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CP4-ES-2300 FRev. 2B	**TITLE**: Collection of Soil Samples	Page 1 of 18

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REVISION/CHANGE LOG

Revision/Change Letter	Description of Changes	Pages Affected	Date of Revision/Change
FR0	Initial FRNP release	All	10/20/2017
FR1	General Revision	All	1/17/2018
FR1A	Nonintent changes to correct Approver/SMA/SME/Functional Area have been incorporated per CP3-NS-2001. Date for review cycle has been reset.	All	7/19/2021
FR2	General Revision with the addition of section 6.9, Vegetation Sampling with a Spoon, Trowel, or Scoop. Incorporated hazards and controls from JHA throughout procedure identified in Periodic Review.	All	5/11/2022
FR2A	Periodic Review has been completed with no changes identified in procedure technical content. Nonintent change to correct FA, SMA, SME, Approver, and dates has been incorporated per CP3-NS-2001. Date for review cycle has been reset	All	10/6/2022
FR2B	Intent change to add procedure to Use References to incorporate PFAS sampling and minor edits.	3,5,7,14-16	11/6/2024

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1.0 PURPOSE AND SCOPE

1.1 Purpose

This procedure describes the standard methods and equipment needed to collect environmental or geotechnical soil samples for description, physical and/or chemical analyses. The sampling methods described include:

Encore sampler

Trier, spade, spoon, trowel or scoop

Stainless steel hand-operated auger

Thin-walled sampler

Split-barrel sampler or MacroCore Sampler

A sampling and analysis plan or sampling and analysis event plan (SAP/SAEP) or task-specific Work Package (WP) may specify the type of soil sampler(s) to be used to collect disturbed or undisturbed soil samples at the surface, from boreholes, or test pit, trench, excavation, trench sidewalls, or bottoms. The manual or powered equipment and methods used to reach or access and sample soil at the surface and in the subsurface are dependent upon project objectives and soil conditions (for example, degree of consolidation and moisture content; type; volume and depth of sample required; and the characteristics of the soil to be sampled). The methods used may be either manual (such as, drive hammer, hand auger, post-hole digger, and slide hammer) or powered (such as, drill rig, direct push, pneumatic hammer, manually controlled mechanical or hydraulic earth drills, conventional excavation equipment).

1.2 Scope

This procedure applies to the Deactivation & Remediation (D&R) contractor personnel, and subcontractor personnel that perform soil sampling at the U.S. Department of Energy (DOE)-owned Paducah site.

2.0 REFERENCES

2.1 Use References

- CP3-EN-0227, *Trenching, Excavation and Penetration Permit*
- CP3-ES-2700, *Sample and Miscellaneous Data Forms* Chg B
- CP3-ES-2708, *Chain of Custody Forms, Field Sample Logs, Sample Labels and Custody Seals*
- CP3-WM-1017, *Safe Handling and Opening of Sealed Containers*
- CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*
- CP4-ER-2701, *Large Equipment Decontamination*
- CP4-ES-2303, *Borehole Logging*
- CP4-ES-2702, *Decontamination of Sampling Equipment and Devices*
- CP4-ES-2704, *Trip Equipment and Field Blank Preparation*
- CP5-TS-1000, *Per- and Polyfluoroalkyl Substances Sampling Guidelines* Chg B

2.2 Source References

- Society for Testing and Materials (ASTM) D 1452 – 80 (Reapproved 2000), *Practice for Soil Investigation and Sampling by Auger Borings.*
- ASTM D 1587 – 00, *Method for Thin-Walled Tube Geotechnical Sampling of Soils.*
- ASTM D 2937 – 04, *Density of Soil in Place by the Drive-Cylinder Method.*
- ASTM D 3550 – 01, *Practice for Ring-Lined Barrel Sampling of Soils.*
- ASTM D 4700 – 91 (Reapproved 1998), *Soil Sampling from the Vadose Zone.*
- ASTM D 5451 – 93 (Reapproved 2004), *Standard Practice for Sampling Using a Trier Sampler.*
- ASTM D 5633 – 04, *Practice for Sampling with a Scoop.*
- ASTM D 5784 – 95, *Guide for Use of Hollow-Stem Augers for Geo-environmental Exploration and the Installation of Subsurface Water-Quality Monitoring Devices.*
- ASTM D 6169 – 98 (Reapproved 2005), *Guide for Selection of Soil and Rock Sampling Devices with Drill Rigs for Environmental Investigations*.
- U.S. Environmental Protection Agency, November 2001, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*. Region 4, Environmental Compliance Branch, Athens, GA.
- JHA-10905, *Soil Sample Collection for Characterization*

