DOE/PPPO/03-0049&D4

Work Plan for the Investigation of Potential Contaminated Soils at the Former X-770 Building Site Portsmouth Gaseous Diffusion Plant, Piketon, Ohio

This document is approved for public release per review by:

Henry H. Thomas *08/02/07*

PORTS Classification/Information Office Date

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Work Plan
for the
Investigation of Potential Contaminated Soils
at the Former X-770 Building Site
Portsmouth Gaseous Diffusion Plant,
Piketon, Ohio

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LATA/PARALLAX PORTSMOUTH, LLC
managing the
Environmental Remediation Activities at the
Portsmouth Gaseous Diffusion Plant
under contract DE-AC24-05OH20192
for the
U.S. DEPARTMENT OF ENERGY

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ACRONYMS

bgs	below ground surface
CAS/CMS	Cleanup Alternatives Study/Corrective Measures Study
COCs	contaminants of concern
DCA	dichloroethane
DCE	dichloroethene
DOE	U.S. Department of Energy
DQO	data quality objective
ECD	electron capture detector
GC	gas chromatography
ICP	inductively coupled plasma
LLW	low level waste
LPP	LATA/Parallax Portsmouth, LLC
mg/kg	milligrams per kilogram
MS	mass spectrometry
n/a	not analyzed
Ohio EPA	Ohio Environmental Protection Agency
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pCi/g	picocuries per gram
pCi/kg	picocuries per kilogram
PEMS	Project Environmental Measurements System
PORTS	Portsmouth Gaseous Diffusion Plant
PPE	personal protective equipment
PRG	preliminary remediation goal
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RL	Reporting limit
SWMU	Solid Waste Management Unit
TCE	trichloroethene
UF_6	uranium hexafluoride
U.S. EPA	United States Environmental Protection Agency
VOC	volatile organic compound
XRF	X-ray fluorescence

1. INTRODUCTION

This Work Plan defines the approach that will be implemented to sample soils below the concrete pad at the former X-770 Mechanical Testing Facility (X-770 Building) site at the Portsmouth Gaseous Diffusion Plant (PORTS). The building was demolished and removed in early 2007 and the concrete pad was left in place. The X-770 Solid Waste Management Unit (SWMU) is defined as the vadose zone soils beneath the concrete pad at the former X-770 Building. The investigation area also includes the former roof storm-water drain lines and the surface water collection trench constructed to contain runoff generated during the X-770 Building demolition, to a distance of 10 ft beyond the pad. Soil sampling will be conducted to determine the levels of constituents in Table 1 in the soils below the pad and collection trench. This Work Plan provides the technical approach, approximate locations of the samples to be collected, types of samples to be collected, sampling regimen, and laboratory methods to be used.

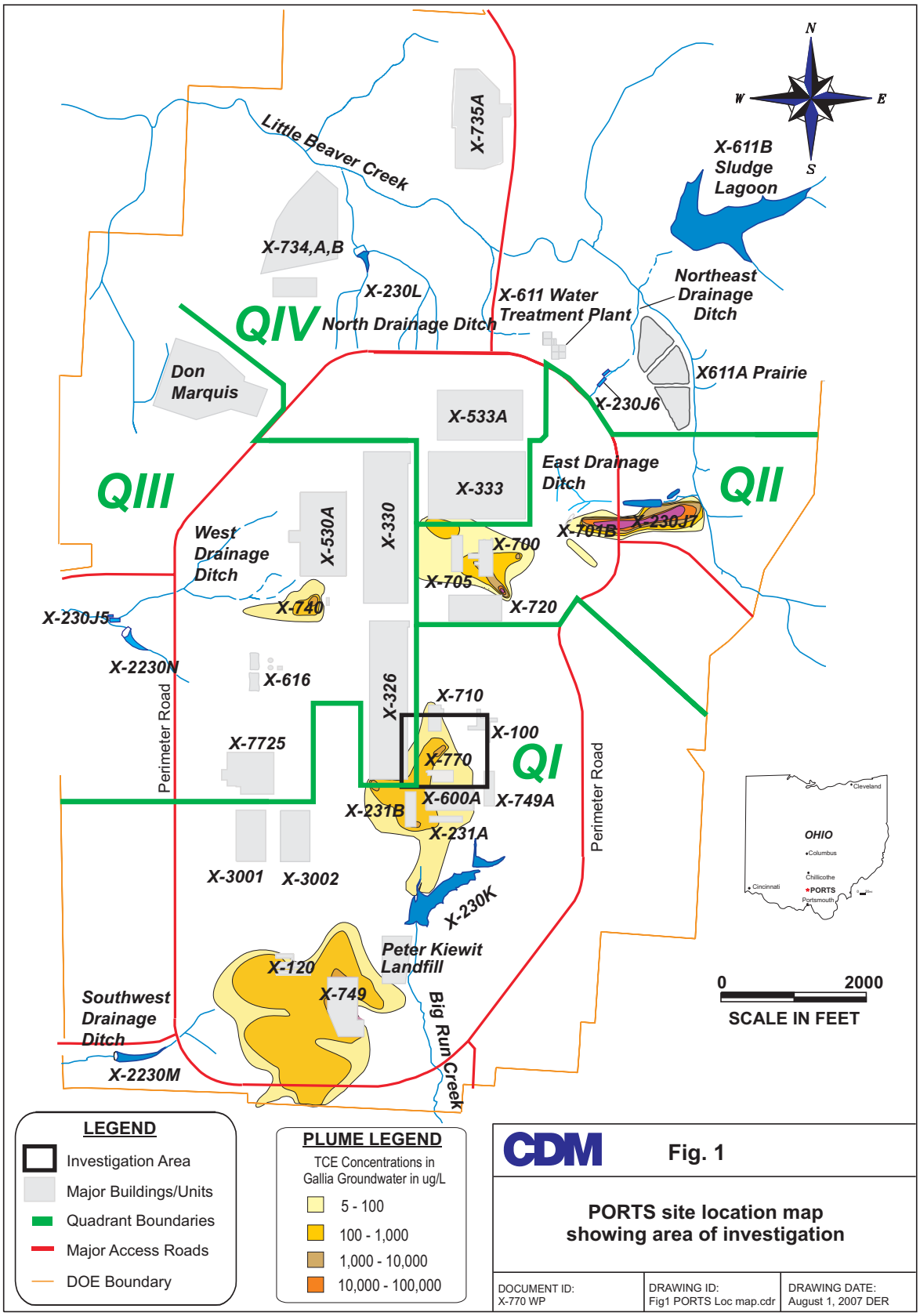
The former X-770 Building site is located in the east central section (Quadrant I) of PORTS (see Figure 1). A description of the general plant-site, the former X-770 Building Unit, and site geology and hydrogeology can be found in the *Quadrant I RCRA Facility Investigation Report* (DOE 1996), and the *Quadrant I Cleanup Alternatives Study/Corrective Measures Study* (DOE 2000). The U.S Department of Energy (DOE) is responsible for certain environmental restoration and waste management activities, uranium programs, and long-term stewardship of non-leased facilities at PORTS. LATA Parallax Portsmouth, LLC (LPP) is the Environmental Remediation Prime Contractor at PORTS and is responsible for investigation and cleanup actions under the direction of DOE. LPP is also responsible for providing remediation design requirements, oversight of subcontractor activities, and maintenance, monitoring, and evaluation of remediation systems.

1.1 PURPOSE AND SCOPE

The purpose of this investigation is to characterize the X-770 SWMU soils to determine nature and extent of contamination below the existing concrete pad and within the temporary surface water collection trench used during demolition activities. The constituents to be investigated are trichloroethene (TCE) and TCE degradation products, polychlorinated biphenyls (PCBs), Resource Conservation and Recovery Act (RCRA) metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver), uranium, uranium isotopes, and technetium-99. The remedy for the Quadrant I Groundwater Investigative Area plume is in place and the performance of the remedy is being reviewed on a five-year frequency. Sampling locations presented in this Work Plan are preliminary; this plan allows for the flexibility to make adjustments to the sampling locations based on field conditions at the time of sampling.

