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JUN 2 4 2014

PPPO-02-2333246-14

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Division of Waste Management
Kentucky Department for Environmental Protection
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Frankfort, Kentucky 40601

Ms. Jennifer Tufts
Federal Facility Agreement Manager
U.S. Environmental Protection Agency, Region 4
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Atlanta, Georgia 30303

Dear Mr. Mullins and Ms. Tufts:

TRANSMITTAL OF THE ADDENDUM TO THE WORK PLAN FOR THE SOILS OPERABLE UNIT REMEDIAL INVESTIGATION/FEASIBILITY STUDY AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY, REMEDIAL INVESTIGATION 2, SAMPLING AND ANALYSIS PLAN (DOE/LX/07-0120&D2/R2/A1)

Enclosed for your review and approval is the certified *Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2, Sampling and Analysis Plan*, DOE/LX/07-0120&D2/R2/A1. The approach included in this work plan was scoped by the Federal Facility Agreement (FFA) parties during scoping meetings held in March and April 2014. As agreed to by the FFA parties, the Quality Assurance Project Plan (QAPP) worksheets from the original work plan were used to develop the addendum. Modifications consistent with the scoping meetings discussions only were made to the QAPP worksheets necessary to define the field sampling for this subsequent remedial investigation (RI), known as Soils Operable Unit (OU) RI 2. As a result, many of the QAPP worksheets from the original work plan did not require modification because the scope of the Soils OU RI 2 did not affect their content. Because both the modified and non-modified QAPP worksheets have been included as part of the addendum, the U.S. Department of Energy (DOE) requests that the FFA parties focus their review of the QAPP portion of the addendum to the revision 2 QAPP worksheets dated June 2014 (Worksheets 1, 2, 9, 10, 11, 12-11, 12-12, 13, 14, 15-6, 16, 18, 20, 21, 23, 26, 28, and 30). A redline version of the modified QAPP worksheets has been provided to assist with your review.

As a result of additional funding received in fiscal year 2014, this project is working to an accelerated schedule, as discussed in the February FFA Managers meeting. In order to meet the accelerated schedule, DOE requests a 30-day review of the A1 addendum. Based on this schedule, comments are requested no later than July 24, 2014.

If you have any questions or require additional information, please contact Lisa Santoro at (270) 441-6804.

Sincerely,

William E. Murphie
Manager
Portsmouth/Paducah Project Office

Enclosures:
1. Certification Page
2. *Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2, Sampling and Analysis Plan*
3. Redlined QAPP Worksheets

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CERTIFICATION

Document Identification: ***Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2, Sampling and Analysis Plan*, DOE/LX/07-0120&D2/R2/A1**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

LATA Environmental Services of Kentucky, LLC

Mark J. Duff, Paducah Project Manager

6-23-14
Date Signed

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U.S. Department of Energy

William E. Murphie, Manager
Portsmouth/Paducah Project Office

6/24/14
Date Signed

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Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2 Sampling and Analysis Plan

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Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2 Sampling and Analysis Plan

Date Issued—June 2014

Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
LATA ENVIRONMENTAL SERVICES OF KENTUCKY, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-10CC40020

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ACRONYMS

AOC	area of concern
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOECAP	DOE Consolidated Audit Program
DQO	data quality objective
EDD	electronic data deliverable
EPA	U.S. Environmental Protection Agency
ES&H	environment, safety, and health
FFA	Federal Facility Agreement
FIDLER	field instrument for the detection of low energy radiation
FS	feasibility study
GC	gas chromatography
GWS	gamma walkover survey
KDEP	Kentucky Department for Environmental Protection
LATA Kentucky	LATA Environmental Services of Kentucky, LLC
MBWA	Management by Walking Around
MDL	method detection limit
MS	mass spectrometry
N/A	not applicable
NFA	no further action
OREIS	Oak Ridge Environmental Information System
OU	operable unit
PCB	polychlorinated biphenyl
PEGASIS	Portsmouth/Paducah Project Office Environmental Geographic Analytical Spatial Information System
PGDP	Paducah Gaseous Diffusion Plant
PQO	project quality objective
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
QL	quantitation limit
RI	remedial investigation
SAP	Sampling and Analysis Plan
SAR	SWMU assessment report
SMO	Sample Management Office
SOP	standard operating procedure
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TBD	to be determined
UFP	Uniform Federal Policy
VOC	volatile organic compound
XRF	X-ray fluorescence

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EXECUTIVE SUMMARY

This *Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2, Sampling and Analysis Plan* is comprised of the Quality Assurance Project Plan (QAPP) worksheets necessary to define the field sampling for this subsequent remedial investigation (RI), known as Soils Operable Unit (OU) RI 2. Sixteen solid waste management units (SWMUs)/areas of concern (AOCs), listed in Table ES.1, were determined to require additional characterization subsequent to the Soils OU RI to delineate the extent of contamination at the Paducah Gaseous Diffusion Plant (PGDP). These SWMUs/AOCs are subject to a remedial investigation/feasibility study (RI/FS). The Sampling and Analysis Plan (SAP) describes how additional sampling will be performed and supplements the approved RI/FS Work Plan for the Soils OU, which was completed in June 2010 (DOE 2010). Information not included in this SAP should be referenced from the June 2010 RI/FS Work Plan. Deviations to the June 2010 RI/FS Work Plan are documented in this addendum.

The data collected from this sampling effort will be used to conduct a Baseline Human Health Risk Assessment and a Screening Ecological Risk Assessment. To be consistent with the approved RI/FS Work Plan, project action limits have been set to the child resident no action limits (at an excess lifetime cancer risk of 1E-6 and/or hazard index of 0.1) found in *Methods for Conducting Risk Assessments and Risk Evaluation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/OR/07-1506&D2/V1. Data gaps to be addressed at each of the SWMUs/AOCs are listed in Table ES.1. SWMUs that were recommended for deferral to other OUs also are noted in this addendum.

Table ES.1. Soils OU RI 2 SWMUs/AOCs

SWMU/ AOC	Location	Description	Data Gap
13	C-746-P&P1	P&P1 Scrap Yards	Extent of affected surface soil undefined
15	C-746-C	C Scrap Yard	Extent undefined to the east
16	C-746-D	D Scrap Yard	Deferred to Soils and Slabs OU
26	C-400 to C-404	4-inch Underground Transfer Line	Extent of affected surface soil undefined
47	C-400	Tc-99 Storage Tank Area	Deferred to Soils and Slabs OU
56	C-540-A	PCB Staging Area	To be evaluated with SWMU 80
74	C-340	Transformer Spill Site	Deferred to Soils and Slabs OU
77	C-634-B	Sulfuric Acid Storage Tank	Nature and extent undefined
80	C-540	PCB Spill Site	Vertical extent undefined, horizontal extent undefined south of road
204	Dyke Road	Historical Staging Area	Nature and extent undefined
211-A	C-720	TCE Spill Site Northwest	Extent undefined to the south and west
224	C-340	DMSA OS-13, empty drum storage	No additional sampling required; previous sampling to be included in RI Report
225	C-533-1	DMSA OS-14, rail cars	225-A: Nature and extent undefined 225-B: Nature and extent defined; to be included in Phase 2 RI Report
226	C-745-B	DMSA OS-15	Deferred to Soils and Slabs OU
229	C-746-F	DMSA OS-18	Extent undefined to the south and east
565	North of C-611 Water Treatment Plant	Rubble Area K	Extent undefined to the north

Samples will be analyzed for the same parameters as in the first RI. This SAP summarizes the information known about the SWMUs/AOCs and describes how the additional investigation will fill the data gaps and support remedial decision making.

SWMU 27 and SWMU 1 were not included as part of the 16 deferred SWMUs/AOCs and therefore are not listed in Table ES-1; however, the units are included within the scope of this work plan. SWMU 27, the C-722 Acid Neutralization Tank, will be further investigated as part of this subsequent investigation, as stated in the 2013 RI Report (DOE 2013a). The 2013 RI Report states, "Examination of the interior of the tank is necessary to support an NFA decision for SWMU 27. Future disposition of SWMU 27 will be based upon findings of the examination. The future disposition may include the following: alternative development in the FS, further sampling as part of the subsequent RI, or an NFA."

SWMU 1, C-747-C Oil Land Farm, currently is being remediated as part of the Southwest Plume source action. During the Southwest Plume source action, soil from the top 4 ft of the soil mixing area in SWMU 1 will be removed, stockpiled adjacent to the mixing area on a synthetic liner, covered with a liner to prevent erosion, and respread in the excavation after soil mixing action is complete. Because soils in the mixing area will be disturbed, the surface soils in that area will require recharacterization for use in the Soils OU. Surface soil sampling will occur following the completion of the source action once the soil has been respread. This sampling supports the requirement identified in the 2012 Remedial Design Support Investigation for SWMU 1 (DOE 2013b).

1. INTRODUCTION

This *Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2 Sampling and Analysis Plan* is comprised of the Quality Assurance Project Plan (QAPP) worksheets necessary to define the field sampling for this subsequent remedial investigation (RI), known as Soils Operable Unit (OU) RI 2. Sixteen solid waste management units (SWMUs)/areas of concern (AOCs), listed in Table 1, were determined to require additional characterization subsequent to the Soils OU RI to delineate the extent of contamination at the Paducah Gaseous Diffusion Plant (PGDP) (Figure 1). These SWMUs/AOCs are subject to a remedial investigation/feasibility study (FS). This Sampling and Analysis Plan (SAP) describes how additional sampling will be performed and supplements the approved RI/FS Work Plan for the Soils OU, which was completed in June 2010 (DOE 2010). Information not included in this SAP should be referenced from the June 2010 RI/FS Work Plan. Deviations to the June 2010 RI/FS Work Plan are documented in this section. A crosswalk of procedures listed in the June 2010 RI/FS Work Plan with current procedures is provided in Appendix B.

Table 1. Soils OU SWMUs/AOCs Identified for Further Characterization

SWMU/ AOC	Location	Description	Data Gap
13	C-746-P&P1	P&P1 Scrap Yards	Extent of affected surface soil undefined
15	C-746-C	C Scrap Yard	Extent undefined to the east
16	C-746-D	D Scrap Yard	Deferred to Soils and Slabs OU
26	C-400 to C-404	4-inch Underground Transfer Line	Extent of affected surface soil undefined
47	C-400	Tc-99 Storage Tank Area	Deferred to Soils and Slabs OU
56	C-540-A	PCB Staging Area	To be evaluated with SWMU 80
74	C-340	Transformer Spill Site	Deferred to Soils and Slabs OU
77	C-634-B	Sulfuric Acid Storage Tank	Nature and extent undefined
80	C-540	PCB Spill Site	Vertical extent undefined, horizontal extent undefined south of road
204	Dyke Road	Historical Staging Area	Nature and extent undefined
211-A	C-720	TCE Spill Site Northwest	Extent undefined to the south and west
224	C-340	DMSA OS-13, empty drum storage	No additional sampling required; previous sampling to be included in RI Report
225	C-533-1	DMSA OS-14, rail cars	225-A: Nature and extent undefined 225-B: Nature and extent defined; to be included in Phase 2 RI Report
226	C-745-B	DMSA OS-15	Deferred to Soils and Slabs OU
229	C-746-F	DMSA OS-18	Extent undefined to the south and east
565	North of C-611 Water Treatment Plant	Rubble Area K	Extent undefined to the north

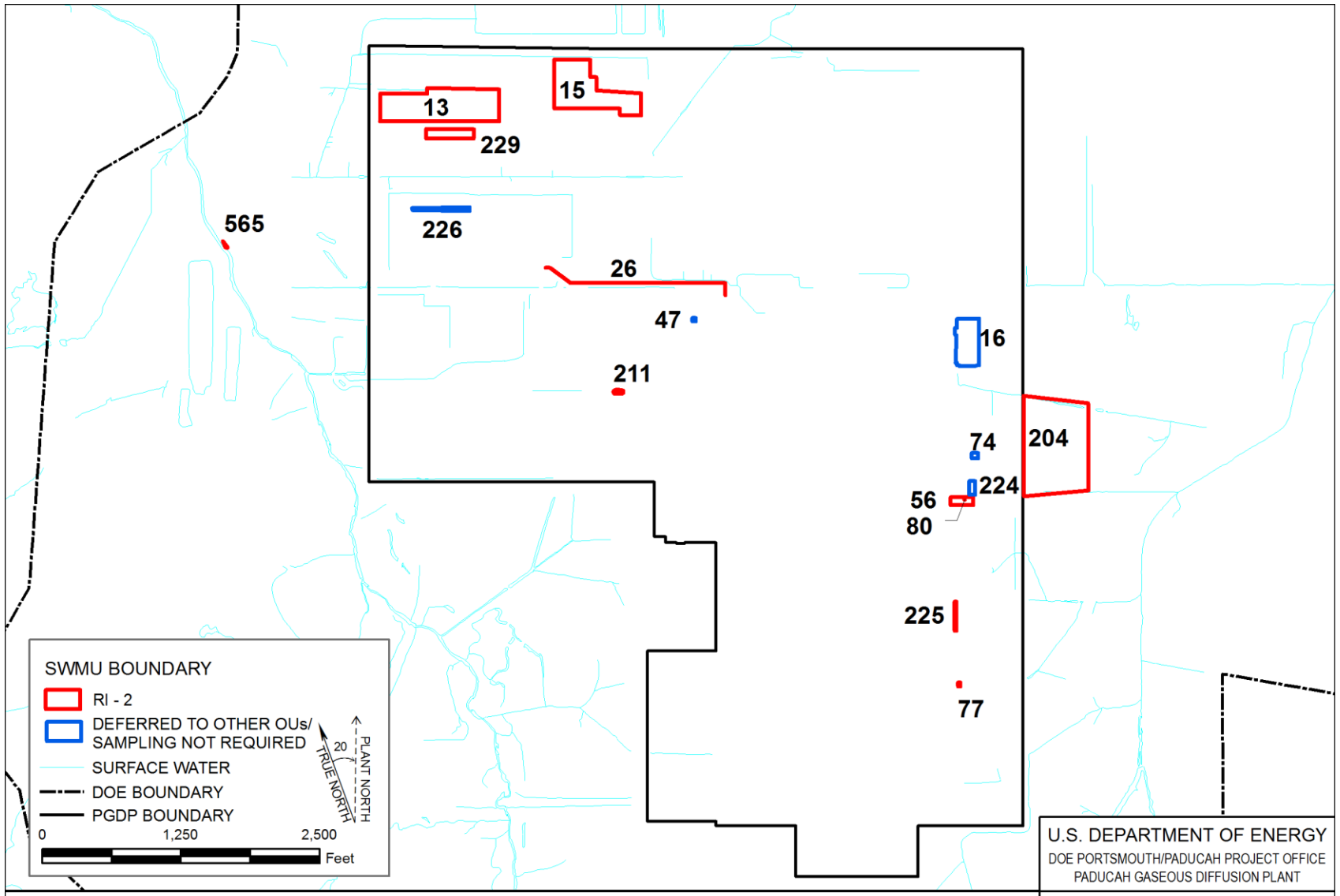

Figure 1. Soils OU RI 2 SWMUs/AOCs

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1.1 SWMUs SAMPLED UNDER THIS WORK PLAN

SWMUs/AOCs sampled under this SAP are listed below and are further described in QAPP Worksheet #10, presented in Section 2. The sampling strategy is detailed in Section 9 of the June 2010 RI/FS Work Plan (DOE 2010).

SWMU 13	C-746-P&P1 Scrap Yards
SWMU 15	C-746-C Scrap Yard
SWMU 26	C-400 to C-404 4-inch Underground Transfer Line
SWMU 56	C-540-A PCB Staging Area
SWMU 77	C-634-B Sulfuric Acid Storage Tank
SWMU 80	C-540 PCB Spill Site
AOC 204	Historical Staging Area
SWMU 211-A	C-720 TCE Spill Site Northwest
SWMU 225-A	DMSA OS-14, rail cars
SWMU 229	DMSA OS-18
AOC 565	Rubble Area K
SWMU 1	C-747-C Oil Land Farm
SWMU 27	C-722 Acid Neutralization Tank

1.2 SWMUs DEFERRED TO OTHER OPERABLE UNITS OR DO NOT REQUIRE ADDITIONAL SAMPLING

The Federal Facility Agreement (FFA) parties participated in site walkdowns and project scoping meetings during March and April 2014. As a result, the parties identified SWMUs for deferral to other OUs and SWMUs that do not require additional sampling. The basis for these decisions is discussed within the SWMU-specific sections.

1.2.1 SWMU 16

SWMU 16 was deferred to this subsequent RI to further delineate the nature and extent of contamination. After a site walkdown by the FFA parties on March 10, 2014, the parties proposed to defer this unit to the Soils and Slabs OU on the basis that the conditions that existed during the initial RI that prohibited sampling activities have not changed.

Additionally, during the initial RI, SWMU 16 did not undergo a gamma walkover survey (GWS) using a field instrument for the detection of low energy radiation (FIDLER). The influence of radiation due to proximity to a cylinder yard would have prevented the ability to determine accurately if/where a sample would be required. Elevated gamma dose rate from the cylinder yard exhibits a positive bias on the walkover field instrument.

No characterization activities will be conducted for this unit during this field investigation and the unit will not be included in the RI report.

1.2.2 SWMU 47

This unit was deferred to this subsequent RI to further delineate extent of contamination to the south and west of the unit. After a site walkdown by the FFA parties on March 10, 2014, the parties proposed to defer SWMU 47 to the Soils and Slabs OU and the Decontamination and Decommissioning (D&D) OU on the basis that the unit is located directly next to the C-400 Building and could be recontaminated

during D&D of the building. No characterization activities will be conducted for this unit during this field investigation, and the unit will not be included in the RI report.

1.2.3 SWMU 74

This unit was deferred to this subsequent RI to further delineate nature and extent of contamination from the unit. After a site walkdown by the FFA parties on March 10, 2014, the parties proposed to defer SWMU 74 to the Soils and Slabs OU on the basis that the unit is located directly next to and includes a portion of the C-340 Building slab. No characterization activities will be conducted for this unit during this field investigation, and the unit will not be included in the RI report.

1.2.4 SWMU 226

This unit was deferred to this subsequent RI to further delineate extent of contamination to the east and west of the unit. After a site walkdown by the FFA parties on March 10, 2014, and further discussion during scoping, the parties proposed to defer SWMU 226 to the Soils and Slabs OU on the basis that the unit is located directly next to the C-745-B cylinder yard interfering with the GWS and the judgmental sample and could be recontaminated during D&D of the yard. No characterization activities will be conducted for this unit during this field investigation, and the unit will not be included in the RI report.

1.2.5 SWMU 224

SWMU 224 is considered adequately characterized, as determined in March 2014 scoping meetings between the FFA parties. Samples previously collected from the grid containing SWMU 224 (i.e., 224-001M, see Figure 2) will be used to define nature and extent and to perform a risk analysis. Existing contamination in the SWMU 224 area is assumed to be associated with SWMUs 56 and 80, which will be characterized further, as described in this addendum. This unit will be included in the RI report.

1.3 DEVIATIONS FROM THE JUNE 2010 SOILS OU RI/FS WORK PLAN

This work plan addendum describes how additional sampling will be performed for the previously mentioned Soils OU SWMUs/AOCs. Information not included in this SAP should be referenced from the June 2010 RI/FS Work Plan. Deviations to the June 2010 RI/FS Work Plan are documented in this section. Additional deviations are presented on a SWMU/AOC-specific basis in QAPP Worksheet #10 (Section 2).

1.3.1 Concrete and Asphalt

Previously, the work plan stated should any individual sample point within the grid be obstructed (such as by a building or concrete slab), then the nearest possible location will be substituted. If a suitable location (e.g., the entire quadrant of the grid) is not available, then the composite will consist of fewer than five points, as necessary. If an entire grid is obstructed, the composite sample will not be collected. In this addendum, concrete coring will be utilized to allow collection of soil samples below the concrete slabs for specific SWMUs/AOCs. If an entire grid is obstructed by concrete, soil sampling will begin immediately below the concrete. If the concrete is greater than 1-ft thick, then the 0 to 1 ft below ground surface (bgs) surface soil sample will not be collected because no surface soil, as defined during project scoping (i.e., 0–1 ft bgs), is present.

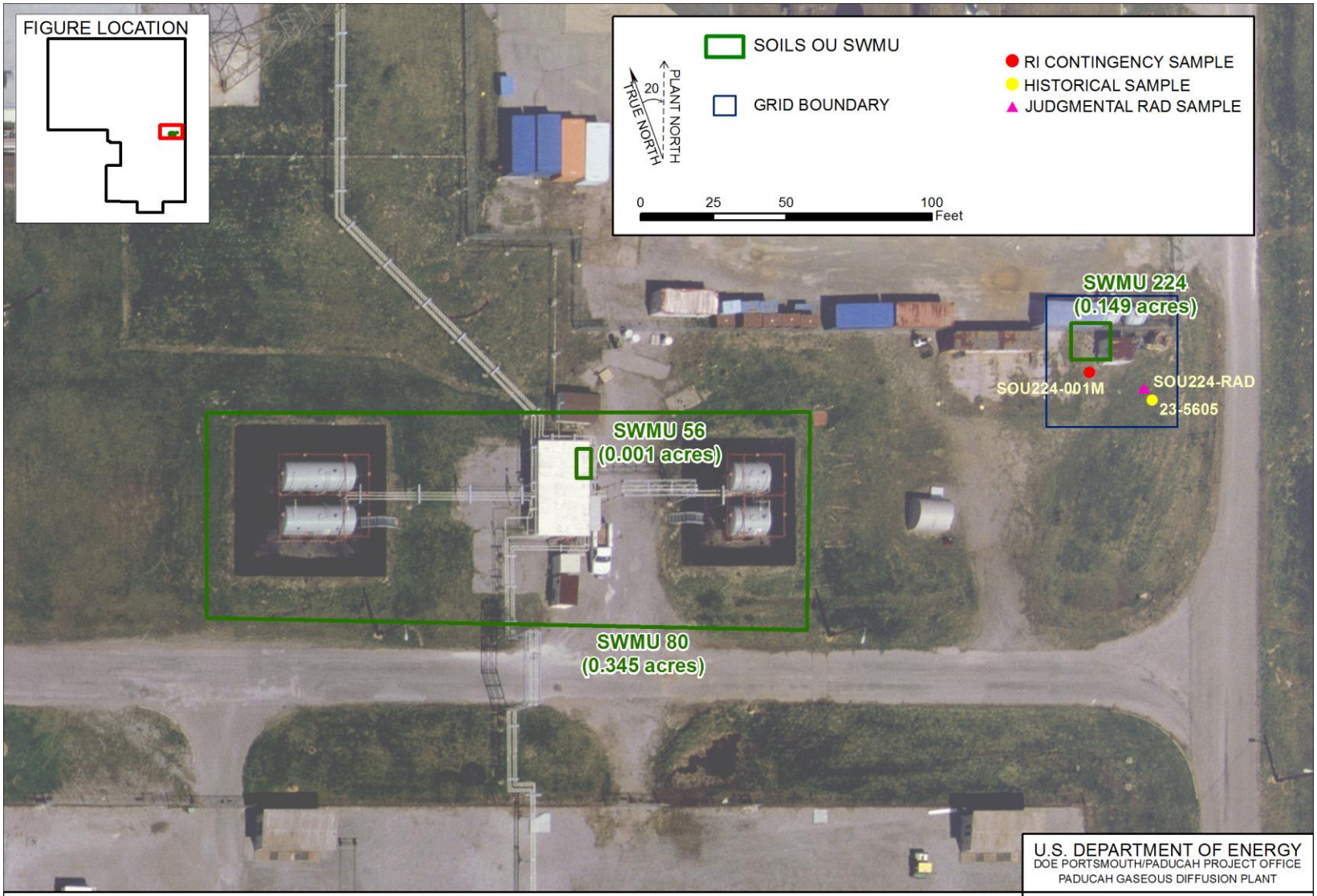

Figure 2. SWMU 224

1.3.2 Gamma Walkover Survey Judgmental Grab Sample

In the 2010 RI/FS Work Plan (DOE 2010), judgmental grab samples (soil) were collected from the location of the single highest count per minute reading from the GWS. For this addendum, the method for determining the location from which a judgmental grab sample will be collected differs and is described in Appendix A.