3.0 COMMITMENTS

None

4.0 PRECAUTIONS AND LIMITATIONS

4.1 Precautions

4.1.1 A two-way radio and/or cell phone shall be kept at the sampling site during any sampling event for communication purposes and when working in facilities or areas that may contain a potentially explosive atmosphere, then only intrinsically safe radios, cell phones, etc. shall be used.

4.1.2 Industrial Hygiene (IH) and Radiological Control (RADCON) will review Radiological Work Permit (RWP) and other documents before opening any containerized waste or sampling-non containerized waste to determine proper Personal Protective Equipment (PPE), respiratory protection, and IH sampling required. IH controls and PPE will be documented on a task-specific Job Hazard Analysis (JHA) or Industrial Hygiene Work Permit (IHWP) if required.

4.1.3 A portable eyewash must be within 10 seconds from work area if there is a potential for chemical or debris to get into eyes.

4.1.4 Personnel will have completed PCB Awareness Training and avoid direct skin contact with samples or soil material if potential exists for exposure to PCB contaminated material.

4.1.5 Personnel shall be aware of the potential for chemical hazards in the area and shall evacuate the area and notify supervision if he or she suspects chemical exposure, such as: strange smell, vapor cloud, burning or itching sensation, spill of unknown liquid, broken lines or damage to equipment that may contain hazardous chemicals.

4.1.6 Personnel shall be made familiar with the hazards associated with exposure to volatile organic compounds (VOCs), specifically, trichloroethylene (TCE) and vinyl chloride (VCL).

4.1.7 Respiratory protection shall be required when direct read BZ monitoring detects exposure levels greater than the action limits or data show exposure levels at or above action limits.

4.1.8 An Excavation or Penetration Permit is required for all sample locations where penetration is required to a depth greater than six inches below ground surface.

4.1.9 **If** refusal to advance the sampling device is encountered before the required sample depth is reached, **then** the location will be moved and reattempted.

4.1.10 **If** refusal to advance the sampling device is encountered after three attempts, **then** the location will be abandoned and will **NOT** be sampled.

4.1.11 Personnel should avoid manual handling of waste containers when possible. If a waste container must be moved, the preferred methods for movement are to use a forklift, drum cart or drum dolly.

4.1.12 Personnel shall contact Waste Management for proper management and/or storage of waste and ensure hazardous and non-hazardous waste is segregated.

4.2 Limitations

4.2.1 **If** collecting samples for PFAS parameters, **then** consult sampling guidelines discussed in CP5-TS-1000, *Per- and Polyfluoroalkyl Substances Sampling Guidelines*. Chg B

4.2.2 Soil samples collected for Volatile Organic Compounds (VOC) analysis will always be collected first, regardless of the sampler used, to minimize loss of volatiles due to disturbance and off-gassing.

4.2.3 **If** the VOC soil sample is **NOT** collected, labeled, and shipped in the sampler (such as, thin-walled tube or insert), **then** the preferred collection method is to use an EnCore® or equivalent sampler.

4.2.4 The breakthrough time of Supreno EC Microflex Nitrile gloves is 2 hours for TCE. Personnel shall **NOT** use Supreno EC Microflex Nitrile gloves more than 2 hours after contact with TCE contaminated liquid or soil.

4.2.5 The breakthrough time of Showa 730 gloves is 4 hours for TCE. Personnel shall **NOT** use Showa 730 gloves for more than 4 hours after contact with TCE contaminated liquid or soil.

