Department of Energy

Portsmouth/Paducah Project Office
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513
(859) 219-4000

OCT 23 2009

Ms. Jennifer Tufts
U.S. Environmental Protection Agency, Region 4
Federal Facilities Branch
61 Forsyth Street
Atlanta, Georgia 30303

PPPO-02-150-10

Mr. Edward Winner, FFA Manager
Kentucky Department for Environmental Protection
Division of Waste Management
200 Fair Oaks Lane, 2nd Floor
Frankfort, Kentucky 40601

Dear Ms. Tufts and Mr. Winner:

TRANSMITTAL OF THE D2/R1 REMOVAL ACTION WORK PLAN FOR CONTAMINATED SEDIMENT ASSOCIATED WITH THE SURFACE WATER OPERABLE UNIT (ON-SITE) AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY (DOE/LX/07-0221&D2/R1)

References:

1. Letter from A. Webb to R. Knerr, "Conditional Approval of the Removal Action Work Plan for Contaminated Sediment Associated with Surface Water Operable Unit (On-Site) (DOE/LX/07-0221&D2)," dated September 23, 2009
2. Letter from J. Tufts to R. Knerr, "Conditional Approval of the D2 Removal Action Work Plan for Contaminated Sediment Associated with Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0221&D2)," dated September 21, 2009
3. Letter from R. Knerr to J. Tufts and E. Winner, "Transmittal of the Removal Action Work Plan for Contaminated Sediment Associated with Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0221&D2)," (PPPO-02-629-09), dated August 21, 2009

Please find enclosed the certified D2/R1 *Removal Action Work Plan for Contaminated Sediment Associated with Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0221&D2/R1)* (RAWP) for your review. Also enclosed is a red-lined version of the document and a summary table in response to comments received from the Kentucky Department for Environmental Protection (KDEP) (reference 1) and U.S. Environmental Protection Agency (EPA) (reference 2).

KDEP and EPA conditionally approved the subject D2 RAWP (reference 3), in letters dated September 23, 2009, and September 21, 2009, respectively. All conditions, as stated in KDEP's letter (reference 1) were incorporated or addressed as described in the attached comment response summary. As previously discussed between U.S. Department of Energy, EPA, and KDEP during a teleconference on October 6, 2009 the parties agreed to a modification for the condition originally described in EPA's letter (reference 2). The modified condition is as follows:

1) A draft protocol for fill and cover material verification is attached.

If you have any questions or require additional information, please contact David Dollins at (270) 441-6819.

Sincerely,

Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosures:
1. Certification Page
2. D2/R1 RAWP
3. Comment Response Summary
4. Red-lined Document

cc w/enclosures:
AR File/Kevil
DMC/Kevil
EIC/PAD

e-copy w/enclosures:
ballard.turpin@epa.gov, EPA/Atlanta
brandy.mitchell@prs-llc.net, PRS/Kevil
christa.turner@ky.gov, KDEP/Frankfort
craig.jones@prs-llc.net, PRS/Kevil
dave.dollins@lex.doe.gov, PPPO/PAD
dennis.ferrigno@prs-llc.net, PRS/Kevil
edward.winner@ky.gov, KDEP/Frankfort
jana.white@prs-llc.net, PRS/Kevil
janet.miller@lex.doe.gov, PRC/PAD
jennifer.blewett@prs-llc.net, PRS/Kevil
john.lea@prs-llc.net, PRS/Kevil
john.morgan@prs-llc.net, PRS/Kevil
mike.spry@prs-llc.net, PRS/Kevil
msmith@techlawinc.com, TLI
myrna.redfield@prs-llc.net, PRS/Kevil
rachel.blumenfeld@lex.doe.gov, PPPO/LEX
reinhard.knerr@lex.doe.gov, PPPO/PAD
rich.bonczek@lex.doe.gov, PPPO/LEX
teresa.overby@prs-llc.net, PRS/Kevil
tufts.jennifer@epa.gov, EPA/Atlanta

CERTIFICATION

Document Identification: ***D2/R1 Removal Action Work Plan for Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* (DOE/LX/07-0221&D2/R1)**

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 assure 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.

Paducah Remediation Services, LLC
Operator

Myrna Redfield, Environmental Monitoring/
Restoration Deputy

10/22/09
Date Signed

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 assure 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.

U.S. Department of Energy (DOE)
Owner

Reinhard Knerr, Paducah Site Lead
Portsmouth/Paducah Project Office

10/22/09
Date Signed

DOE/LX/07-0221&D2/R1
Primary Document

Removal Action Work Plan for Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

CLEARED FOR PUBLIC RELEASE

Tetra Tech, Inc.

contributed to the preparation of this document and should not be considered an eligible contractor for its review.

DOE/OR/07-0221&D2/R1
Primary Document

Removal Action Work Plan for Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

Date Issued—October 2009

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

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the

Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

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PREFACE

This *Removal Action Work Plan for Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0221&D2/R1, was prepared in accordance with requirements under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980. The three objectives of this report are to (1) update the schedule for performing construction activities; (2) provide a summary level description of the plans and the goals attainment to be utilized for the removal action; and (3) detail a crosswalk between each applicable or relevant and appropriate requirement (ARAR) for the design and implementation of the removal action, the citation that mandates the ARAR, and the specification or plan that implements the ARAR. The removal action goals of this project are to ensure direct contact risk at Sections 3 and 5 of the North-South Diversion Ditch and Kentucky Pollutant Discharge Elimination System Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and areas for the current industrial worker falls within the EPA risk range (EPA 1999).

