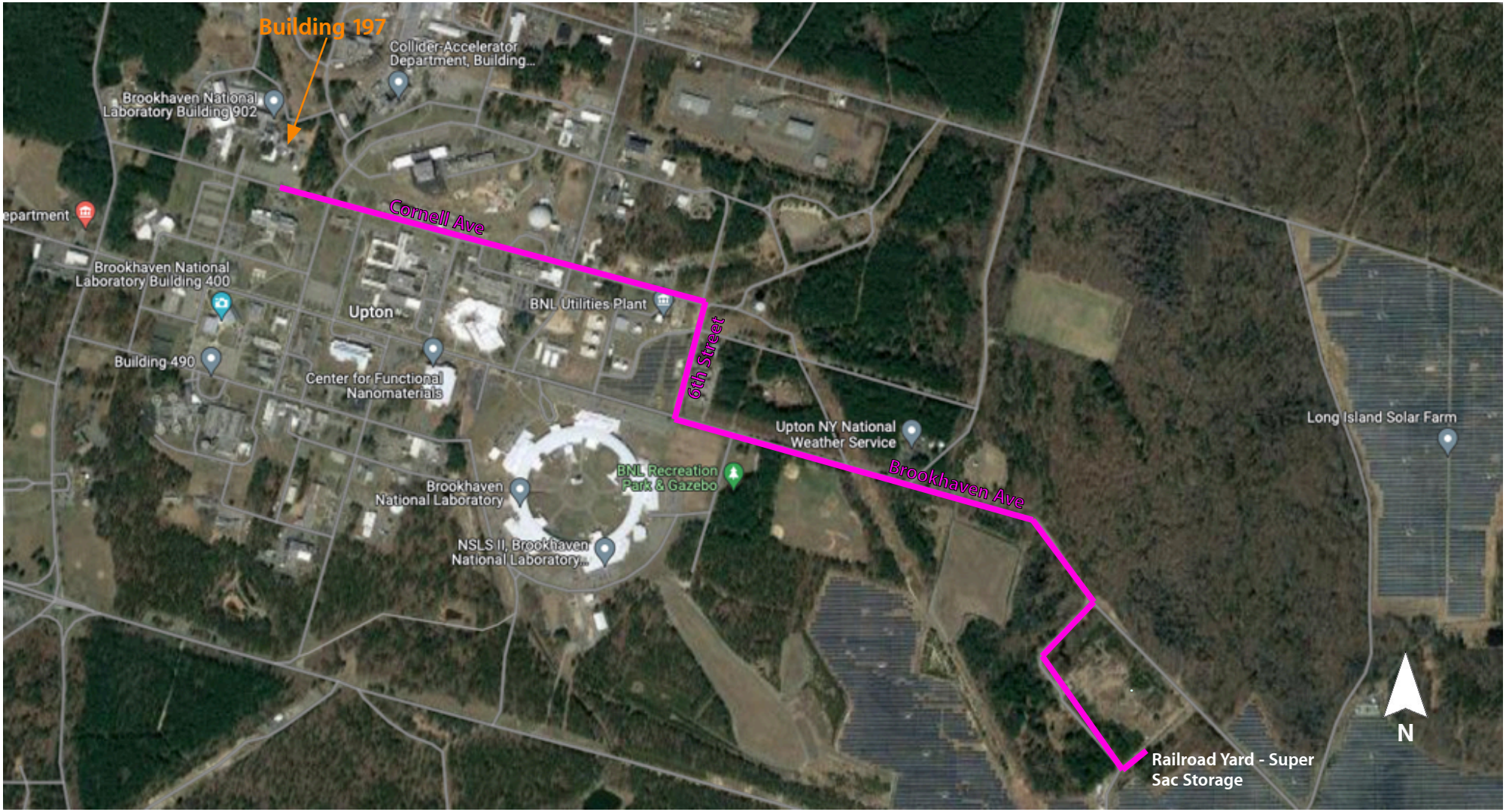
PROJECT **Building 197**
Cornell Avenue
Remediation Site Layout

CLIENT BROOKHAVEN NATIONAL LABORATORY

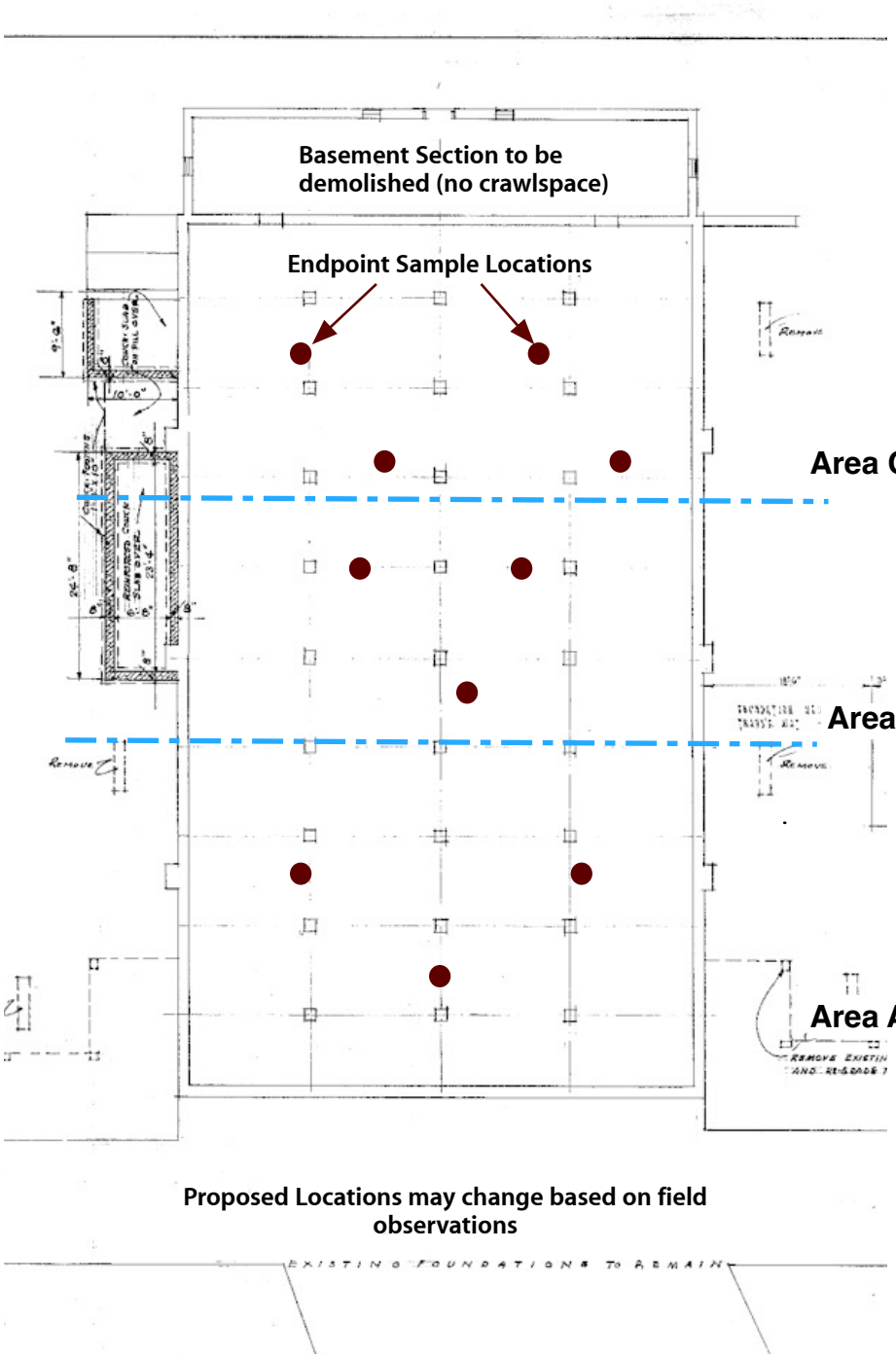
KEY PLAN
NO SCALE

PROJECT #: 24522
COMMENTS:

Figure 5-1



ENVIROSCIENCE CONSULTANTS A Mainline Company	ENVIROSCIENCE CONSULTANTS, LLC 2150 SMITHTOWN AVENUE RONKONKOMA, NY 11779 (631) 580-3191 FAX 580-3195 www.envirohealth.org	PROJECT CLIENT	**Building 197** Cornell Avenue Truck Route to Train Yard BROOKHAVEN NATIONAL LABORATORY	KEY PLAN NO SCALE	PROJECT #: 24522 COMMENTS:	NOT TO SCALE Figure 5-2



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PROJECT: **Building 197**
Cornell Avenue
Proposed Endpoint Sample Locations