5.0 PREREQUISITES

5.1.1 Review the SAP/SAEP or WP for the sampling methods and equipment to be used, and reference to any photos, maps or figures that indicate or show proposed soil sampling locations, methods to be used, type, and number of soil samples to be collected.

5.1.2 Notify Radiological Control (RADCON) **and** Safety & Health personnel before initiating sampling to determine required surveys **and** monitoring requirements for Radiological Work Permit (RWP) **and** Industrial Hygiene Work Plan (IHWP).

5.1.3 The project shall provide all data that is available to IH for review of know concentrations of VOCs in the area (if needed):

A. **If** an IHWP is required based on evaluation, **then** specific controls and PPE will be listed for the specific soil location to be sampled.

B. **If** an IHWP is not required based on evaluation from IH, **then** follow General PPE Guidelines below:

- Company Issued Clothing
- Ear Plugs
- Face Shield
- Hard Hats (posted area/during rig work/when overhead hazards exist)
- Safety Glasses w/ Side Shields
- Steel-toe Boots
- Cut resistant or leather gloves for handling items with sharp edges or corners
- High Viz Clothing (when working around roadways and heavy equipment)
- Chemical Resistant Gloves: Supreno EC Microflex Nitrile or Showa 730 gloves
- Single layer Tychem 5000 Apron and sleeves or Silver Shield Apron and sleeves (if more than incidental body contact with TCE contaminated liquid or soil is expected)

5.1.4 Obtain an Excavation or Penetration Permit according to CP3-EN-0227, Trenching, Excavation and Penetration Permit, for all sample locations where penetration is required to a depth greater than six inches below ground surface.

5.1.5 Obtain chain-of-custody forms, field sample logs, sample labels, and custody seals as necessary from Sample Management Office (SMO).

5.1.6 **If** required, **then** prior to beginning work, read and sign off on the RWP, task specific JHA and/or IHWP.

5.1.7 Request removal of concrete, pavement, or any other overlay before soil sample collection.

5.1.8 Ensure the site is clear of vegetation to ensure worker safety by minimizing trip hazards.

5.1.9 Label sample containers with known information before collection of the sample according to CP3-ES-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals.*

5.1.10 As needed, use a plastic sheet as a ground cover for staging equipment and/or materials, as necessary, to prevent equipment from contacting potentially contaminated surfaces.

6.0 INSTRUCTIONS

6.1 General Sampling Requirements

Sampler.

6.1.1 **If** sampling a container, **then** visually inspect each container for obvious signs of pressurization, such as bulged lids or escaping gases **and if** a container exhibits sings of pressurization , **then** stop work, leave the area immediately **and** notify PSS, Front Line Manager (FLM), IH and Safety Manager.

6.1.2 **If** sampling a container**, then** open each container individually according to CP3-WM-1017, *Safe Handling and Opening of Sealed Containers*, one at a time and close the container before opening the next.

6.1.3 Manage waste according to CP3-WM-1037, *Generation and Temporary Storage of Waste Materials*.

NOTE:
Rinsate blanks are **NOT** required when using disposable sampling equipment.

6.1.4 Collect the number **and** type of Quality Control (QC) samples as specified in the SAP/SAEP or WP.

6.1.5 Prepare QC samples according to CP4-ES-2704, *Trip, Equipment and Field Blank Preparation*.

6.1.6 Prepare field logbooks, data forms, and other records according to CP3-ES-2700, *Sample and Miscellaneous Data Forms.* Chg B

6.1.7 Ensure sampling tools and equipment are decontaminated and ready for use according to CP4-ES-2702, *Decontamination of Sampling Equipment and Devices*.

6.1.8 Ensure sampling tools and equipment are protected from sources of contamination by wrapping in aluminum foil, sealing in plastic or other storage containers, or placing on plastic sheeting in staging area.

6.1.9 Ensure disposable sampling equipment is new and unused.

6.1.10 Ensure only new and certified precleaned sample containers are used for each sampling event.

6.1.11 **If** decontamination of equipment will be necessary during the sampling event, **then** prepare a decontamination area in proximity to the area to be sampled.