1.4 SWMU 225

The location of SWMU 225 was mapped incorrectly in the June 2010 RI/FS Work Plan (DOE 2010); as a result, an area to the west of the original SWMU location was sampled. Sampling results from the area indicate contamination. Based on this, SWMU 225 has been divided into SWMU 225-A and SWMU 225-B, where SWMU 225-A is the original SWMU location and SWMU 225-B is the new area located to the west. The characterization of SWMU 225-A is included within the scope of this addendum. SWMU 225-B was previously sampled during the 2010 RI; therefore, additional sampling will not be conducted at this unit. Data previously collected for SWMU 225-B will be included in the Soils OU Phase II RI Report.

1.5 EXAMINATION OF SWMU 27

The *Soils Operable Unit Remedial Investigation Report at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-0325&D2/R1 (DOE 2013a), states the following regarding SWMU 27:

> Examination of the interior of the tank is necessary to support an NFA decision for SWMU 27. Future disposition of SWMU 27 will be based upon findings of the examination. The future disposition may include the following: alternative development in the FS, further sampling as part of the subsequent RI, or an NFA.

During field activities under this subsequent RI, SWMU 27 will be further investigated. The underground tank will be breached and an initial observation will be conducted to determine if the tank contains any material (i.e., concrete, sludge, liquid, etc.). If the tank has been filled with soil or concrete, the tank will be resealed and the unit will be recommended for a no further action (NFA) decision. If the tank has not been filled, an examination of the interior will be conducted using a recording device (i.e., camera, scope, etc.). If the tank is determined to contain sludge or liquid, a sample of the material will be collected and analyzed for metals, radionuclides, polychlorinated biphenyls (PCBs), volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs). The examination and analytical results will be documented in an addendum to the Soils OU Phase I RI Report (DOE 2013a). Based on the examination and analytical data, if available, the future disposition may include alternative development in an FS or an NFA.

All work related to SWMU 27 will be performed in a manner that prevents the risk of bodily harm to employees, other project personnel, and the general public and avoids damage to property or the environment. In 1989, a sludge sample collected from the tank was found to contain 365 mg/kg mercury. In 1992, sludge in the tank was removed and the sample collected indicated that the sludge contained trichloroethene, 1,1,1-trichloroethane, PCBs, total uranium, and technetium-99 (DOE 1999). Requirements will be followed for safe and compliant work associated with metals contamination, radiological contamination, PCB contamination, and other identified or unidentified hazards associated with this examination. In addition, federal and state environment, safety, and health (ES&H) regulations applicable to the examination will be implemented during the course of this work. Proper ES&H controls

and monitoring shall be in place during the opening, examining, sampling, if required, and sealing of the tank. An activity hazard analysis/work control document will be developed to detail ES&H and compliance provisions beyond those established in the June 2010 RI/FS Work Plan.

1.6 RECHARACTERIZATION OF SWMU 1

SWMU 1, C-747-C Oil Land Farm, currently is being remediated as part of the Southwest Plume source action. During the Southwest Plume source action, soil from the top 4 ft of the soil mixing area in SWMU 1 to be mixed will be removed, stockpiled adjacent to the mixing area on a synthetic liner, covered with a liner to prevent erosion, and respread in the excavation after soil mixing action is complete. Because soils in the mixing area will be disturbed, the surface soils in that area will require recharacterization for use in the Soils OU. Surface soil sampling will occur following the completion of the source action once the soil has been respread. This sampling supports the requirement identified in the 2012 Remedial Design Support Investigation for SWMU 1 (DOE 2013b).

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2. QUALITY ASSURANCE PROJECT PLAN

The worksheets that follow are taken from the approved June 2010 RI/FS Work Plan. Updates have been made to necessary worksheets and are denoted with a revision number and revision date in the page header. For QAPP Worksheet #15, method detection limits (MDLs) and quantitation limits (QLs) may change based on the laboratory that is contracted for the Soils OU project. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #1
Title Page

UFP-QAPP Manual Section 2.1:

Document Title: *Quality Assurance Project Plan (QAPP) for the Remedial Investigation/Feasibility Study (RI/FS) for Soils Operable Unit Field Investigation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Lead Organization: U.S. Department of Energy (DOE)

Preparer's Name and Organizational Affiliation: Contractor

Preparer's Address, Telephone Number, and E-mail Address: 761 Veterans Avenue, Kevil, KY, 42053; (270) 441-5000

Preparation Date (Day/Month/Year): 06/2014

Document Control Number: DOE/LX/07-0120&D2/R2/A1

LATA Kentucky Environmental Remediation Project Manager	Signature Mark J. Duff	Date: 6-19-14
LATA Kentucky Regulatory Manager	Signature Myrna Espinosa Redfield	Date: 6/18/14
LATA Kentucky Environmental Monitoring Manager	Signature Lisa Crabtree	Date: 6/18/14

QAPP Worksheet #2
QAPP Identifying Information

UFP-QAPP Manual Section 2.2.4:
Site Name/Project Name: Paducah Gaseous Diffusion Plant
Site Location: Paducah, Kentucky
Site Number/Code: KY8890008982
Contractor Name: LATA Environmental Services of Kentucky, LLC
Contractor Number: DE-AC30-10CC40020
Contract Title: Paducah Gaseous Diffusion Plant Paducah Environmental Remediation Project
Work Assignment Number: N/A

1. Identify guidance used to prepare QAPP:

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Implementing Environmental Quality Systems, Version 2.0, 126 pages.

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Quality Assurance Project Plans: Part 1 UFP QAPP Manual, Version 1.0, 177 pages (DTIC ADA 427785 or EPA-505-B-04-900A).

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Quality Assurance Project Plans: Part 2A UFP QAPP Worksheets, Version 1.0, 44 pages.

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Quality Assurance Project Plans: Part 2B Quality Assurance/Quality Control Compendium: Minimum QA/QC activities, Version 1.0, 76 pages.

2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant*, DOE/OR/07-1707 (FFA)

3. Identify approval entity: DOE, EPA Region 4, and Kentucky Department for Environmental Protection (KDEP)

4. Indicate whether the QAPP is a generic or a project-specific QAPP (circle one).

5. List dates of scoping sessions that were held: March 2014 and April 2014

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

6. List dates and titles of QAPP documents written for previous site work, if applicable:

Title:	**Approval Date:**
Data and Documents Management and Quality Assurance Plan for Paducah Environmental Management and Enrichment Facilities, DOE/OR/07-1595&D2 (DOE 1998)	10/5/1998
Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0120&D2/R2) (DOE 2010)	10/6/2010
Paducah Gaseous Diffusion Plant Programmatic Quality Assurance Project Plan (DOE/LX/07-1269&D2/R1)	5/14/2013

7. List organizational partners (stakeholders) and connection with lead organization:
DOE, EPA Region 4, KDEP

8. List data users: DOE, LATA Environmental Services, LLC, (LATA Kentucky), subcontractors, EPA Region 4, KDEP

9. If any required QAPP elements and required information are not applicable to the project, then indicate the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion here.

Required QAPP Element(s) and Corresponding QAPP Section(s)	**Required Information**	**Worksheet No.**	**Crosswalk to Related Documents**
Project Management and Objectives			
2.1 Title and Approval Page	- Title and Approval Page	1	
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	2	
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	3 4	

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Worksheet No.	Crosswalk to Related Documents
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	5 6 7 8	
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	9 10	
2.6 Project Quality Objectives (PQOs) and Measurement Performance Criteria 2.6.1 Development of PQOs Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	11 12	
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13	
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	14 15 16	

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Worksheet No.	Crosswalk to Related Documents
Measurement/Data Acquisition			
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/Standard Operating Procedures (SOP) Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	17/18/19/20 21 22	
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	23 25	
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	26 27	

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Worksheet No.	Crosswalk to Related Documents
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- Quality Control (QC) Samples Table - Screening/Confirmatory Analysis Decision Tree	28	
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	29 30	
Assessment/Oversight			
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	31 32	
4.2 Quality Assurance (QA) Management Reports	- QA Management Reports Table	33	.
Data Review			
5.1 Overview	Introductory Statement	34	
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	34 35 36 37	
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining	Not applicable	Not applicable	

QAPP Worksheet #3
Distribution List

UFP-QAPP Manual Section 2.3.1:

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
The QAPP is submitted as a section of the RI/FS Work Plan; thus, it will be included on the RI/FS Work Plan distribution list.	N/A	N/A	N/A	N/A	N/A	N/A

N/A = not applicable

QAPP Worksheet #4-1
Project Personnel Sign-Off Sheet

UFP-QAPP Manual Section 2.3.2
Organization: Contractor

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Contractor	ER/EM Director	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Project Manager	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Quality Assurance Manager	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Task Lead	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Environmental Engineer	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Environmental Compliance and Protection Lead	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Environmental Sampling Lead	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	QA Specialist	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Health and Safety Representative	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Waste Coordinator	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A

N/A = not available

QAPP Worksheet #4-2
Project Personnel Sign-Off Sheet

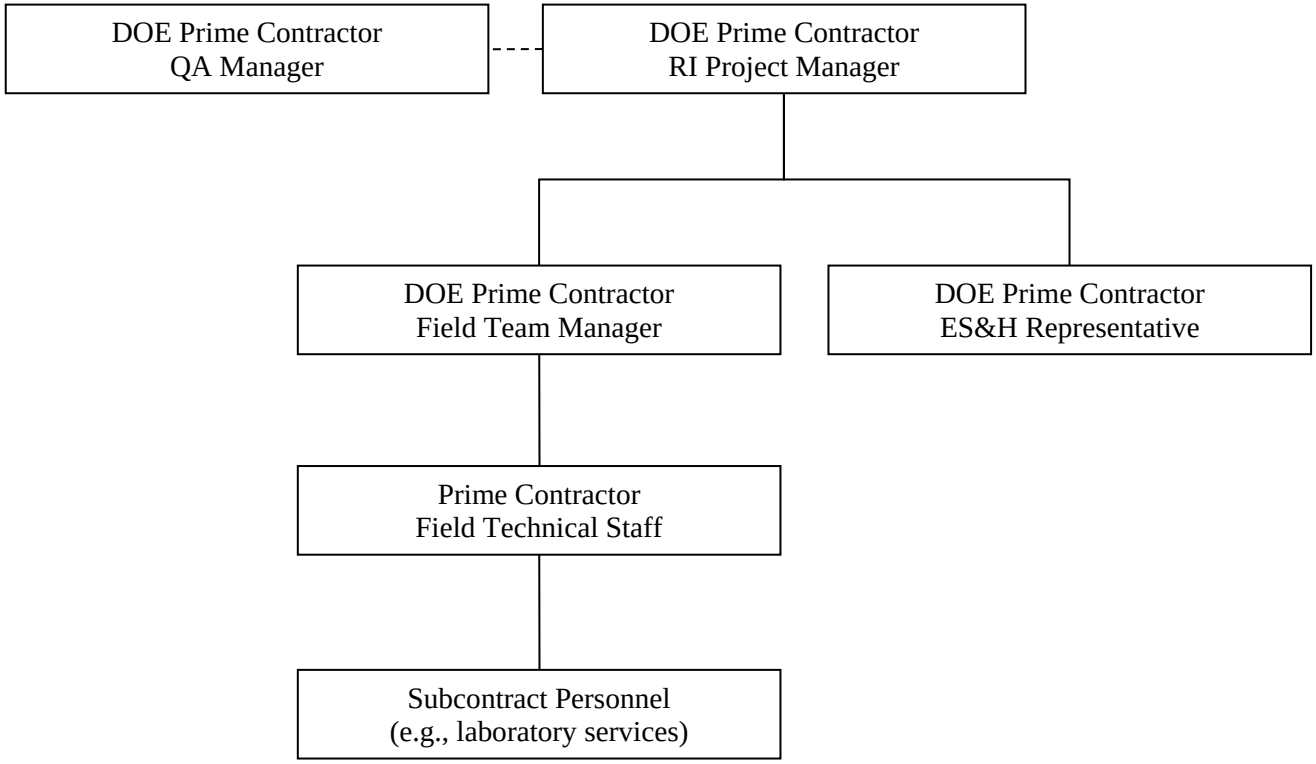
Organization: Contractor/Subcontractor

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
N/A	N/A	N/A	N/A	N/A

N/A = not applicable

QAPP Worksheet #5
Project Organizational Chart

UFP-QAPP Manual Section 2.4.1



QAPP Worksheet #6
Communication Pathways

UFP-QAPP Manual Section 2.4.2:

Note: Formal communications across company or regulatory boundaries occur via letter. Other forms of communication such as e-mail, verbal, meetings, etc., will occur throughout the project.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Federal Facility Agreement, DOE/OR/07-1707 (PRS-035)	DOE Paducah Site Lead	N/A	N/A	All formal communication among DOE, EPA, and the Kentucky Department for Environmental Protection
Federal Facility Agreement, DOE/OR/07-1707 (PRS-035)	DOE Paducah Environmental Restoration Project Manager	N/A	N/A	All formal communications between DOE and Contractor for Environmental Restoration Projects
All Project Requirements	Prime Contractor Site Manager	N/A	N/A	All formal communication between Contractor and DOE
All Project Requirements	Contractor ER/EM Director	N/A	N/A	All communications between the project and the Site Manager
All Project Requirements	Contractor ER/EM Deputy Director	N/A	N/A	All communications between the project and the Site Manager
All Project Requirements	Contractor Project Manager	N/A	N/A	All communication between the project and the ER/EM Director
Project Quality Assurance Requirements	Contractor QA Manager	N/A	N/A	All quality related communications between the QA Department and the ER/EM Director
Project Quality Assurance Requirements	Contractor QA Specialist	N/A	N/A	All project quality related communications between the QA Department and the Contractor Project Manager
FFA Compliance	Contractor FFA Project Manager	N/A	N/A	All internal communication regarding FFA compliance with the Contractor Project Manager
Sampling Requirements	Contractor Environmental Sampling Lead	N/A	N/A	All internal communication regarding field sampling with the Contractor Project Manager
Analytical Laboratory Interface	Contractor Lab Coordinator	N/A	N/A	All communication between Contractor and analytical laboratory
Waste Management Requirements	Contractor Waste Coordinator	N/A	N/A	All internal communication regarding waste project waste management with the Contractor Project Manager

QAPP Worksheet #6
Communication Pathways (continued)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Environmental Compliance Requirements	Contractor Environmental Compliance Lead	N/A	N/A	All internal correspondence regarding environmental requirements and compliance with the Contractor Project Manager
Subcontractor Requirements (if applicable)	Contractor Senior Subcontract Administrator	N/A	N/A	All correspondence between the project and subcontractors, if applicable
Health and Safety requirements	Contractor Health and Safety Representative	N/A	N/A	All internal communication regarding safety and health requirements with the Contractor Project Manager

N/A = not available, as personnel may change

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

UFP-QAPP Manual Section 2.4.3:

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
N/A	Paducah Site Lead	DOE	Overall site responsibility–liaison with EPA and Commonwealth of Kentucky	N/A
N/A	Paducah Environmental Restoration Project Manager	DOE	Environmental Restoration project responsibility	N/A
N/A	Paducah Site Manager (Acting)	Contractor	Contractor lead responsible for site	N/A
N/A	ER/EM Director	Contractor	Overall ER/EM project responsibility	N/A
N/A	Project Manager	Contractor	Overall soils/surface water responsibility	N/A
N/A	Quality Assurance Manager	Contractor	Overall project QA responsibility	N/A
N/A	Environmental Engineer	Contractor	Project coordination	N/A
N/A	Federal Facility Agreement Project Manager	Contractor	Project compliance with the FFA	N/A
N/A	Environmental Engineer	Contractor	Project SAP	N/A
N/A	Environmental Compliance and Protection Lead	Contractor	Project Environmental Compliance Protection responsibility	N/A
N/A	Environmental Sampling Lead	Contractor	Project Sampling responsibility	N/A
N/A	QA Specialist	Contractor	Project QA responsibility	N/A
N/A	Health and Safety Representative	Contractor	Project Safety and Health Responsibility	N/A
N/A	Waste Coordinator	Contractor	Overall Project waste management responsibility	N/A
N/A	Data Validator	Independent, Third-Party Contractor	Performing fixed-base laboratory data validation according to specified procedures	N/A

N/A = not available, as personnel may change

QAPP Worksheet #8
Special Personnel Training Requirements Table

UFP-QAPP Manual Section 2.4.4:

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates[1]
There will be no specialized training required for this project. Training required for this project is standard training that personnel already have.	N/A	N/A	N/A	N/A	N/A	N/A

[1] If training records and/or certificates are on file elsewhere, document their location in this column. If training records and/or certificates do not exist or are not available, then this should be noted.
N/A = not applicable

QAPP Worksheet #9
Project Scoping Session Participants Sheet

UFP-QAPP Manual Section 2.5.1:

Project Name Soils Operable Unit Remedial Investigation/Feasibility Study Phase II **Projected Date(s) of Sampling** TBD **Project Manager** Jennifer Watson	**Site Name** Paducah Gaseous Diffusion Plant **Site Location** Paducah, KY
Date of Session: January 2014 **Scoping Session Purpose:** Discuss objectives and scope of project, work plan requirements, and deadlines	

Position Title	Affiliation	Name	Phone #	E-mail Address	Project Role
Radiation Safety and Emergency Programs Manager	LATA Kentucky	Kelly Ausbrooks	(270) 441-5123	kelly.ausbrooks@lataky.com	Technical support
Health Physicist	LATA Kentucky	John Volpe	(502) 330-0222	john_volpe@bellsouth.net	Technical support
Scientist	LATA Kentucky	LeAnne Garner	(270) 441-5436	leanne.garner@lataky.com	Document preparation
Project Manager	LATA Kentucky	Jennifer Watson	(270) 441-5293	jennifer.watson@lataky.com	Project management
Manager of Projects	LATA Kentucky	Craig Jones	(270) 441-5114	craig.jones@lataky.com	Project management
Regulatory Manager	LATA Kentucky	Myrna Redfield	(270) 441-5113	myrna.redfield@lataky.com	Compliance support
Environmental Management Manager	LATA Kentucky	Lisa Crabtree	(270) 441-5135	lisa.crabtree@lataky.com	Laboratory/data support
Waste Disposition Manager	LATA Kentucky	Mike Zeiss	(270) 441-5106	mike.zeiss@lataky.com	Waste support
Site Operations and Maintenance Manager	LATA Kentucky	Tim Fralix	(270) 441-5025	tim.fralix@lataky.com	Work controls support
Environmental Reporting and Deliverable Quality Manager	LATA Kentucky	Jennifer Blewett	(270) 441-5070	jennifer.blewett@lataky.com	Document production
Project Management Office	LATA Kentucky	Linda Kobel	(770) 364-0336	linda.kobel@lataky.com	PM support
Business Manager	LATA Kentucky	Mark Cauley	(270) 441-5011	mark.cauley@lataky.com	Business support

QAPP Worksheet #9
Project Scoping Session Participant Sheet (continued)

Name of Project: Sitewide Evaluation
Date of Session: March–April 2014
Scoping Session Purpose: Discuss objectives and scope of project, work plan requirements, and deadlines

Name	Affiliation	Phone #	E-mail Address
Jennifer Tufts	EPA	(404) 562-8513	tufts.jennifer@epa.gov
Jon Richards	EAP	(404) 562-8648	richards.jon@epa.gov
Todd Mullins	KDWM	(502) 564-8158	todd.mullins@ky.gov
Gaye Brewer	KDWM	(270) 898-8468	gaye.brewer@ky.gov
Nathan Garner	KYRHB	(502) 564-8390	nathan.garner@ky.gov
Stephanie Brock	KYRHB	(502) 564-8390	stephaniec.brock@ky.gov
Lisa Santoro	DOE	(270) 441-6804	lisa.santoro@lex.doe.gov
Rich Bonczek	DOE	(859) 219-4051	rich.bonczek@lex.doe.gov
Don Dihel	DOE	(270) 441-6824	don.dihel@lex.doe.gov
Dennis Greene	Pro2Serve	(270) 441-6851	dennis.greene@lex.doe.gov
Bobette Nourse	SMSI	(865) 712-2669	bobette.nourse@lex.doe.gov
Martin Clauberg	SMSI	(865) 259-7155	martin.clauberg@lex.doe.gov
Kelly Ausbrooks	LATA Kentucky	(270) 441-5123	kelly.ausbrooks@lataky.com
John Volpe	LATA Kentucky	(502) 330-0222	john_volpe@bellsouth.net
LeAnne Garner	LATA Kentucky	(270) 441-5436	leanne.garner@lataky.com
Jennifer Watson	LATA Kentucky	(270) 441-5293	jennifer.watson@lataky.com

QAPP Worksheet #10
Problem Definition

UFP-QAPP Manual Section 2.5.2:

The problem to be addressed by the project: The DOE, EPA, and Commonwealth of Kentucky have entered into an FFA agreement to investigate and, if warranted, remediate 86 areas (AOCs/SWMUs) of PGDP. The areas are listed in Section 1 of the RI/FS Work Plan. These investigations include collecting samples as noted in the work plan and analyzing the samples for field and laboratory analyses to identify the nature and extent of contamination. The soils in the various AOCs/SWMUs may have been contaminated through plant operations.