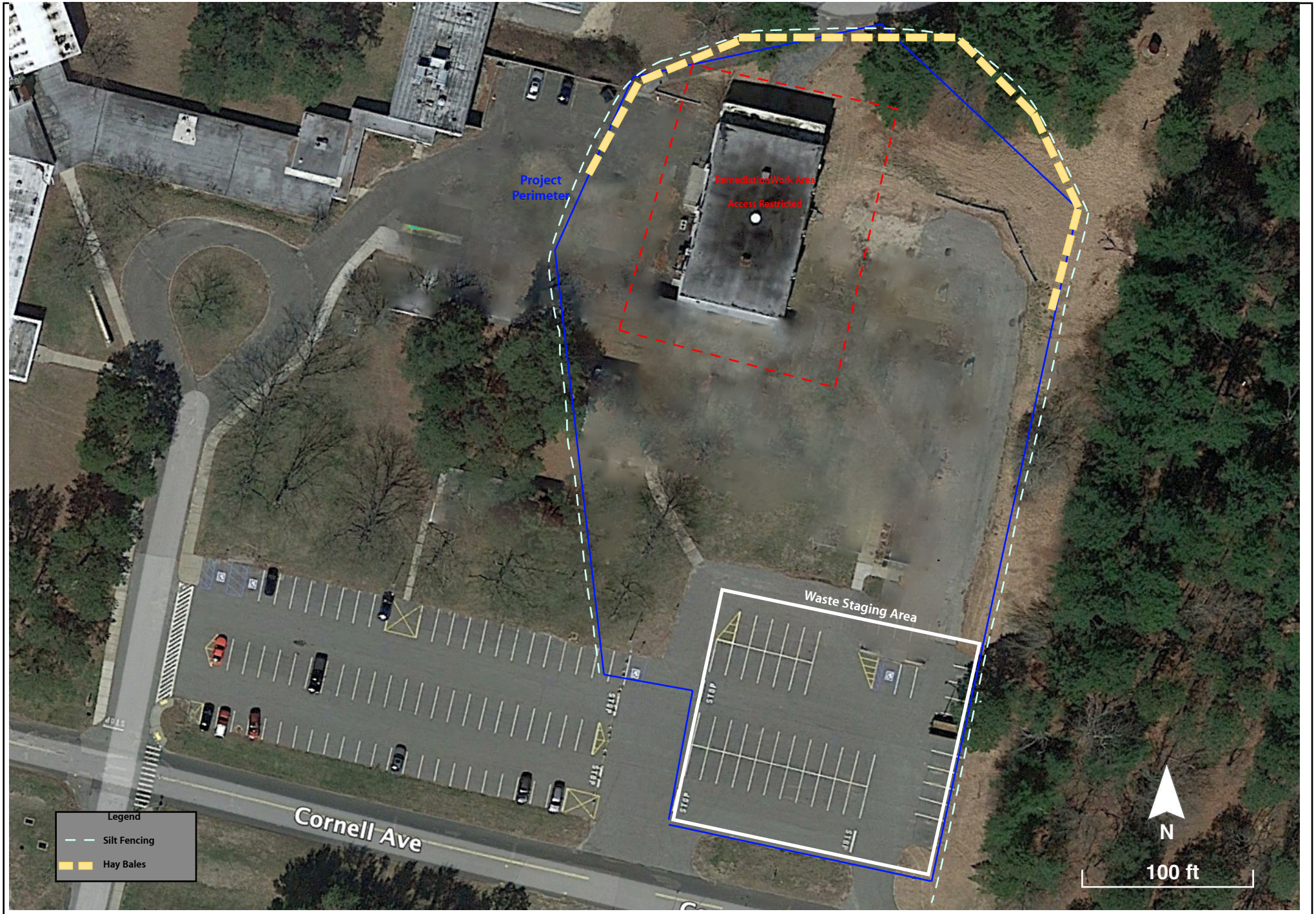
CLIENT: BROOKHAVEN NATIONAL LABORATORY

KEY PLAN
NO SCALE

PROJECT #: 24522
COMMENTS:

NOT TO SCALE

Figure 5-3



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PROJECT **Building 197**
Cornell Avenue
Erosion Control Plan

CLIENT BROOKHAVEN NATIONAL LABORATORY

KEY PLAN
NO SCALE

PROJECT #: 24522
COMMENTS:

Figure 7-1

Appendix B

Community Air Monitoring Plan

Brookhaven National Laboratory

Building 197
Community Air Monitoring Plan

Upton, NY 11973

January 2025

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COMMUNITY AIR MONITORING PLAN

Brookhaven National Laboratory

Building 197

Upton, NY 11973

January 2025

Enviroscience Project No. 24522

Prepared for: Brookhaven Science Associates
Upton, NY 11973

Prepared by: Enviroscience Consultants, LLC
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Bart Gallagher

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Kathryn Loddengaard

Certified Industrial Hygienist:

TABLE OF CONTENTS

Community Air Monitoring Program – Building 197 (High Bay Section)

TABLES

FIGURES

LIST OF ACRONYMS

BNL	Brookhaven National Laboratory
CAMP	Community Air Monitoring Plan
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CHMM	Certified Hazardous Material Manager
DOE	United States Department of Energy
ESHR	Environmental Safety and Health Representative
GCAMP	Generic Community Air Monitoring Plan
HEMO	BNL Heavy Equipment Machine Operator
JHA	Job Hazard Analysis
µg/m^3	micrograms per cubic meter
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PM	Project Manager
PM10	Particulate Matter (10 µg/m^3 or less in diameter)
USEPA	United States Environmental Protection Agency

1.0 INTRODUCTION

The purpose of this Community Air Monitoring Plan (CAMP) is to describe the monitoring activities that will be taken by Brookhaven National Laboratory (BNL) to detect any potential airborne releases of constituents of concern during the implementation of remedial activities associated with Building 197. Building 197 is located on Cornell Avenue, west of Center Street, on the BNL campus in Upton, New York. This monitoring will be performed during the demolition of the superstructure, remediation activities, and waste handling associated with mercury-contaminated sand and soil at Building 197's High Bay Area. This CAMP specifies the air emissions action levels, air monitoring procedures, monitoring schedule and data collection and reporting to be performed during the above remedial activities at the site.

This CAMP fulfills the requirements as set forth by the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (GCAMP), dated May 2010. This plan is designed to address protections against the specific contaminants identified in the Final Subsurface Investigation Report of the Bldg. 197 North Central Crawl Space at Brookhaven National Laboratory, dated March 2024.

The contaminant of concern that has been identified at the site within the crawl space is mercury. The presence of mercury contamination within the crawl space of Building 197 warrants the establishment of on-site contaminant mitigation procedures to ensure airborne action levels are not exceeded due to its low occupational exposure limit and toxicity. In the event that the action levels are exceeded, pre-established response activities to mitigate those levels and protect the workers will be implemented. Based on past sampling and monitoring no VOC's or radiological contamination exists within the building and will not be monitored for as part of this CAMP.

Community air monitoring will include the following direct-read instruments:

- Arizona Jerome Mercury Vapor Analyzer
- Dust-Trak for particulates.

The Dust-Trak units and Jerome meters will be mounted in stationary positions around the perimeter of the work area and in the work area zone.

"Clean Air Act (42 United States Code [U.S.C.] Section 7401, et seq.) and National Emissions Standards for Hazardous Air Pollutants (NESHAP) (40CFR 61) regulates and limits the emissions of hazardous air pollutants. All activities with the potential to create airborne emissions will

require confinement or containment with confirmatory air sampling to verify compliance with these requirements and applicable standards." The specific 40 CFR 61 Subpart E does not apply to this project as per the details below:

> "The National Emission Standards for Hazardous Air Pollutants (NESHAP) for Mercury (40 CFR Part 61, Subpart E) apply to the new and existing facilities which process mercury ore to recover mercury, use mercury chlor-alkali cells to produce chlorine gas and alkali metal hydroxide, and incinerate or dry wastewater treatment plant sludge. In general, all NESHAP standards require initial notifications, performance tests, and periodic reports by the owners/operators of the affected facilities. They are also required to maintain records of the occurrence and duration of any startup, shutdown, or malfunction in the operation of an affected facility, or any period during which the monitoring system is inoperative. These notifications, reports, and records are essential in determining compliance with 40 CFR Part 61, Subpart E."

2.0 AIR MONITORING PROCEDURES

2.1 Monitoring Station Locations and Power

CAMP monitoring will be performed at the CAMP monitoring stations that are just outside of the boundary for particulate matter less than 10 microns in diameter (PM10) as summarized in Table 2.1. Four stationary monitoring locations will be established based on the prevailing wind direction each day. One station will be placed upwind, two stations will be placed downwind, and one station will be placed crosswind. The crosswind location will also be chosen based on its proximity to other buildings. The CAMP stations will be adjusted every day to account for changing wind directions. Additionally, should the wind direction change during the work day the equipment will be moved to reflect this change. Figure 1, shows the location of the CAMP monitoring boundary and an example of CAMP monitoring stations locations based on wind direction.

The CAMP equipment (Jerome meter/Dust Trak) will be housed in pelican cases for protection and placed on tripods approximately four feet above the ground. Monitoring equipment will not be operated in the rain.

Power will be provided to the CAMP stations by external rechargeable battery packs incorporated into the equipment enclosures. At the end of each day the batteries will be plugged into charging stations.

The CAMP stations will be specifically for perimeter monitoring for the duration of the project. OSHA Personal air monitoring will be conducted to monitor worker exposure inside the work area, which is not addressed in this document.

Table 2-1 – Perimeter Air Monitoring Specifications

Parameter	Monitoring Locations	Monitored Parameters	Conducted During
Jerome J405 Mercury Analyzer	Perimeter monitoring	Mercury vapors	Crawl Space sand-soil removals/waste handling
TSI Dust-Trak	Perimeter monitoring	Particulates (PM10)	Building Demolition, Crawl Space sand-soil removals/waste handling

The monitoring stations deliver real-time continuous data to the CAMP monitor onsite to an online website via a Netronix modem. Data will be provided in both total numbers and 15 - minute averages. Additionally, the physical stations will be checked at least four times throughout each workday and when Removal Action activities are being performed to ensure they are running properly. The data will be downloaded from each of the monitoring stations at the end of each workday.