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FIGURES

TABLES

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ACRONYMS

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
BJC	Bechtel Jacobs Company LLC
BMP	best management practice
BRA	Baseline Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	*Code of Federal Regulations*
COC	contaminant of concern
CWA	Clean Water Act
DOE	U.S. Department of Energy
ECP	Environmental Compliance Plan
EDE	effective dose equivalent
EE/CA	Engineering Evaluation/Cost Analysis
ELCR	excess lifetime cancer risk
EM	environmental management
EPA	U.S. Environmental Protection Agency
ES&H	Environmental, Safety, and Health
EU	exposure unit
FFA	Federal Facility Agreement
HI	hazard index
ICM	Interim Corrective Measures
KAR	*Kentucky Administrative Regulations*
KEEC	Kentucky Energy and Environment Cabinet
KPDES	Kentucky Pollutant Discharge Elimination System
LLW	low-level waste
LMES	Lockheed Martin Energy Systems
NEPA	National Environmental Policy Act
NRC	Nuclear Regulatory Commission
NSDD	North-South Diversion Ditch
NWP	Nationwide Permit
PAH	polyaromatic hydrocarbons
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
PRS	Paducah Remediation Services, LLC
QA/QC	Quality Assurance/Quality Control
RA	Removal Action
RAO	Removal Action Objective
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
SI	Site Investigation
SWMU	Solid Waste Management Unit
SWOU	Surface Water Operable Unit
TBC	to be considered
TCA	trichloroethane
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
TSCA	Toxic Substances Control Act

USC	*United States Code*
UTS	Universal Treatment Standard

EXECUTIVE SUMMARY

The Paducah Gaseous Diffusion Plant (PGDP) is an active uranium enrichment facility owned by the U.S. Department of Energy (DOE). DOE is conducting environmental restoration activities at PGDP in compliance with the requirements of the Commonwealth of Kentucky and the U.S. Environmental Protection Agency (EPA) under the Comprehensive Environmental Response, Compensation, and Liability Act. PGDP was placed on the National Priorities List in 1994. DOE, EPA, and Commonwealth of Kentucky entered into a Federal Facility Agreement in 1998.

DOE, EPA, and Commonwealth of Kentucky have entered into a written agreement to remediate contaminants associated with sediment in Sections 3, 4, and 5 of the North-South Diversion Ditch (NSDD) and Kentucky Pollutant Discharge Elimination System (KPDES) Outfalls 001, 008, 010, 011, and 015 and associated internal ditches and areas of PGDP. This agreement, the *Action Memorandum for Contaminated Sediment Associated with the SWOU (On-Site)* (DOE 2009a), documents the non-time-critical removal action that will occur in specific areas or defined exposure units (EUs)[1] located within PGDP Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and specific areas or EUs located within the NSDD Sections 3 and 5. This action implements excavation and removal of "hot spots" associated with these areas and includes one or more engineering controls to prevent transport of contaminated soils and sediment, as needed, during removal activities. After completing the removal action and upon verifying the removal action objectives (RAOs) are achieved (including site restoration), engineering and temporary access controls will be evaluated and discontinued as appropriate. Completion of this removal action will reduce the risk to current and future industrial workers and recreational users from direct contact by removing known sources of contamination.

The RAOs for this removal action are consistent with the overall Remedial Action Objectives for the Surface Water Operable Unit and include the following:

- Ensure direct contact risk at the on-site ditches for the current industrial worker falls within the EPA risk range (EPA 1999).

- Ensure direct contact risk at the NSDD for both the current industrial worker and recreational user falls within the EPA risk range (EPA 1999).

Upon completion of this an interim action and in keeping with the phased approach, this action will be followed by the Comprehensive Site Operable Unit evaluation, with implementation of additional and final actions, as needed, to ensure long-term protectiveness (DOE 2009b).

[1] An EU is defined as approximately 0.5 acres. This is consistent with the EU size used for Sections 1 and 2 of the NSDD (DOE 2002), the EU size used for the Surface Water Operable Unit (On-site) Site Investigation (DOE 2008a) and the EU size for industrial areas specified in the PGDP Risk Methods Document (DOE 2001).

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1. INTRODUCTION

This Surface Water Operable Unit (SWOU) (On-Site) Removal Action is being conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA). The SWOU Removal Action will address the potential threat to human health and the environment from direct contact with contaminated soil and sediments located within the North-South Diversion Ditch (NSDD) Sections 3 and 5 and PGDP Outfalls 001, 008, 010, 011, and 015, and their associated internal ditches and areas within the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky (Figures 1 and 2). This removal action will include excavation of "hot spots" to a depth of 2 ft and management and proper disposition of the remediation waste.

The PGDP was constructed from 1951 to 1954, began operating in 1952, and was fully operational by 1955, supplying enriched uranium for commercial reactors and military defense reactors. PGDP was operated by Union Carbide Corporation until 1984, when Martin Marietta Energy Systems, Inc. [which later became Lockheed Martin Energy Systems, Inc. (LMES)], was contracted to operate the plant for the U.S. Department of Energy (DOE). On July 1, 1993, DOE leased the plant production/operations facilities to the United States Enrichment Corporations; however, DOE maintains ownership of the plant and is responsible for environmental restoration and waste management activities. On April 1, 1998, Bechtel Jacobs Company LLC, (BJC) replaced LMES in implementing the Environmental Management (EM) Program at PGDP. On April 23, 2006, Paducah Remediation Services, LLC, (PRS) replaced BJC in implementing the EM Program at PGDP.