1.2 AREA DESCRIPTION

Groundwater monitoring and remediation activities at PORTS have been conducted in four areas (or quadrants) defined by the direction of groundwater and surface water flow. The former X-770 Building site is located in the northeast portion of Quadrant I, where the surface water generally drains to the south to the X-230K South Holding Pond and Big Run Creek (see Figure 1). Groundwater under the X-770 Building site is contaminated with TCE and other VOCs from upgradient sources and is being addressed as part of the Quadrant I Groundwater Investigative Area plume.


N
W
E
S
Little Beaver Creek
X-735A
X-611B
Sludge
Lagoon
X-734,A,B
X-230L
X-611 Water
Treatment Plant
Northeast
Drainage
Ditch
QIV
North Drainage Ditch
Don
Marquis
X611A Prairie
X-230J6
X-533A
East Drainage
Ditch
QIII
QII
X-333
X-330
X-530A
West
Drainage
Ditch
X-701B
X-230J1
X-700
X-705
X-720
X-740
X-230J5
X-2230N
X-616
X-326
X-710
X-100
Perimeter Road
X-7725
X-770
QI
X-600A
X-749A
X-231B
X-231A
Perimeter Road
X-3001
X-3002
X-230K
Peter Kiewit
Landfill
X-120
X-749
Southwest
Drainage
Ditch
Big Run Creek
X-2230M
Cleveland
OHIO
Columbus
Chillicothe
Cincinnati
PORTS
Portsmouth
0
2000
SCALE IN FEET
LEGEND
Investigation Area
Major Buildings/Units
Quadrant Boundaries
Major Access Roads
DOE Boundary
PLUME LEGEND
TCE Concentrations in
Gallia Groundwater in ug/L
5 - 100
100 - 1,000
1,000 - 10,000
10,000 - 100,000
CDM
Fig. 1
PORTS site location map
showing area of investigation
DOCUMENT ID:
X-770 WP
DRAWING ID:
Fig1 PORTS Loc map.cdr
DRAWING DATE:
August 1, 2007 DER

All surface water at PORTS eventually drains into the Scioto River, which flows south to the Ohio River. The primary surface drainage in the central and eastern portion of Quadrant I is Big Run Creek, which discharges into the Scioto River.

1.3 X-770 BUILDING HISTORY

The former X-770 Building housed test facilities that evaluated the performance and reliability of equipment and components used in the gaseous diffusion process. The facility built in 1955, was a steel frame building with a gravel roof and corrugated asbestos siding. It was 100 ft wide, 220 ft long, 30 ft high and was located between the X-760 Pilot Investigation Building and the X-600 Steam Plant. The structure covered a control room and several enclosed test areas that were designed for evaluating equipment of various sizes by using uranium hexafluoride (UF_6) as the test gas. The actual components and arrangements used varied with each test. This facility contained many of the operations that would be found in a gaseous diffusion process building. These operations, as well as the frequent change-out of equipment at the facility, necessitated the use of industrial solvents in cold baths for UF_6 sampling purposes and as cleaning agents. Operations at the facility ceased in the mid-1980s.

The building was demolished and removed (down to the concrete pad) in early 2007 with the concrete pad sealed and left in place. Potential contaminants associated with the former X-770 Building include TCE (and degradation products), PCBs, RCRA metals, uranium, uranium isotopes, and technetium-99. The primary potential release pathways for the facility are considered to be spills to adjacent soils during handling operations in and around the building and discharges to the building's pits and drain systems. No releases have been documented, but because waste management practices were not as rigorous during the years the X-770 Building operated, minor releases may have occurred.

1.4 DEVELOPMENT OF CONCEPTUAL SITE MODEL

1.4.1 Facility Description

The former X-770 Building was located near the center of the Quadrant I Groundwater Investigative Area plume, south of both the X-710 Technical Services Building and the X-760 Pilot Investigation Building. It was immediately downwind of the main process vents from the Portsmouth cascade. A description and history of the building is presented in Section 1.3 "X-770 Building History."

1.4.2 Potential Contaminants

Potential contaminants associated with the former X-770 Building (as documented in the Quadrant I Decision Document) include TCE and degradation products (1,1-dichloroethane [DCA]; 1,1-dichloroethene [DCE]; cis-1,2-DCE; trans-1,2-DCE; 1,2-DCA; and vinyl chloride), PCBs, mercury, uranium, uranium isotopes, and technetium-99.

1.4.3 Fate and Transport

No releases have been documented, however, because waste management practices were not as rigorous during the years the X-770 Building operated, various spills and/or improper disposal practices may have occurred. During operations the primary pathways for released contaminants are assumed to be spills on the concrete pad and disposal of waste products to adjacent soils in and around the building. Depending on the location and size of the release, the contaminants may have migrated to the building's pits and drain systems. Joints and cracks in the concrete pad and piping may have provided a pathway for

contaminants to migrate into the gravel sub-grade where lateral movement of the contaminants may have occurred. Contaminants may have migrated vertically through the soil possibly reaching the water table. The soil in the former X-770 Building area is composed of clayey silts and very fine sand. Groundwater is usually encountered approximately 12 ft below the surface in this area.

The 6- to 10-inch thick concrete pad was constructed with 1-inch expansion joints. The expansion joints are filled with two strips of ½-inch pre-molded bituminous filler. Floor drains were also present throughout the building. There are five facility pits with associated floor drains as well as one lube-oil pit without a drain (Figure 2). Beneath the concrete pad, a gravel sub-grade of varying thickness is likely present. This gravel sub-grade could allow contamination to disperse laterally to lower areas. Concrete foundation footers are also present beneath the pad at each support column, and backfill surrounding the footers is also a potential pathway for contaminant migration. Additionally, roof drain pipes that run underground east to west on the north and south side of the building concrete pad are potential pathways.

TCE and degradation products have been detected in monitoring wells in the vicinity of the building. The highest groundwater concentration of TCE is found in monitoring well X770-MW17G, located adjacent to the eastern side of the building. TCE was likely used throughout the building as a degreasing solvent, and may also have been used in cold baths to solidify the UF_6 process gas in the cold trap room located on the eastern end of the building.

Spills of TCE within the X-770 building may have preferentially traveled through cracks and joints in the concrete as well as into floor drains. If cracks or joints in the concrete extend through the thickness of the pad or if cracks exist in the drain pipes beneath the pad, TCE would have entered the gravel sub-grade through these openings. Lateral movement of fluids in the gravel sub-grade could allow pooling in low areas around pipes and footers. As the TCE contacts the soil, predominantly vertical movement is expected through the soils, eventually reaching the groundwater.

PCB wipe samples were collected during the preparation for the X-770 building demolition with results indicating PCB contamination was present throughout most of the building. The exact source of the PCBs is uncertain, however lube oil and transformer oil are suspected. Similar to spills of TCE, oils containing PCBs would preferentially travel through cracks and joints in the concrete as well as into floor drains. If cracks or joints in the concrete pad or sumps extend through the thickness of the concrete or if cracks exist in the drain pipes beneath the pad, PCBs would have entered the gravel sub-grade and underlying soils. The migration of PCBs within the soils is expected to be limited due to the tendency for PCBs to adhere to the soil particles, which reduces vertical migration. However, transport of oils containing PCBs through soils may be facilitated by solvents such as TCE (EPA 1989).

As part of the equipment testing, UF_6 process gas was piped from the X-330 Process Building to the X-770 Building. Residues from process gas releases within the building may have collected on the floor. Also, releases from plant site operations could have collected on the X-770 Building roof, resulting in possible uranium runoff into the building roof drainage system. This includes piping located outside of the concrete pad and approximately 4 ft below the ground surface. If the drainage system piping contained cracks or leaks, the relatively insoluble and dense uranium oxides could have entered the surrounding soils.

Manometers containing mercury were used in the building. Processes where other RCRA metals were potentially used within the X-770 Building have not been documented, however, at the request of Ohio EPA, this investigation will analyze soil samples for the full RCRA metals list which includes mercury. The Quad I Decision Document stated that mercury is the only potential RCRA metal associated with the former X-770 building.