In addition to the stationary CAMP stations a portable Jerome J505 Mercury Analyzer will be kept onsite and used as necessary in and around the work area.

A daily monitoring logbook will be kept onsite in a dedicated marble notebook. Information regarding the CAMP Monitoring will be recorded every day including hourly wind direction/ speed, weather conditions/ stoppages, equipment set up locations, daily work area activities, any exceedances on the monitoring thresholds and associated work stoppages, and steps taken to resolve the exceedance. Any other relevant project information will also be recorded in the logbook.

2.2 Air Monitoring Action Levels

The CAMP at the project site consists of a combination of perimeter monitoring for particulates (dust) and mercury vapors. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (ug/m3) greater than the upwind monitor for a 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. In accordance with U.S. EPA National Air Quality Standards (NAAQS) PM-10 concentrations will not exceed 150 ug/m3. Audible alarms will be connected to the equipment. If there are exceedances of 150 ug/m3 then all work will be stopped and dust suppression actions will be taken. Work will restart only after it is confirmed that the dust concentrations are below 100 ug/m3.

However, if upwind concentrations of PM 10 exceed 150 uq/m3 the site conditions will be re-evaluated as it is likely other factors not related to demolition or remediation activities are impacting the concentrations. These factors could include high winds or high humidity.

Baseline air sampling for mercury and particulates will be performed prior to building demolition and soil-disturbing activities. This will be done to ascertain the PM levels that occur on a normal/regular day and will be compared to levels measured after building demo and soil disturbing activities begin. However, it should be noted that although a baseline will be established representing a "normal day" different weather conditions may impact the PM levels throughout the project, i.e. high humidity tends to increase the PM 10 numbers. Therefore, the downwind locations will also be compared to the upwind locations on a daily basis.

In accordance with Threshold Limit Values determined by the American Conference of Governmental and Industrial Hygienists (ACGIH) , mercury vapors will not exceed 20 ug/m3. See Table 2-2 for the action levels established for the Removal Action at the Site.

Table 2-2 CAMP Levels for Particulates and Mercury Vapor (Direct Reading Instrumentation)

Parameter	Zone Location and Monitoring Interval	Action levels (Above Upwind)	Response Activity
Dust (PM10)	Perimeter and community monitoring locations with dust Readings every 60 seconds,	<100ug/m^3	• Continue monitoring.

Parameter	Zone Location and Monitoring Interval	Action levels (Above Upwind)	Response Activity
	calculate 15- minute average during Removal Action activities	>100 ug/m^3	• Continue monitoring. • Begin water dust suppression measures. • ESHR and field crew will be notified by Enviroscience personnel that early warning alert level has been reached.
		>150ug/m^3	• Cease activities, re-evaluate dust suppression measures. • Implement new suppression methods and restart monitoring. Confirm new suppression methods are effective (i.e., levels are <100 ug/m3)
Mercury Vapors	Perimeter and community monitoring locations with mercury vapor readings every 60 seconds during Removal Action activities	<20 ug/m^3	• Continue monitoring
		≥20 ug/m^3	• Continue monitoring • Begin suppression measures by tarping exposed materials • ESHR and field crew will be notified by Enviroscience personnel that early warning alert level has been reached Confirm new suppression methods are effective (i.e., levels are <0.20 ug/m3)

Parameter	Zone Location and Monitoring Interval	Action levels (Above Upwind)	Response Activity
Mercury Vapors	Perimeter and community monitoring locations with mercury vapor readings every 60 seconds during Removal Action activities	$\geq$25 ug/m^3	• Pause activities, re-evaluate dust suppression measures • Use portable Jerome Monitor to evaluate the work area utilizing additional suppression measures

2.3 Equipment Maintenance and Calibration

All monitoring equipment will be maintained and calibrated as per the equipment manufacturer's recommendations.

The TSI Dust-Trak equipment will be calibrated daily prior to the sampling event to ensure correct PM 10 measurements. Prior to the start of each dust track a zero calibration filter will be connected to the device and the zeroing cycle will be run. This will ensure proper measurements throughout the day.

The Jerome Analyzer, will be calibrated prior to the start of each workday by running the five minute device warmup. During the warmup the equipment will be connected to the zero filter. Measurements will then be collected while the zero filter is connected until readings stabilize. Calibration values will be recorded in the Project Logbook.

2.4 Monitoring Schedule

Each working day, air monitoring will continue for up to 30 minutes after Removal Action activities cease to prevent off-site migration of contaminants before the HEMOs and support personnel leave the site. No release of contaminants above background levels is anticipated during non-working hours. No monitoring will occur during non-working hours.

3.0 REPORTING

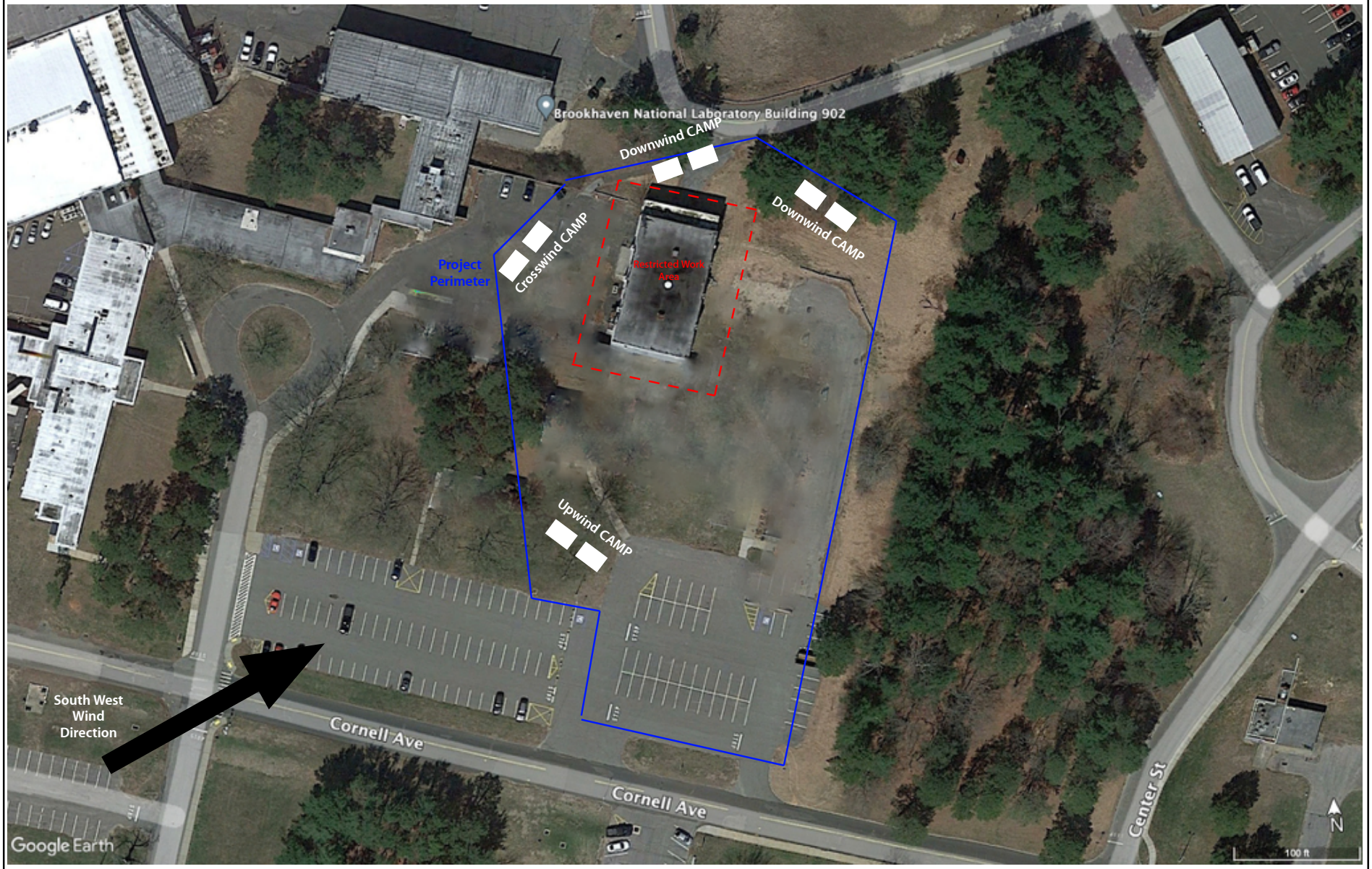
3.1 Project Reporting Procedures

The on-site Enviroscience personnel will maintain a daily project log and will report any exceedances of airborne levels on a daily basis to the BNL ES&H Representative or Project Lead as they occur. Whenever the results indicate that perimeter measurements exceed the thresholds stated in this document, the exceedances will be reported immediately to the BNL ES&H Representative or Project Lead so appropriate engineering controls can be implemented to reduce airborne levels. Work will only commence once the appropriate engineering controls have been put in place.

The monitoring data will be downloaded from the equipment daily. The monitoring data will be made available to designated BNL project personnel on a weekly basis when the daily data is compiled into a weekly report for review. All reports and data will be provided to the NYSDEC and NYSDOH daily or as results are available.