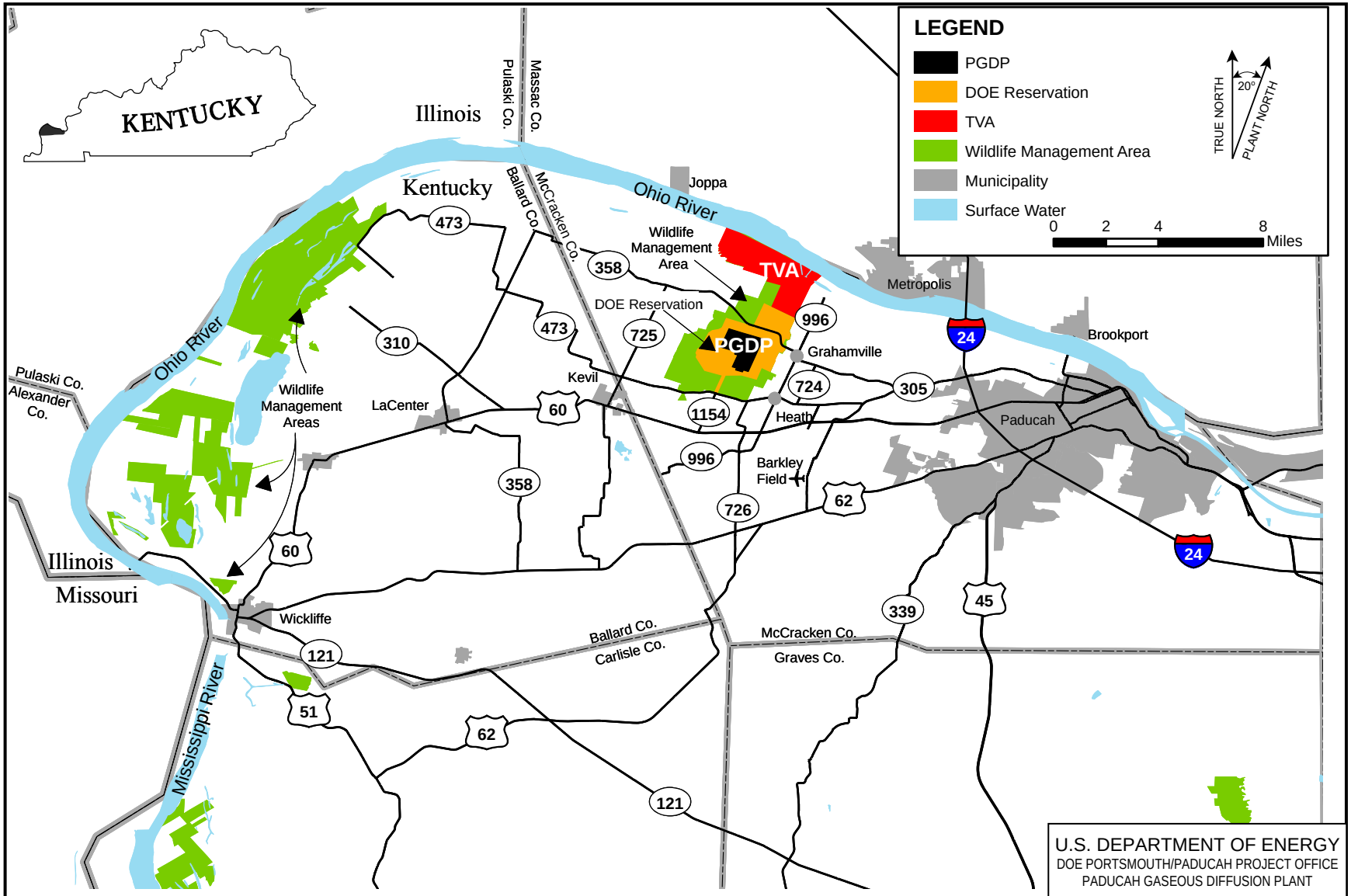
PGDP was placed on the National Priorities List effective June 30, 1994 (59 *Federal Register* 27989, May 31, 1994). A Federal Facility Agreement (FFA) negotiated by DOE, U.S. Environmental Protection Agency (EPA), and the Commonwealth of Kentucky coordinates the requirements of the Resource Conservation and Recovery Act of 1980 (RCRA) and CERCLA at the facility.

1.1 PURPOSE OF THE REMOVAL ACTION WORK PLAN

Preparation of this Removal Action Work Plan (RAWP) follows the development and approval of an Engineering Evaluation/Cost Analysis (EE/CA) (DOE 2008b) and an Action Memorandum (DOE 2009). This RAWP provides the project schedule for implementation of the removal action, summarizes the work to be performed, identifies project plans to be used during construction, and provides a crosswalk to identify the applicable or relevant and appropriate requirements (ARARs).