Figure 2

X-770 FLOOR PLAN

0' 10' 20'
SCALE IN FEET

LEGEND

- Sump Outlines
- Floor Drains & Piping
- Storm Drains & Piping

AUTOCAD

U.S. DEPARTMENT OF ENERGY
PORTSMOUTH PADUCAH PROJECT OFFICE

LATA Parallax Portsmouth, LLC Portsmouth, Ohio	DESIGN SUBCONTRACTOR CDM Camp Dresser & McKee PIKETON, OHIO

TITLE
Proposed Soil Sampling Locations At X-770

JOB NO.	DOE CONTRACT NO.	CAD FILENAME
	DE-AC24-050H20192	

CLASS NO.	BLDG. NO.	PLANT NO.
	X-770	PORTS

SCALE: As Noted

LATA Parallax Portsmouth, LLC	DWG NO	REV
	Figure 2	0

1.4.4 Uncertainties in the Conceptual Site Model

Uncertainties in the conceptual site model include the locations and volumes of potential contaminant releases within and surrounding the former X-770 Building. The areas where potential contaminants were used and stored were not documented. The location of expansion joints, pits, and pipelines may vary from what is shown in Figure 2. The use and potential release of RCRA metals (other than mercury) in the X-770 Building was not documented.

2. SCOPE OF WORK

This section presents the work activities planned for the investigation of soils immediately below the concrete pad at the former X-770 Building site. Based on knowledge of past operations associated with the X-770 Building, the soils investigation area will include the area beneath the concrete pad and an area 10-ft beyond the pad's perimeter, incorporating the roof storm-water drain lines and the former surface water collection trench constructed to contain runoff generated during the X-770 Building demolition. If soil sample results from within that area indicate soil contamination exists, additional sampling locations may be necessary for up to an additional 10-ft (to a maximum distance of 20-ft) beyond the pad's perimeter. Remediation, as necessary, of the building piping and storm water drains within 20 ft of the concrete pad's perimeter will be addressed as part of the concrete pad removal work plan. Any remaining piping associated with this unit that is beyond the X-770 Building site and not addressed in the concrete pad removal work plan will be investigated, as necessary, during future D&D activities.

Sampling will be conducted using fixed base laboratory analyses and reviewing the analytical results to determine if additional sampling is required as part of a second sampling mobilization. Soil sampling will concentrate on identifying contamination within the vadose (unsaturated) zone only. Samples will be collected and analyzed for TCE (and degradation products), PCBs, RCRA metals (arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver), isotopic uranium and technetium-99.

2.1 GEOPHYSICAL SURVEY

A geophysical survey of the investigation area will be conducted to identify underground utilities before the sampling locations are finalized.

2.2 SOIL CHARACTERIZATION SAMPLING AND ANALYSIS ACTIVITIES

2.2.1 Previous Sampling

The former X-770 Building was located near the center of the Quadrant I Groundwater Investigative Area plume (see Figure 1) and was immediately downwind of the main process vents from the Portsmouth cascade. This building was not originally identified as having a history of releases to environmental media and was not investigated as part of the RCRA Facility Investigation (RFI).

However, RFI soil sampling associated with the investigation of the X-760 Pilot Investigation Building provided limited coverage of the area surrounding the X-770 Building. Subsequent investigations have revealed that past operations at the building may have contributed to soil and groundwater contamination. Groundwater contamination is currently addressed as part of the Quadrant I Groundwater Investigative Area plume. A single tetrachloroethene (PCE) detection in soil north of the X-770 Building was reported in the RFI and is below the preliminary remediation goal (PRG) for PCE. All detections of radiological parameters in soil reported for the X-760 Pilot Investigation Building during the RFI were below background levels.

2.2.2 Soil Sampling

The investigation will employ soil sampling using direct push technology, and the soil samples will be analyzed at an off-site fixed base laboratory The list of soil constituents for this investigation are listed below in Table 1.

The process for determining the sampling depths and locations is described in the paragraph following Table 1.

Table 1. X-770 Building soil list of constituents

PCB, total
1,1-Dichloroethane
1,2-Dichloroethane
1,1-Dichloroethene
cis-1,2-Dichloroethene
trans-1,2-Dichloroethene
Trichloroethene
Vinyl chloride
Arsenic
Barium
Cadmium
Chromium
Lead
Mercury
Selenium
Silver
Technetium-99
Uranium, total
Uranium-234
Uranium-235+D
Uranium-236
Uranium-238+D

Figure 2 shows the planned layout of sampling locations. Sampling locations are distributed laterally to sample areas where contamination is most likely to be present (e.g., drainage lines, sump pits, floor joints, and building footer and slab back-fill) based on the X-770 Building floor plan. Sampling locations have a maximum spacing of approximately 30 to 40 ft, resulting in approximately 580 ft^2 per sample average coverage over the entire investigation area. Sampling personnel will core through the concrete pad (approximately 6 to 10 inches thick) and collect soil samples to a depth of 12 ft below ground surface (bgs) (approximately to the top of groundwater). Soil samples will be collected at 2-ft bgs, 6-ft bgs, 9-ft bgs and 12-ft bgs intervals starting immediately below the base of the concrete pad/gravel subgrade. In addition to the intervals collected above, a 0-6 inch bgs interval will be collected at locations outside the building footprint and analyzed for RCRA metals, PCBs, and radiologicals.

To investigate the building piping and storm drain piping, sampling locations shown in Figure 2 and listed in Table 2 will include an additional sample interval. The sample will be collected at approximately the 4-ft bgs interval and will be analyzed for VOCs, RCRA metals, PCBs, and radiologicals.

Table 2. Underground piping sampling locations

X770-DPT-01	X770-DPT-17	X770-DPT-33
X770-DPT-02	X770-DPT-23	X770-DPT-35
X770-DPT-03	X770-DPT-24	X770-DPT-36
X770-DPT-07	X770-DPT-25	X770-DPT-37
X770-DPT-08	X770-DPT-26	X770-DPT-41
X770-DPT-09	X770-DPT-30	X770-DPT-42
X770-DPT-10		

If a planned location or interval cannot be sampled within 5 ft laterally and 1 ft vertically of the planned location, DOE in consultation with the Ohio Environmental Protection Agency (Ohio EPA) will discuss an appropriate new location.

Once analytical results for TCE (and degradation products), PCBs and radiological analysis are received from the laboratory, the results will be reviewed to determine if any analytes were detected above the laboratory reporting limits (RLs). Table 3 provides the laboratory RLs which will be used during this review. If a sample location is identified as having contamination above the RL for a particular analyte then an additional location or locations will be sampled around that location. A typical scenario may be to "step out" approximately 10-ft from the original location in order to determine the extent of the contamination. (Figure 3) The specific approach to be used at each location where contamination is identified above the RL will be discussed with Ohio EPA and agreed to prior to implementation in the field. Samples beyond 20 ft of the concrete pad are not planned or included in this Work Plan.

Table 3. Reporting limits

Analyte Group	Laboratory Reporting Limit
PCB, total	33 ppb
1,1-Dichloroethane	5.0 ppb
1,2-Dichloroethane	5.0 ppb
1,1-Dichloroethene	5.0 ppb
cis-1,2-Dichloroethene	2.5 ppb
trans-1,2-Dichloroethene	2.5 ppb
Trichloroethene	5.0 ppb
Vinyl chloride	5.0 ppb
Technetium-99	0.15 pCi/g
Uranium, total	0.07 ug/g

The RL will vary slightly depending sample size analyzed, chemical and/or matrix interferences, and laboratory performing the analysis.

Results obtained from the analysis for RCRA metals will be reviewed and discussed with Ohio EPA prior to being used in the decision process for determining nature and extent.

All samples will be scanned in the field for radioactivity levels with a handheld radiation meter (LUDLUM 12, set to x1 scale) to determine if there is obvious radiological contamination before containerizing samples.