NOTES:

In general, proposed environmental soil sampling locations are designated before the sampling event and approximately located using a Global Positioning System (GPS) device or other suitable method, or civil surveyed and temporarily marked with a labeled survey pin flag, survey stake, or survey paint.

RADCON and/or Safety personnel survey sample locations as necessary before sampling.

6.1.12 Locate proposed sample points using photos, maps, or figures from the SAP/SAEP or WP for guidance before sample collection.

6.1.13 **If** method and sample equipment are specified in SAP/SAEP or WP **then** collect the sample using the defined method and sample equipment.

6.2 Soil Sample Site Preparation

NOTE:

Protective groundcover may be required when powered equipment such as drill rigs, direct push rigs, pneumatic hammers, and manually controlled mechanical or hydraulic earth drills are used to reach the required sample depth and collect the soil samples.

6.2.1 Prepare the area around the proposed sample location by laying down plastic sheeting or an equivalent material as groundcover to contain Investigation-Derived Waste (IDW) and prevent contact with potentially transferable contaminants.

6.2.2 Cut a hole in the plastic sheeting of sufficient size to access the sample point.

6.2.3 Remove surface vegetation and debris from the sample point if necessary with a stainless steel or Teflon® coated spade.

6.3 VOC Sampling Requirements

6.3.1 Reference the associated SAP/SAEP or WP for specific VOC sampling methods.

NOTES:

When the EnCore® sampler piston is fully deployed, the winged stem is turned using the slot found in the handle to lock the piston in place.

Three EnCore® or equivalent samples are collected to represent one sampling point. Any deviation is recorded in the field logbook or data form, and on the Chain-of-Custody (COC) form.

6.3.2 Use the EnCore®, or equivalent sampler, and sample container to collect the VOC sample(s) following the current EnCore® or equivalent sample collection and sampling procedure.

NOTE:

Any deviations are to be recorded in the field logbook or data form, and on the COC form.

6.3.3 **If** coarse-grained soil prevents the use of the EnCore® or equivalent sampler for VOC sample collection, **then** use a clean spoon or spatula and directly transfer the sample into the sample container.

6.3.4 Minimize the headspace by completely filling the VOC sample container with soil.

6.4 Soil Sampling with a Trier, Spoon, Trowel, or Scoop

6.4.1 For soil sample collection at grade, along test pit, trench, excavation sidewalls, or bottom, use a Stainless steel, Teflon®-coated or Teflon® spoon or scoop to remove the layer of soil that may have been disturbed and in contact with the spade, heavy equipment bucket, or grader blade.

6.4.2 Place soil IDW on groundcover when sampling at grade.

NOTE:

A trowel may be used to cut a block of soil sample if the SAP/SAEP or WP requires a description and sampling of an undisturbed soil profile.

Geologist/Sampler

6.4.3 **If** requested, **then** document the undisturbed sample according to CP4-ES-2303, *Borehole Logging*, **or** record on field sampling data sheet, before sample processing for analysis.

NOTES:

A trier sampler may be used to collect a core of soil that is fine-grained and cohesive.

A trier sampler is well suited for collecting soil samples from a test pit, trench, or excavation sidewalls and bottoms when the test pit, trench, or excavation can be safely entered and exited for sample collection or when the sample points can be safely accessed without entry by using an extension rod connected to the trier sampler.

Sampler

6.4.4 Use a decontaminated stainless steel trier or a Teflon®-coated or stainless steel trowel, scoop, scoopula, spoon, or spatula to collect the soil sample and place in a stainless steel, glass, Teflon®, or disposable bowl.

6.4.5 Process each sample according to Section **6.8**.

6.4.6 Before backfilling each sample point, record the depth from which the sample was taken.

NOTE:

Use of soil generated during sample collection for backfill is only permitted when the Regional Gravel Aquifer (RGA) has **NOT** been penetrated.

6.4.7 Backfill the sample location to grade, if appropriate, using soil IDW generated during sample collection as specified in the SAP/SAEP or WP.