1.2 SCOPE OF THE REMOVAL ACTION WORK PLAN

This RAWP is prepared in accordance with CERCLA, as amended by Superfund Amendments and Reauthorization Act, and is consistent with the National Contingency Plan and the Paducah FFA. This removal action is consistent with and will not preclude anticipated objectives for future CERCLA actions at PGDP. The following items are included in this RAWP:



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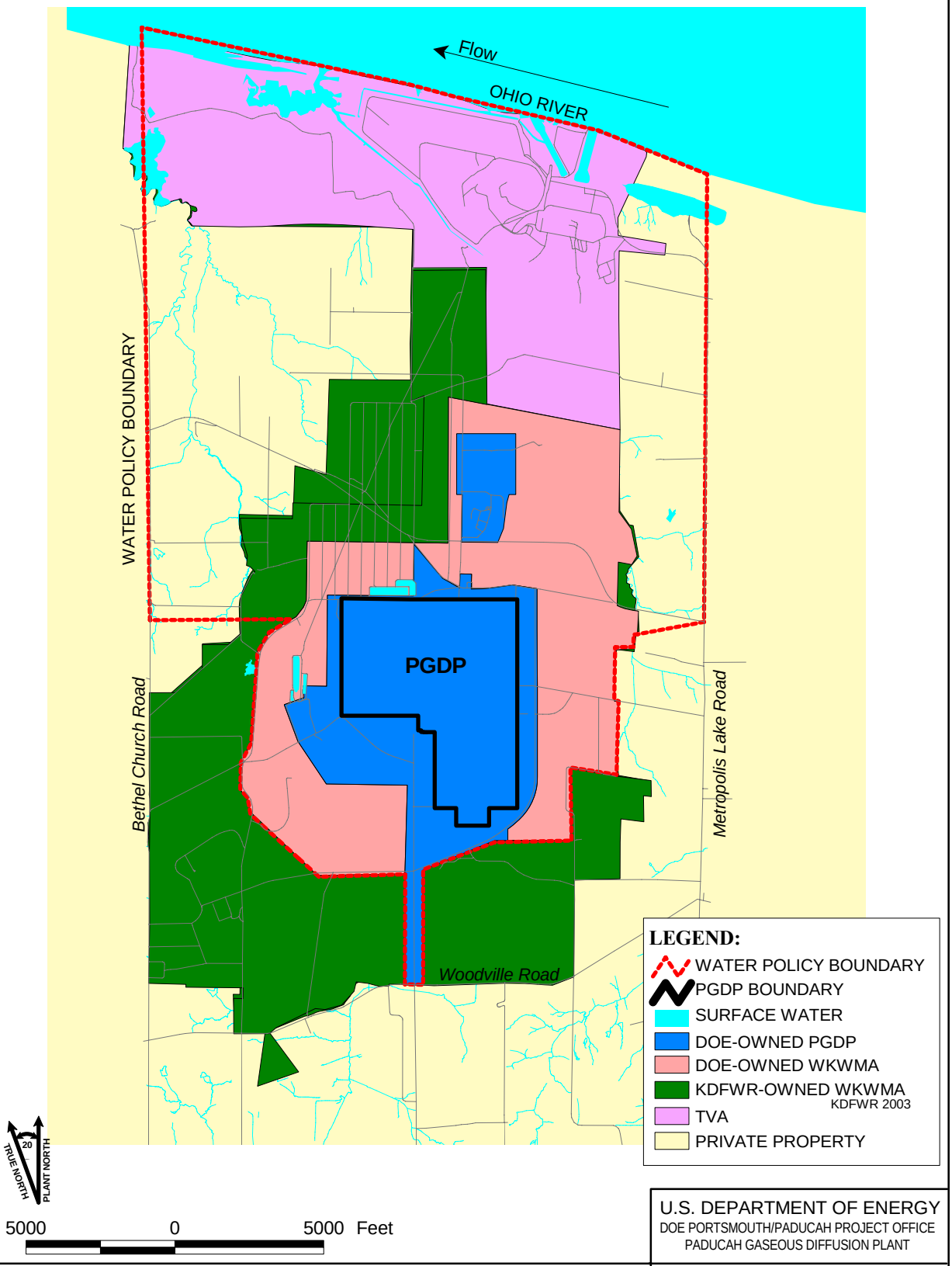
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure 1. PGDP Site Location



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PADUCAH GASEOUS DIFFUSION PLANT

Figure 2. PGDP Land Ownership Map

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

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- A summary level description of the SWOU (On-Site) removal action;
- An updated schedule for performing construction activities;
- A design package that contains a scope of work, design drawings, and any project calculations; and
- Various project plans [e.g., Environmental, Safety, and Health (ES&H), Waste Management, Quality Assurance (QA), Sampling and Analysis, and Data Management]; and
- A detailed crosswalk between each ARAR identified for the design and implementation of the removal action and the measures required to meet the ARARs during the construction and operation phases of the remedial action.

2. PROJECT ORGANIZATION

The project organization chart outlining the relationship of key personnel and organizations is shown in Figure 3. The roles and responsibilities of the project team are described below.

DOE Project Manager—Serves as the point of contact with regulatory agencies, and directs the overall completion of the removal action in accordance with the approved Action Memorandum and RAWP. Establishes baseline scope, schedule, and budget and serves as the primary interface for environmental management activities implemented by DOE's Prime Contractor.

Prime Contractor Project Manager—Serves as the primary point of contact with DOE to implement the removal action. Performs work in accordance with the baseline scope and schedule and directs the day-to-day activities of PRS personnel.

Quality Assurance/Quality Control Manager—Verifies all work is completed in accordance with the Quality Assurance Plan. Develops QA/Quality Control (QC) procedures and implementing administrative procedures that govern both technical and nontechnical work.

Field Superintendent—Oversees all field activities and verifies field operations follow established plans and procedures.

Health and Safety Representative—Develops the ES&H plan and oversees implementation of Integrated Safety Management Systems and the overall safety and health of employees, both in the field and the office. Provides direct support to the Prime Contractor Project Manager concerning the safety and health of project personnel, the general public, and impacts to property and the environment. Each task will have the proper ES&H controls in place before work begins, meeting all applicable federal and state regulations.