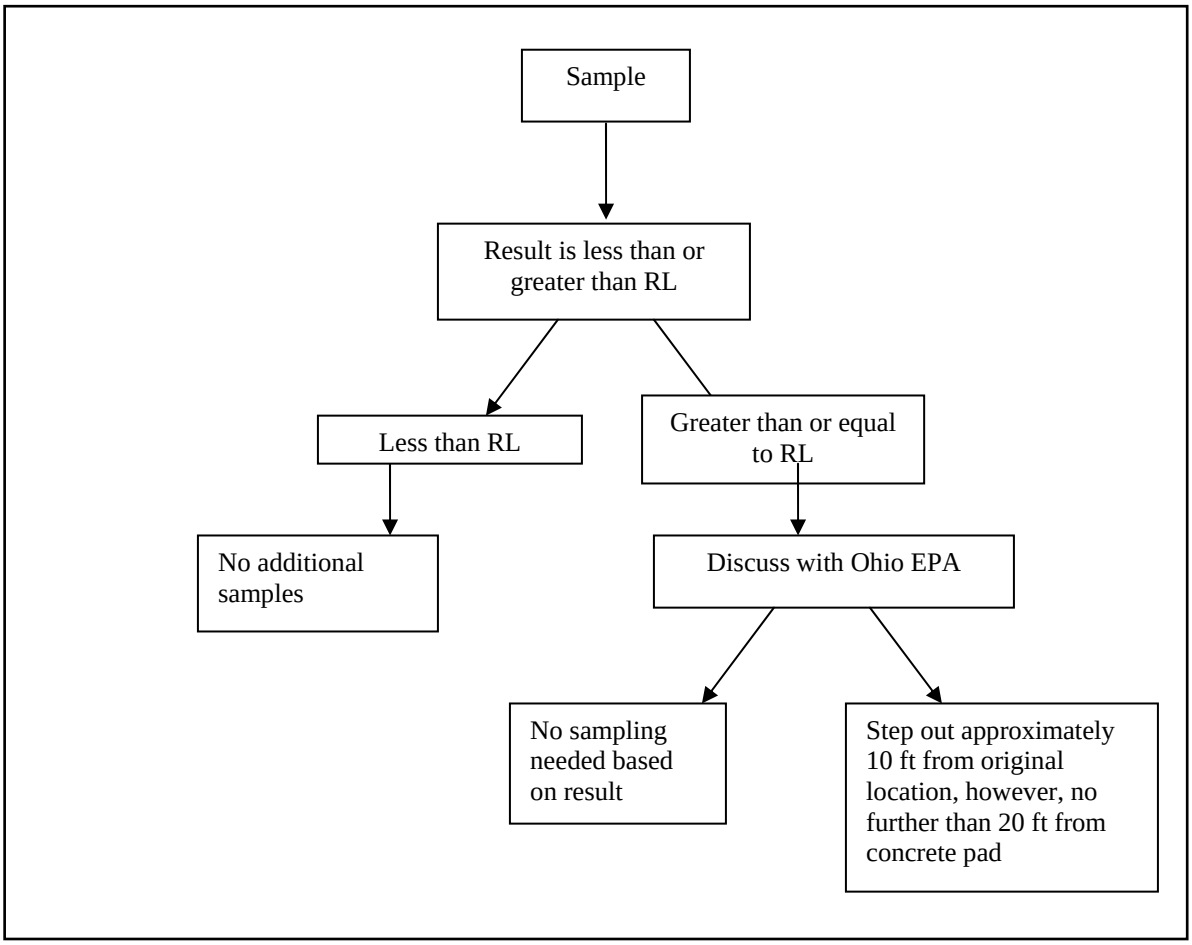


Figure 3. Horizontal decision

2.2.3 Sampling Procedures

Sampling activities will be conducted in accordance with the latest revisions on file of the following procedures:

LPP-SOP-1-4	Subsurface Soil Sampling (Appendix A)
LPP-SOP-1-2	Sample Custody
LPP-PORTS-GWS-006	Decontamination of Sampling Equipment
LPP-PO-1623	Sample Shipping of Non-Hazardous Samples to Off-Site Laboratories
LPP-PORTS-GWS-009	Field Log Books
LPP-ER-N004	Direct Push Technology (DPT) Drilling, Sampling, & Micro Well Installation

Soil collected for VOC analyses will be collected from the designated location and depth according to step 17 of Section 5.2.3 of the Subsurface Soil Sampling procedure LPP-SOP-1-4 (included in Appendix A). Sample containers for other parameters will be filled from the remaining soils directly above the VOC sampled horizon.

Following soil sampling, the locations will be filled with bentonite/grout to prevent surface runoff from migrating to the subsurface.

2.2.4 Off-site Laboratory Analysis

Analyses will be conducted for the analytes and methods listed in Table 4. The samples from each sampling location will be analyzed in descending order, starting with the uppermost sample continuing downward to a maximum depth of 12-ft bgs.

Table 4. Analytes and methods

Analyte Group	Fixed-Base Laboratory Method
VOCs	SW-846 5035
PCBs	GC/ECD, Method 8082
RCRA Metals (As, Ba, Cd, Cr, Pb, Se, and Ag)	ICP, Method 6010B/6020
Total Mercury	SW-846 7471A
Total Uranium	Approved method per laboratory QA Plan
Uranium Isotopes and Technetium-99	Approved method per laboratory QA Plan

ECD = Electron Capture Detector
GC = Gas Chromatography
ICP = Inductively Coupled Plasma
MS = Mass Spectrometry

2.3 LABORATORY AND FIELD QUALITY ASSURANCE/QUALITY CONTROL MEASURES

QA/QC measures will be implemented in accordance with Section 4 of this Work Plan. Field QC measures will include samples collected or prepared in the field during sampling activities and submitted to the laboratory to assess the quality of the sample collection process, sample handling and shipment, and sample analysis (for total measurement error). For purposes of this Work Plan, field QC samples include field duplicates and field blanks.

- Field Duplicates – One field duplicate for every twenty samples. Field duplicates will be analyzed for the same set of analytical parameters as the non-QC samples being collected. The purpose of field duplicates is to determine precision that is a function of variance in sample composition, sampling techniques and analytical techniques. Duplicate samples will be collected in the same manner as regular samples.

- Blanks – One field and one rinsate blank sample will be collected for every thirty samples. Field blank samples are preserved bottles taken to the sampling location and filled with water that meets or exceeds the standards for deionized ultra-filtered water. Rinsate blank samples are samples of deionized ultra-filtered water that has been used to rinse decontaminated sampling equipment. The blanks will be analyzed for all analytes of concern for the sampling location. The purpose of field and rinsate blanks is to verify that the presence of a given analyte in a sample is not due to a source of external contamination (e.g., potable water used in the decontamination process, contaminated sampling equipment, airborne contamination from an adjacent facility or operation, etc.).

For the purposes of this Work Plan, laboratory QA measures are those checks that an analyst routinely runs to determine the precision and accuracy of the analytical methods and equipment (method error). Laboratory QA measures typically include blanks, standards, duplicates, standard reference materials, and standard addition (matrix spikes). The QA measures will be specified in the contract with the laboratory that performs the analysis of samples collected for this scope of work.

The Quality Assurance Program Plan (QAPP) and Quality Implementation Plan requirements will be applied to all activities in a manner consistent with the nature of the work performed and the requirements applicable to each work activity. The QAPP establishes the responsibilities and requirements which personnel are committed to in the performance of day to day work activities. Procedures have been developed to establish the methods used to accomplish specific elements of the QAPP. These procedures typically fall into two categories: administrative (covering generic topics such as training, reviews, document control, nonconformance reporting, and records), and technical (covering such topics as engineering).

2.4 SAMPLE MANAGEMENT

All sample management activities including generating field chain-of-custody documentation, labeling of sample containers, and generating laboratory chain-of-custody forms will be performed using the Project Environmental Measurements System (PEMS).

3. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC measures will be communicated to the project team through planning documents, procedures, work instructions and thorough training and orientation meetings. Management and project assessments will verify that adequate QA/QC controls are in place to perform the sampling task. Prior to commencement of work activities, management will make certain that project staff are properly trained and qualified.