3.2 Data Review and Interpretation

Once the project is completed the full results of the CAMP will be included in the final Mercury Remediation Closure report. .



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PROJECT **Building 197**
Cornell Avenue
Site Plan and Example CAMP Layout

CLIENT **BROOKHAVEN NATIONAL LABORATORY**

KEY PLAN
NO SCALE

PROJECT #: 24522
COMMENTS:

Figure 1

Appendix C

Field Sampling Procedures

BROOKHAVEN NATIONAL LABORATORY

ENVIRONMENTAL MONITORING PROCEDURE

Collection and Frequency of Field Quality Control Samples

The only official copy of this file is the one online. Before using this printed copy, **verify** that it is the **most current version** by checking the document effective date on this website.

PREPARED BY:

DocuSigned by: Larry Singh

L. Singh 10/31/2022

Author/Subject Matter Expert/Date

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(Signatures on File)

Revision Log

SECTION	Page #	Rev. #	Date	Reason(s) for Revision
Revision Log	2	5	11/20/17	Remove old revision statements (2007) only need to maintain a history of five years.
Attachment 1		5	11/20/17	Deleted references to Attachment 1 throughout the SOP.
2.0	4	5	11/20/17	Removed reference to the ES&H Directorate Records Management Procedure.
4.7		5	11/20/17	Removed reference to Supplement A Form.
5.2		5	11/20/17	Removed reference to Supplement A Form. Required blank information to be written on COC.
8.6		5	11/20/17	Removed reference to Supplement A Form.
10	11	5	11/20/17	Added Facility and Risk Assessments standard statements and remove reference to the JRA.
11	11	5	11/20/17	Added EMS section.
3.4	4	6	10/12/22	Field Blank definition.
3.10	5	6	10/12/22	Trip Blank, comes from contract lab only. Should not be made by field team.
6.1.2	6	6	10/12/22	Corrected where trip blanks are sampled.
10	9	6	10/12/22	Renamed Section, Applicable FRAs/JHAs.
Revision Log	2	6	10/20/22	Remove old revision statements (2017) only need to maintain a history of five years.

1.0 PURPOSE AND SCOPE

The purpose of this procedure is to establish a frequency and provide a standardized method for the collection of field quality control samples. This procedure covers samples collected in support of the BNL Environmental Surveillance Program and those projects monitored under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) program and shall be used as a guide when collecting trip blanks, field blanks, equipment rinseate blanks, duplicate samples, matrix spike, and matrix spike duplicate samples. Project-specific Data Quality Objectives (DQOs) may alter the collection frequency of these Quality Control (QC) samples.

2.0 RESPONSIBILITIES

2.1 It is the responsibility of the project manager to inform field sampling personnel what field Quality Control (QC) samples are required based on the DQOs for the project. QC samples are also collected to verify the completeness of decontamination.

3.0 DEFINITIONS

3.1 Batch – A set of bottles or sampling equipment prepared for decontamination at one time.

3.2 Duplicate sample – A second sample for a particular analysis collected simultaneously at a sampling location, using the same sampling apparatus and identical sampling containers. Duplicates shall be analyzed to check contract analytical laboratory reproducibility of the analytical data.

3.3 Equipment blank (reusable equipment) – Sample used to verify the effectiveness of the decontamination process for non-dedicated or reusable sampling equipment. Equipment blanks are collected from the final rinse water generated using a Type 1 reagent grade water source.

3.4 Field Blank – A field blank is a sample that is prepared in the field to evaluate the potential for contamination of a sample by site contaminants from a source not associated with the sample collected (for example air-borne dust or organic vapors which could contaminate a soil sample).

3.5 Matrix Spike (MS) – Analysis of a known concentration of target analyte(s), added at the analytical laboratory to an aliquot of a sample. It is used to measure the efficiency of all steps of the sampling and analytical methods in recovering the target analyte(s) from the sample.

3.6 Matrix Spike/Matrix Spike Duplicate (MS/MSD) – Analyses of two separate aliquots taken from a single field sample and spiked, at the analytical laboratory, with a target

analyte(s) prior to sample preparation and analysis. They are used to reinforce the matrix spike information.

3.7 Recharge Basin – An earthen structure (i.e., hole, swale, excavated pit) used for the discharge and recharge of clean water (potable and stormwater) to the groundwater aquifer. BNL sampling locations include, but are not limited to, recharge basins HN, HO, HS, HW, HT-E, HT-W, HZ, and CSF.

3.8 Split Samples – Replicate of the same samples collected to evaluate the sampling and analytical precision of a sampling program.

3.9 Surface water – Water that is on the Earth's surface, such as in a stream, river, lake, or reservoir. BNL sampling locations include the Peconic River and its control sites, including but not limited to, HV, HY, HM-N, HM-S, HQ, HA, and HH.

3.10 Trip Blank – Consist of an aliquot of Type 1 reagent grade water, which is sealed in a sample bottle by the contract analytical laboratory. The trip blank is used to determine if any cross-contamination occurs between aqueous samples during shipment, handling, or storage. Trip blanks are analyzed for aqueous volatile organic compounds (VOCs) only.

4.0 PREREQUISITES

4.1 Type-1 reagent grade water

4.2 Cooler with crushed ice

4.3 Personal Protective Equipment (PPE), as required by the work permit for routine environmental monitoring and any other job-specific PPE

4.4 Sample labels

4.5 BNL Chain-of-Custody Form (EM-SOP-109. Chain of Custody, Storage, Packaging, and Shipment of Samples Procedure)

4.6 Black pen

5.0 PRECAUTIONS

5.1 Exercise caution when handling sample preservatives and filling bottles which contain preservatives. Gloves and safety glasses shall be worn at all times when handling preservatives.

5.2 If trip, field, or equipment blanks are collected and associated with samples on more than one Chain-of-Custody (COC), all associated COC numbers shall be stated in comment field of the COC header.

5.3 All samples shall be submitted/shipped for analysis the same day as sampling is completed. If this is not possible, the samples must be placed inside a secured area and

those requiring cooling shall be placed inside a refrigerator or a cooler with sufficient ice to maintain the samples at the required temperature. The samples must then be submitted/shipped the next working day.

5.4 If safety issues are encountered at any time during sampling, stop work and notify supervisor (see SBMS Stop Work Subject Area).

5.5 PPE shall be used, as required, by the Environmental Protection Division (EPD) Health and Safety Plan and associated work permits (following the SBMS Work Planning and Controls for Experiments and Operations Subject Area).

5.6 A cellular phone shall be accessible at all times for emergency use.

5.7 Only clean, disposable powder-free gloves shall be worn when handling sampling equipment, sample containers, and collecting samples.

5.8 All field equipment shall be decontaminated before use. If sampling equipment is to be reused, follow EM-SOP-801, Decontamination of Environmental Sampling Equipment.

5.9 Record any unusual occurrences in the field logbook and on the appropriate sample log.

5.10 Label all bottles using the appropriate sample identification number as outlined in EM-SOP-202, Sample Location Identification.

6.0 PROCEDURE

6.1 Trip Blanks

6.1.1 Trip blanks shall be taken in the field each day when water samples are being collected for VOC analysis. A separate trip blank shall be taken for each sampling team or cooler.

6.1.2 The trip blanks (clean 40-ml Teflon lined septum vials containing HCL preserved Type I reagent grade water) should have been received from the same contract analytical laboratory that will be analyzing the samples being taken.

NOTE: The trip blank vials are never to be opened outside the contract analytical laboratory that they came from.

6.1.3 Label all bottles using the appropriate sample identification number using EM-SOP-202, Sample Location Identifications.

6.1.4 Place the trip blank samples on ice or refrigerate, with samples, as needed.

6.1.5 Complete the COC form, identifying the trip blank in the sample description field and ship the samples for analysis.

6.2 Field Blanks

6.2.1 Field blanks for routine environmental sampling of groundwater shall be collected at a rate of 5 percent (one out of every 20 samples collected) for each parameter being analyzed.

6.2.2 Field blanks for non-routine environmental samples shall be collected at a rate determined by the project manager.

6.2.3 During the sampling event, fill the necessary containers for each parameter being analyzed with Type 1 reagent grade water using the methods described in EM-SOP-100, Sample Collection Methods for Radiological and Non-Radiological Parameters in Environmental Water Samples.

6.2.4 Label all bottles using the appropriate sample identification number using EM-SOP-202, Sample Location Identifications.

6.2.5 Place samples that require cooling on ice or refrigerate (e.g., VOC samples).

6.2.6 Complete the COC form, identifying the field blank in the sample description field and ship the samples for analysis.

6.3 Duplicate Samples

6.3.1 Duplicate samples for environmental sampling of Sewage Treatment Plant samples (Daily) shall be collected at a rate of one duplicate sample every two months or bimonthly for each parameter being analyzed, as per the monthly Environmental Sampling Schedule.

6.3.2 Duplicate samples for environmental sampling of surface water, recharge basins, and State Pollutant Discharge Elimination System (SPDES) outfall locations shall be collected at a rate of one duplicate sample per calendar quarter for each parameter being analyzed, as per the monthly Environmental Sampling Schedule.

6.3.3 Duplicate samples for environmental sampling of groundwater shall be collected at a rate of 5 percent (one out of every 20 samples collected) for each parameter being analyzed.

6.3.4 Duplicate samples for environmental sampling of process and potable wells shall be collected at the rate of one duplicate sample for each sampling event for each parameter being analyzed.