Field Technical Staff—Provides direct support to the Field Superintendent concerning technical aspects of the project.

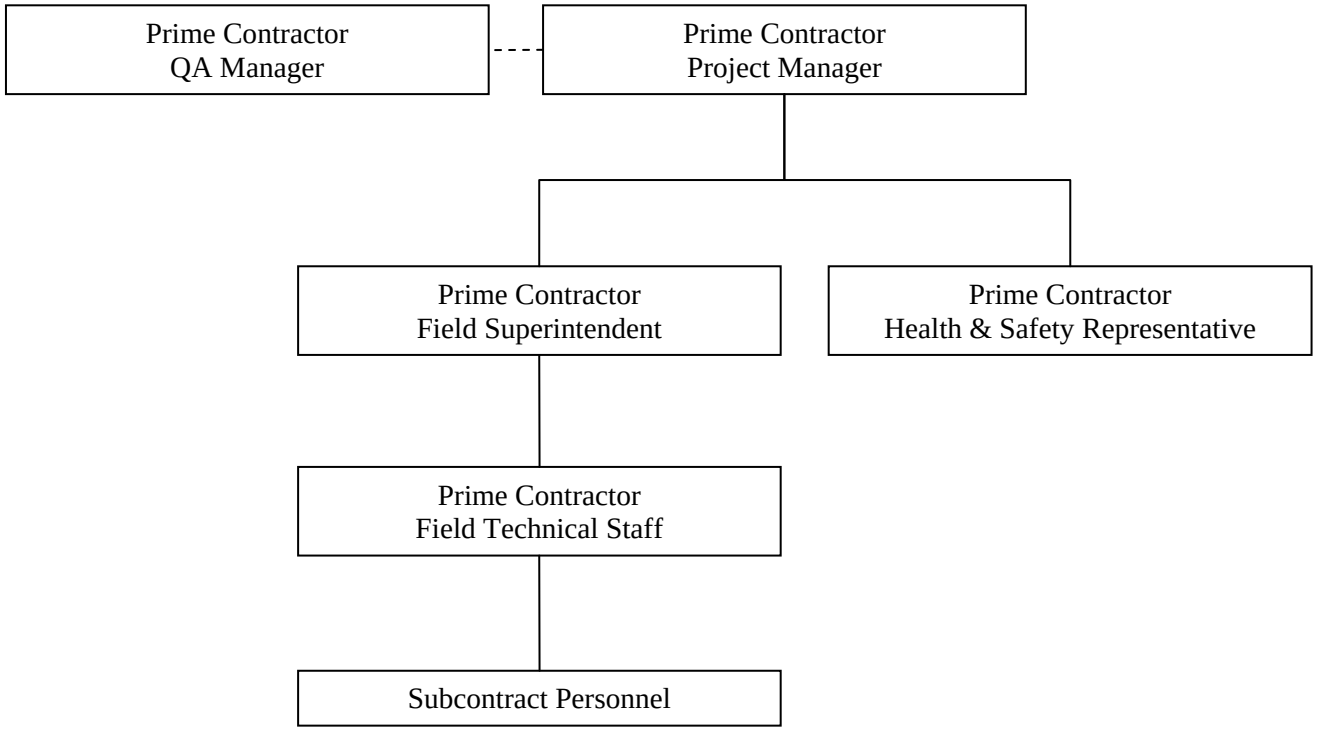

Figure 3. Project Organization

3. PROJECT DESCRIPTION

The SWOU Removal Action addressed in this RAWP will include implementation of one or more engineering controls to prevent further migration of contaminants; temporary access controls, such as, exclusion fencing and hazard postings as required; removal of identified "hot spots" to a depth of 2 ft (DOE 2009a); post-excavation sampling; restoring the excavated area with clean clay and soil; and managing and properly disposing of remediation waste. Work will include mobilization; installation of Best Management Practice (BMP) controls; excavation; post-excavation sampling; restoration; soil handling, transportation and disposal; and demobilization. Installation of temporary BMP controls will be completed in accordance with *Best Management Practices Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PRS/PROG/0017, and is dependent upon the site conditions at the time of excavation. After excavation of the "hot spot" area is complete, and upon verification that the removal action objectives (RAOs) are achieved (including site restoration), localized engineering controls and temporary access controls will be evaluated and discontinued, as appropriate. Design drawings provided in Appendix B show general site layouts for the removal actions.

3.1 HISTORY

Sections 3 and 5 of the NSDD and Kentucky Pollutant Discharge Elimination System (KPDES) Outfalls 001, 008, 010, 011, and 015 and associated internal ditches and areas have received surface water runoff and wastewater from various sources within the PGDP. Each of these areas has been investigated previously. The contamination associated with these areas originated from plant activities.

3.1.1 NSDD Sections 3 and 5

Sections 3 and 5 of the NSDD, Solid Waste Management Unit (SWMU) 58, are located outside the security fenced area (PGDP boundary) on property owned by DOE (Figure 4). The NSDD originates within the north-central portion of the PGDP and discharges into Little Bayou Creek to the north of the plant. Sections 3 and 5 of the NSDD are posted for radiological contamination pursuant to 10 *CFR* Part 835 requirements.