The DOE Prime Contractor's QA program will provide the appropriate resources to facilitate quality work. The QA Program includes a framework for achieving quality, contains explanations of various elements that may be applicable to project work, and includes procedures to effectively implement the elements. Inclusion of the applicable quality elements and procedures during project planning helps build quality into the project. Certain quality procedures assist in properly dealing with problems if they arise during project activities. The key quality elements are planning the project, qualification of personnel, technical review of project work, procurement of technical services and measurement, assessment of the work, and rapid correction of problems.

The QA Program also includes a QA staff that is available to provide information and guidance in quality matters and to assist in meeting QA requirements. QA and project staff share a common goal to achieve high quality project products and results. The QA staff will work to customize the QA procedures to identify the quality measures that will be most helpful to this project. A QA staff member will work with the project team to achieve these common goals in this regard.

During project execution, the adequacy of QA/QC measures will be assessed by team members, and management, to determine if the scope of work and governing documents are being implemented effectively. All team members and workers are responsible for identifying, and reporting project difficulties, and for suggesting improvements to work processes. If necessary, QA/QC measures will be modified using the change control process and communication to the project team. Lessons learned and other feedback will be provided to foster continuous improvement.

4. WASTE MANAGEMENT

Waste generated during the project will be characterized in accordance with applicable state and federal requirements, including Ohio Administrative Code solid and hazardous waste regulations, and shipped to an appropriate treatment and/or disposal facility. Both liquid and solid waste will be generated during this investigation.

Liquid waste will include decontamination water and other waste waters generated as a result of sampling activities. All liquid wastes will be containerized and treated at existing, permitted on-site groundwater treatment facilities and/or sent to an appropriately permitted off-site facility for disposal.

Solid waste may include contaminated soils, excess soil from soil sampling, and contaminated personal protective equipment (PPE). The solid waste will be characterized and sent to an approved off-site treatment/disposal facility. If radiological contamination is found, the waste will be containerized and sent to an approved off-site facility for disposal. Low level waste (LLW) and PCB/LLW will be characterized and sent to an approved off-site disposal facility.

5. SCHEDULE AND MILESTONES

Proposed milestones for the project are presented in this section of the Work Plan.

5.1 INVESTIGATION SCHEDULE

Initiation of field activities is contingent upon Ohio EPA approval of the Work Plan. Additional time to complete the investigation may be requested by DOE based on circumstances, such as, inclement weather or discussions with Ohio EPA regarding overall approach.

5.2 INVESTIGATION MILESTONES

Proposed milestones to track remedial progress are outlined in Table 5.

Table 5. Milestones for the former X-770 Building site investigation

Milestone	Action Date
Initiate Field Investigation	45 calendar days after Ohio EPA approval of the Work Plan
Data Review with Ohio EPA	15 calendar days after receipt of soil sampling analytical results

6. ENVIRONMENT, HEALTH AND SAFETY

The Health and Safety Program is designed to minimize the number of injuries and illnesses, with an ultimate goal of zero accidents and injuries. The appropriate supervision, training, and PPE will be provided to keep employees safe. Management and staff share responsibility for health and safety, and all levels are accountable for specific health and safety activities. Full participation by, and cooperation with, all employees are crucial to the overall success of the health and safety program for this project. Principles that will be adhered to during this work include:

- Occupationally caused injuries and illnesses are preventable;
- Preventing occupationally caused injuries and illnesses is one of the highest responsibilities;
- Providing safe working conditions in the field is a priority;
- Employees have the right to information and training;
- Working safely is a condition of employment and is a shared responsibility between management and staff; and
- The project cannot succeed unless injuries and exposures are mitigated, managed, and prevented.

Safety will be the responsibility of each employee. Ultimately, however, the successful implementation of the Health and Safety Program depends on the integrated activities of the managers, health and safety staff, and employees. Manager and employee cooperation is required in all health and safety matters. The object is and will always be a Health and Safety Program that reduces the number of accidents, injuries, and illnesses to a minimum.

7. REFERENCES

DOE (U.S. Department of Energy) 1996. *Quadrant I RCRA Facility Investigation Report for the Portsmouth Uranium Enrichment Plant, Piketon, Ohio,* DOE/OR/11-1231/V1&D3, Lockheed Martin Energy Systems, Inc. Piketon, OH.

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Ohio EPA (Ohio Environmental Protection Agency) 2001. *US DOE Portsmouth Quadrant I Decision Document, Portsmouth Gaseous Diffusion Plant,* Ohio Environmental Protection Agency, Southeast District Office, Logan, Ohio, March 2001.

U.S. EPA (U.S. Environmental Protection Agency) 2004. *Improving Sampling, Analysis, and Data Management for Site Investigation and Cleanup,* EPA/542/F-04/001a, Office of Solid Waste and Emergency Response, April 2004.

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U.S. EPA (U.S. Environmental Protection Agency) 1989. *Superfund Ground Water Issue, Facilitated Transport,* EPA/540/4-89/003, Office of Research and Development, August 1989.

APPENDIX A

Subsurface Soil Sampling
LPP SOP: 1-4

LATA Parallax

LATA/PARALLAX PORTSMOUTH, LLC

PERFORMANCE DOCUMENT COVER PAGE

This procedure is effective for use 14 calendar days from the day it is copied and issued or until guidance is issued designating a revision or cancellation of the information.

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TRANSITION PROCEDURE INCORPORATION FORM

LATA/Parallax Portsmouth

LPP CONTROLLED COPY

(Reason for Request: June 27, 2005 LATA/Parallax Portsmouth Transition)

Old Procedure Number:	Revision #	Old Title:
SOP 1-4	5	Subsurface Soil Sampling
New Procedure Number:	**Revision #**	**New Title:**
LPP SOP 1-4	Ø	Subsurface Soil Sampling

USQD/Configuration Item: Y N	Additional Nuclear Safety Review Required: Y (N)	Comments: New USQD Required: Y (N)

Instructions: This Document identifies editorial and/or organizational revisions to the referenced procedure which are necessary for LATA/Parallax Portsmouth (LLC) to transition management responsibility. Questions regarding specific references and procedures should be addressed to the LPP procedure owner identified below.

Concurrence Signature blocks: (Provide printed name and signature in all blocks.)	
LPP Procedure Owner: Del Baird	Date: 6-07-05
Procedure Reviewed by: Noah Lawson	Date: 060405
Nuclear Safety: Review Not Required_____	Date:
Quality Assurance: Review Not Required_____	Date:
Approved For Use by: (signed after all requested changes have been incorporated)	Date: 6/23/05
Effective Date: June 27, 2005	WORKING COPY Date_____ Initials_____

TRANSITION PROCEDURE INCORPORATION FORM

LATA/Parallax Portsmouth

LPP SOP 1-4

(Reason for Request: June 27, 2005 LATA/Parallax Portsmouth Transition)

This procedure is subject to the following global change requests: (Circle all that apply.)

1. Replace all references to ~~BJC~~ and STR with LPP. CDM
2. Change logo from ~~BJC~~ to LPP. CDM
3. Update referenced procedures and/or documents with LPP identifiers.
4. Replace ~~BJC~~ position titles with corresponding LPP position titles. CDM
5. Delete current revision log; procedure reverts to Revision 0. - Mark applicable date changes

_____ Initials indicating no specific changes required.

This procedure is accepted subject to the following specific change requests. (General comments can also be made in the table below.)