6.4.8 **If** the location is to be civil surveyed, **then** label and stake the location using a survey pin flag, survey stake, or survey paint, and record the information.

6.4.9 Repeat Steps **6.4.1** through **6.4.8** until all soil samples have been collected at the sample site.

6.5 Manual Sampling Using an Auger

> WARNING:
>
> Hand auger attachments and equipment must be handled properly to prevent injury to personnel.
>
> Personnel must ensure that proper connections and couplings are made on the hand auger.
>
> It may be necessary to auger down several times and remove soil from the borehole to reach the desired sample depth.

6.5.1 Use a manual auger or a manually controlled mechanical or hydraulic earth drill to advance the auger to the desired depth.

6.5.2 Carefully stage excess IDW soil from the auger bucket or solid auger flights on the plastic sheeting to prevent the spread of contaminants.

6.5.3 Attach a decontaminated auger bucket on the sampler insertion equipment and insert into the borehole.

6.5.4 Avoid hitting the borehole wall while inserting the auger bucket to minimize sidewall sloughing and the possibility of cross contamination.

6.5.5 Mark sampler insertion equipment for a reference point.

6.5.6 Rotate the auger to collect the sample and carefully retrieve the full bucket.

6.5.7 Remove the soil sample from the auger bucket using a stainless steel, Teflon®-coated, or Teflon® spoon or spatula to collect the required sample and place in a stainless steel, glass, Teflon® or a disposable bowl for mixing.

6.5.8 Process sample according to Section **6.8**.

> NOTE:
>
> Use of soil generated during sample collection for backfill is only permitted when the RGA has **NOT** been penetrated.

6.5.9 Backfill the borehole to grade using soil IDW generated during sample collection or other approved material as specified in the SAP/SAEP or WP.

6.5.10 **If** the location is to be civil surveyed, **then** label and stake the location using a survey pin flag, survey stake, or survey paint, and record the information.

6.5.11 Repeat Steps **6.5.1** through **6.5.10** until all soil samples have been collected at the sample location.

6.6 Sampling Using a Thin-Walled Tube Sampler

NOTES:

A drill or direct push rig or hand operated auger may be used to reach the top of the interval to be sampled at the location.

The thin-walled sampler is pushed through the bottom of the borehole to collect the sample and the core is extracted from the borehole.

The undisturbed sample is normally described according to CP4-ES-2303, before soil sample collection.

6.6.1 Advance the borehole to the desired sample depth using the method specified in the SAP/SAEP or WP before collecting the sample.

NOTE:

Depending on the method used, it may be necessary to clear and remove soil from the borehole several times to reach the desired sample depth.

6.6.2 Stage excess soil IDW on the plastic sheeting to prevent the spread of contaminants and/or cross contamination.

6.6.3 Assemble the thin-walled sampler and attach to sampler insertion equipment (reference SAP/SAEP or WP).

6.6.4 Carefully lower the thin-walled sampler and insertion equipment to the bottom of the borehole.

6.6.5 Avoid hitting the borehole wall while inserting the sampler to minimize sidewall sloughing and the possibility of cross contamination.

6.6.6 Mark manual sampler insertion equipment for a reference point.

6.6.7 Rest the dead weight of the rods and sampler on the bottom of the borehole.

6.6.8 Position a drive device on the sampling rods.

6.6.9 Shove, twist, push, or pound the tube holder into the soil using the specified method in the SAP/SAEP or WP until the tube is full or refusal to advance the sampler is met.

6.6.10 Carefully retract sampler and sample insertion equipment from the borehole to minimize loss of soil from the thin-walled tube and disassemble.

6.6.11 **If** the collection tube will be used as the sample container, **then** immediately cover both ends of the tube with Teflon® film or microcrystalline wax and cap.

6.6.12 **If** the tube will **NOT** be used as the sample container, **then** proceed to Step **6.6.15**.

6.6.13 Label the top and bottom end of the tube and indicate which end is to be opened at the laboratory.

NOTE:

Do **NOT** use electrical tape to tape end caps.