3.1.2 Outfalls 001, 008, 010, 011, and 015 and Their Associated Internal Ditches

Outfalls 001, 008, 010, 011, and 015, which are located outside the security fenced area (PGDP boundary) on property owned by DOE, and their associated internal ditches and areas (including SWMUs 92 and 97) are shown in Figure 5. The internal plant ditches that discharge to NSDD and the outfalls were trenched when PGDP was built and became fully operational when the plant was opened in 1951. Water discharged at each outfall is regulated by a KPDES permit, and the water quality is tested regularly at established monitoring stations, in accordance with the conditions of the KPDES permit. SWMU 92 was designated as a SWMU due to placement of polychlorinated biphenyl (PCB)-contaminated soils as fill from a transformer rupture in 1967. SWMU 97 was designated as a SWMU due to a diesel oil spill that occurred on March 9, 1979.

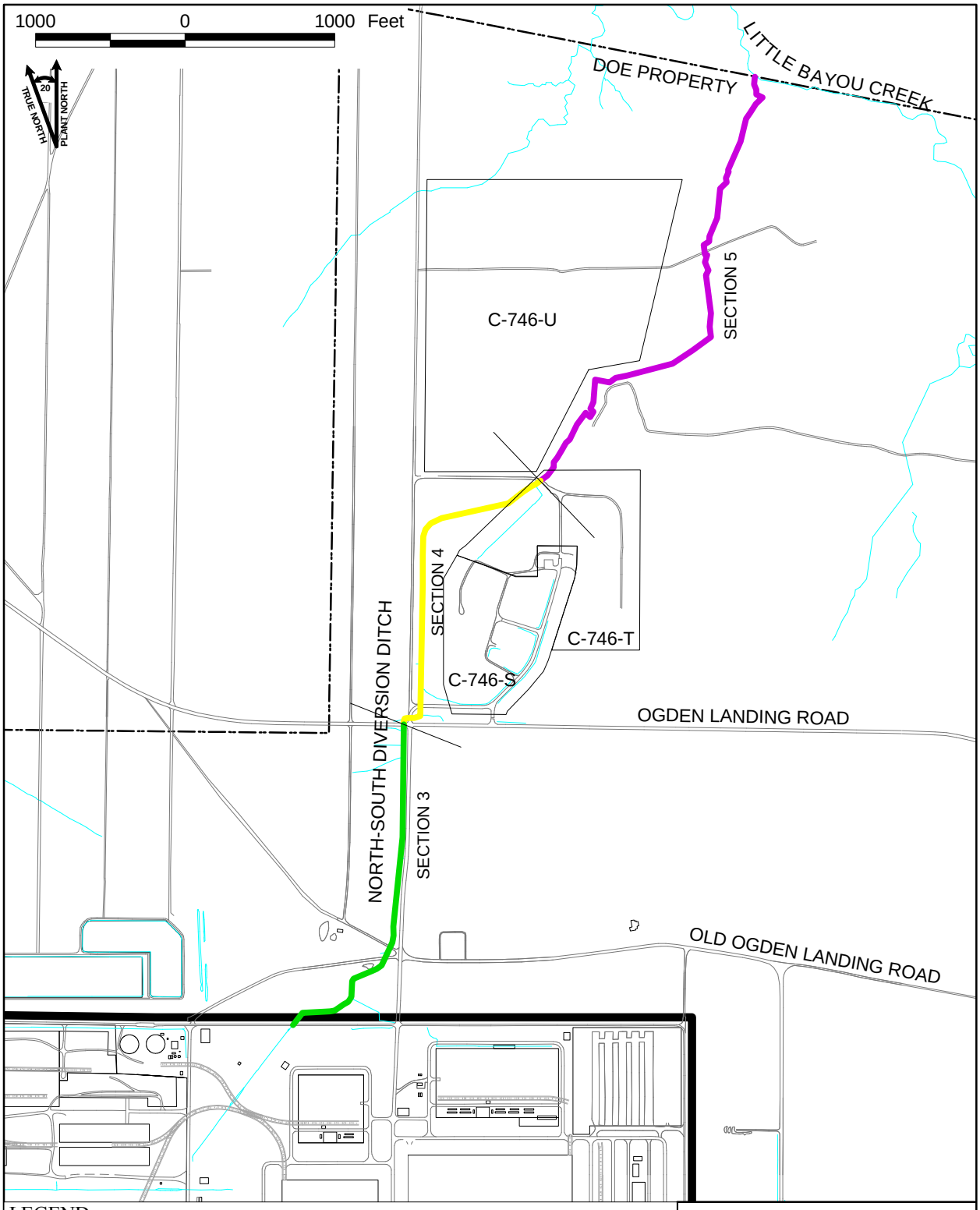

Figure 4. Sections 3, 4, and 5 of the NSDD

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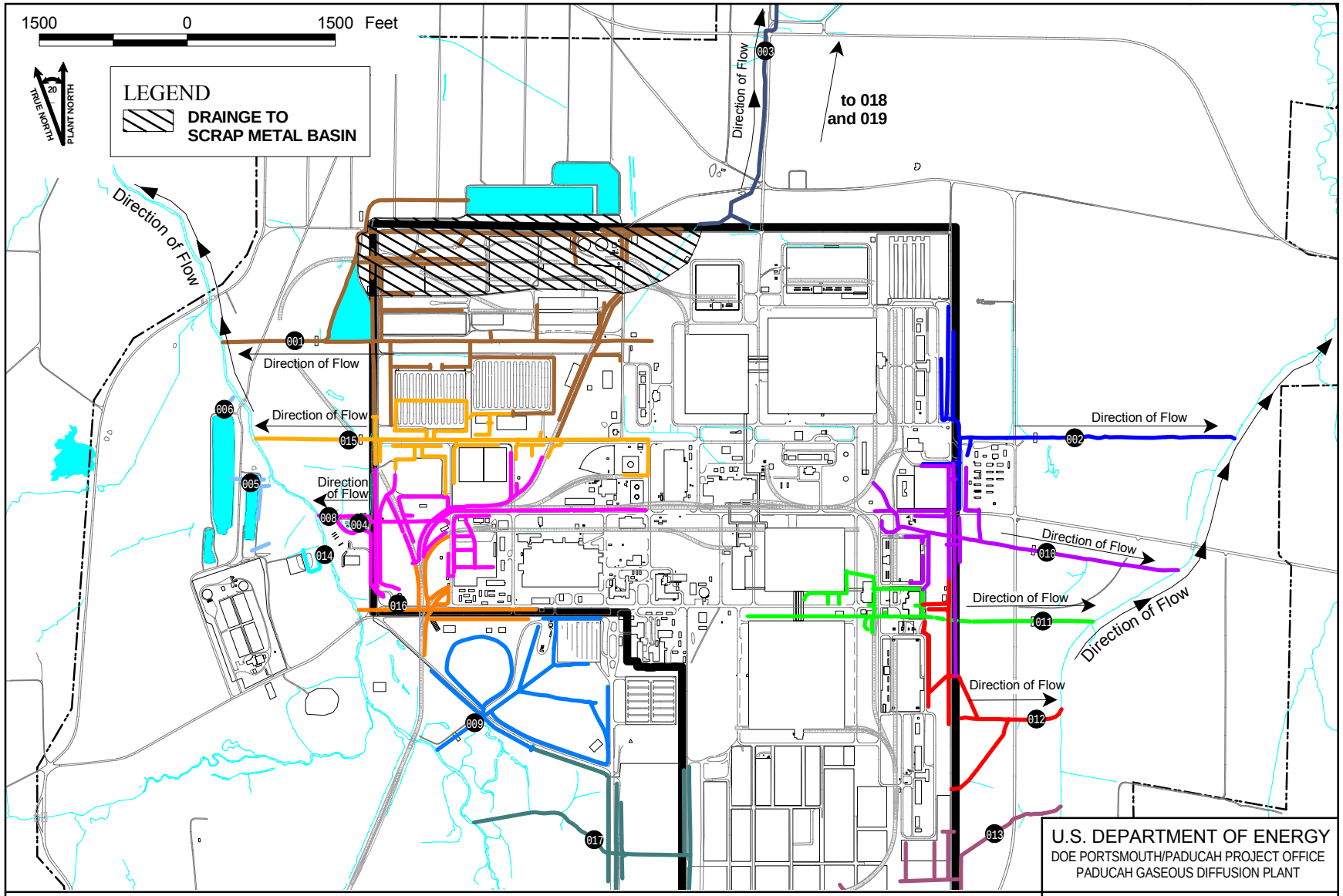

Figure 5. KPDES Outfalls 001, 008, 010, 011, and 015 and SWMUs 92 and 97

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3.1.3 Site Investigation

NSDD Sections 3, 4, and 5 and KPDES Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and areas (including SWMUs 92 and 97) have been characterized in several previous investigations. These included the Phase I and Phase II Site Investigations (SIs) (CH2M HILL 1991;1992); various Waste Area Group and SWMU remedial investigations, site evaluations, and removal actions; and a 1996 PCB Study by the U.S. Army Corps of Engineers (COE 1996). In 2005, the SI for the SWOU (On-Site) was conducted and focused on the first sequenced response action for on-site portions of the SWOU at PGDP (DOE 2008a). The investigation involved the collection of surface soil and sediment samples from various outfalls and their associated internal ditches and storm sewer discharge water to evaluate areas within the SWOU having the greatest potential for contaminant discharge to creeks surrounding PGDP.