Page	Section	BJC Reference	LPP Reference
		[Enter the reference or language to be revised]	
2	2.3	All bullets	Delete all bullets except •LPP SOP 1-2, Sample Custody
3	5.1 #6	Set up a decontamination line, if decontamination is required, in accordance with CDM Federal SOP 4-5.	Set up a decontamination line in accordance with applicable decontamination procedure.
3	5.2 #2	Describe lithology, according to CDM Federal SOP 3-5, in the field logbook or on the lithologic log form.	Describe lithology in the field logbook or on the lithologic log form.
4 and 5	5.2.1 #12	SEE CDM FEDERAL SOPs 1-2 and 2-1 or site-specific plans.	SEE LPP SOP 1-2 or site-specific plans.
5	5.2.2 #11	Decontaminate all equipment according to CDM Federal SOP 4-5 between each sample.	Decontaminate all equipment according to applicable procedures between each sample.
5	5.2.2 #13	SEE CDM FEDERAL SOPs 1-2 and 2-1 or site-specific plans	See LPP SOP 1-2 or site specific plans
6	5.2.3 #2	The drilling rig will be decontaminated at a separate location prior to drilling, per CDM Federal SOP 4-5 or the site-specific decontamination procedures.	... location prior to drilling, per applicable procedures or the site-specific decontamination process.

TRANSITION PROCEDURE INCORPORATION FORM

LATA/Parallax Portsmouth

LPP SOP 1-4

(Reason for Request: June 27, 2005 LATA/Parallax Portsmouth Transition)

This procedure is subject to the following global change requests: (Circle all that apply.)

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5. Delete current revision log; procedure reverts to Revision 0.

_____ Initials indicating no specific changes required.

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Page	Section	BJC Reference	LPP Preference
		[Enter the reference or language to be revised]	
8	5.2.3 #25	... Sampling equipment according to CDM Federal SOP 4-5 before...	... Sampling equipment according to applicable decontamination procedures before...
8	5.2.3 #27	SEE CDM Federal SOPs 1-2 and 2-1 or site specific plans.	See ~~CDM Federal~~ NL 060495 LPP SOPs 1-2 or site specific plans.

Subsurface Soil Sampling

Prepared: Del R. Baird

Technical Review: Kim Taylor

QA Review: David O. Johnson

Approved: Michael C. Molly 2/24/04
Signature/Date

Issued: 2/10/04
Signature/Date

1.0 Objective

The objective of this standard operating procedure (SOP) is to define the techniques and requirements for collecting soil samples from the unconsolidated zone. Techniques include use of hand augers, Shelby tubes, continuous core samplers, and split-spoon samplers.

2.0 Background

2.1 Definitions

Unconsolidated Zone - The layer of soil above bedrock that exists in a relatively loose state.

Hand Auger - A stainless steel cylinder (bucket) approximately 7 to 10 centimeters (cm) (3 to 4 inches) in diameter and 30 cm (1 foot) in length, open at both ends with the bottom edge designed to twist into the soil and cut out a soil core. The bucket collects the soil sample. The auger has a T-shaped handle (for hand operation) attached to the top of the bucket by extendable stainless steel rod(s).

Shelby Tube - A cylindrical sampling device, generally made of steel, that is driven into the subsurface soil through the hollow-stem auger. The tube, once retrieved, may be capped and the undisturbed soil sample extruded in the laboratory prior to analysis.

Split-Spoon/Split-Barrel Sampler - A cylindrical sampling device generally made of carbon steel that fits into a hollow-stem auger. The spoon is hinged lengthwise, which allows the sample to be retrieved by opening ("splitting") the spoon.

Slide Hammer – A device consisting of a drive weight (hammer) and a drive weight fall guide.

Subsurface Soil - The soil that exists deeper than approximately 30 cm (1 foot) from the surface but above bedrock or any other consolidated material.

Grab Sample - A discrete portion or aliquot taken from a specific location at a given point in time.

Liner - A cylindrical sampling device, generally made of brass, stainless steel, or Teflon® that is placed inside a split-spoon or hand auger bucket to collect undisturbed samples.

Composite Sample - Two or more sub-samples taken from a specific media and site at a specific point in time. The sub-samples are collected and mixed, and then a single average sample is taken from the mixture.

Auger Flight - A steel section length attached to an auger to extend the auger and remove unconsolidated material as coring depth increases.

2.2 Discussion

Shallow subsurface soil samples (to depths between 0.15 cm to 3 meters (m) [6 inches and 10 feet]) may be collected using hand augers. However, soil samples collected with a hand auger are commonly of poorer quality than those collected by split-spoon/split-barrel or Shelby tube samplers since the soil sample is disturbed in the augering process. Split-spoon/split-barrel and Shelby tube liners are generally used during collection of soil samples using a hollow-stem auger, but may also be used to collect undisturbed soil samples from hand auger borings using a slide-hammer device. Liners are used to minimize the loss of volatile organic compounds (VOCs). The size and construction material of sampling devices should be selected based on project and analytical objectives and defined in site-specific plans.

2.3 Associated Procedures

- CDM Federal SOP 1-2, Sample Custody
- CDM Federal SOP 2-1, Packaging and Shipping Environmental Samples
- CDM Federal SOP 3-5, Lithologic Logging
- CDM Federal SOP 4-1, Field Logbook Content and Control
- CDM Federal SOP 4-5, Field Equipment Decontamination at Nonradioactive Sites

3.0 Responsibilities

Site Manager - The site manager is responsible for ensuring that field personnel are trained in the use of this procedure and the required equipment, and for ensuring that subsurface soil samples are collected in accordance with this procedure and any other SOPs pertaining to specific media sampling. The site manager must also ensure that the quantity and location of subsurface soil samples collected meet the requirements of the site-specific plans.

Field Team Leader - The field team leader is responsible for ensuring that field personnel collect subsurface soil samples in accordance with this SOP and other relevant procedures.

4.0 Required Equipment

4.1 General

- Site-specific plans
- Field logbook
- Indelible black ink pens and markers
- Labels and appropriate forms/documentation for sample shipment
- Clear, waterproof tape
- Appropriate sample containers
- Insulated cooler(s) and waterproof sealing tape
- Ice bags or "blue ice"
- Latex or appropriate gloves
- Plastic zip-top bags
- Personal protective clothing and equipment
- Stainless steel and/or Teflon-lined spatulas and pans, trays, bowls, trowels, or spoons
- Plastic sheeting
- Decontamination supplies

Additional equipment is discussed in Section 5.2.5, Field Sampling/Preservation Methods.

4.2 Manual (Hand) Augering

- T-handle
- Hand auger: flighted-, bucket-, or tube-type auger as required by the site-specific plans
- Extension rods
- Wrench(es), pliers
- Slide-hammer with extension rods

4.3 Split-Spoon/Split-Barrel and Shelby Tube Sampling

- Drill rig equipped with a 63-kilogram (kg) (140-lb) drop hammer and sufficient hollow-stem augers to drill to the depths required by the site-specific plans.
- Sufficient numbers of split-spoon/split-barrel or Shelby tube samplers so that at least one is always decontaminated and available for sampling. Three split-spoon/split-barrel or Shelby tube samplers are generally the minimum necessary. (Shelby tubes are usually used only once.)
- Split-spoon liners (as appropriate).
- Wrench(es), hammer.

5.0 Procedures

5.1 Preparation

1. Don the appropriate personal protective clothing as dictated by the site-specific health and safety plan.

2. Locate sampling location(s) in accordance with project documents (e.g., work plan) and document pertinent information in the appropriate field logbook. When possible, reference locations back to existing site features such as buildings, roads, intersections, etc.

3. Processes for verifying depth of sampling must be specified in the site-specific plans.

4. Clear away vegetation and debris from the ground surface at the boring location.

5. Prepare an area next to the sample collection location for laying out cuttings by placing plastic sheeting on the ground to cover the immediate area surrounding the borehole.

6. Set up a decontamination line, if decontamination is required, in accordance with CDM Federal SOP 4-5.

5.2 Collection

The following general steps must be followed when collecting all subsurface soil samples:

1. VOC samples or samples that may be degraded by aeration shall be collected first and with the least disturbance possible.

2. Sampling information shall be recorded in the field logbook and on any associated forms. Describe lithology, according to CDM Federal SOP 3-5, in the field logbook or on the lithologic log form.

3. Specific sampling devices to be used shall be identified in the site-specific plans and recorded in the field logbook.