This addendum to the RI/FS Work Plan will address 12 SWMUs/AOCs identified during comment resolution of the Phase I RI report where data are absent or insufficient to fully characterize the nature and extent of contamination of the unit and to support remedy selection. The SWMUs/AOCs addressed by the addendum, their reason for deferal to a subsequent RI, and the activities to be performed are as follows. Maps showing sampling grids are presented following this table.

SWMU 13. This unit was deferred to this subsequent RI to further delineate the extent of contamination in surface soils. Activities to be conducted for this unit include a GWS and grid-based composite sampling of surface soil. Surface soil samples will be collected from 158 grids. Figure 3 shows a map of the sampling grids. Subsurface characterization was determined to be delineated adequately by the SWMU 13 site evaluation. The SWMU 13 site evaluation concluded that no Burial Ground OU response action is required at SWMU 13; therefore, it was removed from Burial Grounds OU, but retained as part of Soils OU for investigation of surface soils.

SWMU 15. This unit was deferred to this subsequent RI to further delineate the extent of lead contamination to the east of the unit related to grid 015-037. Activities to be conducted for this unit include a judgmental grab sample and grid-based composite sampling of surface and shallow subsurface soil. Soil samples will be collected from one grid. Figure 4 shows a map of the sampling grids. If stepouts are required based on the criteria established in Section 9 of the June 2010 RI/FS Work Plan, they will be placed only to the north and south of the grid; they will not cross the ditch to the west of the grid. No additional GWS is required for this unit. The location of the judgmental grab sample will be selected using existing survey data following the protocol established in Section 1.3.2 of this addendum.

SWMU 26. This unit was deferred to this subsequent RI to further delineate the extent of contamination in surface soils. The activity to be conducted for this unit includes grid-based composite sampling of surface soil. Surface soil samples will be collected from 35 grids. Figure 5 shows a map of the sampling grids. Sampling of the entire SWMU will be conducted with the exception of grids within the gravel lot of the C-752 waste facility, in the grids within the footprint of the C-404 Hazardous Waste Landfill, within the ditch previously sampled by the Surface Water OU, or along the northern side of the North-South Diversion Ditch. No additional GWS or judgmental grab sample is required for this unit.

SWMU 77. This unit was deferred to this subsequent RI to further delineate the nature and extent of contamination of the unit. The activity to be conducted for this unit includes grid-based composite sampling of surface and shallow subsurface soil will be collected from one grid. The five-

QAPP Worksheet #10
Problem Definition
(Continued)

UFP-QAPP Manual Section 2.5.2:

point composite will consist of two locations next to the pump station, two locations along the west wall of the unit, and one location within the grass area between the concrete pad and road on the east side of the unit. Figure 6 shows a map of the sampling grids. Analytical parameters for this unit will include pH. No additional GWS or judgmental grab sample is required for this unit.

SWMUs 56/80. This unit was deferred to this subsequent RI to further delineate the horizontal extend of PCBs and radionuclides south of the road and vertical extent of the unit. Activities to be conducted for this unit include a GWS and grid-based composite sampling of surface and shallow subsurface soil. Soil samples will be collected from 13 grids. One grid will be placed south of SWMU 224 encompassing the culvert. Three grids will be placed across the road to the south of the unit between the road and fence. One grid will be placed across the road to the east of the unit encompassing the culvert. These culverts and their associated ditches are not included under the SWOU. The remaining grids will encompass grid SOU080-002. No additional stepouts to the south with be implemented. Figure 7 shows a map of the sampling grids. A GWS will only be conducted at grid SOU080-002. The survey is being conducted to verify historical data from the Department of Justice location JP-0153. The survey data will be reviewed and discussed with EPA and KDEP to determine if further soil sampling is warranted.

AOC 204. This unit was deferred to this subsequent RI to further delineate the nature and extent of contamination of the unit. Activities to be conducted for this unit include a GWS and grid-based composite sampling of surface and shallow subsurface soil. The gamma walkover survey will be conducted in the northern portion of the unit between Outfall 010 and the wooded area within the unit. Soil samples will be collected from 186 grids. Figure 8 shows a map of the sampling grids. Sampling will not be conducted in the grids located in the removal action areas of Outfall 011 or in the areas along Outfall 010 previously sampled by the Surface Water OU.

SWMU 211-A. This unit was deferred to this subsequent RI to further delineate the extent of metal, PCBs, polycyclic aromatic hydrocarbons, and radionuclide contamination to the south and west of the unit related to grid SOU211-001G. Activities to be conducted for this unit include a judgmental grab sample and grid-based composite sampling of surface and shallow subsurface soil. Soil samples will be collected from eight grids. Sampling will follow the work plan except for the following:

- In grid SOU211-001G, samples will be collected from intervals 0 to 1 ft bgs, 1 to 4 ft bgs, and 4 to 7 ft bgs and analyzed for Total PCBs using PCB test kits. Additionally, sampling will extend below the defined 10 ft bgs in order to fully delineate the extent of PCBs found in the 7 to 10 ft bgs sample interval. Two additional soil intervals will be collected, 10 to 13 ft bgs and 13 to 16 ft bgs, and will be analyzed for Total PCBs using PCB test kits.

- The locations of the five-point composite for grid SOU211-001H are identified on Figure 9.

- All intervals (0 to 1 ft bgs, 1 to 4 ft bgs, 4 to 7 ft bgs, 7 to 10 ft bgs) will be sampled in grid 211-001J.

QAPP Worksheet #10
Problem Definition
(Continued)

UFP-QAPP Manual Section 2.5.2:

A potential stepout is to the west of grid SOU211-001J. Figure 9 shows a map of the sampling grids.

SWMU 224. SWMU 224 was previously sampled and received a GWS during the 2010 RI; therefore, additional sampling will not be conducted at this unit. Data previously collected for SWMU 224, as discussed in Section 1.2.5, will be included in the Soils OU Phase II RI Report.

SWMU 225-A. This unit was deferred to this subsequent RI to further delineate the nature and extent of contamination of the unit. The activity to be conducted for this unit includes surface soil sampling. The surface soil sample will consist of a 5-point composite from 0 to 6 inches bgs consistent with the sampling protocol for outside DOE Material Storage Areas (DMSAs) in the June 2010 RI/FS Work Plan collected at the gravel-soil interface next to the railroad. Figure 10 shows a map of the sampling grids. A GWS will not be conducted at this unit due to its proximity to a cylinder yard.

SWMU 225-B. SWMU 225-B was previously sampled during the 2010 RI; therefore, additional sampling will not be conducted at this unit. Data previously collected for SWMU 225-B will be included in the Soils OU Phase II RI Report.

SWMU 229. This unit was deferred to this subsequent RI to further delineate the extent of radionuclide contamination to the south and east of the unit. The activity to be conducted for this unit includes a GWS with one judgmental sample.

AOC 565. This unit was deferred to this subsequent RI to further delineate the extent of radionuclide contamination to the north of the unit. The activity to be conducted for this unit includes a GWS with one judgmental sample. The survey will encompass the area to the north, south, and east of the location exhibiting elevated readings from which a judgmental sample was collected previously.

Addtionally, this addendum will address SWMU 1 and SWMU 27.

SWMU 1. During the Southwest Plume VOC source area remedial action, soil from the top 4 ft of the soil mixing area in SWMU 1 to be mixed will be removed, stockpiled adjacent to the mixing area on a synthetic liner, covered with a liner to prevent erosion, and respread in the excavation after soil mixing action is complete. Because soils in the mixing area will be disturbed, the surface soils in that area will require recharacterization for use in the Soils OU. This sampling supports the requirement identified in the 2012 Remedial Design Support Investigation for SWMU 1 (DOE 2013b). The disturbed areas within the unit will be sampled using a grid-based composite technique. Only the Soils OU grids within the disturbed areas will be sampled. Approximately 28 grids will be sampled. The grids include SOU001-002, SOU001-003, SOU001-004, SOU001-005, SOU001-012, SOU001-013, SOU001-014, SOU001-015, SOU001-016, SOU001-017, SOU001-020, SOU001-021,

QAPP Worksheet #10
Problem Definition
(Continued)

UFP-QAPP Manual Section 2.5.2:

SOU001-023, SOU001-024, SOU001-025, SOU001-026, SOU001-027, SOU001-028, SOU001-029, SOU001-030, SOU001-031, SOU001-032, SOU001-033, SOU001-034, SOU001-035, SOU001-038, SOU001-039, and SOU001-040. Figure 11 shows a map of the sampling grids. Samples will be collected from the surface (0–1 ft bgs) and shallow subsurface (1–4 ft bgs). Samples will be submitted for field lab analysis of Resource Conservation and Recovery Act metals, plus uranium, by X-ray fluorescence (XRF) and Total PCB by PCB test kits. Ten percent of the samples will be submitted for fixed-base laboratory confirmation and analyzed for metals, PCBs, radionuclides, and SVOCs. No GWS will be performed. All results from these field activities will be reported in an addendum to the Soils OU Phase I RI Report (DOE 2013a).

SWMU 27. SWMU 27 will be examined and sampled, if required as stated in the Soils OU RI Report (DOE 2013a). Parameters will include metals, PCBs, radionuclides, SVOCs, and VOCs. All results from these field activities will be reported in an addendum to the Soils OU Phase I RI Report. Based on the examination and analytical data, if available, the future disposition may include alternative development in the Phase I FS or an NFA.

The environmental questions being asked: Are the AOCs/SWMUs contaminated and, if so, to what extent and with what contaminants?

Observations from any site reconnaissance reports: See SWMU Assessment Reports (SARs).

A synopsis of secondary data or information from site reports: See previously issued SARs for the areas to be addressed, Section 5 of the RI/FS Work Plan, and the Soils OU Phase I RI Report.

The possible classes of contaminants and the affected matrices:

See Section 5 of RI/FS Work Plan that provides information regarding the potential contaminants found within the soil matrices by AOC/SWMU.

The rationale for inclusion of chemical and nonchemical analyses: As noted in Sections 5 and 9 of the RI/FS Work Plan and the AOC/SARs, various chemical and radiological parameters will be analyzed to determine the nature and extent of contamination at each AOC/SWMU.

Information concerning various environmental indicators: Environmental indicators include metals, PCBs, and radiological parameters for PGDP contamination and are used as indicators for this project.

Project decision conditions ("If..., then..." statements): See Section 1 of the RI/FS Work Plan, which provides the data quality objectives (DQOs) (if…then…statements).