6.3.5 Duplicate samples for non-routine environmental sampling shall be collected at a rate determined by the project manager or sample requester.

6.3.6 Matrix spike and matrix spike duplicate samples are collected as a duplicate sample set and sent to the contract analytical laboratory that performs the addition of the target analyte(s). These samples are collected at the rate of one per 20 samples per matrix per sampling event. The project manager shall determine if these are necessary prior to commencement of sampling.

6.3.7 Split samples are collected, as required, by regulatory agencies as determined by the project manager when laboratory results are questioned (a second contract analytical laboratory is needed to confirm the results). The split sample is submitted to the regulatory agency or selected contract analytical laboratory for analysis. See Section 6.6 on split sample requirements.

6.3.8 All duplicate samples shall be collected following the sampling methods described in EM-SOP-100, Sample Collection Methods for Radiological and Non-Radiological Parameters in Environmental and Facility Effluent Water Samples.

6.3.9 Label all bottles using the appropriate sample identification number using EM-SOP-202, Sample Location Identification.

6.3.10 Place samples that require cooling on ice or refrigerate (e.g., VOC samples).

6.3.11 All field duplicate ID information must be sent to the Environmental Information Management System (EIMS) Data Entry Specialist.

6.3.12 Complete the COC and ship the samples for analysis.

6.3.13 Note the duplicate sample identification number and COC number when documenting the sampling event in the field logbook.

6.4 Equipment Blanks

6.4.1 Equipment rinsate blanks shall be collected during groundwater sampling using non-dedicated equipment at a rate of one per 20 samples, or one per sampling event (when fewer than 20 samples are collected) for each parameter being analyzed.

Note: When multiple sets of sampling equipment are washed together, this frequency may be changed to one per batch washed, with a batch not to exceed 20 sets of sampling equipment.

6.4.2 Equipment rinseate blanks for non-routine environmental sampling shall be collected at a per batch rate determined by the project manager or sample requestor.

6.4.3 Once the sampling equipment decontamination has been completed, collect the final rinse of the equipment with Type 1 regent grade water in the appropriate sampling containers following the sampling methods described in EM-SOP-100, Sample Collection Methods for Radiological and Non-Radiological Parameters in Environmental Water Samples.

6.4.4 Label all bottles using the appropriate sample identification number using EM-SOP-202, Sample Location Identification.

6.4.5 Place samples that require cooling on ice (e.g., VOC samples).

6.4.6 Complete the COC and ship the samples for analysis.

6.4.7 Note the equipment blank identification number and COC number when documenting the sampling event in the field logbook.

6.5 QC Checks on Sample Containers (Bottle Blank)

6.5.1 QC checks of new sampling containers purchased with a certificate of analysis and washed according to Environmental Protection Agency (EPA) cleaning protocols or supplied by the contract analytical laboratory shall be performed at a rate determined by the project manager.

6.5.2 Although BNL makes every effort to obtain pre-cleaned bottles (contract laboratory supplied or purchased), there may be instances where a sampling bottle needs to be reused. A QC check after decontamination of the sampling bottles shall be performed at a rate determined by the project manager.

6.5.3 Fill each container with Type 1 regent grade water using the appropriate sampling method described in EM-SOP-100, Sample Collection Methods for Radiological and Non-Radiological Parameters in Environmental Water Samples.

6.5.4 Label all bottles using the appropriate sample identification number using EM-SOP-202, Sample Location Identification.

6.5.5 Complete a COC and ship the samples for analysis.

6.5.6 Note the identification number of the quality control samples and the COC number in the Field logbook.

6.6 Split Samples

6.6.1 As required, collect a split sample using the same sampling equipment, method, and bottle type used for collection of the original sample, or as instructed by the regulatory agency or project manager.

6.6.2 Label all bottles using the appropriate sample identification number using EM-SOP-202, Sample Location Identification.

6.6.3 Place samples that require cooling on ice or refrigerate (e.g., VOCs).

6.6.4 Complete a separate COC for each split collected and ship the samples to a contract analytical laboratory for analysis or sign-over to the requesting regulatory.

6.6.5 Note the split sample identification number and COC number when documenting the sampling event in the field logbook.

6.7 Records Management

6.7.1 All records generated as the result of this SOP, as well as field logs and notes, are to be maintained in the appropriate file(s) in accordance with the “Records Management” Subject Area.

7.0 IMPLEMENTATION AND TRAINING

7.1 Staff (field teams, project managers) responsible for implementing this procedure shall receive training and be thoroughly familiar with its contents and requirements. Each staff member shall document that they have read and understand the procedure.

8.0 REFERENCES

8.1 EM-SOP-100, Sample Collection Methods for Radiological and Non-Radiological Parameters in Environmental Water Samples

8.2 EM-SOP-109, Chain-of-Custody, Storage, Packaging, and Shipment of Samples Procedure

8.3 EM-SOP-201, Documentation of Field Activities

8.4 EM-SOP-202, Sample Location Identification

8.5 EM-SOP-801, Decontamination of Environmental Sampling Equipment

9.0 ATTACHMENTS

None

10.0 APPLICABLE FRAs/JHAs

10.1 The applicable Facility Risk Assessments (FRAs) and Job Hazard Analysis (JHAs) for this procedure can be found using the EMS/OHSAS tab on the EPD website.

10.2 Facility Risk Assessments are performed in accordance with the Facility Hazard Analysis and Risk Assessment Subject Area and are completed using the Hazard Validation Tool.

11.0 EMS INFORMATION

11.1 Significant Environmental Aspects Associated with this Procedure - No Environmental Aspects have been directly associated with this procedure.

Please click here to acknowledge that you have read and understand this procedure.

Appendix D

Waste Management Technical Work Document

Removal and Packaging of Bldg. 197 Contaminated Soil

PREPARED BY:	REVIEWED BY:	APPROVED BY:
6/20/24 Jason Nalepa WM Operations Supervisor/Date	06/20/24 Ed Gavin WM Work Control Coordinator/Date	6/21/24 Ron Privivo WM Program Manager/Date
	6/20/24 Léo Palumbo WM Operations Manager /Date	**EFFECTIVE DATE** 6/21/24
File Code: **DM5020.24**	6/20/24 Glen Todzia WM Compliance Manager/NNSS WCO/Date	

TABLE OF CONTENTS

1.0 Purpose/Scope

The purpose of this plan is to describe the process for the removal of non-RCRA Hazardous mercury contaminated soil from the crawl space of Building 197 and its subsequent loading into 9 Cubic Yard Supersacks. The resulting supersacks of waste soil will be transported by rail to Veolia Environmental Services in Gum Springs, Arkansas for disposal.

2.0 Responsibilities

2.1 Waste Management Operations Manager

The Operations Manager shall be responsible for coordinating, review, and approval of the Work Documents and ensuring the start of work activities is properly authorized.

2.2 WM Operations Supervisor

The Operations Supervisor shall be responsible for oversight of work performed by Waste Management personnel. Ensure that the work is performed in accordance with established controls. Proper execution involves following all precautions and procedural steps as described in this Technical Work Document (TWD), Work Permit (WP) and the Job Hazard Analysis (JHA).

2.3 WM Technicians

The WM Technicians shall be responsible for the execution of work instructions as outlined in this TWD, WP and associated JHA.

3.0 Equipment

[1] PPE as prescribed in the Work Permit

[2] Jobsite postings (barricades, boundary tape, signage)

[3] Spray paint or markers suitable for marking supersacks.

[4] 9 CY supersacks

[5] Tarps for 9 CY supersacks

[6] Load frames for supersacks

[7] Dynamometer

[8] Geotech fabric

[9] Herculite and berm wood

[10] Two-way radios for communications
[11] Portable ladder

4.0 Prerequisites

[1] A Work Permit, prepared in accordance with SBMS Subject Area "Work Planning and Control", has been approved to authorize the performance of work prescribed in this TWD.

[2] All personnel involved in the execution of the work prescribed in this TWD shall attend a pre-job briefing on the TWD, WP and JHA.

[3] A WM Waste Verifier shall observe the packaging of all waste. The Waste Verifier shall also be a qualified/trained Hazardous Waste Generator.

5.0 Precautions

[1] Establish work boundaries by use of signage, barricades, construction tape, rope, or combination of all to prevent entry of non-authorized personnel.

6.0 Procedure

6.1 Mobilization and Site Preparation

[1] WM Technicians shall mobilize the equipment identified in Sec. 3.0 to Bldg. 197 and the rail yard as directed by the WM Operations Supervisor.

[2] WM Operations Supervisor will designate waste package staging areas at Bldg. 197 and the rail yard.

[3] At the designated staging areas at Bldg. 197 and the rail yard, WM Technicians shall place lengths of Geotech onto the ground in the waste staging area to protect the integrity of the staged waste packages and to prevent spread of contamination to clean soil. Ensure that Geotech is not placed in such a way that may result in the collection/pooling of liquids around waste packages.

6.2 Loading Contaminated Soil into 9 CY supersacks

Note: Both a WM Waste Verifier and F&O Heavy Equipment (HEMO) Operator will be provided with two-way radios and communications shall be established at the beginning of each shift.

[1] WM Operations Supervisor or designee will request the riggers to place a load frame within the designated loading area.

[2] WM Technicians shall place a supersack into the load frame in accordance with Attachment 1 in preparation for soil loading. Mark each supersack with a Package ID number beginning with #1

Note: The WM Waste Verifier shall observe all material being added to the package. The waste being added to the package shall be limited to soil, rocks, and small pieces of concrete rubble. Nothing shall be placed in the package that could damage the integrity of the package (e.g.: rebar, lumber, etc.)