6.6.14 Use silicone tape to tape both end caps to ensure retention before shipping tube to the laboratory.

6.6.15 Process sample according to Section **6.8**.

NOTE:

Use of soil generated during sample collection for backfill is only permitted when sampling has **NOT** penetrated the RGA.

6.6.16 Backfill the borehole to grade using soil IDW generated during sample collection or other acceptable material as specified in the SAP/SAEP or WP.

6.6.17 **If** the location is to be civil surveyed, **then** label and stake the location using a survey pin flag, survey stake, or survey paint, **and** record the information.

6.6.18 Repeat Steps **6.6.1** through **6.6.17** until all soil samples have been collected at the sampling location.

6.7 Sampling Using a Split-Barrel or MacroCore® Sampler

6.7.1 Advance the borehole to the desired sampling depth using the method specified in the SAP/SAEP or WP.

6.7.2 Stage excess soil IDW on the plastic sheeting to prevent spread of contamination.

NOTE:

It may be necessary to clear and remove soil from the borehole several times to reach the desired sampling depth.

6.7.3 Carefully remove the drilling or penetration device from the borehole and stage excess IDW soil on the plastic sheeting to prevent cross contamination.

6.7.4 After reaching the sampling depth, install the split spoon or MacroCore® sampler (with or without liner or insert) on the drill rods and reinsert into the borehole when ready to sample.

6.7.5 Avoid hitting the borehole wall while reinserting to minimize sidewall sloughing and the possibility of cross contamination.

6.7.6 Mark sampler insertion equipment for a reference point.

6.7.7 Position the driving device on the sample insertion equipment.

6.7.8 Rest the dead weight of the sampler, sample insertion rod, and hammer on the bottom of the borehole.

6.7.9 Power or manually drive the sampler into the soil.

6.7.10 When using standard penetration test equipment to drive the sampler, mark the drill rods in successive 6-inch increments to observe advancement of the sampler.

6.7.11 Advance the split-barrel sampler the required distance (generally 18 inches) with blows from the 140-pound hammer.

NOTE:

Generally, refusal to advance is indicated if more than 50 blows are required to advance the sampler 6 inches.

6.7.12 Count and record the number of blows applied for each 6-inch increment of sampler advancement.

6.7.13 Carefully retrieve and open the sampler and remove tube, if used, from the borehole.

6.7.14 Remove disturbed material in the upper end of the sample tube using a stainless steel or Teflon®-coated spatula or spoon and if the collection tube will be used as the sample container, then immediately cover both ends of the tube with Teflon® film and cap.

NOTE:

Do **NOT** use electrical tape to tape end caps.

6.7.15 Use silicone tape to tape both end caps to ensure retention before shipping tube to the laboratory.

6.7.16 **If** the tube will **NOT** be used as the sample container, **then** process the sample according to Section **6.8**.

NOTE:

Use of soil generated during sample collection for backfill is only permitted when sampling has **NOT** penetrated the RGA.

6.7.17 Backfill the borehole to grade using soil IDW generated during sample collection or another acceptable material as specified in the SAP/SAEP or WP.

6.7.18 **If** the location is to be civil surveyed, **then** label **and** stake the location using a survey pin flag, survey stake, or survey paint, **and** record the information.

6.7.19 Repeat Steps **6.7.1** through **6.7.17** until all soil core samples have been collected at the sampling location.

6.8 Soil Sample Processing

NOTES:

The type of soil sample collected may be a discrete sample or a composite sample. Each of these sample types are processed to ensure a sample is collected that is representative of the source material and meets data quality objectives given in the SAP/SAEP or WP.

Compositing of samples is **NOT** an acceptable means of collecting samples to be analyzed for VOCs.

6.8.1 Handle soil samples for VOC analysis according to Section **6.3**.

NOTE:

Stainless steel or glass bowls are **NOT** to be used in the collection of VOC samples.

6.8.2 Collect the soil in a stainless steel or glass bowl as follows unless directed otherwise by the SAP/SAEP or WP.

NOTE:

Plastic may be used instead of stainless steel or glass for sampling if samples are being analyzed by field laboratory [such as, polychlorinated biphenyl (PCB) test kits, X-ray fluorescence (XRF)].