The SI identified a potential for or threat of release into the environment of hazardous substances, as defined by CERCLA § 101 (14), pollutants, or contaminants, as defined by CERCLA § 101 (33), including cesium-137, neptunium-237, uranium-238, thorium-228, thorium-230, antimony, arsenic, iron, lead, manganese, Total PCBs, total polyaromatic hydrocarbons (PAHs), and trichloroethene (TCE). A complete list of detected analytes is provided in the *Surface Water Operable Unit (On-Site) Site Investigation and Baseline Risk Assessment Report at the Paducah Gaseous Diffusion Plant* (Appendix D, Table D.1.).

On January 19, 2007, DOE submitted a Non-Time-Critical Removal Notification for SWOU (On-Site) indicating that a removal action was warranted based upon the results of the SI/Baseline Risk Assessment (SI/BRA) (DOE 2008a). Subsequent to receiving Removal Notification approval, DOE prepared an EE/CA that described the environmental conditions that supported the need for a removal action, developed and evaluated various alternatives, and recommended the preferred alternative. The recommended response action cited within the EE/CA is consistent with the final actions for the PGDP and will contribute to the efficient performance of long-term remediation of PGDP.

3.1.4 Previous and Current Actions

Previous actions for the NSDD began in 1977 with the installation of the C-616-C Lift Station, which diverted all normal flow from upstream locations in the NSDD to the C-616-F Full Flow Lagoon. In 1982, a portion of NSDD (Section 4) located north of Ogden Landing Road was relocated to its present configuration to facilitate construction of the C-746-S and C-746-T Landfills.