[3] The WM Operations Supervisor shall request the HEMO Operator to begin loading contaminated soil into the supersack. Loading shall be performed as directed by the WM Operations Supervisor, and under the oversight of a WM Waste Verifier.

Note: If mercury is observed in the soil, the excavation and loading will be halted immediately, and the contracted spill response team will be notified to begin the appropriate remediation.

[4] The WM Operations Supervisor shall inform the HEMO Operator when they are loading the last bucket of soil to be placed in the supersack and request that the bucket be positioned to permit the taking of a sample.

WM Technicians shall:

[5] Retrieve a 16 oz. sample from the last backhoe bucket to be placed into the supersack using a plastic sample bottle and place the sample contents into a 5-gallon poly pail.

[6] Close the supersack in accordance with closure instructions (Attachment 1).

[7] Request the HEMO Operator to attach the Dynamometer to the crane hook then remove the supersack from the load frame by placing all lifting straps on the hook of the crane and move it to the staging area.

[8] While the 9 CY supersack is suspended record the weight of the package, the corresponding Supersack ID No., the waste volume, and the percentage by volume of the waste types in the supersack (soil and debris) on Attachment 2.

Note: Intervals of ten supersacks and their respective samples will be used until the remaining soil drops below ten supersacks in volume. Thereafter, 16 oz. samples will be taken from each of the remaining supersacks and be mixed as one composite sample.

[9] When ten (10) supersacks have been filled and closed, generate a NRWCF for each set of ten completed super sacks. Apply non-hazardous waste labels to each super sack and record the NRWCF# on the corresponding Att. 2.

[10] From the 5-gallon pail that the (10) 16 oz. samples were added, thoroughly mix the soil in the 5-gallon pail and collect 2 x 250 ml. glass bottle samples. The composite sample bottles shall be labeled with the corresponding C of C sample # and the corresponding NRWCF # so that samples can be traced to the sampled packages.

[11] Pour the remaining soil in the 5-gal bucket back into the last open supersack.

[12] Waste Management Operations Manager or designee will complete the required information on the Chain of Custody (CoC), requesting TCLP metals and deliver the samples to the sample group for off-site testing.

[13] Record the CoC number on the corresponding Att. 2

[14] When 10 supersacks are filled at the staging area at B197, arrange for the riggers to load, and transport the filled supersacks to the BNL railroad spur staging area.

[15] Waste Management technicians shall accompany / follow the transportation vehicle and ensure it passes through the vehicle radiation monitor in accordance with WM-SOP-425.

Note: Contact the WM Operations Manager for guidance if the transport vehicle alarms the vehicle radiation monitor.

[16] At the end of the shift ensure that all supersacks containing waste at the B197 and BNL rail spur staging area are tarped to provide protection from the elements.

6.3 Waste Staging Area Management

[1] The WM Operations Supervisor or designee will inspect the waste staging areas at the excavation site (Bldg. 197) and at the railroad spur weekly and complete the Waste Package Weekly Inspection Record (Attachment 3) ensuring that: all packages are intact, closed, labeled/marked, and protected from water intrusion from rainfall or puddling. If any unacceptable conditions are found, they shall be corrected immediately.

7.0 References

[1] SBMS Subject Area, "*Work Planning and Control*"

[2] SBMS Subject Area, "*Waste*"

[3] WM-SOP-425, "*Hazardous Waste Operations*"

8.0 Attachments

Attachment 1 – Installation and Closure Procedures Custom Soft Sided Packages

Attachment 2 – Waste Package Inventory Sheet

Attachment 3 - Waste Package Weekly Inspection Record

Attachment 1
Installation and Closure Procedures
Custom Soft Sided Package
Duffle closure with Safety Seal

Strategic Packaging Systems
An I.C.E. Packaging Company, LLC
276 Warren Street | Madisonville, TN | 37354
423-545-9505

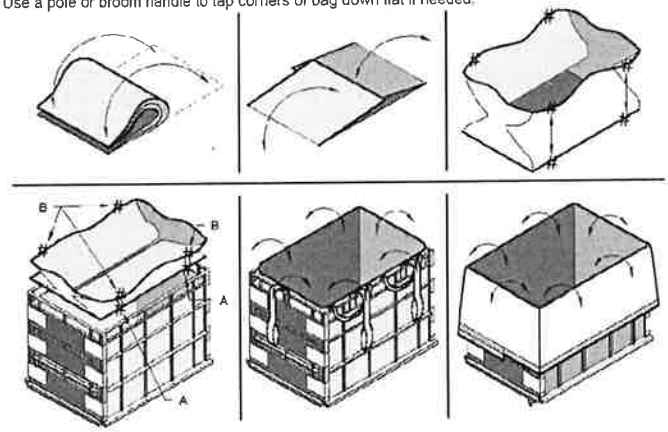
Installation and Closure Procedures
Custom Soft Sided Package
Duffle closure with Safety Seal

Scope:

The scope of this procedure is to ensure the correct installation and closure of Strategic Packaging System's custom soft sided bag with duffle closure and safely seal. A minimum of two personnel will be needed.

Installation:

1) Bag starts folded in half. Unfold bag on solid surface clear of any debris.
2) Walls are folded over the floor of the bag. Pull top of walls out towards outer edges.
3) Locate two points on the top of the long wall and two points on the bottom of the long wall on each side of the bag (#). Push in middle of long walls so you can align points on top of wall over points on edge of floor.
4) With one person per long wall, pick up bag by both sets up points (#). Keep bag level with floor and lift over top of frame.
5) Release the floor while holding onto the top of wall. (**Release A, Hold B**)
6) While holding the top of the wall (B#), pull all webbing, if any, attached to the exterior of the bag to the outside. Make sure the straps are not caught under package or twisted on walls.
7) Pull the duffle out from the inside of the bag and pull towards the outside of the bag. Duffle will keep bag open inside the frame.
8) Use a pole or broom handle to tap corners of bag down flat if needed.

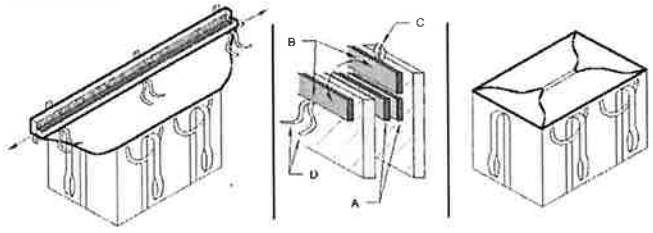


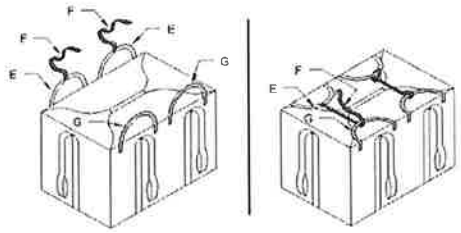
Attachment 1
Installation and Closure Procedures
Custom Soft Sided Package
Duffle closure with Safety Seal

Strategic Packaging Systems
An I.C.E. Packaging Company, LLC
276 Warren Street | Madisonville, TN | 37354
423-545-9505

Closure:

1) After loading the bag, pull the duffle top up over the load towards the center of the package.
2) If needed, remove the lower portion of 4" sacrificial geo to expose hook on duffle.
3) Locate the webbing loops at the center of the short walls along edge of the duffle. With one person on each end of the bag, pull the loops away from the bag to align the 4" hook and loop duffle closure. Press firmly together to securely close the bag. (Main Closure) (A)
4) Remove the upper portion of the 4" sacrificial geo to expose the hook on the safety seal. Fold the top 4" on half of duffle over main closure and press firmly to the loop on the exterior of the bag to securely close the safety seal. (Second Closure) (B)
5) If 1" webbing tie-off loops (C) and straps (D) are located on the safety seal, tie each loop with the corresponding straps as a final security measure on closure.
6) Fold the duffle material over the top of the bag.
7) If 2" or 4" webbing Cross-tie system is present on the upper walls, pull the cross-tie loops over the top of package toward one another. Locate the cross-tie strap (F) attached to cross-tie loops (E) on one long wall of package. Lace them through the opposing cross-ties loops (G) on the opposite long wall. If hook and loop is present then press firmly together and tie the remaining ends. If no hook and loop is present then tie to original loop.