Chg B

6.8.3 Collect soil aliquots in the same manner and of generally equal proportion.

NOTES:

A stainless steel or glass bowl and stainless steel spoon function well for compositing purposes.

The most common method of compositing is referred to as quartering.

Quartering is repeated several times until the sample is adequately mixed.

If round bowls are used for sample mixing, then adequate mixing is achieved by stirring the material in a circular fashion, reversing direction, and occasionally turning the material over.

6.8.4 Ensure aliquots are well mixed to ensure the sample is representative of the source material:

- Divide the sample material into quarters and mix each quarter individually.
- Mix two quarters together thoroughly to form halves.
- Mix the two halves together thoroughly to form a representative composite sample.

6.8.5 Transfer soil samples into sample containers, using appropriate equipment (i.e., stainless steel or Teflon® spoon, spatula, or disposable scoop) and securely tighten lid.

6.8.6 Store sample containers in a cooler with ice or blue ice to maintain the preservation temperature as required.

6.8.7 Record all field observations and sampling methods according to CP3-ES-2700.

Chg B

6.9 Vegetation Sampling with a Spoon, Trowel, or Scoop

6.9.1 For vegetation sampling choose the most appropriate sampling technique to perform sampling.

NOTE:

Vegetation sampling can vary greatly. Sampling techniques could include spoon, scoop, trowel, gloved hand, scissors, or other equipment.

6.9.2 Use a decontaminated sampling device to collect the vegetation sample.

6.9.3 Place vegetation sample in a container.

6.9.4 Repeat steps **6.9.1** through **6.9.3** until all vegetation samples have been collected at the sample site.

6.9.5 Record any remaining information on the sample label.

6.9.6 Seal sample containers and affix custody seals according to CP4-ES-2708.

6.9.7 Store sample containers in a cooler with ice or blue ice to maintain the preservation temperature as required.

6.9.8 Record all field observations and sampling methods according to CP3-ES-2700. Chg B

7.0 ACCEPTANCE CRITERIA

None

8.0 POST PERFORMANCE WORK ACTIVITIES

8.1 Pickup **and** bag any plastic sheeting, trash, and other disposable supplies before moving to the next sample location.

8.2 Remove all rope, barriers, placards, etc. used to secure the area.

8.3 As necessary, request survey of sample containers from radiological areas.

8.4 Contact the transportation specialist for guidance before transporting samples, contaminated equipment, tools, and supplies on public roads.

8.5 Ensure all equipment is decontaminated according to CP4-ER-2701, *Large Equipment Decontamination,* or CP4-ES-2702, before radiological survey out and demobilization from the site.

8.6 Manage waste generated during soil sampling activities according to CP3-WM-1037.

8.7 Complete COC forms according to CP4-ES-2708.

8.8 Release samples **and** related COC documentation for shipment to an off-site laboratory.

8.9 Handle **and** decontaminate reusable sampling equipment, tools, or supplies according to CP4-ES-2702.

9.0 RECORDS

9.1 Records Generated

The following records may be generated by this procedure:

- Field Logbook Entries
- Data Form Entries

Forms are to be completed according to CP3-OP-0024, *Forms Control*.

9.2 Records Disposition

Chg B

The records are to be maintained according to CP3-RD-0010, *Records Management Process*.

Appendix A – Acronyms/Definitions

ACRONYMS

ASTM – American Society for Testing and Materials

COC – Chain of Custody

D&R- Deactivation & Remediation

DOE - U.S. Department of Energy

GPS - Global Positioning System

IDW - Investigation-Derived Waste

IHWP – Industrial Hygiene Work Plan

JHA – Job Hazard Analysis

PCB - Polychlorinated Biphenyl

PFAS – Per- and Polyfluoroalkyl Substances

Chg B

QC – Quality Control

RGA – Regional Gravel Aquifer

RADCON – Radiological Control

RWP – Radiological Work Permit

SAP/SAEP - Sampling and Analysis Plan or Sampling and Analysis Even Plan

SMO – Sample Management Office

VOC – Volatile Organic Compounds

WP – Work Package

XRF – X-ray Fluorescence

DEFINITIONS

Composite Sample – A sample that consists of a number of discrete soil samples collected from a body of material and mixed before analysis. The objective of soil sample compositing is to represent the average condition of the sampled soil.