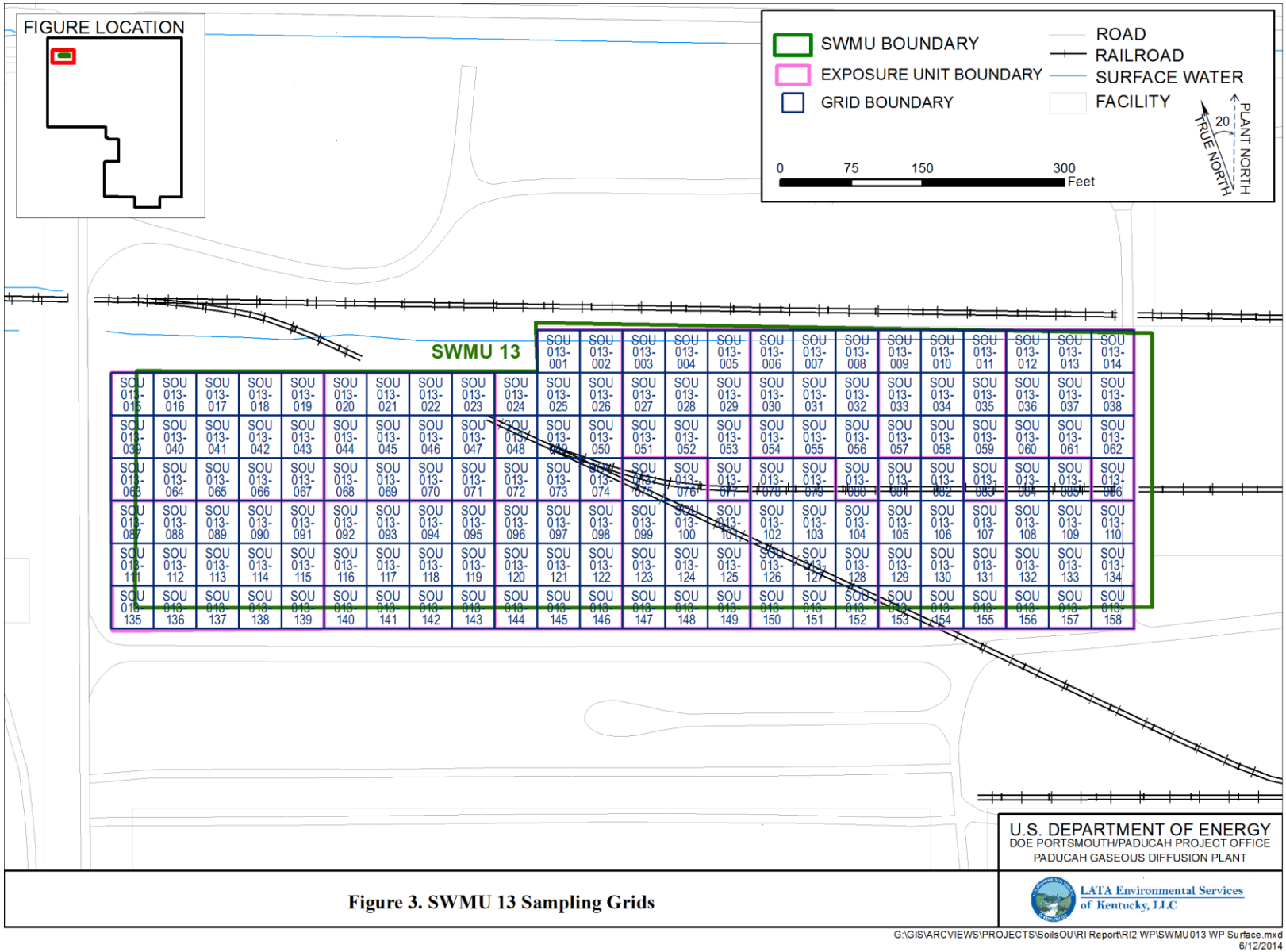


Figure 3. SWMU 13 Sampling Grids

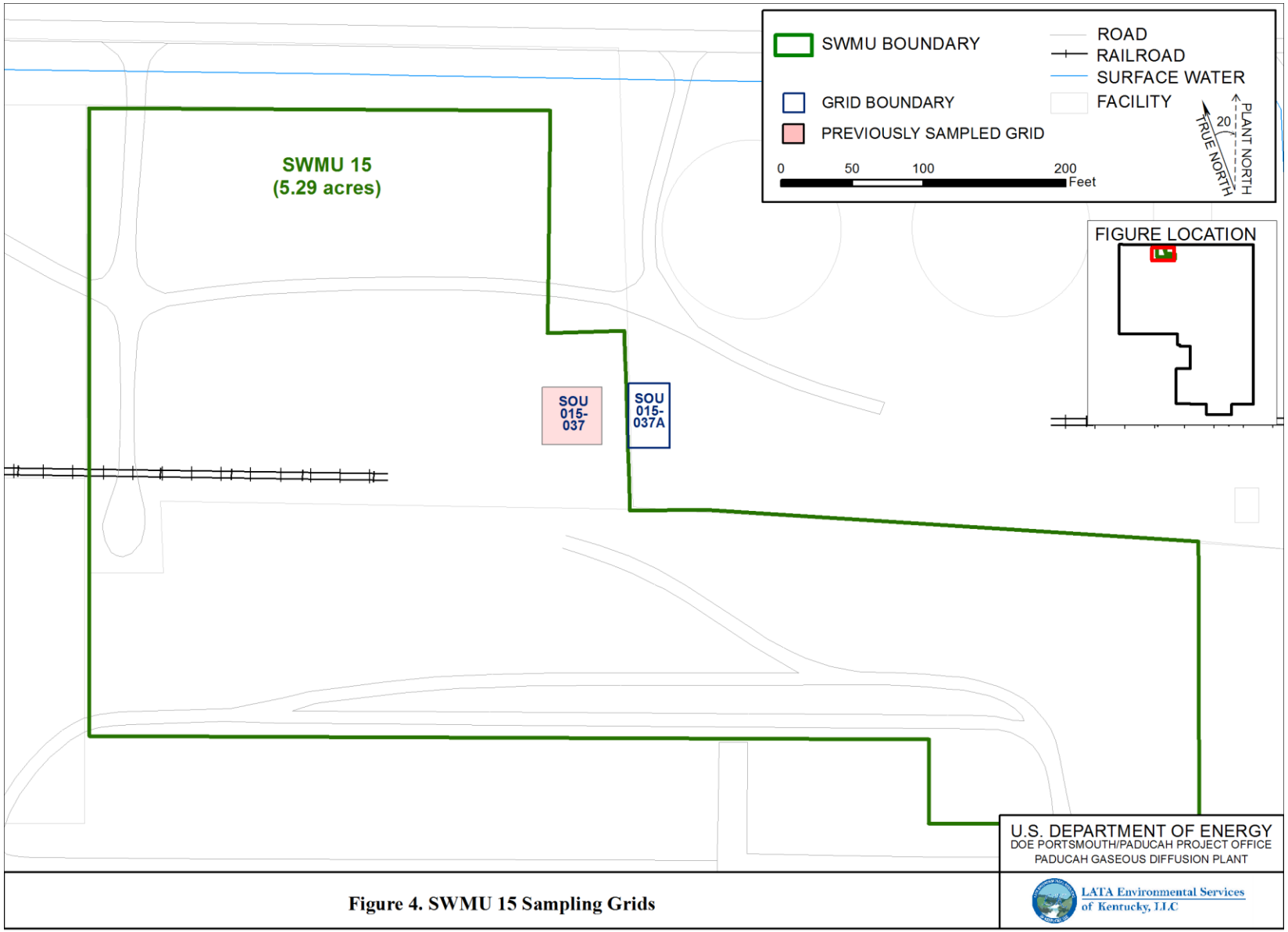


Figure 4. SWMU 15 Sampling Grids

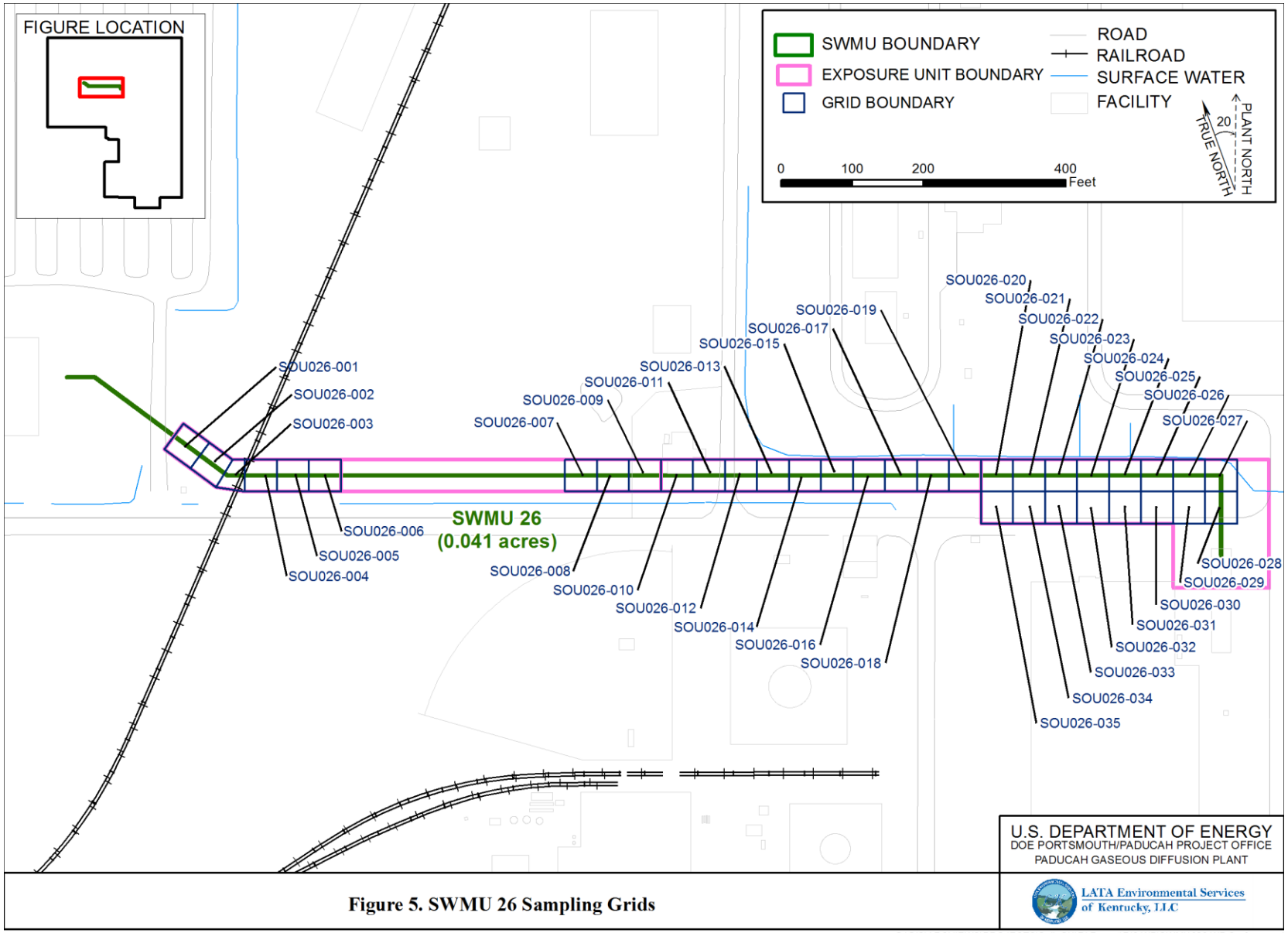


Figure 5. SWMU 26 Sampling Grids

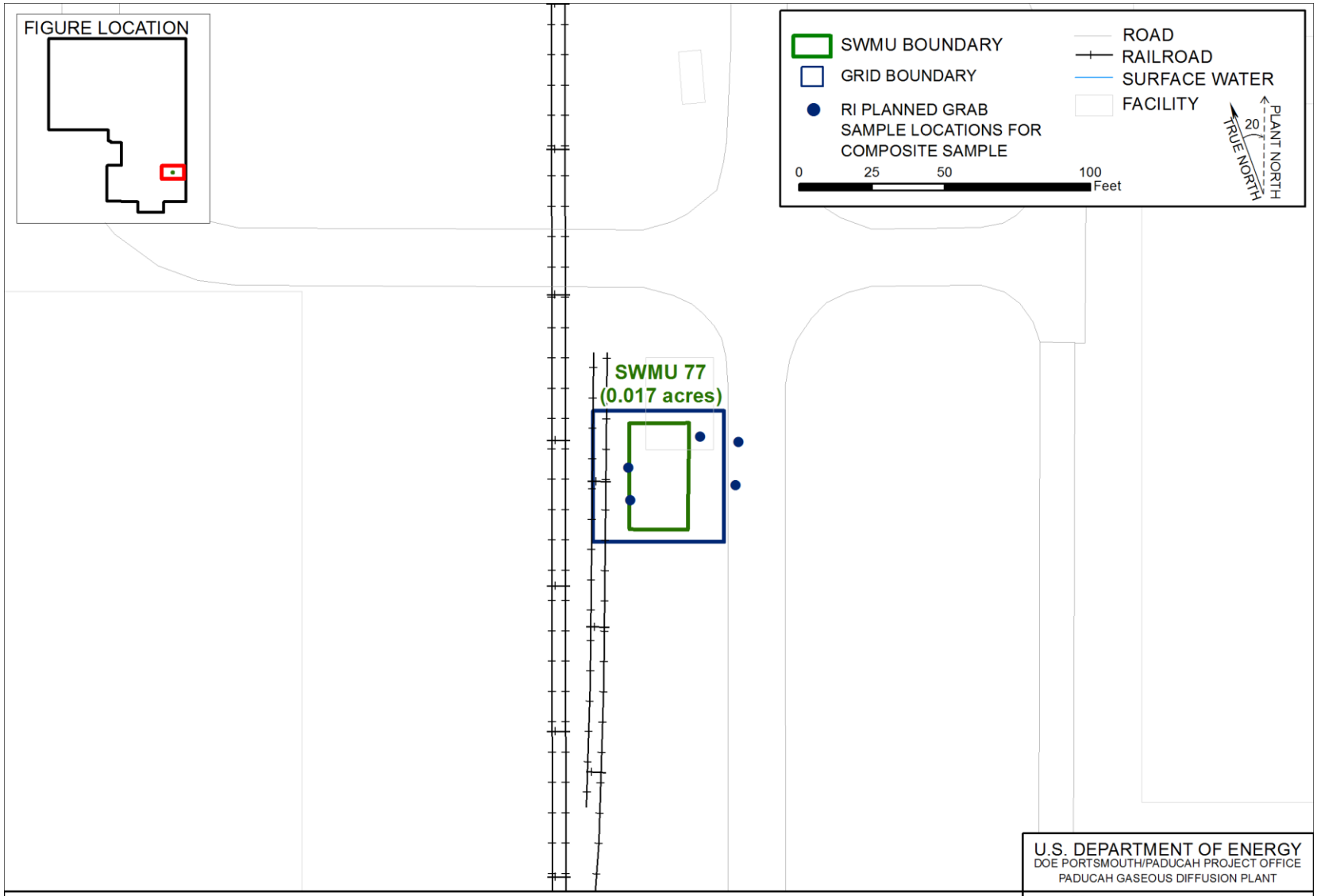


Figure 6. SWMU 77 Sampling Grids

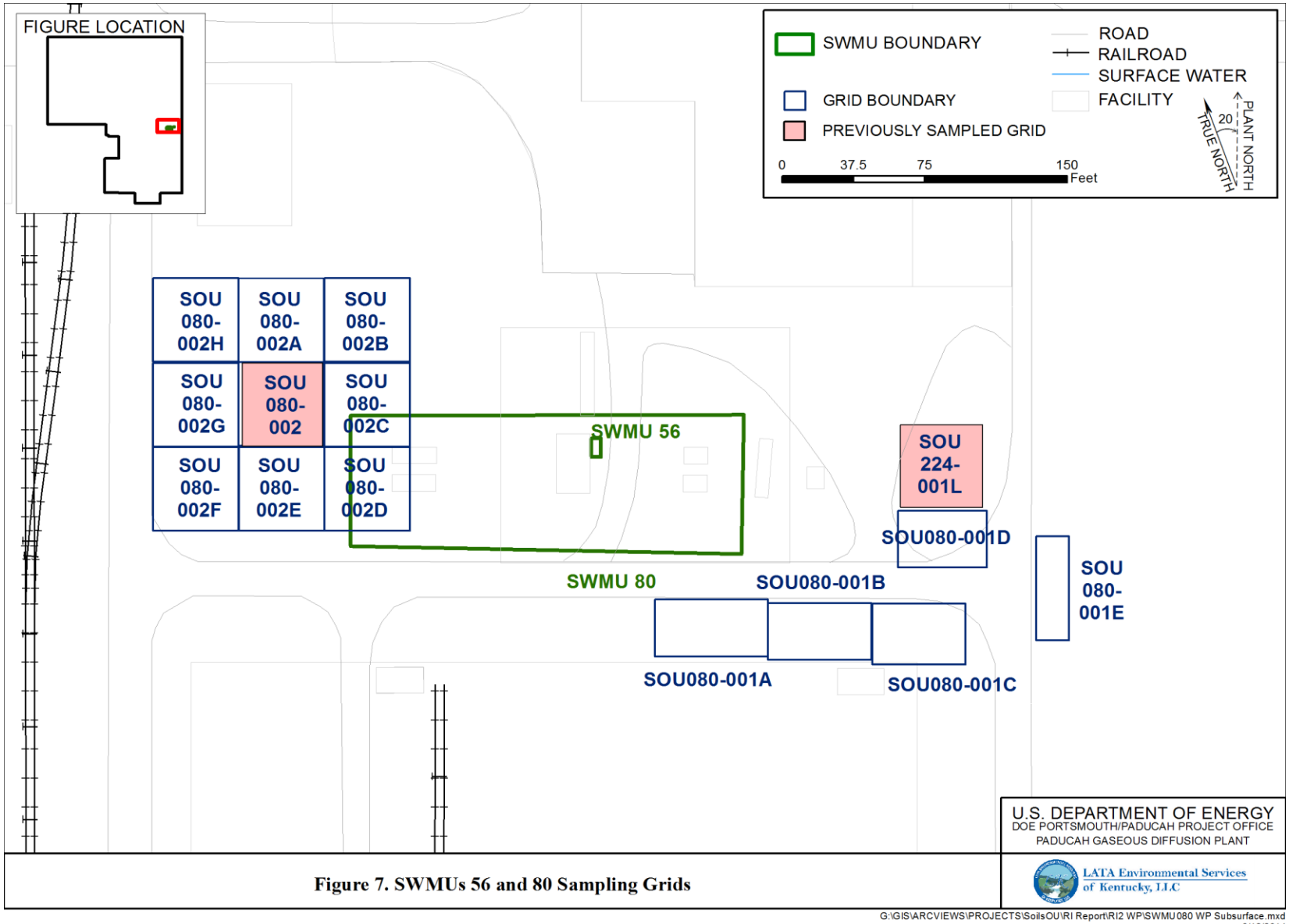


Figure 7. SWMUs 56 and 80 Sampling Grids

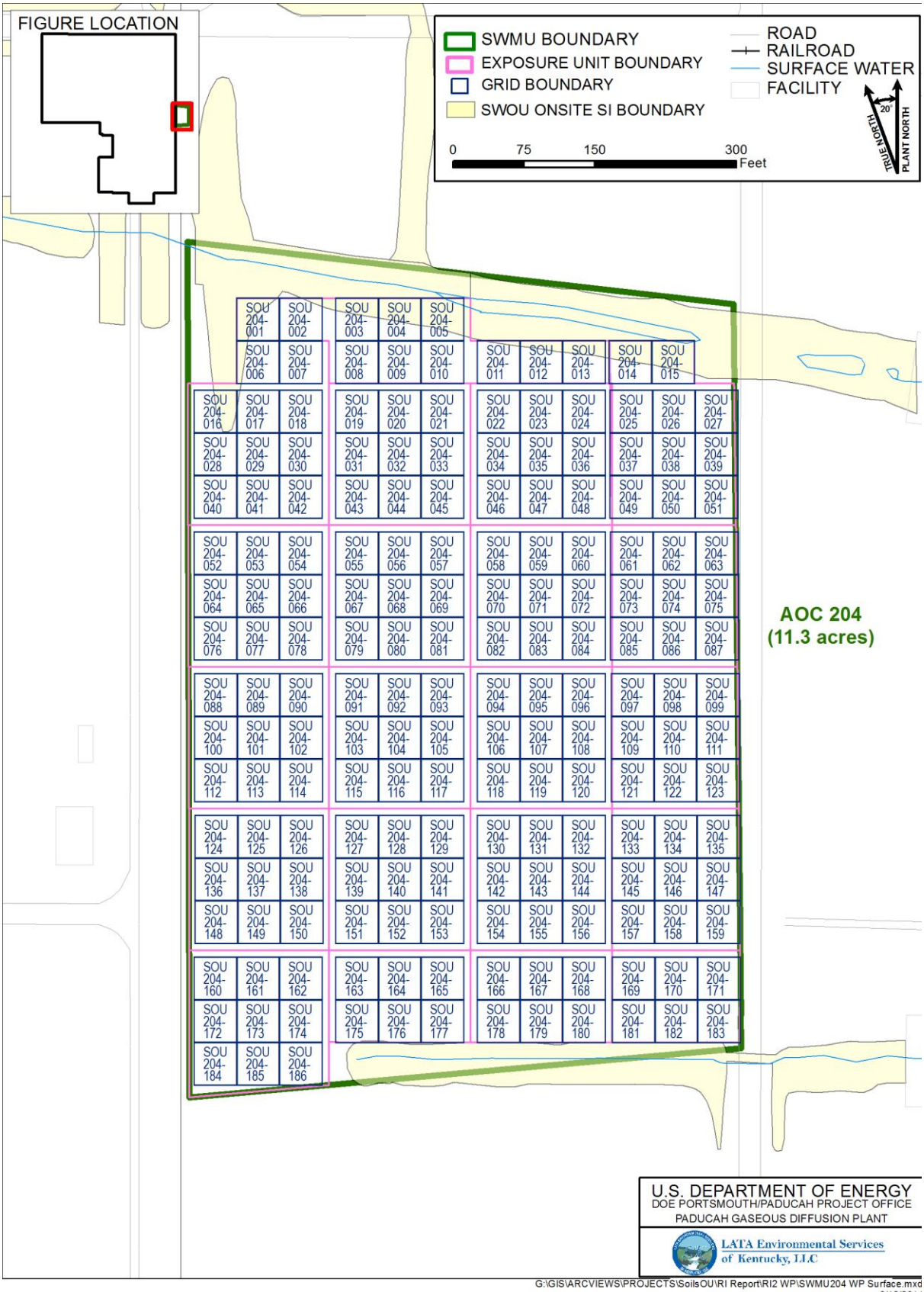


Figure 8. AOC 204 Sampling Grids

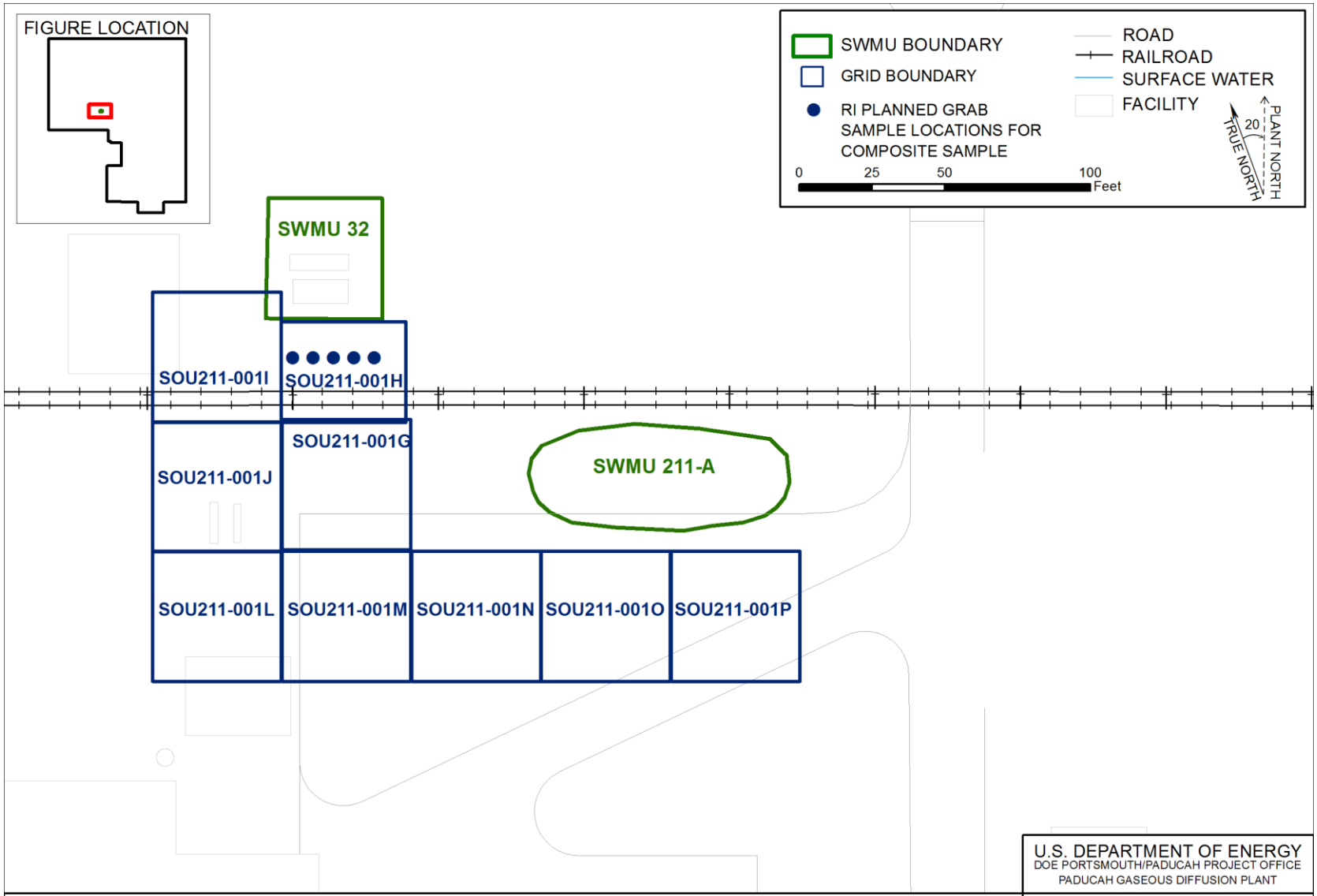


Figure 9. SWMU 211-A Soil Sampling Grids

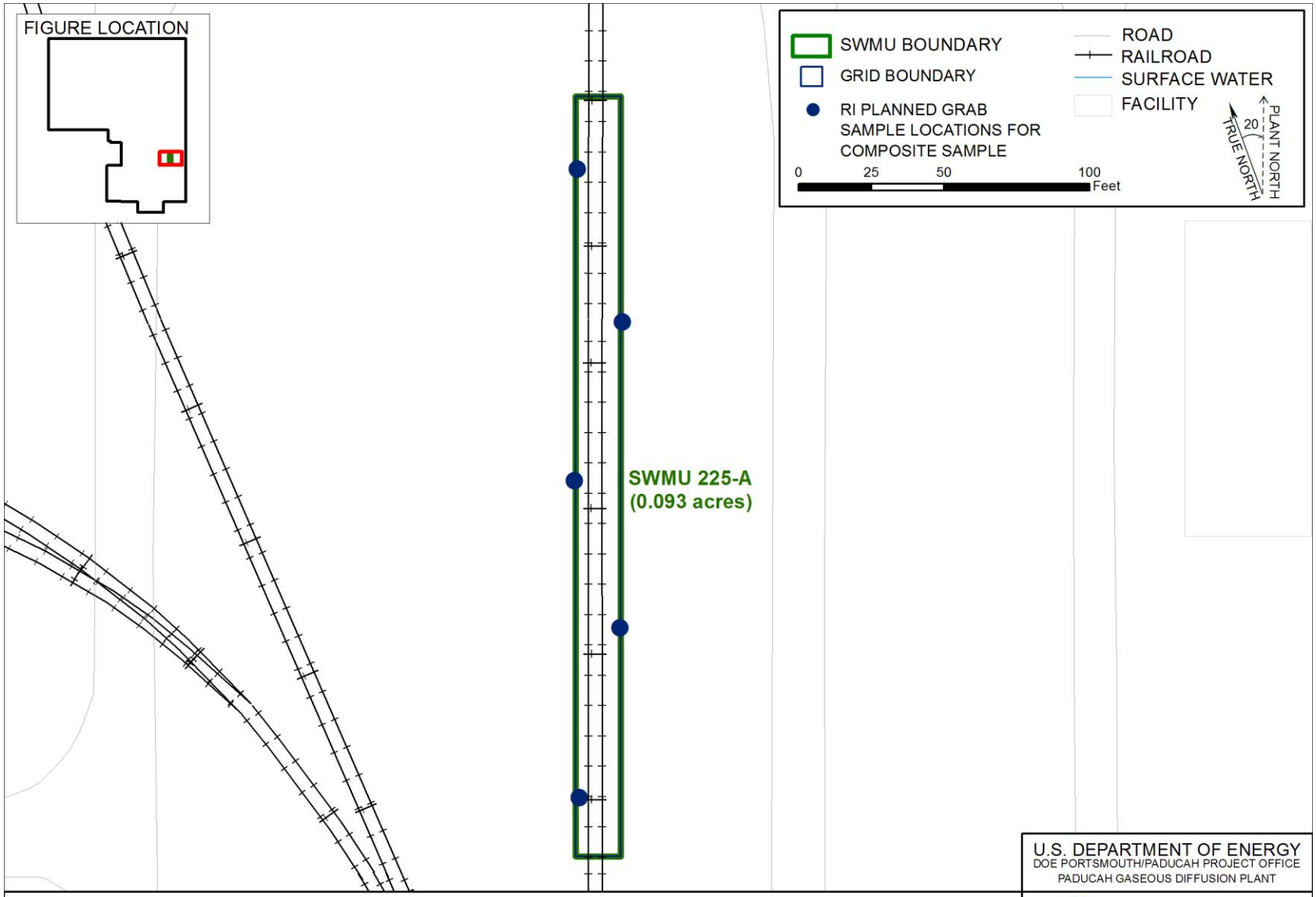


Figure 10. SWMU 225-A Sampling Grids

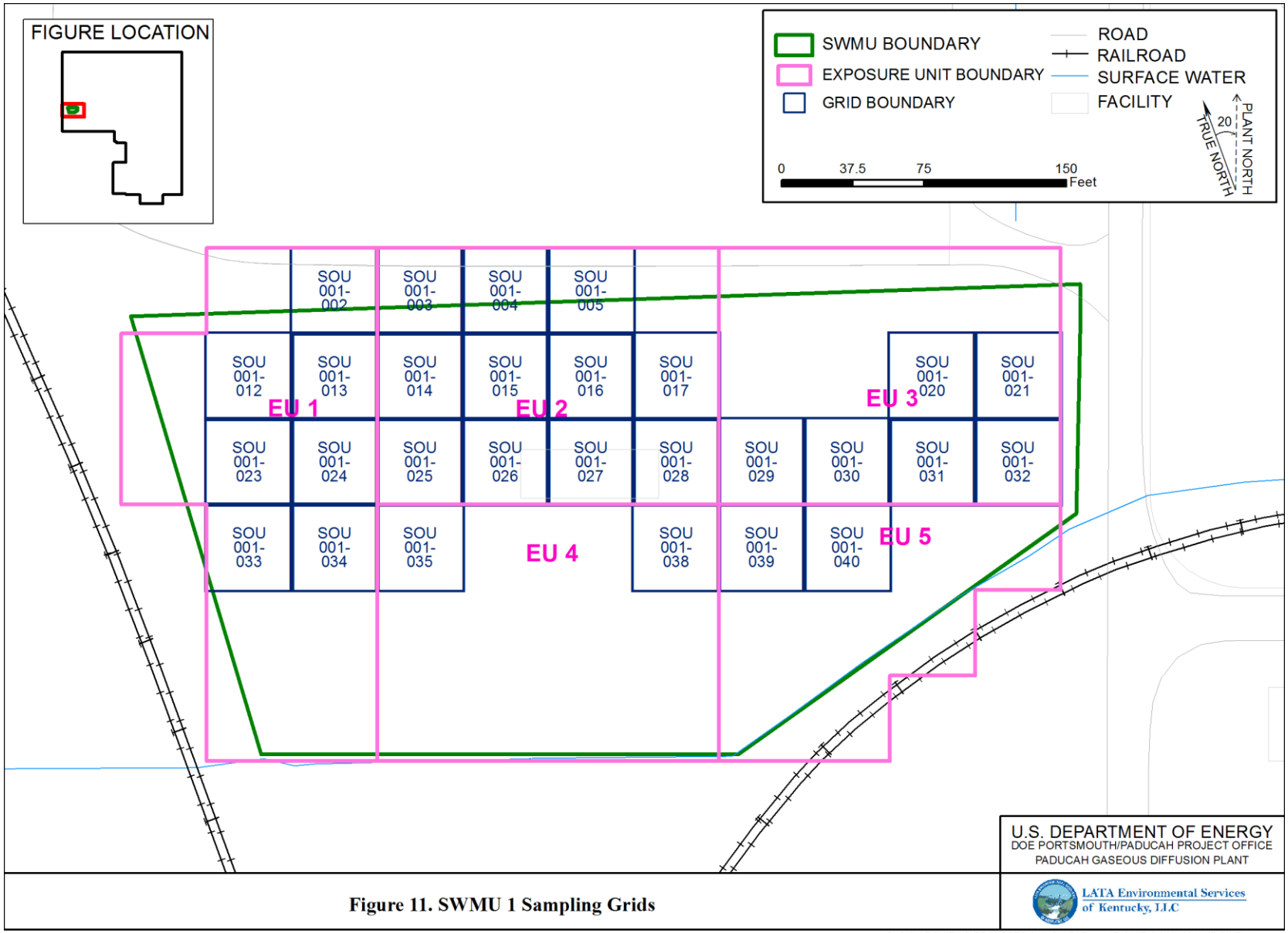


Figure 11. SWMU 1 Sampling Grids

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements

UFP-QAPP Manual Section 2.6.1:

Who will use the data? DOE, KDEP, and EPA will use the environmental sampling data to determine the nature and extent of contamination and assess any potential risks to ecological and human health posed by the contamination.

What will the data be used for? To determine the nature and extent of contamination and complete a baseline human health risk assessment and a screening ecological risk assessment.

What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) Field screening data will be used to characterize metals, PCBs, and radiological contamination. Based on the type of anomaly identified, a percentage of the samples collected for field screening will be submitted to a fixed-base laboratory for analyses of target analytes listed on worksheet #10 and analyzed in a DOE Consolidated Audit Program (DOECAP) audited laboratory. Note that soil results will be reported on an "as received" or wet weight basis.