Attachment 2
Waste Package Inventory Sheet
(Reproduce this sheet as needed)

Non-Radioactive Waste Control Form (NRWCF) # _____

Chain of Custody (CoC) # _____

Supersack ID No.	Weight (lb)	Volume (yd^3)	Waste Type (%volume)			WM Waste Verifier
			Soil %	Debris %		

Attachment #3
Waste Package Weekly Inspection Record

1. All waste package markings used for individual identification and association with sample results are legible
2. Waste packages are staged out of standing water and are protected from the weather.
3. Waste packages are closed and secured so as to prevent water intrusion or prohibited items from being introduced.
4. Waste Packages are intact and free from damage

_____ _____

WM Operations Supervisor or Designee, Sign / date Indicate Waste Staging Area (197 or Rail)

2150 Smithtown Avenue
Ronkonkoma, New York 11779

37 Moore Avenue
Mt. Kisco, New York 10549

(631) 580-3191

www.EnviroHealth.org

Comment Number	Section	Comment	Response	Follow-up Responses and Changes to the Remedial Report (as necessary)
Email from Alexander Klein, NYSDEC, to Robert Gordon, DOE, on August 23, 2024.				
The New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) have reviewed the *Brookhaven National Laboratory- Building 197 High Bay Section Demolition and Mercury Removal Plan*, dated May 2024. The Department has the following comments below.				
1	1.2	Third paragraph should state Appendix D, not Appendix B.	Correction has been made.	Correction made in revised plan.
2	4.1.2	2nd paragraph: The wood floor of the high bay building is proposed as a temporary "cap" for mercury vapors while the building is being demolished. Please indicate whether BNL will cover the floor and crawlspace should the floor be damaged during demolition activities to prevent the open-air spreading of mercury vapors, or whether the floor is meant to help segregate construction debris from contaminated soils as indicated during the last IAG monthly call.	The intention is to keep the first floor intact as much as possible to help keep excessive amounts of debris from mingling with the soil below. By reducing debris mingling we hope to reduce the amount of time spent removing debris during the loading of the super sacks. The wood floor and crawlspace will not be covered during demolition as this process is not practical due to sharp objects and wood pieces grabbing onto tarps or plastic during deployment. The wood floor will also not be safe to walk on following demolition and BNL safety personnel have already indicated that no one will be allowed on the structure once demolition starts.	
3	4.1.2	4th Paragraph: Utilizing water for dust suppression is acceptable. Please indicate that the use of water will not result in runoff leaving the exclusion zone.	This wording will be added to section 4.1.2; however, it is also mentioned at the end of section 7.3.	Section 4.1.2 amended to address this comment.
4	5.2.1	Should elemental mercury be encountered in soils under the crawlspace, in addition to creating a new plan to address the removal of elemental mercury, the contractor will cover areas where elemental mercury is encountered with plastic to prevent stormwater from moving through contaminated soils and	Following demolition of the structure and removal of the first floor the unexcavated crawlspace will be inspected for any visible mercury. If elemental mercury is encountered plastic will be installed over the contaminated area. BNL currently has an option in its disposal contract for this work to supply a vac truck with operator should elemental mercury be	Section 5.2.1 was amended to detail the contingency measures.

Comment Number	Section	Comment	Response	Follow-up Responses and Changes to the Remedial Report (as necessary)
		stabilize the excavation/work area until a plan to manage elemental mercury is provided. Alternatively, NYSDEC suggests this contingency plan be drafted prior to the start of work to account for the possibility of an elemental mercury encounter.	found. In this instance any beads would be collected via the vac truck and all waste drummed for future sampling and disposal. Following the removal of the visible beads excavation of the remaining soil would continue along with applicable post excavation samples.	
5	5.2.2	The foundation walls exposed to the mercury-contaminated crawlspace should be sampled for mercury contamination before foundation materials are disposed as typical construction and debris materials.	Foundation walls will be sampled for mercury prior to disposal. Samples would be taken for any materials removed or left in place.	
6	5.4	In addition to the bucket being decontaminated, the knuckle and lower boom arm of the excavator will also be decontaminated. If gross contamination is visible on any other portion of the excavator exposed to contaminated soils, those areas of the excavator will be decontaminated as well.	This clarification will be made in the report.	Section 5.4 was amended to address this comment.
7	7.2	Please indicate how areas will be protected prior to and during precipitation events, including types of cover, and how cover will be weighed down.	The area is enclosed by the continuous concrete foundation to prevent runoff from the excavation area. Soil will be scrapped and excavated each day to a depth depending on the area being worked on. Only the amount of soil that can be packaged each day will be piled up adjacent to the foundation. The intent will be to scrape the soil to the sides of the foundation wall and directly load the soil into the super sacks. All super sacks will then be closed, relocated to the staging area, covered with a tarp , and routinely inspected until loading for final disposal. We are not intending to cover the soil within the excavation each day.	

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8	Figure 5-2	Clarify the number of the figure which is labeled 1-1 in the Work Plan and 5-2 in the Table of Contents.	The figure number has been corrected to show the correct label.	Figure number is updated in revised plan.
9	Figure 7-1	Include the figure number on the figure.	Correction has been made.	Figure number added in revised plan.
10	Appendix B, 3.1	In the first paragraph include immediately reporting any exceedances, corrective measures taken and if effective, to New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH) along with BNL Representative or Project Lead. Additionally, add text to state CAMP reports will be provided to the NYSDEC and NYSDOH daily.	These changes have been made. BNL will request contact information for who the daily reports should be sent to along with DEC personnel to notify in the event of an exceedance.	This information was added to the CAMP.

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Email from Adriana Morocho Torres, EPA, to Robert Gordon, DOE, on August 23, 2024.				
The U.S. Environmental Protection Agency reviewed the Building 197 High Bay Section Demolition and Mercury Removal Plan dated May 2024. Please see EPA's comments and suggestions below.				
1		It's not clear how much mercury was handled at the site. There are no suggestions if the cinder block walls were sampled. Mercury vapor tends to penetrate the porous cinder block. If it's enough vapor it may actually condense in the void space, and you could have high concentrations of mercury in that waste stream. EPA suggests requesting the demo debris be sampled before disposal (we should really be sampling anything before it goes off site so not sure why/how they already determined where the waste is going). Anything going off site should meet the LDR requirements specifically section V that spells out the retorting requirement for concentrations over 260 mg/kg. The good news is Vieola is equipped with retrotort incinerators so that shouldn't be an issue.	BNL will collect representative samples from the building structure (upper walls), first floor wood subfloor above the original mercury spill area, and basement cinder block walls and support columns prior to disposal to assure they meet the disposal facility requirements.	Representative samples were collected of various C&D materials in Building 197 on November 25th and sent out for both total and TCLP mercury analyses. None of the sample results indicated that the C&D materials would be considered hazardous waste, and all mercury total results were less than 260 mg/kg except for the sub-flooring composite sample. Based on these results, alternative plans are being made for transportation and disposal of the sub-flooring material, which will most likely be managed through Veolia similar to the contaminated soil and concrete impacted by mercury in the crawl space. Additional samples are going to be collected of the C&D materials during demolition to confirm results and ensure appropriate disposal method. Wording was added to section 4.1.2 to recognize collection of these additional waste characterization samples and when/how they will be collected.
2		Mercury may penetrate the metal. There are promulgated standards for recycling steel with mercury	Metal debris will be segregated during demolition in dumpsters and scanned by	Additional information was added to section 4.1.2 to capture the use of an

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		in it. At a minimum EPA requests the metal be scanned with an XRF and make sure it meets those requirements before sending it off site. For LCP we used the criteria set forth in Title 40 chapter 1 Subchapter C Part 63 (FFFFF) of the CFR to determine the appropriateness of recycling steel. Based on that criteria steel that is less than 0.13 mg/kg total mercury may be recycled. The XRF should be able to scan below that concentration.	appropriate field instrument to confirm that scrap metal can be recycled.	XRF to confirm proper disposal of any metals.
3		Suggest sampling the wood as a separate item before it goes off site for disposal.	Refer to comment 1 response.	
4		EPA suggests considering conducting this work in the winter to take advantage of the colder temperatures and reduce mercury vaporization.	This has been considered and is currently the plan.	
5		Elementary mercury can be found by visually inspecting the area or the MVA. splatter, pin pricks, puddles, rivulets or worse. If elevated vapor readings are seen on the Jerome or Lumex and cannot be seen, then there's micro beads but likely a source of elemental. Screening can be done in open air, but EPA recommend enclosing the samples or sample areas in plastic to capture any vapors.	The locations of post excavation end point samples for Areas A1, B1, and C1 for laboratory analysis are identified in Figure 5-3 of the report. Prior to being placed in appropriate container for laboratory analysis, the samples will be placed in sealed plastic bags and allowed to sit for 24 hours. After this period the air within the bags will be measured with a Jerome, value documented, and the post excavation samples will be collected in accordance with analytical laboratory requirements. Additional field vapor measurements will be conducted in Areas A1, B1, and C1 shown on	After a follow-up meeting with EPA on December 5, 2024 a decision was made by BNL to adopt the method of enclosing remediation/sampling areas in plastic to capture vapors and aid in the remediation process. Section 5.2 was updated to show that the "plastic method" will be used along with a Lumex® MVA.

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			Figure 5-3 by placing samples in plastic bags. After 24 hours these samples would be screened using the Jerome but not analyzed by the contract laboratory if the screening results are equal or lower than the samples being collected for laboratory analysis. Figure 5-3 will be updated to show these additional vapor sample locations. It should be noted that the exact locations may be change based on field conditions/observations.	
6	4.2.3	How was mercury previously removed/recovered from inside the building/between flooring layers? What type of assessment was done to ensure all mercury was recovered from flooring materials? I would expect Hg in cracks and under wood flooring. a comprehensive MVA assessment should have been done with a Lumex or equally sensitive (nanogram/m3) MVA.	Limited historical information is available on the process that created the spill however a report from BNL to DOE in 1998 references interviews with past employees of the building. The area of the spill site contained an experiment looking at the heat transfer characteristics of mercury from the 1950's to 1960's. Part of this experiment contained a glass pipe system under the floor leading to a stainless vessel in the crawlspace. The interviewer recalled a glass pipe breaking and spilling about 1 gallon of mercury on the soil. The glass piping and tank were removed at some point in the 1970's. Previous removals in 1998 involved the use of a vac truck to remove fifteen (15) drums of soil where the leak occurred. Recovery operations halted when footings to the first floor were in danger of being undermined. A decision was made to address any remaining contamination during the demolition of the facility.	