4. Care must be taken to prevent cross-contamination and misidentification of samples.

5. Sample containers containing samples for VOC analysis should be filled completely to minimize headspace.

5.2.1 Manual (Hand) Augering

The following steps must be followed when collecting hand-augered samples:

1. Auger to the depth required for sampling. Place cuttings on plastic sheeting or as specified in the site-specific plans. If possible, lay out the cuttings in stratigraphic order.

2. Throughout the augering, make detailed notes concerning the geologic features of the soil or sediments in the field logbook.

3. Cease augering when the top of the specified sampling depth has been reached. If required, remove the auger from the hole and decontaminate the auger or use a separate decontaminated auger, then obtain the sample.

4. Collect a grab sample for VOC analyses (or samples that may be degraded by aeration) immediately and place in sample container. Sample bottles should be filled completely to minimize headspace.

5. Remaining sample should be homogenized for other analyses prior to placing samples in the appropriate containers. Label containers as required.

6. Wipe containers with a clean Kimwipe or paper towel to remove residual soil from the exterior of the container(s).

7. Label the sample container with the appropriate information. Secure the label by covering it with a piece of clear tape.

8. Place the containers in zip-top plastic bags and seal the bags. Pack samples in a cooler with ice.

9. Proceed with further sampling, as required by the site-specific plans.

10. When all sampling is complete, dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.

11. Complete the field logbook entry and other appropriate forms, being sure to record all relevant information before leaving the site.

12. Properly package all samples for shipment and complete all necessary sample shipment documentation. Remand custody of samples to the appropriate personnel. See CDM Federal

SOPs 1-2 and 2-1 or site-specific plans.

5.2.2 Manual (Hand) Augering Using a Tube Sampler with Liner or Slide-Hammer

The following steps must be followed when collecting hand-augered samples using a tube sampler with liner or slide-hammer:

1. Auger to the depth required for sampling. Place cuttings on the plastic sheeting as specified in the site-specific plans. If possible, lay out the cuttings in stratigraphic order.

2. Throughout augering, make detailed notes in the field logbook concerning the geologic features of the soil or sediments.

3. Cease augering when the top of the specified sampling depth has been reached. Remove the auger from the hole and decontaminate.

4. Prepare a decontaminated tube sampler by installing a decontaminated liner in the auger tube.

5. Obtain the sample by driving the sample tube through the sample interval with the slide-hammer. Remove the liner from the tube and immediately cover the ends with Teflon tape and cap the ends of the tube. Seal the caps with waterproof tape.

6. Wipe sealed liners with a clean Kimwipe or paper towel.

7. Label the sealed liners as required in the site-specific plans. Mark the top and bottom of the sample on the outside of the liner.

8. Place sealed liners in zip-top plastic bags and seal the bags. Pack samples in a chilled cooler.

9. Proceed with further sampling, as required by the site-specific plans.

10. When sampling is complete, dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.

11. Decontaminate all equipment according to CDM Federal SOP 4-5 between each sample.

12. Complete the field logbook entry and other forms, being sure to record all relevant information before leaving the site.

13. Properly package all samples for shipment and complete all necessary sample shipment documentation. Remand custody of samples to the appropriate personnel. See CDM Federal SOPs 1-2 and 2-1 or site-specific plans.

5.2.3 Split-Spoon/Split Barrel Sampling

Note: Steps 1 through 12 describe activities to be performed by a licensed drilling contractor, not CDM personnel.

The following steps must be followed when collecting split-spoon samples:

1. Remove any pavement and subbase material from an area of twice the bit diameter, if necessary.
2. The drilling rig will be decontaminated at a separate location prior to drilling, per CDM Federal SOP 4-5 or the site-specific decontamination procedures.
3. Attach the hollow-stem auger with the cutting head, plug, and center rod(s) to the drill rig.
4. Begin drilling and proceed to the first designated sample depth, adding auger(s) as necessary.
5. Upon reaching the designated sample depth, slightly raise the auger(s) to disengage the cutting head, and rotate the auger without advancement to clean cuttings from the bottom of the hole.
6. Remove the plug and center rods.
7. If required by the site-specific sampling plan, install decontaminated liners in the split-spoon/split barrel sampler.
8. Install a decontaminated split-spoon on the center rod(s) and insert it into the hollow-stem auger. Connect the hammer assembly and lightly tap the rods to seat the drive shoe at the top of undisturbed soil or sediment.
9. Mark the center rod in 15-cm (6-inch) increments from the top of the auger(s).
10. Drive the split-spoon using the hammer. Use a full 76-cm (30-inch) drop as specified by the American Society for Testing and Materials (ASTM) Method D-1586. Record the number of blows required to drive the spoon or tube through each 15-cm (6-inch) increment.
11. Cease driving when the full length of the spoon has been driven or upon refusal. Refusal occurs when little or no progress is made for 50 blows of the hammer. ASTM D1586-99 § 7.2.1 and 7.2.2 defines "refusal" as >50 blows per 6-inch advance or a total of 100 blows.
12. Pull the split-spoon free by using upswings of the hammer to loosen the sampler. Pull out the center rod and split-spoon.
13. Unscrew the split-spoon assembly from the center rod and place it on the plastic sheeting.
14. Remove the drive shoe and head assembly. If necessary, tap the split-spoon assembly with a hammer to loosen threaded couplings.
15. With the drive shoe and head assembly off, open (split) the split-spoon, being careful not to disturb the sample.
16. Label sample containers with appropriate information. Secure the label, covering it with a piece of clear tape. If liners were used, immediately install Teflon tape over the ends of the liners, cap the liners, and seal the caps over the ends of the liner with waterproof tape. Label the samples

as required by the site-specific plans. Mark the top and bottom of each sample on the outside of each liner. Indicate boring/well number and depth on the outside of the liner, as required.

17. If VOC analyses are to be conducted on the soil sample and liners were not used, place that sample in its sample container immediately after opening the split-spoon, filling the sample bottle completely. Seal the container immediately, then describe it in the field logbook and/or associated forms. Record the sample identification number, depth from which the sample was taken, and the analyses to be performed on the samples in the field logbook and on the appropriate forms.

18. Remaining sample should be homogenized prior to placing samples in appropriate containers.

19. Wipe containers with a clean Kimwipe or paper towel. Label containers as required when liners are not used.

20. Place containers and/or sealed liners in zip-top plastic bags and seal the bags. Pack samples in a chilled cooler.

21. In the field logbook and on the boring log, describe sample lithology by observing cuttings and/or the bottom end of the liner.

22. Continue to advance the borehole to the next sampling point. Collect samples as outlined above.

23. When sampling is complete, remove the drilling rig to the heavy equipment decontamination area.

24. Dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans. Backfill bore hole as specified in project-specific plans.

25. Decontaminate split-spoons and other small sampling equipment according to CDM Federal SOP 4-5 before proceeding to other sampling locations.

26. Complete the field logbook entry and other forms, being sure to record all relevant information before leaving the site.

27. Properly package all samples for shipment to laboratories and complete all necessary sample shipment documentation. Remand custody of the samples to the appropriate personnel. See CDM Federal SOPs 1-2 and 2-1 or site-specific plans.

5.2.4 Shelby Tube Sampling

Note: Steps 1 through 11 describe activities to be performed by a licensed drilling contractor, not CDM personnel.