How "good" do the data need to be in order to support the environmental decision? The data need to be able to characterize and delineate the nature and extent of each SWMU/AOC. The data will be used to evaluate potential risks to ecological and human health. The acquired data must be of known quality to increase confidence that the SWMUs and AOCs are being and will be addressed appropriately.

How much data are needed? (number of samples for each analytical group, matrix, and concentration) Soil samples and radiological walkover data will be collected in accordance with Chapter 9 of the June 2010 RI/FS Work Plan.

Where, when, and how should the data be collected/generated? This investigation will evaluate 13 SWMUs/AOCs. The collection of field data and analytical data will enable DOE to increase confidence that SWMU/AOCs have been adequately characterized so that response actions can be planned. Soil samples and radiological walkover data will be collected in accordance with Chapter 9 of the June 2010 RI/FS Work Plan.

Field analysis will be completed for each collected soil sample using the following field analytical methods:

- Immunoassay/colorimetric method to measure soil PCB concentrations
- XRF technology to measure metals concentrations

A minimum of 10% of the soil samples will be submitted to a DOECAP audited laboratory.

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements
(Continued)

Who will collect and generate the data? A sample team of individuals who are properly trained and skilled in the execution of the sampling procedures defined in this work plan will collect samples and perform the field screening measurements. The sample team members are responsible for safe conduct of work at all times and are responsible for collecting, preserving, handling, and storing samples in accordance with the provisions of the work plan. The sample team will perform radiological surveys and collect the soil samples following contractor sampling procedures.

How will the data be reported? Field data will be recorded on chain-of-custody forms, in field logbooks, and field data sheets. The fixed-base laboratory will provide data in an electronic data deliverable (EDD) format. Project data will be reported from the Paducah Oak Ridge Environmental Information System (OREIS).

How will the data be archived? Data will be archived in Paducah OREIS as required.

QAPP Worksheet #12-1
Measurement Performance Criteria Table

UFP-QAPP Manual Section 2.6.2:

Matrix	Soil/sediment
Analytical Group[1]	Volatile Organic Compounds
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	SW846-8260	Precision–Lab	RPD–22%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Trip Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-2
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Semivolatile Organic Compounds
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-8270	Precision–Lab	RPD–38%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-3
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Metals (aluminum, antimony, barium, beryllium, calcium, chromium, iron, magnesium, manganese, molybdenum, nickel, sodium, vanadium, and zinc)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-6020	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-4
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Metals (arsenic, cadmium, cobalt, copper, lead, mercury, selenium, silver, thallium, uranium)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	SW846-6020	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness	90%	Data completeness check	S&A
	SW846-7471	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-5
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	PCBs
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-8082	Precision–Lab	RPD–43%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-6
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (Gross alpha and Gross beta)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	EPA 900	Precision–Lab	RPD–30% (gross alpha)	Laboratory Duplicates	A
		Precision–Lab	RPD–25% (gross beta)	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-7
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (uranium-234, uranium-235, uranium-238)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	Alpha spectroscopy	Precision–Lab	RPD–20%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-8
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (americium-241, neptunium-237, plutonium-238, plutonium-239/240, thorium-228, thorium-230, thorium-232)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	Alpha spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-9
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (cesium-137)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	Gamma spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-10
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (technetium-99)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	Liquid scintillation	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-11
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Metals (arsenic, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, uranium, vanadium, and zinc)
Concentration Level	Moderate

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-6200 (XRF)	Precision	RPD—50%	Field Duplicates	S
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.

QAPP Worksheet #12-12
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	PCBs (test kits)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	Manufacturer's instructions	Precision	RPD—≤50%	Field Duplicates	S
		Accuracy/Bias-Contamination	N/A	N/A	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3] Reference number from QAPP Worksheet #23 (see Section 3.2).
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
N/A = not applicable

QAPP Worksheet #13
Secondary Data Criteria and Limitations Table

UFP-QAPP Manual Section 2.7:

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Appendix C "Analytical Data"; process knowledge	Data are from various sources, also see Section 5	DOE; previous analytical sampling/analysis results; contaminant conclusions based process knowledge	To determine whether SWMU is contaminated; to perform risk assessments and to provide input to the remedy alternatives	Radiological data should be evaluated for analytical limitations, data is used for planning purposes only

QAPP Worksheet #14
Summary of Project Tasks[1]

UFP-QAPP Manual Section 2.8.1:

Sampling Tasks: See Worksheet #10.

Analysis Tasks: See Worksheet #18.

Quality Control Tasks: QC Samples: Worksheets #20 & 28; Equipment Calibration: Worksheets #22 & 24; Data Review/Validation: Worksheets #34, 35, 36, & 37.

Secondary Data: See Section 9 (Field Sampling Plan) of the RI/FS Work Plan. Project data will be reported from Paducah OREIS and also will be available in Portsmouth/Paducah Project Office Environmental Geographic Analytical Spatial Information System (PEGASIS), accessible at http://padgis.latakentucky.com/padgis/.

Data Management Tasks: See Section 12 (Data Management Implementation Plan) of the RI/FS Work Plan.

Documentation and Records: Documentation and Records will be per DOE Prime Contractor procedure PAD-DOC-1009, *Records Management, Administrative Records, and Document Control*. Also, see Section 12 (Data Management Implementation Plan) of the RI/FS Work Plan.

Assessment/Audit Tasks: Assessments and audits will be per DOE Prime Contractor procedure PAD-QAP-1420, *Conduct of Assessments*. Also, see Section 11 (Quality Assurance Project Plan) of the RI/FS Work Plan.

Data Review Tasks: Data review tasks will be per DOE Prime Contractor procedure PAD-ENM-5003, *Quality Assured Data*.

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #15-1
Reference Limits and Evaluation Table

UFP-QAPP Manual Section 2.8.1:
Matrix: Soil/Sediment
Analytical Group: volatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Acetone	67-64-1	53,400	10	5	1	6.47	10
Acrolein	107-02-8	4.29	10	5	1	2.901	4.29
Acrylonitrile	107-13-1	64.5	10	5	1	1.126	10
Benzene	71-43-2	327	10	5	1	0.253	10
Bromodichloromethane	75-27-4	390	10	5	1	0.254	10
Bromoform	75-25-2	13,800	10	5	1	0.366	10
Bromomethane	74-83-9	186	10	5	1	0.396	10
2-Butanone	78-93-3	153,000	10	5	1	0.389	10
Carbon disulfide	75-15-0	15,700	10	5	1	0.369	10
Carbon tetrachloride	56-23-5	97.8	10	5	1	0.360	10
Chlorobenzene	108-90-7	4,470	10	5	1	0.382	10
Chloroethane	75-00-3	978	10	5	1	0.382	10
2-Chloroethyl vinyl ether	110-75-8	N/A	10	5	1	0.523	10
Chloroform	67-66-3	18.2	10	5	1	0.092	10
Chloromethane	74-87-3	884	10	5	1	0.553	10
Dibromochloromethane	124-48-1	334	10	5	1	0.329	10
Dibromomethane	74-95-3	3,170	10	5	1	0.405	10
Dichlorodifluoromethane	75-71-8	5,200	10	5	1	0.449	10
1,1-Dichloroethane	75-34-3	22,900	10	5	1	0.392	10
1,2-Dichloroethane	107-06-2	152	10	5	1	0.372	10
1,1-Dichloroethene	75-35-4	27.6	10	5	1	0.365	10
cis-1,2-Dichloroethene	156-59-2	1,980	10	5	1	0.159	10
trans-1,2-Dichloroethene	156-60-5	3,260	10	5	1	0.178	10

QAPP Worksheet #15-1
Reference Limits and Evaluation Table (Continued)

Matrix: Soil/Sediment
Analytical Group: volatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
1,2-Dichloropropane	78-87-5	180	10	5	1	0.317	10
cis-1,3-Dichloropropene	10061-01-5	N/A	10	5	1	0.339	10
trans-1,3-Dichloropropene	10061-02-6	N/A	10	5	1	0.349	10
trans-1,4-Dichloro-2-butene (100)	110-57-6	N/A	10	5	1	0.397	10
Ethyl benzene	100-41-4	6,010	10	5	1	0.299	10
Ethyl methacrylate	97-63-2	99,700	10	5	1	0.240	10
Iodomethane	74-88-4	N/A	10	5	1	1.511	10
2-Hexanone	591-78-6	N/A	10	5	1	0.261	10
Methylene chloride	75-09-2	3,920	10	5	1	0.801	10
4-Methyl-2-pentanone	108-10-1	9,660	10	5	1	0.326	10
Styrene	100-42-5	128,000	10	5	1	0.347	10
1,1,1,2-Tetrachloroethane	630-20-6	1,430	10	5	1	0.238	10
1,1,2,2-Tetrachloroethane	79-34-5	145	10	5	1	0.272	10
Tetrachloroethene	127-18-4	1,170	10	5	1	0.280	10
Toluene	108-88-3	31,200	10	5	1	0.303	10
1,1,1-Trichloroethane	71-55-6	23,200	10	5	1	0.291	10
1,1,2-Trichloroethane	79-00-5	345	10	5	1	0.573	10
Trichloroethene	79-01-6	741	10	5	1	0.290	10
Trichlorofluoromethane	75-69-4	19,300	10	5	1	0.167	10
1,2,3-Trichloropropane	96-18-4	0.629	10	5	1	0.559	0.629
Vinyl acetate	108-05-4	21,300	10	5	1	0.305	10
Vinyl chloride	75-01-4	40	10	5	1	0.428	10
m,p-xylene	NS831	107,000	20	5	1	0.569	20
o-xylene	95-47-6	659,000	10	5	1	0.318	10

N/A = not available
[1] Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001). See Section 6.1.1 for additional information.
[2] Analytical MDLs and QLs are those documented in validated methods.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: semivolatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
1,2,4-Trichlorobenzene	120-82-1	12,200	660	660		33.3	660
1,2-Dichlorobenzene	95-50-1	40,000	660	660		33.3	660
1,3-Dichlorobenzene	541-73-1	997	660	660		33.3	660
1,4-Dichlorobenzene	106-46-7	1,360	660	660		33.3	660
2,4,5-Trichlorophenol	95-95-4	160,000	660	660		33.3	660
2,4,6-Trichlorophenol	88-06-2	8,510	660	660		33.3	660
2,4-Dichlorophenol	120-83-2	6,930	660	660		33.3	660
2,4-Dimethylphenol	105-67-9	32,000	660	660		33.3	660
2,4-Dinitrotoluene	121-14-2	209	660	660		33.3	209
2,6-Dinitrotoluene	606-20-2	209	660	660		33.3	209
2-Chloronaphthalene	91-58-7	33,800	660	660		33.3	660
2-Chlorophenol	95-57-8	2,810	660	660		33.3	660
2-Methylnaphthalene	91-57-6	N/A	660	660		33.3	660
2-Nitrophenol	88-75-5	N/A	660	660		33.3	660
4-Bromophenyl phenyl ether	101-55-3	N/A	660	660		33.3	660

QAPP Worksheet #15-2
Reference Limits and Evaluation Table (Continued)

Matrix: Soil/Sediment
Analytical Group: semivolatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
4-Chlorophenylphenyl ether	7005-72-3	N/A	660	660		33.3	660
Acenaphthene	83-32-9	N/A	660	660		33.3	660
Acenaphthylene	208-96-8	N/A	660	660		33.3	660
Anthracene	120-12-7	526,000	660	660		33.3	660
Benz(a)anthracene	56-55-3	67	660	660		33.3	67
Benzo(a)pyrene	50-32-8	6.7	660	660		33.3	6.7
Benzo(b)fluoranthene	205-99-2	67	660	660		33.3	67
Benzo(ghi)perylene	191-24-2	N/A	660	660		33.3	660
Benzo(k)fluoranthene	207-08-9	670	660	660		33.3	660
bis(2-chloroethoxy)methane	111-91-1	N/A	660	660		33.3	660
bis(2-chloroethyl) ether	111-44-4	29	660	660		33.4	29
bis(2-chloroisopropyl) ether	108-60-1	1,340	660	660		33.3	660
bis(2-ethylhexyl)phthalate	117-81-7	2,840	660	660		43.3	660
Butyl benzyl phthalate	85-68-7	373,000	660	660		33.3	660
Chrysene	218-01-9	6,700	660	660		33.3	660
Dibenz(a,h)anthracene	53-70-3	6.7	660	660		33.3	6.7
Dibenzofuran	132-64-9	2,930	660	660		33.3	660
Diethylphthalate	84-66-2	1,970,000	660	660		33.3	660
Dimethylphthalate	131-11-3	24,600,000	660	660		33.3	660
Di-n-butylphthalate	84-74-2	264,000	660	660		33.3	660
Di-n-octylphthalate	117-84-0	49,200	660	660		33.3	660
Fluoranthene	206-44-0	34,300	660	660		33.3	660
Fluorene	86-73-7	50,100	660	660		33.3	660
Hexachlorobenzene	118-74-1	58.5	660	660		33.3	58.5
Hexachlorobutadiene	87-68-3	320	660	660		33.3	320
Hexachlorocyclopentadiene	77-47-4	9,590	660	660		330	660
Hexachloroethane	67-72-1	1,600	660	660		33.3	660
Indeno(1,2,3-cd)pyrene	193-39-5	67	660	660		33.3	67
Isophorone	78-59-1	98,500	660	660		33.3	660

QAPP Worksheet #15-2
Reference Limits and Evaluation Table (Continued)

Matrix: Soil/Sediment
Analytical Group: semivolatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
m,p-cresol		9,770[4]	660	660		66.6	660
Naphthalene	91-20-3	3,470	660	660		33.3	660
Nitrobenzene	98-95-3	492	660	660		33.3	660
N-Nitroso-di-n-propylamine	621-64-7	7.3	660	660		33.3	7.3
N-Nitrosodiphenylamine	86-30-6	10,400	660	660		33.3	660
o-cresol	95-48-7	79,900	660	660		33.3	660
Phenanthrene	85-01-8	N/A	660	660		33.3	660
Phenol	108-95-2	1,480,000	660	660		33.3	660
Pyrene	129-00-0	25,700	660	660		33.3	660
Pyridine	110-86-1	1,600	660	660		66.6	660
3,3'-Dichlorobenzidine	91-94-1	208	1,300	1 300		33.3	208
4-Chloro-3-methylphenol	59-50-7	N/A	1,300	1 300		33.3	1 300
4-Chloroaniline	106-47-8	6,390	1,300	1 300		33.3	1 300
Benzyl Alcohol	100-51-6	593,000	1,300	1 300		33.3	1 300
2,4-Dinitrophenol	51-28-5	5,280	3,300	3 300		330	3 300
2-Methyl-4,6-dinitrophenol	534-52-1	N/A	3,300	3 300		330	3 300
2-Nitroaniline	88-74-4	91.3	3,300	3 300		33.3	91.3
3-Nitroaniline	99-09-2	N/A	3,300	3 300		33.3	3 300
4-Nitroaniline	100-01-6	N/A	3,300	3 300		330	3 300
4-Nitrophenol	100-02-7	21,100	3,300	3 300		330	3 300
Benzoic Acid	65-85-0	10,600,000	3,300	3 300		330	3 300
Pentachlorophenol	87-86-5	646	3,300	3 300		330	646

N/A = not available
[1] Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001). See Section 6.1.1 for additional information.
[2] Analytical MDLs and QLs are those documented in validated methods.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.
[4] Lowest no action limit among m-cresol and p-cresol was used.

QAPP Worksheet #15-3
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: metals
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Aluminum	7429-90-5	732	20	20			20
Antimony	7440-36-0	0.0635	10	10		0.164	0.164
Arsenic	7440-38-2	0.132	1	1		0.203	0.203
Barium	7440-39-3	37	2.5	2.5		0.057	2.5
Beryllium	7440-41-7	0.16	0.5	0.5		0.011	0.16
Cadmium	7440-43-9	2.64	0.5	0.5		0.011	0.5
Chromium	7440-47-3	60.5	2.5	2.5		0.302	2.5
Copper	7440-50-8	68.1	2.5	2.5		0.0536	2.5
Iron	7439-89-6	314	20	20		3.30	20
Lead	7439-92-1	50	20	1		0.026	20
Manganese	7439-96-5	7.46	2.5	2.5		0.054	2.5
Mercury	7439-97-6	0.158	0.02	0.02		0.006	0.02
Molybdenum	7439-98-7	10.9	5	5		0.077	5
Nickel	7440-02-0	34	5	5		0.0822	5
Selenium	7782-49-2	12.1	1	1		0.045	1
Silver	7440-22-4	6.12	1	1		0.008	1
Thallium	7440-28-0	0.107[4]	2	2		0.058	0.107
Uranium	7440-61-1	2.16	1	1		0.012	1
Vanadium	7440-62-2	0.562	2.5	2.5		0.735	0.735
Zinc	7440-66-6	401	20	20		1.33	20

N/A = not available
[1] Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001). See Section 6.1.1 for additional information.
[2] Analytical MDLs and QLs are those documented in validated methods.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.
[4] The no action level for thallium chloride was used.

QAPP Worksheet #15-4
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: radionuclides
Concentration Level: low

Analyte	CAS Number	Project Action Limit (pCi/g)[1]	Project Quantitation Limit (pCi/g)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDCs	Method QLs	MDCs	QLs
Alpha Activity	12587-46-1	N/A	5	5		5	5
Beta Activity	12587-47-2	N/A	5	5		5	5
Americium-241	14596-10-2	0.836	0.05	3		0.05	0.05
Cesium-137	10045-97-3	0.0128	0.1	0.5		0.1	0.1
Neptunium-237	13994-20-2	0.0405	0.05	3		0.05	0.05
Plutonium-238	13981-16-3	2.27	0.05	6		0.05	0.05
Plutonium-239/240	N/A	2.22	0.05	4		0.05	0.05
Technetium-99	14133-76-7	67.4	1	8		1	1
Thorium-228	14274-82-9	0.00418	0.05	3		0.05	0.05
Thorium-230	14269-63-7	2.85	0.05	4		0.05	0.05
Thorium-232	N/A	2.61	0.05	3		0.05	0.05
Uranium-234	13966-29-5	3.81	0.15	3		0.15	0.15
Uranium-235	15117-96-1	0.0591	0.05	2		0.05	0.05
Uranium-238	24678-82-8	0.261	0.15	2		0.15	0.15

N/A = not available
[1] Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001). See Section 6.1.1 for additional information.
[2] Analytical MDCs and QLs are those documented in validated methods.
[3] Achievable MDCs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #15-5
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: PCBs
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Aroclor-1016	12674-11-2	0.0574	0.1	0.1	N/A	5.39	57.4
Aroclor-1221	11104-28-2	0.0574	0.1	0.1	N/A	5.39	57.4
Aroclor-1232	11141-16-5	0.0574	0.1	0.1	N/A	5.39	57.4
Aroclor-1242	53469-21-9	0.0574	0.1	0.1	N/A	5.39	57.4
Aroclor-1248	12672-29-6	0.0574	0.1	0.1	N/A	5.39	57.4
Aroclor-1254	11097-69-1	0.0388	0.1	0.1	N/A	6.13	57.4
Aroclor-1260	11096-82-5	0.0574	0.1	0.1	N/A	6.13	57.4
Total PCBs	1336-36-3	0.0574	0.1	0.1	N/A	51.47	57.4

N/A = not available
[1] Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001). See Section 6.1.1 for additional information.
[2] Analytical MDLs and QLs are those documented in validated methods.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #15-6
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: metals by XRF
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Arsenic	7440-38-2	11	11	11		11	N/A
Chromium	7440-47-3	85	85	85		85	N/A
Copper	7440-50-8	35	35	35		35	N/A
Iron	7439-89-6	28,000	100	100		100	N/A
Lead	7439-92-1	23	13	13		13	N/A
Manganese	7439-96-5	820	85	85		85	N/A
Mercury	7439-97-6	10	10	10		10	N/A
Molybdenum	7439-98-7	830	15	15		15	N/A
Nickel	7440-02-0	65	65	65		65	N/A
Selenium	7782-49-2	20	20	20		20	N/A
Silver	7440-22-4	10	10	10		10	N/A
Uranium	7440-61-1	20	20	20		20	N/A
Vanadium	7440-62-2	70	70	70		70	N/A
Zinc	7440-66-6	60	25	25		25	N/A

N/A = not available
[1] These Project Action Limits are explained in Table 9.2 of the RI/FS Work Plan.
[2] Analytical MDLs and QLs are those documented in validated methods.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. MDLs and QLs may change based on the laboratory that is contracted for the Soils OU project. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award. The Soils OU project will choose a laboratory whose MDLs are less than the Project Action Limits.

QAPP Worksheet #15-7
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: PCBs by test kit
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Total PCBs	1336-36-3	5	5	5		5	N/A

N/A = not available
[1] These Project Action Limits are explained in Table 9.2.
[2] Analytical MDLs and QLs are those documented in validated methods.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #16
Project Schedule/Timeline Table

UFP-QAPP Manual Section 2.8.2:

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Field work for RI 2	Soils OU	10/1/2014	4/9/2015	No	N/A
Submit RI 2 D1 RI Report	Soils OU	6/30/2015	6/30/2015	Yes	TBD
Fieldwork for SWMU 1 soil mixing area	Soils OU	4/6/2015	7/13/2015	No	N/A
Submit RI 1 D2/R1 RI Report Addendum	Soils OU	8/5/2015	8/5/2015	Yes	TBD

QAPP Worksheet #17
Sampling Design and Rationale

UFP-QAPP Manual Section 3.1.1:

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):
The Soils OU SWMUs have been divided into 45 ft^2 grids and will be composite sampled as described in Section 9, "Field Sampling Plan." This approach allows for a non-biased statistical evaluation to determine if the exposure unit within the SWMU is contaminated.

Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [May refer to map or Worksheet #18 for details]:

Surface and subsurface soils will be sampled from Soils OU SWMUs that have not been adequately characterized previously. At each SWMU, a wide range of analyses will be collected: SVOCs, metals, and radionuclides. It is not known the levels of chemicals that will be detected at each SWMU. Available historical data has been provided in Appendix C. Additional information is available in Worksheet 18 and in Section 9, "Field Sampling Plan."

QAPP Worksheet #18-1
Sampling Locations and Methods/SOP Requirements Table

UFP-QAPP Manual Section 3.1.1:

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 13	Soil	surface	SVOCs	See Appendix C of DOE/LX 07-0358 & D2/R1 for available historical information	14 + 1 field duplicate	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358 & D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358 & D2/R1
			PCBs		14 + 1 field duplicate		
			Metals		14 + 1 field duplicate		
			Radionuclides		15[2] + 1 field duplicate		
			Metals by XRF		158 + 8 field duplicate		
			PCBs by test kit		158 + 8 field duplicate		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
[2] Includes judgmental grab sample.