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			There are no reports of mercury being spilled on the floor that would have made its way to the soil in the crawl space. During initial investigations to prepare for the demolition of the high bay a Jerome meter was used to take measurements of the area from 2 ft. to 4 ft. off the floor in various rooms. No readings above 18 ug/m^3 were recorded in any of the areas and the average for all readings was around 12 ug/m^3. Wall and floor materials will be sampled in accordance with comment 1 above.	
7	4.2.4	Depending on site history, I would expect free elemental mercury to be trapped in waste lines under the facility. It usually gets trapped in P-traps, but can make its way past that. I would suggest careful, systematic dismantling of sewer piping and scanning with a nanogram/m3-sensitive MVA to determine presence/absence of mercury. I would expect impact to piping is mercury was used in any extensive way in the lab.	The historical spill was due to the failure of a glass pipe carrying mercury within the crawlspace. It is BNL's policy during demolition that all sanitary fixtures and traps be sampled for mercury prior to demolition. This portion of the building (high bay) contains two bathrooms (men's/ women's) which were disconnected during demo prep activities from the sanitary system and scanned with a Jerome with no findings of mercury in the trap or piping.	
8	5.1	Metallic mercury is very easy to miss if the only delineation method is collection of soil samples for lab analysis. EPA typically use multiple lines of evidence to delineate free mercury in soil. First, we lay sections of poly sheeting down, allow time for vapors to equilibrate and take readings with a Lumex in transects under the poly sheeting (poke a small hole in the poly and take a reading through the hole. This is a qualitative way to collect data and make judgments on how much	Post excavation samples will be collected in accordance with the response to comment 5. BNL will place the soil into Ziplock bags initially to allow the soil to off-gas and will then take readings with the Jerome meter. It should be noted that this method was used during the initial characterization sampling of the soil and no correlation could be made when	As stated above, Section 5.2 was updated to recognize the "plastic method" and Lumex® MVA will be used as part of the remediation process.

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		mercury is present. The idea is to identify vapor sources by finding the hot spots and remediate it through excavation/visible observation. This is a difficult, iterative process (you tend to need to repeat the assessment/remediation process several times), that necessitates use of personnel well experienced in this type of assessment. Relying solely on the standard soil sampling/analytical procedures we typically use for other contaminants will very likely result in an incomplete remediation/leaving elemental Hg in the soil. Analytical sampling should only be done after soil is remediated and no significant vapors are detected in soil (under poly sheeting).	comparing the Jerome MVA results in units of ug/cubic meter with mercury totals analyses (ug/kg) by the contracted analytical laboratory.	
9	5.1	Please clarify is this was one spill event, or multiple spills over time? Any idea how much was spilled and if the spill(s) were immediately remediated or left for a while?	The spill occurred at some time in the 1950/1960's. The exact time is not known. A report from 1998 references a one-time spill of approximately 1 gallon that was recalled be a former employee during an interview at the time. Removal activities of mercury contaminated soil occurred in 1998. Refer to comment 6 for more information.	
10	5.1	If mercury vapors indicate the presence of elemental mercury, excavation needs to be done carefully so that liquid mercury does not spill out of the bucket to the soil below. This is a critical mistake that is made by operators unaware of the risk, and it can lead to unwittingly extending the depth of excavation. Mercury easily falls out of the bucket as you dig and recontaminates the soil below. Don't try to take too	Comment noted.	

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		much at once; keep the bucket flat as it's moved/transferred to the supersack.		
11	5.2	There is no regulatory standard for Hg vapor in soil. But the soil should be scanned for Hg using the poly sheeting/Lumex technique. And outdoor temperature needs to be taken into account when doing the vapor survey. In winter, vapor levels can be deceiving low.	Refer to comment 5 and 8.	Please see follow-up response to comment #5 above.
12	5.2	Delays can be avoided by using the vapor survey method. It gives real-time results and you can clear an area before moving forward.	Refer to comments 5 and 8.	Please see follow-up response to comment #5 above.
13	5.2	Extra care should be taken around footers and foundation walls. Mercury tends to follow the path of least resistance and can migrate down at the soil/concrete footer interface.	Commented noted.	Section 5.1 was updated to say that the footings will be separated out for further waste characterization sampling to ensure proper disposal.
14	5.2	Mercury tracks really easily and can be spread by personnel walking between clean/dirty areas. This type of cross contamination has surprised the best of us - it is not your typical contaminant. Use booties in the dirty zone and remove them at the boundary of the hot zone/clean zone. Screen these areas frequently with the Lumex to make sure mercury is not being tracked.	Comment noted. The Waste Management technicians loading the super sacks and Field Sampling personnel who enter the excavation area will be required to wear proper PPE as documented in final safety work plans.	
15	5.3	Please confirm that the soils will be screened prior to sampling.	Refer to comment 5 and 8 for a response. Please note that following screening the samples will be collected and sent out for	Please see follow-up response to comment #5 above.

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			analysis to generate data to be used to corelate the screened values to the analytical results.	
16	5.4	Please include what cleaning tools and cleaning agent will be used for cleaning the bucket.	The excavator bucket will be cleaned with a firm brush over plastic sheeting. Lose debris will be removed first and placed into the supersacks from the excavation work. A Jerome meter will be used to screen the area around the bucket and, if necessary, Alconox in water will then be used to further wash down the bucket. All water will be collected and drummed for sampling and disposal.	Section 5.4 modified accordingly.
17	7.2	Please be diligent about use of booties in exclusion zone and removal at designated egress points prior to entering the clean zone. Monitoring these areas with an MVA is suggested to confirm tracking is not occurring.	Comment noted. Proper decontamination zones will be established and documented in final work planning documents to prevent contamination migration.	
18	8.1	Table footnote: Based on EPA's experience, this can be deceiving. There can still have pockets of elemental that were missed during sampling. I continue to suggest to use MVAs to find hot spots where elemental may be found. Hot spots should be excavated carefully with spotters looking for elemental beads that can be recovered by other means if found.	The footnote on the table is the assumption at this time. There will be a fulltime Waste Verifier that will be observing all material being added to the waste package (i.e., supersack) and will be looking for elemental mercury. Additional waste characterization samples will also be collected from select supersacks in accordance with the TSDF's and Waste Management's requirements.	
19		Graph: What were the vapor levels that caused a safety concern and what instrument was used? If they were using standard OSHA PEL as their guide, 100 ug/m3 is very high and indicates there will be elemental mercury in that soil. Again, samples analyzed in the lab can be	Figure 2-1 indicates that Hole #11 was not able to be sampled due to high mercury vapor levels. During sampling activities, the floorboards in this area were removed to perform the soil sampling. A Jerome meter was	

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		very deceivingly low. mercury beads/pools are easily missed by standard sampling techniques.	used to screen the breathing area for excessive mercury vapor. Once the meter indicated that levels were approaching 25 ug/m^3 the sample in this area was not collected since an assumption was that the area had mercury contamination. This area will be closely evaluated once floor is removed and prior to excavation.	
20	4.2.1	Please briefly expand on what will be the procedure to follow should bats be found in the building.	BNL's Natural Resource staff would remove the bat as they have the correct training and vaccinations to do so. The bat would then be released into the wild. Any injured bat would be taken to a wildlife rehabilitator who is qualified to work with bats and would also be required to report to the United States Fish and Wildlife Services (USFWS) regarding the injuries. If a dead bat was found it would be collected by BNL and sent to the USFWS.	
21	5.2.2	Please confirm that assessment equipment such as the Lumex or Jerome will be used to screen the soil.	A Jerome will be used in accordance with comment 5 and 8. An XRF will also be used for surfaces possibly containing mercury contamination.	A Jerome®, XRF, and Lumex® will all be used on this project.
22	6.2	What equipment will be used to sample the air? At least refer to the attachments where this information is written.	In addition to personal air monitoring equipment placed on BNL personnel during demo and waste handling tasks, area monitoring will be performed through the use of the Jerome J405 Mercury Analyzer and the TSI Dust Trak Equipment. [Note that the remediation site is greater than 1 mile from any residential sites]. More detail is provided in the Community Air Monitoring Plan (CAMP).	

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23	8.1	What is the plan if elemental mercury is found?	Should elemental mercury be found our disposal contract with Vieola contains a provision for a vac truck with operator to be provided for the removal and containerization effort. Resulting RCRA Hazardous Waste will be managed by BNL's Waste Management Division and then sent off-site for disposal to a TSDF with the proper permits for the treatment of this waste.	Section 5.2.1 was modified to include plan if elemental mercury is found.
24	8.1	Is this the very first time BNL is sending waste to Brookhaven Landfill? Is there a tracking system where waste is sent? We have previously received a FOIA request about waste sent by BNL to the local landfill.	BNL sends most of the site-generated construction & demolition (C&D) debris to the Brookhaven Landfill each year. This practice has been in-place for many years. BNL practices Pollution Prevention by diverting (e.g., recycling/reusing) as much C&D debris from the landfill as possible (e.g., concrete, metal). All of BNL's C&D debris from building demolitions like this project go to the Town of Brookhaven Landfill. Volumes and weights of C&D waste are tracked and are recorded in the BNL Site Environmental Report.	