Discrete Sample – A sample collected from one specific horizon and vertical interval (usually 6 inches) that is not mixed with soil aliquots from other locations.

Direct Push – Direct push sampling involves pushing a small-diameter hollow steel rod into the ground to a selected depth and extracting a soil or groundwater sample, and can be used in most materials that can be augured or sampled with a split spoon. It can be attached to cone penetrometer rods and driven into the soil with hydraulic rams.

Appendix A – Acronyms/Definitions (continued)

Hollow-Stem Auger Drill Rig - The hollow-stem auger column rotates as it drills into the ground and is designed to push soil up and out of the borehole along the outside of the auger. The auger itself is driven either mechanically or by a hydraulically-powered drill rig. A plug is placed through the auger to prevent soil from rising through the hollow portion of the stem. Samples are retrieved by retracting the plug and lowering the sampler (e.g., split spoon w/ tube insert, thin-walled tube collection tube through the auger and driving or pushing the sampler to capture the sample).

Manually Controlled Mechanical Or Hydraulic Earth Drills - A mechanically or hydraulically powered portable drilling unit whose position, orientation, location, and direction is controlled by one or more operators.

Manually Operated Auger – Manually operated augers consist of an auger bit, a solid or tubular drill rod, and a "T" handle. When the drill rod is threaded, extensions can be added or auger bits interchanged. The auger tip drills into the ground as the handle is rotated, and soil retained on the auger tip is brought to the surface and may be used as the soil sample. Alternately, augers can be used to bore to the desired sampling depth, and a tube sampler used for collection. Auger diameters typically range between 1 and 4 inches. Augers normally are used in conjunction with metal shafts 3 to 4 feet in length and T-handles.

Pneumatic Hammer - A pneumatic hammer (jackhammer) is a portable percussive-drill, operated by compressed air and can be used to drive samplers, install drive points, drill rock, break up pavement, etc. It works in the manner of a hammer by jabbing but not by rotating.

Push Or Drive Samplers - Pushed or driven samplers penetrate into the soil without rotation and may be used for obtaining disturbed samples of most soils.

Split Spoons - Split spoons are tubes constructed of high strength alloy steel with a tongue and groove arrangement running the length of the tube, allowing it to be split in half. The two halves are held together by a threaded drive head assembly at the top, and a hardened shoe at the bottom, with a beveled cutting tip. The sampler can be driven manually or by a 140-pound weight dropped through a 30-inch interval.

Test Pits - Test pits are used for exposing and sampling the subsurface soil section. The test pit must be large enough to allow detailed description of the material in situ and allow soil sampling for undisturbed samples. In plan view the test pit will be square, rectangular, or circular.

Test Trenches - Test trenches are used to perform a function similar to test pits, but offer the distinct advantage of a continuous exposure of the continuity and character of the subsurface soil section. Test trenches may be excavated with backhoes, trackhoes, or bulldozers depending upon the required size and depth of the trench.

Thin-Walled Samplers - The thin-walled open sampler consists of a tube affixed to a sampler head assembly, which may or may **NOT** be equipped with a check valve. Thin-walled tubes are sharpened on one end and, therefore, may be easily damaged by buckling or by blunting or tearing of the cutting edge as they are driven into stiff or coarse soils. To reduce the potential for damage, the tube should be pushed rather than driven. The basic principle of operation of the thin-walled sampler is to force the cylindrical tube into the soil in one continuous push without rotation.

Appendix A – Acronyms/Definitions (continued)

Trier - A hand-operated trier consists of a tube that has been cut in half, a solid or tubular drill rod, and a "T" handle. When the drill rod is threaded, extensions can be added for extended reach. The tip of the trier is sharpened which allows the sampler to cut into soil.