QAPP Worksheet #18-2
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 15	Soil	surface	SVOCs	See Appendix C of DOE/LX/ 07-0358& D2/R1 for available historical information	1	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		1		
			Metals		1		
			Radionuclides		2[2]		
			Metals by XRF		1 + 1 field duplicate		
			PCBs by test kit		1 + 1 field duplicate		
		shallow subsurface	Metals by XRF		1 + 1 field duplicate		
			PCBs by test kit		1 + 1 field duplicate		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
[2] Includes judgmental grab sample.

QAPP Worksheet #18-3
Sampling Locations and Methods/SOP Requirements Table

UFP-QAPP Manual Section 3.1.1:

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 26	Soil	surface	SVOCs	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	4 + 1 field duplicate	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		4 + 1 field duplicate		
			Metals		4 + 1 field duplicate		
			Radionuclides		4 + 1 field duplicate		
			Metals by XRF		35 + 2 field duplicate		
			PCBs by test kit		35 + 2 field duplicate		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-4
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 77	Soil	surface	SVOCs	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	1	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			pH		1		
			Metals by XRF		1 + 1 field duplicate		
			PCBs by test kit		1 + 1 field duplicate		
		shallow subsurface	pH		1		
			Metals by XRF		1 + 1 field duplicate		
			PCBs by test kit		1 + 1 field duplicate		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-5
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 56/80	Soil	surface	SVOCs	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	1	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		1		
			Metals		1		
			Radionuclides		2[2]		
			Metals by XRF		13 + 1 field duplicate		
			PCBs by test kit		13 + 1 field duplicate		
		shallow subsurface	SVOCs		1 + 1 field duplicate		
			PCBs		1 + 1 field duplicate		
			Metals		1 + 1 field duplicate		
			Radionuclides		1 + 1 field duplicate		
			Metals by XRF		13 + 1 field duplicate		
			PCBs by test kit		13 + 1 field duplicate		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
[2] Includes judgmental grab sample.

QAPP Worksheet #18-6
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
AOC 204	Soil	surface	SVOCs	See Appendix C of DOE/LX/ 07-0358& D2/R1 for available historical information	21	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		21		
			Metals		21		
			Radionuclides		22[2]		
			Metals by XRF		186 + 5 field duplicates		
			PCBs by test kit		186 + 5 field duplicates		
		shallow subsurface	VOCs		21 + 1 field duplicate		
			SVOCs		21 + 1 field duplicate		
			PCBs		21 + 1 field duplicate		
			Metals		21 + 1 field duplicate		
			Radionuclides		21 + 1 field duplicate		
			Metals by XRF		186 + 5 field duplicates		
			PCBs by test kit		186 + 5 field duplicates		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
[2] Includes judgmental grab sample.

QAPP Worksheet #18-7
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 211-A	Soil	surface	Radionuclides	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	1[2]	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			Metals by XRF		9 + 1 field duplicate		
			PCBs by test kit		9 + 1 field duplicate		
		shallow subsurface	VOCs		1		
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		12 + 1 field duplicate[3]		
			PCBs by test kit		12 + 1 field duplicate[3]		
		Subsurface[4]	PCBs by test kit		2		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
[2] Judgmental grab sample.
[3] Shallow subsurface includes sampling intervals 4 to 7 ft bgs for Grid SOU211-001G and intervals 4 to 7 ft bgs and 7 to 10 ft bgs for Grid SOU 211-001J.
[4] Sampling intervals for subsurface include 10 to 13 ft bgs and 13 to 16 ft bgs; Grid SOU211-001G only.

QAPP Worksheet #18-8
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 225-A	Soil	surface	SVOCs	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	1	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1 + 1 field duplicate		
			PCBs by test kit		1 + 1 field duplicate		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-9
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 229	Soil	surface	Radionuclides	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	1[2]	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
[2] Judgmental grab sample.

QAPP Worksheet #18-10
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
AOC 565	Soil	surface	Radionuclides	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	1[2]	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).
[2] Judgmental grab sample.

QAPP Worksheet #18-11
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 1	Soil	surface	SVOCs	See Appendix C of DOE/LX/ 07-0358& D2/R1 for available historical information	3	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		3		
			Metals		3		
			Radionuclides		3		
			Metals by XRF		28 + 3 field duplicates		
			PCBs by test kit		28 + 3 field duplicates		
		shallow subsurface	SVOCs		3		
			PCBs		3		
			Metals		3		
			Radionuclides		3		
			Metals by XRF		28 + 3 field duplicate		
			PCBs by test kit		28 + 3 field duplicate		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-12
Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 27	Sludge	N/A	SVOCs	See Appendix C of DOE/LX 07-0358& D2/R1 for available historical information	1	See Worksheet #21, Ref. 6 of DOE/LX/ 07-0358& D2/R1	See Worksheet #17, Section 9 of DOE/LX/ 07-0358& D2/R1
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			VOCs		1		

[1] Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume[2]	Containers (number, size, and type)[2]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
soil	Volatile organic compounds	low	SW846-8260			cool 4°C	14 days
soil	Semivolatile organic compounds	low	SW846-8270			cool 4°C	14 days until extraction/40 days
soil	PCBs	low	SW846-8082			cool 4°C	14 days until extraction/40 days
soil	Metals	low	SW846-6020, and -7471			cool 4°C	180 days (28 days for mercury)
soil	Radionuclides	low	see Worksheets #12-6 through #12-10			cool 4°C	180 days
soil	PCBs	low	test kit			cool 4°C	14 days until extraction/40 days
soil	Metals	low	SW846-6200 (XRF)			cool 4°C	180 days (28 days for mercury)

[1] Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
[2] Sample volume and container requirements will be specified by the laboratory.

QAPP Worksheet #20
Field Quality Control Sample Summary Table

UFP-QAPP Manual Section 3.1.1:

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations*	No. of Field Duplicate Pairs	Inorganic No. of MS	No. of Field Blanks	No. of Equip. Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil	VOCs	Low	See Worksheet #12	See Worksheet #10	5%	5%	5%	5%	A	See Worksheet #18
Soil	SVOCs	Low	See Worksheet #12	See Worksheet #10	5%	5%	5%	5%	A	See Worksheet #18
Soil	Metals	Low	See Worksheet #12	See Worksheet #10	5%	5%	5%	5%	A	See Worksheet #18
Soil	Radionuclides	Low	See Worksheet #12	See Worksheet #10	5%	5%	5%	5%	A	See Worksheet #18
Soil	PCBs	Low	See Worksheet #12	See Worksheet #10	5%	5%	5%	5%	A	See Worksheet #18
Soil	XRF	Low	See Worksheet #12	See Worksheet #10	5%	5%	5%	5%	A	See Worksheet #18
Soil	PCB Test Kits	Low	See Worksheet #12	See Worksheet #10	5%	5%	5%	5%	A	See Worksheet #18

*Work package documents will identify the sampling locations, matrices, number of samples, and sample identification numbers for samples to be submitted to DOECAP-audited laboratory. This is not applicable for samples analyzed by field methods.
A = PT sample only will be collected when required by a specific project.

QAPP Worksheet #21
Project Sampling SOP References Table[1]

UFP-QAPP Manual Section 3.1.2:

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
1	PAD-ENM-0023, *Composite Sampling*	Contractor	Sampling	N	N/A
2	PAD-ENM-2300, *Collection of Soil Samples*	Contractor	Sampling	N	N/A
3	PAD-ENM-2700, *Logbooks and Data Forms*	Contractor	Sampling	N	N/A
4	PAD-ENM-2702, *Decontamination of Sampling Equipment*	Contractor	Sampling	N	N/A
5	PAD-ENM-2704, *Trip, Equipment and Field Blank*	Contractor	Sampling	N	N/A
6	PAD-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*	Contractor	Sampling	N	N/A
7	PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*	Contractor	Sampling	N	N/A
8	PAD-ENR-0034, *XRF Field Lab Analysis of Soils*	Contractor	Analytical	N	N/A

[1] It is understood that SOPs are contractor specific.
N/A = not applicable

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

UFP-QAPP Manual Section 3.1.2.4:

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Ludlum Model 3, 12, 2221, and 2224 with Ludlum Model 43-5 Alpha Scintillator	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2
Ludlum Model 3, 12, 2221, and 2224 with Ludlum Model 44-9 Geiger-Müeller Detector	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2
Ludlum Model 2221 and 2224 with Ludlum Model 44-10 Gamma Scintillator or FIDLER	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Continued)

UFP-QAPP Manual Section 3.1.2.4:

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Global Positioning System Gamma Ray Survey Instrumentation	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2

[1] Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #23
Analytical SOP References Table

Reference Number[1]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
8260	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Definitive	VOAs	GC/MS	TBD	TBD
8270	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Definitive	SVOAs	GC/MS	TBD	TBD
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	Definitive	PCBs	GC	TBD	TBD
6020	Inductively Coupled Plasma-Mass Spectrometry	Definitive	Metals	ICP-MS	TBD	TBD
7471	Mercury by Cold-Vapor Atomic Absorption	Definitive	Metals	AA	TBD	TBD
Gas Flow Proportional*	Gross Alpha and Beta Activity	Definitive	Rads	Gas flow proportional counter	TBD	TBD
Alpha Spec*	Alpha Spectrometry	Definitive	Rads	Alpha Spectrometry	TBD	TBD
Gamma Spec*	Gamma Spectrometry	Definitive	Rads	Gamma Spectrometry	TBD	TBD
Liquid Scintillation*	Tc-99 by Liquid Scintillation	Definitive	Rads	Liquid Scintillation	TBD	TBD
XRF	Metals by XRF	to be used as definitive	Metals	XRF	LATA Kentucky	TBD
PCB test kit	Manufacturer's instructions	Screening	PCBs	Test kits	LATA Kentucky	TBD

[1] Analysis will be by the most recent revision.

*Analytical methods for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the RI/FS WP.

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
The laboratory is responsible for maintaining instrument calibration information per their QA Plan. This information is audited annually by the DOECAP. Laboratory(s) contracted will be DOECAP certified.						

[1] Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
The laboratory is responsible for maintaining instrument and equipment maintenance, testing, and inspection information per their QA Plan. This information is audited annually by the DOECAP. Laboratory(s) contracted will be DOECAP certified.								

[1] Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26
Sample Handling System

UFP-QAPP Manual Appendix A:

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT	
Sample Collection (Personnel/Organization):	Sampling Teams/DOE Prime Contractor and Subcontractors
Sample Packaging (Personnel/Organization):	Sampling Teams/DOE Prime Contractor and Subcontractors
Coordination of Shipment (Personnel/Organization):	Lab Coordinator/DOE Prime Contractor
Type of Shipment/Carrier:	Direct Delivery or Overnight/Fed Ex
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization):	Sample Management/Contracted Laboratory/Field Laboratory
Sample Custody and Storage (Personnel/Organization):	Sample Management/Contracted Laboratory/Field Laboratory
Sample Preparation (Personnel/Organization):	Analysts/Contracted Laboratory/Field Laboratory
Sample Determinative Analysis (Personnel/Organization):	Analysts/Contracted Laboratory/Field Laboratory
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection):	6 months
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	120 days
Biological Sample Storage (No. of days from sample collection):	N/A
SAMPLE DISPOSAL	
Personnel/Organization:	Waste Disposition/DOE Prime Contractor and Subcontractors
Number of Days from Analysis	TBD

N/A = not applicable

QAPP Worksheet #27
Sample Custody Requirements[1]

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Field sample custody requirements will be per DOE prime contractor procedure PRS-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal).

Laboratory sample custody procedures are per the DOECAP certified laboratory sample custody procedures.

Sample Identification Procedures:

Sample identification requirements will be per DOE prime contractor project work plan.

Chain-of-custody Procedures:

Chain-of-custody requirements will be per DOE prime contractor procedure PRS-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #28-1
Quality Control Requirements[1]

UFP-QAPP Manual Section 3.4:

Matrix	Soil/XRF
Analytical Group	SMO/Field Screenings
Concentration Level	TBD
Sampling SOP	See #21
Analytical Method/ SOP Reference	EPA methods
Sampler's Name	TBD
Field Sampling Organization	DOE/Contractor
Analytical Organization	SMO/Field Screenings
No. of Sample Locations	See RI/FS SAP

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Duplicates	Minimum 5%	N/A	N/A	N/A	Precision	See PAD-ENM-5003, *Quality Assured Data Procedure*
Field Blanks	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003, *Quality Assured Data Procedure*
Equipment Rinseates	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003, *Quality Assured Data Procedure*
Instrument Blank	Per procedure PAD-ENR-0034 or manufacturer's guidance	PAD-ENR-0034	Check calibration instrument; reanalyze affected sample	Field technician	Accuracy	Per procedure PAD-ENM-5003, *Quality Assured Data Procedure*

[1] It is understood that SOPs are contractor specific.
N/A = not available

QAPP Worksheet #28-2
Quality Control Requirements[1]

UFP-QAPP Manual Section 3.4:

Matrix	PCB Wipe
Analytical Group	SMO/Field Screenings
Concentration Level	TBD
Sampling SOP	See #21
Analytical Method/ SOP Reference	EPA methods
Sampler's Name	TBD
Field Sampling Organization	DOE/LATA Kentucky
Analytical Organization	SMO/Field Screenings
No. of Sample Locations	See RI/FS SAP

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Duplicates	Minimum 5%	N/A	N/A	N/A	Precision	See PAD-ENM-5003, *Quality Assured Data Procedure*

[1] It is understood that SOPs are contractor specific.
N/A = not available

QAPP Worksheet #28-3
Quality Control Requirements[1]

UFP-QAPP Manual Section 3.4:

Matrix	Soil/PCB Test Kit
Analytical Group	SMO/Field Screenings
Concentration Level	TBD
Sampling SOP	See #21
Analytical Method/ SOP Reference	Manufacturer methods
Sampler's Name	TBD
Field Sampling Organization	DOE/LATA Kentucky
Analytical Organization	SMO/Field Screenings
No. of Sample Locations	See RI/FS SAP

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Duplicates	Minimum 5%	N/A	N/A	N/A	Precision	See PAD-ENM-5003, *Quality Assured Data Procedure*

[1] It is understood that SOPs are contractor specific.
N/A = not available

QAPP Worksheet #29
Project Documents and Records Table[1]

UFP-QAPP Manual Section 3.5.1:

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Data Logbooks and associated completed sampling forms, sample chains-of-custody	Laboratory data packages, OREIS database and associated data packages	OREIS database and associated data packages	PRS-ENM-5003, att. G Data Assessment Review Checklist and Comment Form	Form QAP-E-004, Management/Independent Assessment Report

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP*	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	PCBs	Low	See Worksheet #18 For ID Numbers, see Worksheet #27	See Worksheet #23	28-day	TBD	TBD
Soil	Metals	Low		See Worksheet #23	28-day	TBD	TBD
Soil	Radionuclides	Low		See Worksheet #23	28-day	TBD	TBD
Soil	SVOCs	Low		See Worksheet #23	28-day	TBD	TBD
Soil	VOCs	Low		See Worksheet #23	28-day	TBD	TBD
Soil	PCB Test Kits	Low		See Worksheet #23	28-day	LATA Kentucky	TBD
Soil	XRF	Low		See Worksheet #23	28-day	LATA Kentucky	TBD

*Analytical method SOPs for radiochemistry parameters are laboratory specific.

QAPP Worksheet #31
Planned Project Assessments Table

UFP-QAPP Manual Section 4.1.1:

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Independent Assessment/ Surveillance	Minimum of once per project (project duration estimated to be 4 months)	Internal	DOE Prime Contractor QA	QA Specialists	Project Manager	Project Management/QA Specialist	QA Specialist
Laboratory Audit	Annual	External	DOE Consolidated Audit Program (DOECAP)	Laboratory Assessor	Laboratory	Laboratory	DOECAP
Management Assessments	Minimum of once per project (project duration estimated to be 4 months)	Internal	Project Management	Project Management	Project Team	Project Management/QA Specialist	QA Specialist
Management By Walking Around (MBWA)	Monthly per project	Internal	Project Management	Project Management	Project Team	Project Management/QA Specialist	QA Specialist
MBWA Follow-up surveillances	Quarterly (if required)	Internal	Project Management	ER/EM Director, Project Manager or designee	Project Team	Project Management/QA Specialist	QA Specialist

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses[1]

UFP-QAPP Manual Section 4.1.2:

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Management, independent, and surveillances	Form QAP-E-004, Management/ Independent Assessment Report, and QAP-E-0710, Issue Identification Form	Project Management, Issue Owner	Upon issuance of Form QAP-E-004, Management/ Independent Assessment Report, form E-QAP-0710, Issue Identification *Form*, will be completed and attached to the assessment report	E-QAP-0710, Issue Identification Form documents the issue response and/or corrective actions	Action owner as designated by issue owner	Fifteen days for initial issue response, corrective action schedule determined by issue owner, per PRS-QAP-1210

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #33
QA Management Reports Table

UFP-QAPP Manual Section 4.2:

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Management by Walking Around	Monthly	Last day of each month	Project Manager, Contractor	Contractor Management
QA Assessment Reports	Minimum 2 (One management assessment report, one independent assessment report)	Prior to project termination	Project Manager or designee and QA Specialist, Contractor	PM, QA, and Contractor Management

QAPP Worksheet #34
Verification (Step I) Process Table[1]

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Field Logbooks	Field logbooks are verified per DOE prime contractor procedure PRS-ENM-2700, *Logbooks and Data Forms*, and PRS-ENM-5003, *Quality Assured Data*.	Internal	Project Management or designee, Contractor
Chains-of-custody	Chains-of-custody are controlled by DOE prime contractor procedure PRS-ENM-5004, *Sample Tracking, Lab Coordination and Sample Handling Guidance*. Chains-of-custody will be included in data assessment packages for review as part of data verification and data assessment.	Internal	Sample and Data Management, Project Management, and QA Personnel, Contractor
Field and Laboratory Data	Field and analytical data are verified and assessed per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. Data assessment packages will be created per this procedure. The data assessment packages will include field and analytical data, chains of custody, data verification and assessment queries, and other project specific information needed for personnel to adequately review the package. Data assessment packages will be reviewed to document any issues pertaining to the data and to indicate if data met the data quality objectives of the project.	Internal	Sample and Data Management, Project Management, and QA Personnel, Contractor

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table[1]

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Data Deliverables, Analytes, and Holding Times	The laboratory data documentation obtained will be contractual screened and will be included in the data assessment packages, per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*.	Sample and Data Management Personnel, Contractor
IIa	Chain-of Custody, Sample Handling, Sampling Methods and Procedures, and Field Transcription	These items will be validated during the data assessment process as required by DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. The documentation of this validation will be included in the data assessment packages.	Project and QA Personnel, Contractor
IIa	Analytical Methods and Procedures, Laboratory Data Qualifiers, and Standards	These items will be reviewed during the data validation process as required by DOE prime contractor data validation procedures. Data validation will be performed in parallel with data assessment. The data validation report and data validation qualifiers will be considered when the data assessment process is being finalized.	Data Validation Subcontractor, Sample and Data Management, Project and QA Personnel, Contractor
IIa	Audits	The audit reports and accreditation and certification records for the laboratory supporting the projects will be considered in the bidding process.	Sample and Data Management Personnel, Contractor
IIb	Deviations and qualifiers from Step IIa	Any deviations and qualifiers resulting from Step IIa process will be documented in the data assessment packages.	Sample and Data Management, Project, and QA Personnel, Contractor
IIb	Sampling Plan, Sampling Procedures, Co-located Field Duplicates, Project Quantitation Limits, Confirmatory Analyses, Performance Criteria	These items will be evaluated as part of the data verification and data assessment process per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. These items will be considered when evaluating whether the project met their Data Quality Objectives.	Sample and Data Management, Project, and QA Personnel, Contractor

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table[1]

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa/IIb	Soil	Semivolatile organic compounds	Low	DOE prime contractor procedure PRS-ENM-5105, *Volatile and Semivolatile Data Verification and Validation*	TBD
IIa/IIb	Soil	Metals	Low	DOE prime contractor procedure PRS-ENM-5107, *Inorganic Data Verification and Validation*	TBD
IIa/IIb	Soil	Radionuclides	Low	DOE prime contractor procedure PRS-ENM-5102, *Radiochemical Data Verification and Validation*	TBD
IIa/IIb	Soil	PCBs	Low	DOE prime contractor procedure PRS-ENM-0811, *Pesticide and PCB Data* Ver*ification and Validation*	TBD

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #37
Usability Assessment[1]

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used: Field and analytical data are verified and assessed per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. Data assessment packages will be created per this procedure. Data assessment packages will include field and analytical data, chains-of-custody, data verification and assessment queries, and other project specific information needed for personnel to adequately review the package. Data assessment packages will be reviewed to document any issues pertaining to the data and to indicate if DQOs of the project were met.

Describe the evaluative procedures used to assess overall measurement error associated with the project: PARCCS parameters (precision, accuracy, representativeness, comparability, completeness, and sensitivity) will be evaluated per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. This information will be included in the data assessment packages for review by project personnel. Data assessment can be used to document QC exceedances, trends, and/or bias in the data set. Data assessment also can be used to document any statistics used.

Identify the personnel responsible for performing the usability assessment: Project and QA Personnel.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: Data assessment packages will be created, which will include data assessment comments/questions and laboratory comments. Data verification and assessment queries indicating any historical outliers and background soil exceedances also will be included in the data assessment packages.

[1] It is understood that SOPs are contractor specific.

3. REFERENCES

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DOE 2010. *Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0120&D2/R2, U.S. Department of Energy, Paducah, KY, June.

DOE 2013a. *Soils Operable Unit Remedial Investigation Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0358&D2/R1, U.S. Department of Energy, Paducah, KY, February.

DOE 2013b. *Remedial Design Report In Situ* Source Treatment Using Deep Soil Mixing for the Southwest Groundwater Plume Volatile Organic Compound Source at the C-747-C Oil Landfarm *at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1276&D2/R1, U.S. Department of Energy, Paducah, KY, September.

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APPENDIX A

SURVEY PLAN FOR SOILS OPERABLE UNIT SWMUs AND AOCs AT THE PADUCAH GASEOUS DIFFUSION PLANT

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ACRONYMS

AOC	area of concern
CFR	*Code of Federal Regulations*
cpm	counts per minute
DMSA	DOE Material Storage Area
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
GWS	gamma walkover survey
IMC	Individual Measurement Comparison
KRCEE	Kentucky Research Consortium for Energy and Environment
LATA Kentucky	LATA Environmental Services of Kentucky, LLC
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
OU	operable unit
PGDP	Paducah Gaseous Diffusion Plant
RI	remedial investigation
SWMU	solid waste management unit
TRU	transuranic

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A.1. INTRODUCTION AND PURPOSE

The *Addendum to the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Remedial Investigation 2, Sampling and Analysis Plan* was developed to define the field sampling for this subsequent remedial investigation (RI), known as Soils Operable Unit (OU) RI 2. Sixteen solid waste management units (SWMUs)/areas of concern (AOCs) were determined to require additional characterization subsequent to the Soils OU RI to delineate the extent of contamination at the Paducah Gaseous Diffusion Plant (PGDP). These SWMUs/AOCs are subject to an RI/Feasibility Study (FS). This survey plan supplements the approved RI/FS Work Plan for the Soils OU, which was completed in June 2010 (DOE 2010), and describes how the radiological gamma walkover survey (GWS) will be performed. Information not included in the Sampling and Analysis Plan should be referenced from the June 2010 RI/FS Work Plan.