The following steps must be followed when collecting samples using the Shelby tube:

1. Remove any pavement and subbase material from an area of twice the bit diameter, if necessary.

2. The drilling rig will be decontaminated at a separate location prior to drilling.

3. Attach the hollow-stem auger with the cutting head, plug, and center rod(s).
4. Begin drilling and proceed to the first designated sample depth, adding auger(s) as necessary.
5. Upon reaching the designated sample depth, slightly raise the auger(s) to disengage the cutting head, and rotate the auger without advancement to clean cuttings from the bottom of the hole.
6. Remove the plug and center rods.
7. Attach a head assembly to a decontaminated Shelby tube. Attach the Shelby tube assembly to the center rods.
8. Lower the Shelby tube and center rods into the hollow-stem augers and seat it at the bottom. Be sure to leave 30 inches or more of center rod above the lowest point to the hydraulic piston's extension.
9. Use the rig's hydraulic drive to push the Shelby tube into undisturbed soil. The tube should be pushed with a steady force. Note the pressure used to push the Shelby tube in the field logbook.
10. When the Shelby tube has been advanced its full length or to refusal, back off the hydraulic pistons. Attach a hoisting plug to the upper end of the center rod, twist to break off the sample, and pull the apparatus out of the hole with the rig winch.
11. Retrieve the Shelby tube to the surface, detach it from the center rod, and remove the head assembly.
12. Since the typical intent of Shelby tube sampling is for engineering purposes and an undisturbed sample is required, the tube ends should be sealed immediately. Sealing is accomplished by filling any void space in the tube with beeswax, then placing caps on the ends of the tube and taping caps into place. The top and bottom ends of the tube should be marked and the tube transported to the laboratory in an upright position. Indicate boring/well number and depth on outside of liner.
13. Wipe sealed tubes with a clean Kimwipe or paper towel.
14. Place sealed tubes in zip-top plastic bags and seal bags. Pack samples in a chilled cooler.
15. Continue to advance the borehole to the next sampling point. Collect samples as outlined above.
16. When sampling is complete, remove the drilling rig to the heavy equipment decontamination area.
17. Dispose of cuttings, plastic sheeting, etc., as specified in the site-specific plans.
18. Complete the field logbook entry, being sure to record all relevant information before leaving the site. These methods may be used if directed by the EPA region, client, or governing sample plan.

5.2.5 Field Sampling/Preservation Methods

The following three sections contain SW 846 Methods for sampling and field preservation. These methods include EN CORE™ Sampler Method for low-level detection limits, EN CORE Sampler Method for high-level limits/screening, and methanol preservation. These methods may be used if required by the EPA Region, client, or governing sample plan. These methods are very detailed and contain equipment requirements at the beginning of each section.

When collecting soil samples using the EN CORE Sampler Method, collection of soil for moisture content analysis is required. Results of this analysis are used to adjust "wet" concentration results to "dry" concentrations to meet analytical method requirements.

Note: Some variations from these methods, (e.g., sample volume) may be required depending on the contracted analytical laboratory.

5.2.5.1 EN CORE Sampler Collection for Low Level Analyses (≥1 µg/kg)

EN CORE Sampling Equipment Requirements

The following equipment is required for low-level analysis:

- Three 5 grams (g) samplers

Note: The sample volume requirements specified are general requirements. Actual sample volume and/or container sizes may vary depending on client or laboratory requirements.

- One 110-milliliter (mL) (4-ounce [oz.]) widemouth glass jar or applicable container for moisture analysis
- One T-handle
- Paper towels

EN CORE Sampling Steps for Low Level Analysis

1. Remove sampler and cap from package and attach T-handle to sampler body.
2. Quickly push the sampler into a freshly exposed surface of soil until the sampler is full. The O-ring will be visible within the hole on the side of the T-handle. If the O-ring is not visible within this window, then the sampler is not full.
3. Extract sampler and wipe the sampler head with a paper towel so that the cap can be tightly attached.
4. Push cap on with a twisting motion to secure to the sampler body.
5. Rotate the sampler stem counterclockwise until stem locks in place to retain sample within the sampler body.
6. Fill out sample label and attach to sampler.
7. Repeat procedure for the remaining two samplers.

8. Collect moisture sample in 110-mL (4-oz.) widemouth jar using a clean stainless steel spoon or trowel.

9. Store samplers at 4 degrees (°) Celsius (C), ±2°C. Samples must be shipped and delivered to the analytical laboratory for extraction within 48 hours.

Note: Verify requirements for extraction/holding times.

5.2.5.2 EN CORE Sampler Collection for High Level Analyses (≥200 µg/kg)
EN CORE Sampling Equipment Requirements
The following equipment is required for high-level analysis:

- One 5-g sampler or one 25-g sampler (The sampler size used will be dependent on client and laboratory requirements.
- One 110-mL (4-oz.) widemouth glass jar or applicable container specified for moisture analysis.
- One T-handle.
- Paper towels.

EN CORE Sampling Steps for High Level Analysis

1. Remove sample and cap from package and attach T-handle to sampler body.

2. Quickly push the sampler into a freshly exposed surface of soil until the sampler is full. The O-ring will be visible within the hole on the side of the T-handle. If the O-ring is not visible within this window, then the sampler is not full.

3. Use clean paper toweling to quickly wipe the sampler head so that the cap can be tightly attached.

4. Push cap on with a twisting motion to attach cap.

5. Fill out a sample label and attach to sampler.

6. Rotate sampler stem counterclockwise until the stem locks in place to retain the sample within the sampler body.

7. Collect moisture sample in 110-mL (4-oz.) widemouth jar or designated container using a clean stainless steel spoon or trowel.

8. Store samplers at 4°C, ±2°C. Samples must be shipped and delivered to the analytical laboratory for extraction within 48 hours.

Note: Verify requirements for extraction/holding times.

5.2.5.3 Methanol Preservation Sampling for High Level Analyses (≥200 µg/kg)
Methanol Preservation Sampling Equipment Requirements

- One pre-weighed jar that contains methanol or a pre-weighed empty jar accompanied with a pre-weighed vial that contains methanol (laboratory grade)
- One dry weight cup

- Weighing balance that accurately weighs to 0.01 g (with accuracy of ±0.1 g)
- Set of balance weights used in daily balance calibration
- Latex gloves
- Paper towels
- Cutoff plastic syringe or other coring device to deliver 5 g or 25 g of soil

Sampling Preservation Steps

1. Wear gloves during all handling of pre-weighed vials.

2. Weigh the vial containing methanol preservative to the nearest 0.01 g. If the weight of the vial with methanol varies by more than 0.01 g from the original weight recorded on the vial, discard the vial. If the weight is within tolerance, it can be used for soil preservation/collection below.

3. Take the empty jar or the jar that contains the methanol preservative.

4. Quickly collect a 5-g or 25-g sample using a cutoff plastic syringe or other coring device designed to deliver 5 g or 25 g of soil from a freshly exposed surface of soil. The 5-g or 25-g size used is dependent on client and laboratory requirements.

5. Carefully wipe the exterior of the collection device with a clean paper towel.

6. Quickly transfer the soil to an empty jar or a jar that contains methanol. If extruding into a jar that contains methanol, be careful not to splash the methanol outside of the vial. Again, the type of jar used is dependent on the client or laboratory requirements.

7. If the jar used to collect the soil plug was empty before the soil was added, immediately preserve with the methanol provided, using only one vial of methanol preservative per sample jar.

8. Using the paper toweling, remove any soil off of the vial threads and cap the jar.

9. Weigh the jar with the soil in it to the nearest 0.01 g and record the weight on the sample label.

10. Collect dry weight sample using a clean stainless steel spoon or trowel.

11. Store samples at 4°, ±2°C.

12. Ship sample containers with plenty of ice in accordance with DOT regulations (CORROSIVE. FLAMMABLE LIQUID. POISON) to the laboratory.

6.0 Restrictions/Limitations

Basket or spring retainers may be needed for split-spoon sampling in loose, sandy soils.

Shelby tubes may not retain the sample in loose, sandy soils.

7.0 References

American Society for Testing and Materials, *Standard Test Method for Penetration Test and Split Barrel Sampling of Soils*, Standard Method D1586-99, 1999.

U.S. Department of Energy, Hazardous Waste Remedial Actions Program, *Quality Control Requirements for Field Methods*, DOE/HWP-69/R2, September 1996.

U.S. Department of Energy, Hazardous Waste Remedial Actions Program, *Standard Operating Procedures for Site Characterizations*, DOE/HWP-100/R1, September 1996 or current revision.

U.S. Environmental Protection Agency, *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846)*, Third Edition, November 1986, (as amended by Updates I, II, IIA, IIB, III, and IIIA, June 1997). Method 5035 (**Note:** § 6.2.1.8 of this method says samples stored in En Core™ samplers should be analyzed within 48 hours or transferred to soil sample vials in the laboratory within 48 hours): December 1996, Revision O, Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples.

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