The purpose of this survey plan is to define the highest count rate area/location within a SWMU/AOC and sample the area/location with the highest count rate. Table A.1 presents the SWMUs and AOCs included for radiation survey under this Work Plan addendum. Figure A.1 shows the locations of the SWMUs and AOCs that will be evaluated by this survey plan. Figures A.2 and A.3 show the detailed areas for survey at SWMUs 56/80 and at AOC 204.

Table A.1. Soils OU SWMUs/AOCs Identified for Further Characterization

SWMU/AOC	Location	Description
13	C-746-P&P1	P&P1 Scrap Yards
56	C-540-A	PCB Staging Area
80	C-540	PCB Spill Site
204	Dyke Road	Historical Staging Area
229	C-746-F	DMSA OS-18
565	North of C-611 Water Treatment Plant	Rubble Area K

DMSA = DOE material storage area
PCB = polychlorinated biphenyl

A.2. SITE DESCRIPTION AND HISTORY

The PGDP site description and history can be found in Section 4 of the June 2010 RI/FS Work Plan (DOE 2010).

A.3. HISTORICAL DATA REVIEW

Radiological survey records and soil sampling data for the SWMUs and AOCs presented in Table A.1 have been reviewed and evaluated and considered in the design of this survey plan. Walkdowns of the units were conducted by the Federal Facility Agreement parties during March 2014 in support of this survey design.

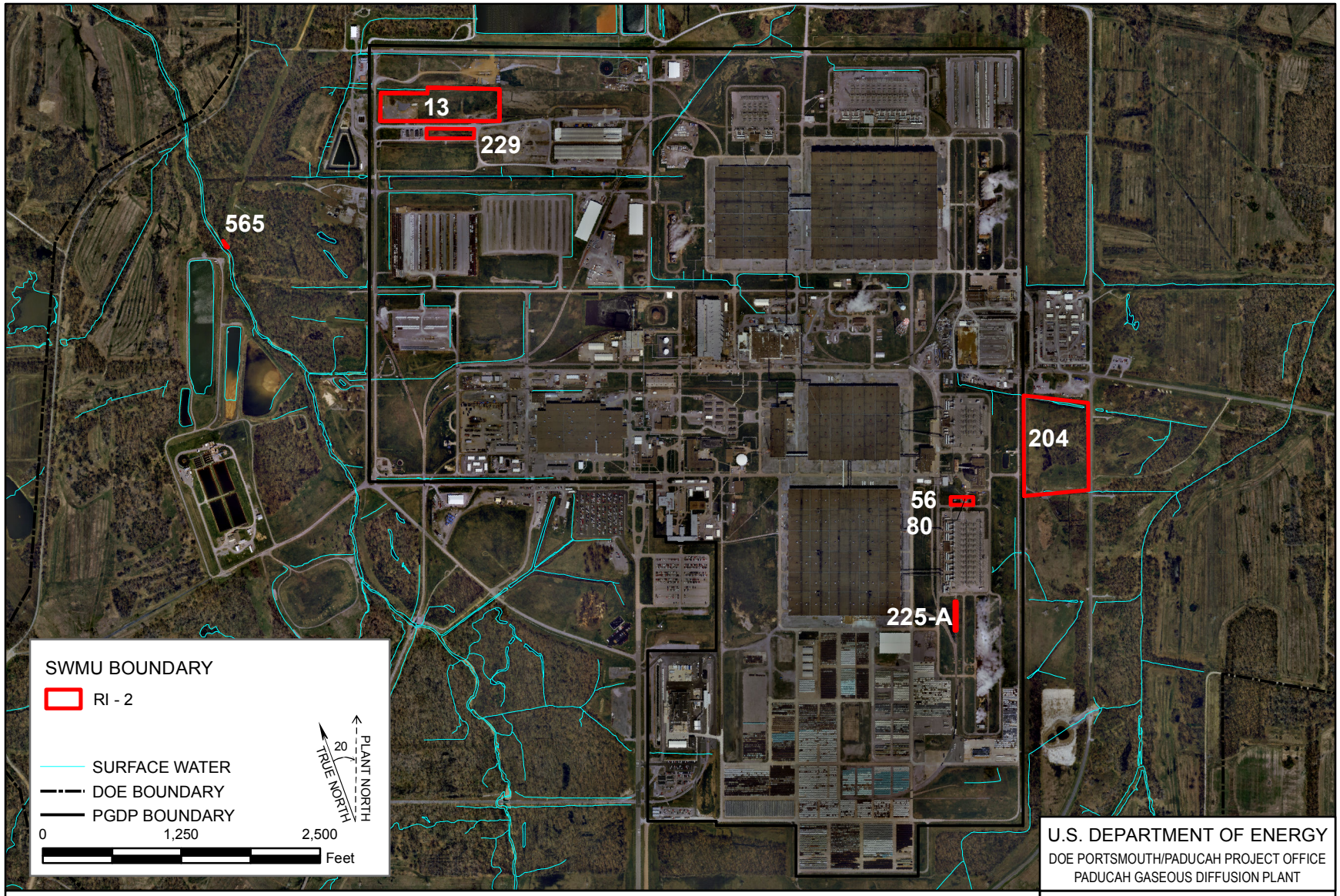

Figure A.1. Soils OU RI 2 SWMUs/AOCs for GWS

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Figure A.2. SWMUs 56 and 80 GWS Area Location

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5/5/2014

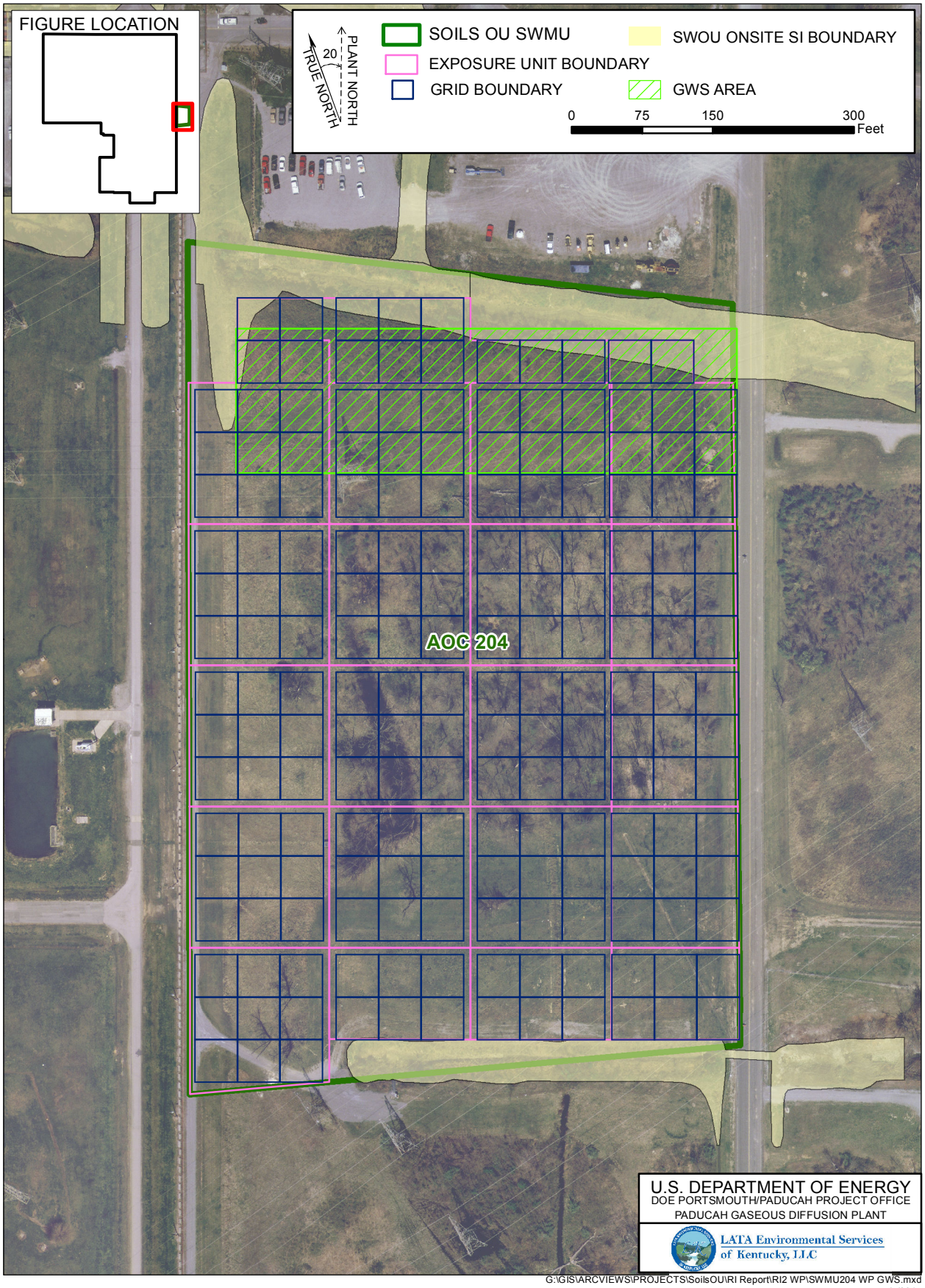

Figure A.3. AOC 204 GWS Area Location

A.4. GAMMA WALKOVER SURVEY AND DATA ASSESSMENT

A.4.1 SURVEY INPUT PARAMETERS

For the purpose of the survey, the area/location with the highest count rate is used as the indicator for establishing the sampling location for radiological contaminants.

- Prior to a GWS of each SWMU/AOC, gamma ray dose rate measurements will be taken around the perimeter of the area.
- GWSs will be conducted by walking lines parallel to one other where possible, separated by approximately one meter.
- Stakes or other indicators will be used, as necessary, to ensure properly spaced lines.
- GWSs will be conducted at a progression rate of approximately one-half meter per second to ensure a data density of at least one measurement per square meter.
- The detector will be held approximately four to six inches above the ground and moved slowly in a serpentine fashion.
- Surface geometries and media other than soil (such as saturated soils, concrete and asphalt surfaces, etc.) that can impact GWS results will be noted.
- GWS data will be logged along with accompanying GPS information in State Plane Coordinates (in feet).
- The units of measurement for GWSs will be gross cpm.

A.4.2 SURVEY QUALITY CONTROL

Prior to the start of surveys for SWMUs/AOCs with a radiation detector, ten measurements will be taken with a known source in a repeatable geometry. The ten measurements will be used to establish a quality control chart that provides mean and two standard deviations above and below the mean for the radiation detector dataset. At the beginning and end of each survey, the radiation detector will be checked with the original source in the original geometry used to establish the quality control chart. Detector response outside of two standard deviations based on the quality control chart will be evaluated to ensure the radiation detector is within the established control limits. Each radiation detector, used for survey of a SWMU/AOC, will have a quality control chart developed prior to use in the field.

Before radiation surveys of SWMUs/AOCs, field work is to begin with the calibration and assessment of all radiation detectors to be utilized for GWS of soils. This step is necessary for establishing quality control for this survey plan. Figure A.4 illustrates the location of the area that is to be used to develop quality control for the radiation detectors. This area was chosen because a quality dataset from Kentucky

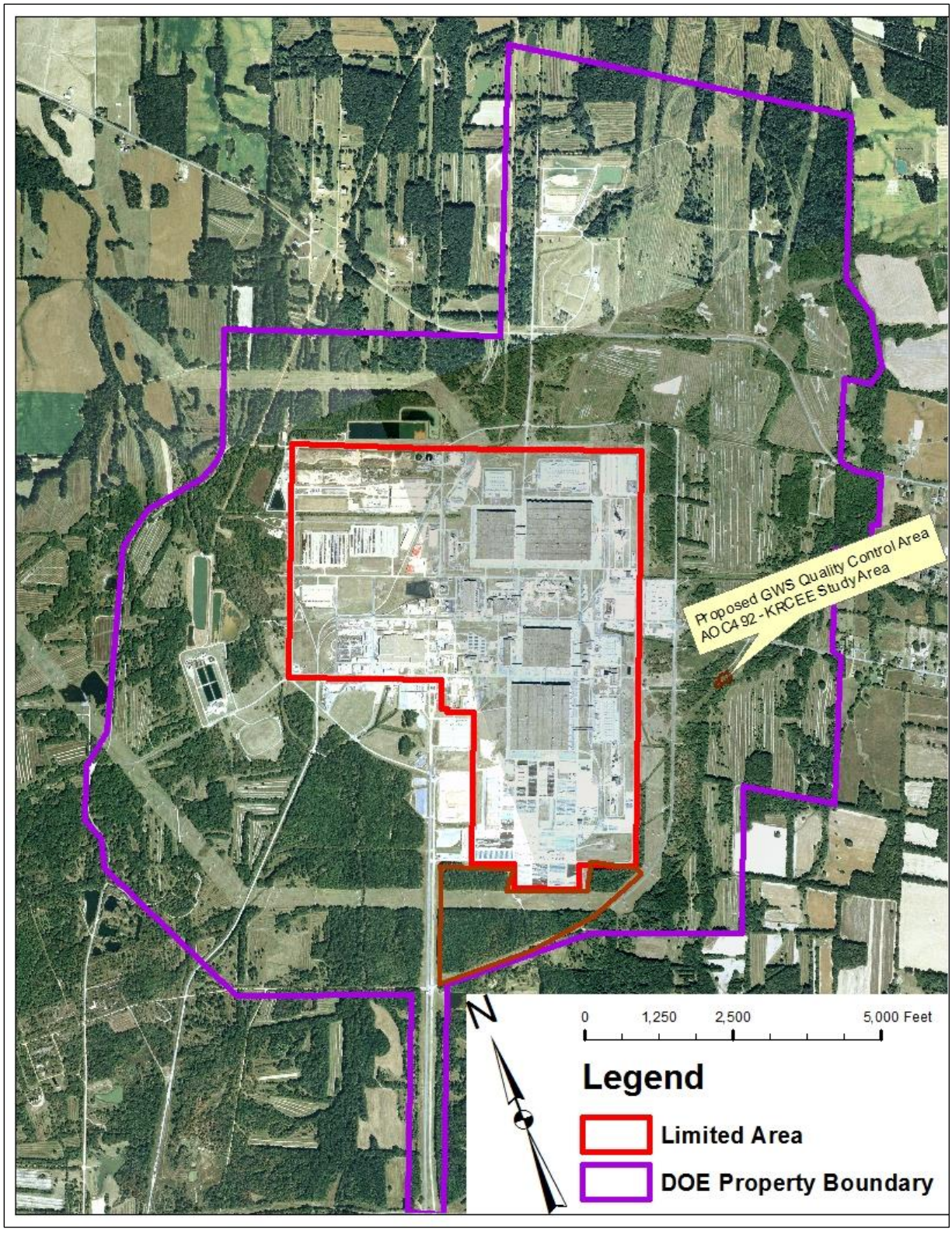

Figure A.4. Quality Control Area within KRCEE Demonstration Project Area

Research Consortium for Energy and Environment (KRCEE's) 2008 Real Time Demonstration Project is available for the area (KRCEE 2008). Figure A.5 shows the GWS for the area using gross count data from KRCEE's 2008 Real Time Demonstration (KRCEE 2008). Prior to GWSs that are used to establish quality control for radiation detectors, gamma ray dose rate measurements are to be taken and recorded at the perimeter of the area to assess potential impacts from activities within the PGDP Limited Area. To establish quality control for the radiation detectors, a GWS for each detector is to be conducted for an area of 200 m^2 within the area shown in Figure A.4. The size of the areas is consistent with grids used for the Soil OU Work Plan (DOE 2010). GWS data for each radiation detector then is used to establish the quality control for the detectors. The GWS data is in cpm. If the quality control for a radiation detector falls outside its established two sigma control limit based on the mean, it will be rechecked to determine whether service or recalibration is needed for the radiation detector.

A.4.3 DATA ASSESSMENT AND SELECTION OF SAMPLE LOCATION

The following describes how the survey data will be evaluated and used to select a sample location.

- GWS data will be downloaded each day and the data will be evaluated the next business day, following completion of the anomaly survey and any confirmation survey.

- The GWS data will be overlaid on a map of the SWMU/AOC.

- Areas of a SWMU/AOC where GWS data are incomplete or questionable because of GPS signal or incomplete coverage will undergo additional GWS.

- The GWS data for the SWMU/AOC will be analyzed using inflection point analysis.

- Probability Plots will used to determine whether a break/inflection point occurs in the data.

- Data above the break/inflection point will be mapped to determine the location of the data above the inflection point within the SWMU/AOC. The analysis may indicate:

  Case 1: A SWMU/AOC with one area with a group of data points with elevated count rate,

  Case 2: A SWMU/AOC with multiple areas with a group data points with elevated count rate,

  Case 3: A SWMU/AOC with single area with a single data point with an elevated count rate (no adjacent points with elevated count rate data), or

  Case 4: A SWMU/AOC with a combination of the above.

  Case 5: If no inflection point is observed for the probability plot, data points above the 95^{th} percent will be mapped and used, along with professional judgment, to determine the location for a judgmental sample.

- After survey data are mapped, sample locations will be determined in accordance with the following:

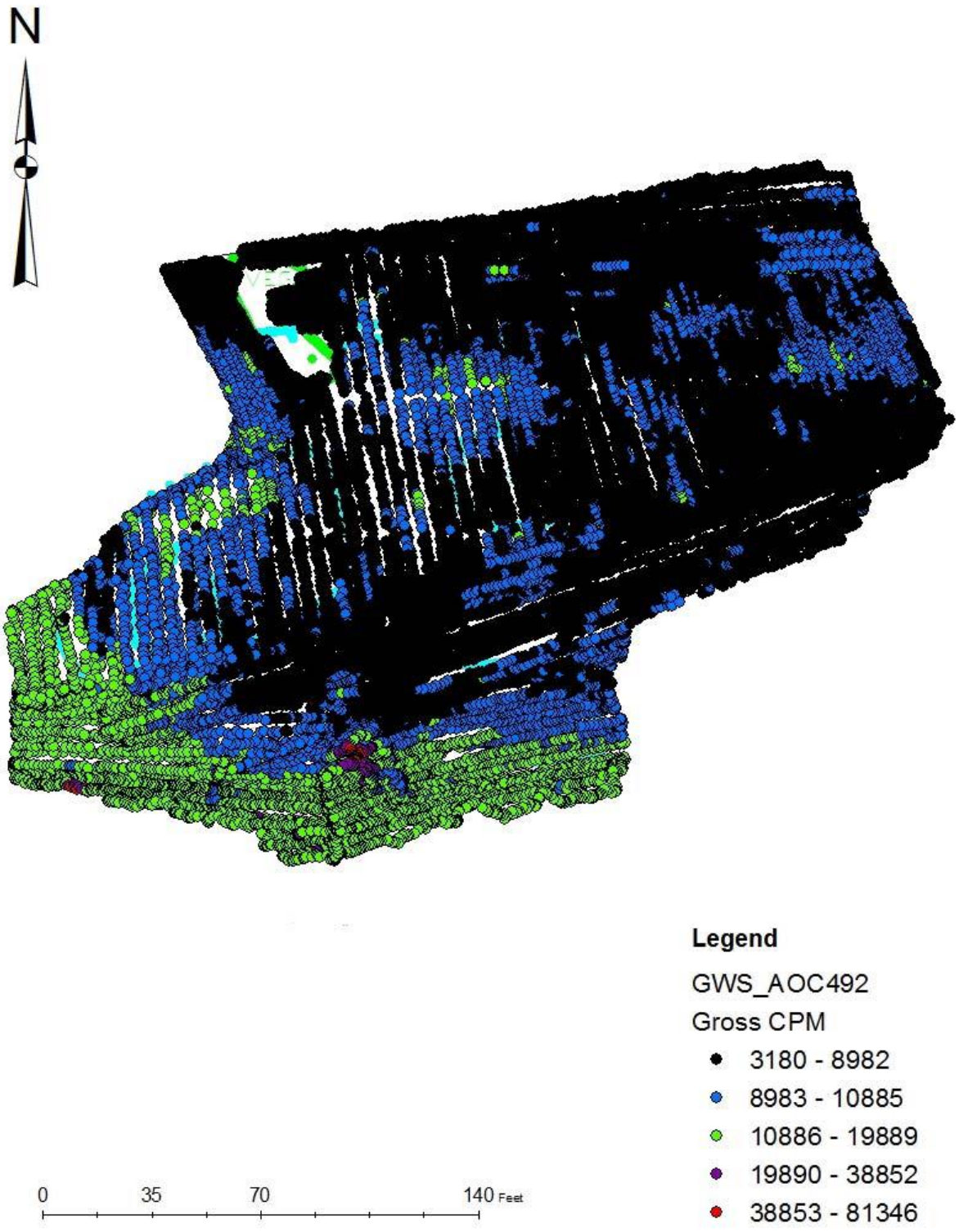

Figure A.5. GWS for AOC 492 and Adjacent Areas Using KRCEE Gross Count Data

Case 1: A SWMU/AOC may have a single area with a group of elevated count rate data points. In this case, the sample area will be resurveyed (e.g., conformation) to determine the boundary of the area (e.g., count rates above the break/infection point) and the location with the highest count rate within the area. The location within the area with the highest count rate will be chosen for sampling.

Case 2: A SWMU/AOC may have multiple areas with a group of elevated count rate data points. The sample areas will be resurveyed (e.g., conformation) to determine the boundary of the each area (e.g., count rate above the break/infection point) and the location with the highest count rate within each area. From the areas, the area with the highest count rate will be chosen for sampling at the location with the highest count rate.

Case 3: A SWMU/AOC may have a single area with elevated count rate with no adjacent elevated points. The single location with the elevated count rate with no adjacent locations with elevated count rate will be resurveyed using a 5 m × 5 m area centered on the single point. The location with the highest count rate within the 5 m × 5 m area will be chosen for sampling.

Case 4: A SWMU/AOC may have single areas with a group of elevated count rate data points, multiple areas with a group of elevated count rate data points, and/or a single area with elevated count rate with no adjacent elevated points. Professional judgment will be used to determine sample location, with a focus on the location with the highest count rate.

Case 5: If no inflection point is observed for the probability plot, data points above the 95th percentile will be mapped and used, along with professional judgment, to determine the location for a judgmental sample.

- If the observed highest location is associated with debris within a SWMU/AOC, additional measurements will be conducted to determine if the elevated count rate is from debris or adjacent soil. These additional measurements will not be combined with the initial survey data for mapping or inflection point analysis. The sample location will be determined as discussed above.

- If the highest count rate is associated with debris, the debris will be moved, if possible, manually. The area under the debris will be surveyed. If moving the debris manually is not possible, the survey will be considered complete. Sample location will be determined as discussed above.

- After a sampling location within an anomaly has been determined, a discussion with the Commonwealth of Kentucky and EPA will be held to gain agreement of the sampling location. The Commonwealth of Kentucky and EPA will send agreement of the sampling location or a proposed alternate location within 3 business days.[3] If there is continued disagreement of the sampling location, discussions will be held to determine an agreed upon location.

- Surveys will be conducted prior to sampling to ensure accurate sample placement.

[3] 3 business days is an expectation for scheduling purposes.

A.5. SURVEY PLAN SUMMARY

This survey plan provides a systematic methodology for defining the criteria that the GWS and sample design should satisfy including types of analyses and measurements, when and where to collect perform measurements, and the decision errors. The survey plan summary is as follows:

- All GWS radiation detectors will be operated and maintained by qualified personnel, in accordance with LATA Kentucky's Radiation Safety Program procedures;
- Real-time logged GWS data will be downloaded immediately after completion of the GWS (within three business days) to ensure data are of sufficient quality and quantity to meet the intended use of the data;
- Radiation detectors will operate under daily quality control to ensure the detectors are operating within control limits; and
- GWS speed, detector height, and integration time shall be maintained throughout the survey to ensure the collection of at a minimum one measurement per square meter.

A.5.1 FIELD APPROACH

Upon receiving authorization from DOE, surveyors from LATA Kentucky will implement this survey plan. A survey team consisting of two surveyors will obtain the specified radiological measurements. The GWS supervisor will ensure that data from each SWMU/AOC are archived separately and the data files include all specified data. GWS will progress until completion. GWS operations will cease for inclement weather. GWS will not be conducted in areas of standing water.

A.5.2 SAFETY HAZARDS

Safety hazards likely to be encountered during the performance of this survey effort include insects (seasonal), wildlife (seasonal), vegetation, slips, trips, falls, heat/cold stress, falling debris, and driving hazards. All survey efforts conducted in support of this plan will be performed in accordance with established activity hazards analyses and work control documents. Surveyors will use the buddy system at all times and maintain radio communications with the GWS supervisor and the PGDP plant shift superintendent. Surveyors shall report his/her position to the GWS supervisor at regular intervals.

A.5.3 SWMU/AOC LOCATIONS

The SWMUs/AOCs selected for further evaluation are presented in Table A.1 and their locations are shown in Figure A.1.

A.5.4 GWS

GWS are performed by moving the detector in a serpentine pattern approximately 1-m wide, while advancing at a rate of approximately 0.5 m/sec. The sensitive area of the detector is maintained as close to the surface as practical, considering the surface conditions; 4 to 6 inches is a reasonable distance. Parallel

scanning passes will be made across the SWMU/AOC where possible. The GWS coverage is based on guidance in MARSSIM for providing a high confidence level of collecting data for areas with elevated count rate.

A.5.5 SEQUENCING OF WORK

Upon receiving authorization from DOE, surveyors will begin implementing this survey plan. Data evaluation will be conducted in parallel with the collection effort to ensure a timely review of data and to ensure that data gaps are identified while the project is underway. Upon completion of the GWS and data collection for a SWMU/AOC, the project team will evaluate the data and determine whether further surveys of the SWMU/AOC are necessary.

A.6. DATA MANAGEMENT

Data collected in support of this effort shall be managed as follows.

- A new data file shall be created for each SWMU/AOC.
- If multiple instruments are used on an individual anomaly, unique data files for each instrument will be created.
- Data files shall include time stamps with both date and time collected.
- Data files shall include X and Y coordinates in State Plane Coordinate System (in ft).
- Data files shall be archived on the network in a dedicated folder. Access will be restricted to project team members.
- A written GWS record shall be prepared for each SWMU/AOC that includes data file name, instrument, surveyor, and area-specific information. The GWS also should include a narrative of any unusual condition or material noted for the SWMU/AOC. If sketches or photographs of the SWMUs/AOCs are produced, these shall be attached to the written survey record. A copy of the written survey record shall be provided to the project manager.
- A copy of the written survey shall be provided to the project manager.

A.7. ANALYSES AND DATA REPORTING SCHEDULE

Data will be reported in the Soils OU Phase II RI Report to be issued in accordance with the project schedule.

A.8. DATA REPORTING

The GWS supervisor shall routinely report the progress and results to the project manager. Data reporting shall include the number of completed GWS for SWMUs/AOCs, the number of anomaly surveys in progress, and the location of the highest count rate in each SWMU/AOC.

A.8.1 IN-PROCESS DATA REVIEW

The GWS supervisor routinely will review data to determine if the requirements of this survey plan are being met. Additionally, the review will ensure that data gaps are identified and corrected during the GWS of each SWMU/AOC.

A.8.2 DATA PRESENTATION METHODOLOGY

Data collected in support of this survey plan, including, but not limited to, GWS data, inflection point analysis, mapping of data, area of highest count rate, and quality control will be presented in a written report upon completion of the project. A copy of the written report will be included with the project final report.

A.8.3 DATA ARCHIVAL

Data files, written surveys, and instrument calibration records shall be archived electronically with the Soils OU project files.

A.9. REFERENCES

DOE (U.S. Department of Energy) 2010. *Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0120&D2/R2, U.S. Department of Energy, Paducah, KY, June.

KRCEE (Kentucky Research Consortium for Energy and Environment) 2008. *Real Time Technology Application Demonstration Project Final Report at the Paducah Gaseous Diffusion Plant, Paducah*, Kentucky, UK/KRCEE DOC#. P18.32 2008, December.

ATTACHMENT A1

TOTAL SURFACE CONTAMINATION MEASUREMENT PARAMETERS AND SURVEY METHOD

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A1.1. INTRODUCTION

GWS will be conducted for selected SWMUs/AOCs in support of the Soils OU RI 2. In addition to the performance of GWSs of soil areas, concrete and asphalt surfaces may be encountered. In order to characterize the concrete and asphalt surfaces, direct measurements of surface radioactivity will be performed. The purpose of this survey plan is to establish a mechanism through which concrete and asphalt that is encountered during the GWS can be characterized for surface contamination. Concrete and asphalt surfaces found to be contaminated in excess of DOE limits will be controlled accordingly, if not already controlled as a contaminated surface. Survey results from surface scans will not be considered when determining sampling locations.

The survey design has been developed and includes current knowledge of historical processes and existing radiological data associated with the concrete and asphalt surfaces of the SWMUs/AOCs. This information has been used along with DOE Prime Contractor procedures in determining guidelines and action levels for this survey. Surface scans will be performed with surface contamination instrumentation such as Geiger-Mueller and phoswich detectors. Due to the nature of surface scanning, these measurements will be documented using traditional survey reports. Dataloggers with GPS equipment will not be used for this application.

A1.2. RADIOLOGICAL HISTORY

Radioactivity levels on surfaces associated with the concrete and asphalt surfaces found in the limited area have the potential for contamination above background levels. In some instances, contamination on concrete and asphalt surfaces may exceed established release criteria. A review of process history indicates the potential for surficial contamination on concrete and asphalt within these SWMUs and AOCs. Some of the SWMUs and AOCs associated with this effort are controlled for contamination in accordance with DOE requirements.

A1.3. CONTAMINANTS AND CRITERIA

For the radiological surveys of the surfaces of the concrete and asphalt surfaces, the predominant radiological contaminant is expected to be processed uranium. The isotopic ratios may be natural or depleted in uranium-235. A historical review did not reveal a likelihood for enriched uranium surface contamination within these areas. In addition to uranium, small amounts of technetium-99 (Tc-99), thorium-230 (Th-230), other fission and activation products, and transuranic radionuclides (TRU) have been identified at some locations around PGDP. Uranium is the most controlling radionuclides likely to be encountered in these areas. The most likely source of contamination would be incidental contact with plant-derived materials that were in contact with the concrete and asphalt surfaces..

The applicable DOE surface contamination criteria, for uncontrolled release are acceptable to demonstrate that objects with potential uranium surface contamination may be released without controls. These values are as follows:

5,000 dpm/100 cm^2 total beta/gamma
1,000 dpm/100 cm^2 removable beta/gamma

5,000 dpm/100 cm^2 total alpha (uranium)
1,000 dpm/100 cm^2 removable alpha (uranium)

Because direct alpha measurements on porous or heavily oxidized surfaces may be affected adversely by surface conditions (e.g., roughness, cracks, pores.) and coverings (e.g., dirt, oil, paint, moisture.), alpha measurements cannot be used reliably to determine contamination levels on weathered surfaces, concrete and asphalt surfaces, wood, and other items that may have shallow subsurface contamination. An alternative is to use beta/gamma measurements as a surrogate for alpha measurements. The ratio of beta/gamma emissions to alpha emissions from processed natural uranium is 1.6 to 1, and for depleted uranium, the beta/gamma to alpha ratio is greater than 2.0 to 1. Information presented in NUREG/CG-1507 and DOE Prime Contractor procedures, used to measure surface contamination, demonstrates that beta/gamma detectors, calibrated with Tc-99, are able to detect and measure accurately uranium contamination on concrete surfaces, unless the surface is extremely weathered, damaged, or has a surface covering exceeding several mg/cm^2. As such, direct beta/gamma measurements are capable of identifying the presence of uranium contamination for natural and depleted uranium isotopic abundances and will be used as a surrogate measurement for alpha contamination levels for surveying porous items potentially contaminated with such materials.

In the case of wood, concrete and asphalt surfaces, and other porous surfaces, the use of the surface contamination limits for scanning may not provide an appropriate level of assurance for determining compliance with uncontrolled release status. This is due to the effective porosity of the material and the potential for volumetric contamination due to the absorption of radioactively contaminated substances (oils, water, etc.). Also, because of the possibility that contamination may exist inside inaccessible areas or that surface conditions might adversely affect measurement accuracy, a guideline of indistinguishable from background will be applicable for scanning measurements of porous items. Areas found to have radioactivity levels in excess of the indistinguishable from background criteria will be assessed further using static measurements.

SWMU/AOC associated concrete is located in areas inside of the limited security area and some is located within areas historically controlled for surface contamination. Further, these SWMUs/AOCs are not located in areas historically known to possess transuranics at levels that require specific control limits. As such, transuranic release criteria is not applicable, and beta/gamma only measurements are appropriate for release of concrete due to the discussion above.

For the purpose of the survey of a SWMU/AOC associated concrete and asphalt surfaces, results will be compared to the following:

- Scans and/or momentary observations that do not indicate activity exceeding the Individual Measurement Comparison (IMC) levels when using beta/gamma instrumentation and methods capable of measuring contamination to levels below the DOE limits outlined above, and

- A population of static measurements will be performed on concrete and asphalt surfaces located within any of the SWMUs/AOCs accessed as part of this work plan. The DOE limits referenced below are used to ensure that the instruments are calibrated and operated in a manner such that the minimum detectable activity (MDA) is less than the DOE limits. Any area found in excess of DOE limits that is not already controlled for contamination will be managed appropriately by the Radiological Control organization. Total beta/gamma measurements will be used as a surrogate to demonstrate compliance. A 1 to 1 ratio provides a conservative estimate of uranium surficial concentration.

Indistinguishable from background is based on the concepts recommended by *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) and NUREG/CR-1507. Table A1.1 indicates the IMC levels that are considered by DOE to be detectable by a surveyor (based on audible response) by scanning or momentary observations for a range of instrument background count rates. Because the actual background likely will differ from the values in this table, an IMC must be determined for the actual detector background; this is performed by interpolation, using a graphical plot of IMC versus background. A graphical plot is included in Figure A1.1. The IMC is used as an indicator of contamination and will be used by the radiological control technician (RCT) to determine when the scan should be paused or when a static measurement is necessary.

Table A1.1. Detectable Count Rates as a Function of Instrument Background

Background (cpm)	IMC Level (cpm)	Background (cpm)	IMC Level (cpm)
1	5	100	170
2	8	150	240
4	12	200	300
6	15	250	380
10	20	300	450
20	40	400	600
30	60	500	700
40	80	600	800
60	110	1,000	1,300
80	130		

A1.4. SURVEY APPROACH

A1.4.1 GENERAL

Surveys shall be performed by trained RCTs who follow standard, approved, written procedures of the DOE Prime Contractor and use properly calibrated instruments sensitive to the potential contaminants.

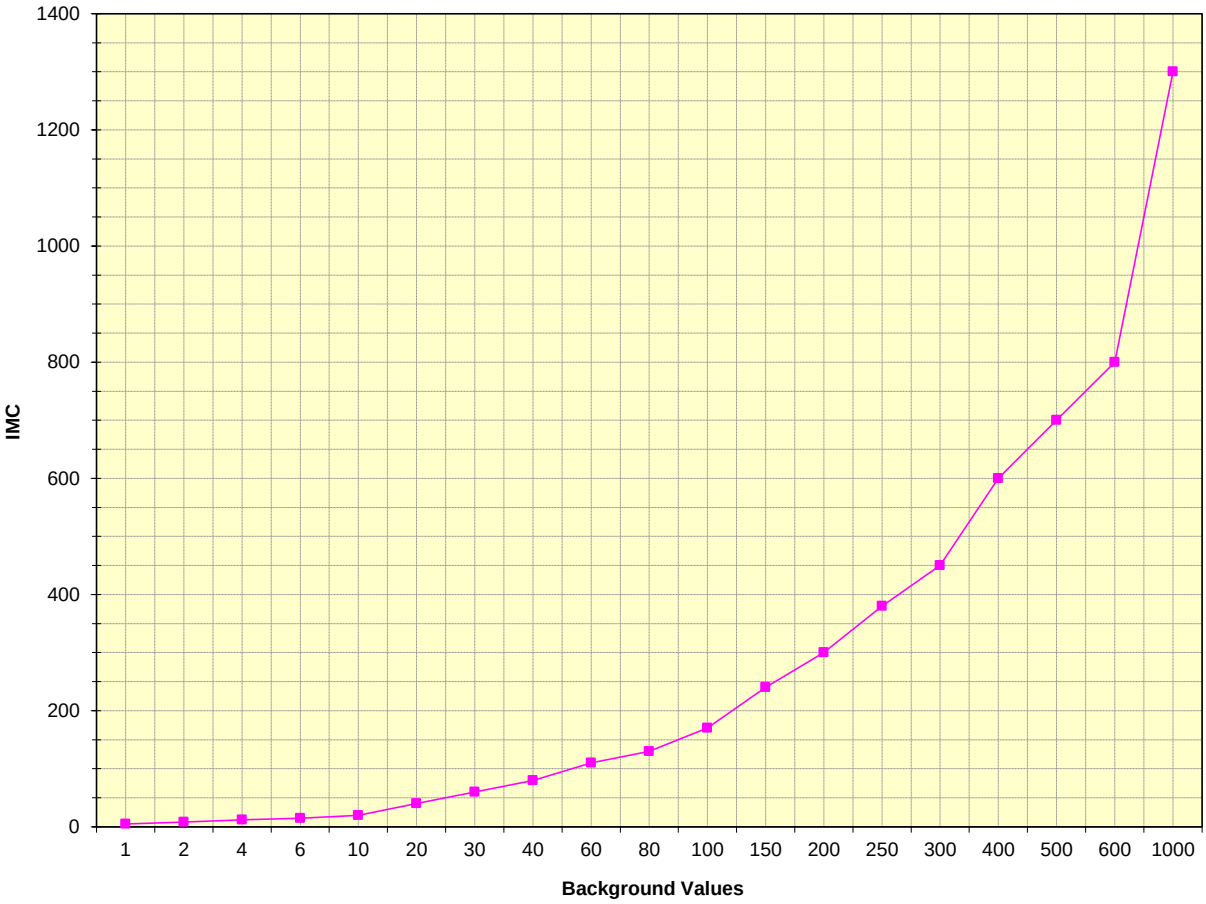

Figure A1.1. Individual Measurement Comparison

A1.4.2 INSTRUMENTATION

Survey instrumentation shall be appropriate for the type of radiation being measured, and count times, survey methods, and calculations used to determine activity levels shall be such that detection sensitivities (MDA) should be < 75% of the applicable release criterion. Table A1.2 identifies instruments typically used for these types of surveys. Sensitivities are for nominal operating parameters. Actual backgrounds and associated distinguishable activity levels will be determined for the specific instrument and methods used at the time of the survey.

Table A1.2. Typical Instruments and Sensitivities

Detector Model	Meter Model	Application	Typical Bkgd. (cpm)	IMC (cpm)	Sensitivity (Lc) (dpm/100 cm^2)	
					Scanning	Static Count (1 minute)
44-9	3 or equivalent	Beta/gamma scan and measurement	50	95	2,500	530

A1.5. SURVEY IMPLEMENTATION

A1.5.1 POROUS MATERIALS

Concrete and asphalt surfaces will be accessed for contamination during the performance of a GWS of soil conducted at the selected SWMUs/AOCs. If concrete and asphalt surfaces are identified during the soil surveys, surveyors (i.e., RCTs) also will conduct surveys of those surfaces..

- Access the surfaces to be surveyed and assure that the surfaces are free of any material that might interfere with meaningful contamination measurements.

- Perform a beta/gamma one-minute timed count to determine the ambient background radiation levels in the area in which the survey is being conducted. Be sure to ensure that the probe is not in contact with potentially contaminated materials at the time of the measurements. Record the readings on the survey form in cpm. The background value shall be recorded on the survey and used as the reference background for this survey unit and for determining the IMC.

- Surveyor will scan the accessible concrete and asphalt surface for beta/gamma-emitting surface contamination.

- During the scan, if the surveyor detects count rates in excess of the IMC, the scan will be paused and to allow for instrument integration. The surveyor will note the areas of highest count rate during the scan on the survey record and will denote these areas on the surface using spray paint or other marking technique. Surveyor will perform a timed one-minute static count in the 10 highest count rate areas as determined during the scan. If the static count result exceeds the DOE release limit, the surveyor will ensure the area is controlled for contamination. If a contaminated area in excess of the DOE limit is discovered to be uncontrolled, the surveyor will notify his/her supervisor immediately.

- If no areas of elevated count rate are discovered, obtain timed one-minute direct measurements at 10 locations using a systematic pattern (e.g., triangular or rectangular grid).

- For concrete or asphalt areas with an accessible surface area less than 10 m^2, at least one timed count will be made per square meter.

- Static measurements will be documented on a traditional survey report in accordance with DOE prime contractor procedures.

Scan results will be reported on the survey. The survey will denote the locations of the scan and the results. An example in the comments section might be, "Surface scan performed of asphalt and concrete in SWMU 5. Asphalt and/or concrete is estimated to have a surface area of 120 m^2. The scan focused on areas of visible discoloration and gouges. Background reading was 60 cpm. All beta/gamma scan readings were less than the IMC of 110 cpm."

A1.6. EVALUATING SURVEY RESULTS

Survey data will be reviewed to assure all aspects of this plan have been followed. Survey data will be evaluated to assure proper instrument performance and acceptable quality assurance/quality control data. Data will be reviewed by the RCT Supervisor to ensure completeness, proper implementation of program quality control requirements, and that areas are properly controlled per DOE regulations.

A1.7. DOCUMENTATION

Results of surface contamination measurements of concrete and asphalt surfaces will be provided in the project final report.

A1.8. QUALITY ASSURANCE

Survey instruments and methods specified in applicable RADCON operating and technical procedures previously have been documented as to their ability to provide a 95% confidence level in detection of surface contamination at levels that meet the requirements of this protocol. Supporting data will be provided on each survey form.

The GWS supervisor will review, evaluate, and validate the survey results including assessment of the quality assurance/quality control information and data.

APPENDIX B

PROCEDURES CROSSWALK

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PROCEDURES CROSSWALK

Phase 1 Work Plan Procedure Reference	Procedure Title	RI 2 SAP Addendum Procedure Reference
PRS-CDL-0029	*Waste Management Plan for the Paducah Environmental Remediation Project*	PAD-PLA-ENV-001
PRS-DOC-1009	*Records Management, Administrative Record, and Document Control*	PAD-RM-1009
PRS-ENM-0811	*Pesticide and PCB Data Verification and Validation*	PAD-ENM-0811
PRS-ENM-1001	*Transmitting Data to the Paducah Oak Ridge Environmental Information System (OREIS)*	PAD-ENM-1001
PRS-ENM-2700	*Logbooks and Data Forms*	PAD-ENM-2700
PRS-ENM-2708	*Chain-of-Custody forms, Field Sample Logs, Sample Labels, and Custody Seals*	PAD-ENM-2708
PRS-ENM-5003	*Quality Assured Data*	PAD-ENM-5003
PRS-ENM-5004	*Sample Tracking, Lab Coordination & Sample Handling Guidance*	PAD-ENM-5004
PRS-ENM-5007	*Data Management Coordination*	PAD-ENM-5007
PRS-ENM-5102	*Radiochemical Data Verification and Validation*	PAD-ENM-5102
PRS-ENM-5105	*Volatile and Semivolatile Data Verification and Validation*	PAD-ENM-5105
PRS-ENM-5107	*Inorganic Data Verification and Validation*	PAD-ENM-5107
PRS-ESH-2007	*Industrial Motorized Trucks (Forklifts)*	PAD-SH-2007[a]
PRS-QAP-1210	*Issues Management Program*	PAD-QA-1210[b]
PRS-WCE-0044	*Adherence to Performance Documents*	PAD-WC-0044
PRS-WSD-0011	*Waste Acceptance Criteria for the Treatment, Storage, and Disposal Facilities at the Paducah DOE Site*	PAD-WD-0011
PRS-WSD-0019	*On-Site Transfer and Movement of Waste Containers and Other Support Equipment*	PAD-WD-0019
PRS-WSD-0307	*Paducah Waste Characterization Sampling and Analysis Plan*	PAD-PROJ-0307
PRS-WSD-0661	*Transportation Safety Document for On-Site Transport within the PGDP*	PAD-WD-0661
PRS-WSD-3010	*Waste Generator Responsibilities for Temporary On-Site Storage of Regulated Waste Materials at Paducah*	PAD-WD-3010
PRS-WSD-3012	*Procurement, Inspection and Management of Items Critical for Paducah Off-Site Waste Shipments*	PAD-QA-3012
PRS-WSD-3015	*Waste Packaging*	PAD-WD-3015

[a] Procedure now is titled *Powered Industrial Trucks*.
[b] Procedure now is titled *Issues Management*.

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