In the 1990s additional actions for the NSDD were conducted, including the installation of another lift station (C-616-H Lift Station) in 1991, implementation of Interim Corrective Measures (ICMs) that included the installation of fencing and signs to restrict access to Little Bayou Creek and portions of the NSDD in 1992, an interim action to mitigate discharge of contaminants into the NSDD (1995), and erection of institutional controls along Sections 3 and 4 of the NSDD to comply with 10 *CFR* Part 835 (1999). Institutional controls consisted of radiological barriers (i.e., yellow and magenta chains), “Fixed Contamination Area” signs, and “10 *CFR* 835” explanation signs.

In 2002, an interim remedial action for Sections 1 and 2 of the NSDD was implemented. The primary objectives of the interim action were to mitigate the introduction of contaminants into the NSDD, decrease the migration of contaminants already present in the NSDD, and decrease the potential for direct human contact with the contaminated material.

Previous actions associated with KPDES Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches began in the early 1980s with the construction of an oil containment lagoon and oil

control structure to contain discharges of oil released to Outfall 008. In 1983, Outfall ditch 011 was included in an extensive PCB "hot spot" removal action conducted by DOE. There have been no CERCLA actions for the internal plant ditches to Outfall 011; however, DOE has implemented several remedial measures and treatability studies in areas of Outfall 011 located outside of the plant security fence. In the early 1980s, DOE excavated the upper 0.46 m (1.5 ft) of sediment in the Outfall 011 ditch from the PGDP security fence to Dyke Road to remove PCB contamination, and the ditch was restored with clean material.

Due to concerns about the presence of PCBs and radiological contamination in outfalls at the plant, ICMs were instituted in 1992 to restrict public access to creeks, outfalls, and lagoons surrounding PGDP. Access restriction was accomplished through the installation of fencing and the posting of warning signs at various off-site locations. Subsequently, in 2000, additional warning signs were posted that identified the creeks, outfalls, and lagoons as contaminated areas. In 2008, warning signs were posted along the creeks that identified some areas as potentially contaminated.

In 1994, discharge water from the C-617 Treatment Lagoon was diverted from Outfall 011 to Outfall 010 to mitigate resuspension of PCB-contaminated sediment. In 1995, DOE coated the Outfall 011 ditch with a bentonite concentrate to prevent erosion and potential contaminant migration. In 1996, DOE performed a Nature's Way bioremediation technology field demonstration in an effort to minimize/eliminate further PCB releases at PGDP (LMES 1997).

3.2 REMOVAL ACTION OBJECTIVES

NSDD Sections 3 and 5 and Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and areas have been identified as SWMUs under the FFA due to the potential for actual or threatened releases of hazardous constituents. These identified areas contain contamination within the upper one ft of surface soil/sediment. The identified contamination was derived from various plant activities conducted at PGDP facilities and was determined to pose human health risks from direct contact with contaminated sediments greater than the EPA risk range under some scenarios.

The RAOs for this removal action are consistent with the overall Remedial Action Objectives for the SWOU and include the following:

- Ensure direct contact risk at the on-site ditches for the current industrial worker falls within the EPA risk range (EPA 1999).

- Ensure direct contact risk at the NSDD for both the current industrial worker and recreational user falls within the EPA risk range (EPA 1999).

Completion of this removal action will reduce the risk to the current and future industrial workers and the current and future recreational user from direct contact by removing known sources of contamination.

Under this action, identified hot spots will be removed and verification of cleanup to a cumulative excess lifetime cancer risk (ELCR) of 1E-05 and a cumulative hazard index (HI) of 1.0 will be conducted following excavation. Verification of cleanup will be based upon comparisons between sampling results and chemical-specific ELCR-based cleanup levels. The ELCR and HI target used in deriving the cleanup levels will be 5E-06 and 1.0, respectively. The cancer risk-based and hazardous-based cleanup levels that will be used in the comparison for the SWOU On-Site Project are shown in Table 1.

Table 1. Cleanup Levels Based on Carcinogenic Risk and Hazard

COC	Risk-Based Concentration	
Arsenic	27	mg/kg
Beryllium	50,000	mg/kg
Total PCB	16	mg/kg
Americium-241	115	pCi/g
Cesium-137	8	pCi/g
Neptunium-237	22	pCi/g
Plutonium-239/240	108	pCi/g
Technetium-99	3,825	pCi/g
Thorium-230	147	pCi/g
Thorium-232	129	pCi/g
Uranium-234	188	pCi/g
Uranium-235	30	pCi/g
Uranium-238	94	pCi/g
COC	**Hazard-Based Concentration**	
Uranium	227	mg/kg

COC = contaminant of concern
ELCR = excess lifetime cancer risk
HI = hazard index
PCB = polychlorinated biphenyl compound

3.3 NATIONAL ENVIRONMENTAL POLICY ACT INTEGRATION

Consistent with DOE's *Secretarial Policy Statement on the National Environmental Policy Act* (NEPA), June 13, 1994, DOE has relied on the CERCLA process for evaluating the proposed activities associated with the removal action and incorporated the analysis for NEPA values (DOE 1994). No significant adverse environmental impacts are expected from implementation of this action. The impact to vulnerable or sensitive populations, habitats, or natural resources (i.e., critical or aquatic habitat, migratory birds, wetlands, streams, and floodplains) has been identified. These impacts have been evaluated and any necessary mitigation measures required to meet ARARs have been incorporated into the design phase and will be implemented during the construction and operation phases of the removal action (see Tables 2 through 4).

3.4 REMOVAL ACTION APPROACH

The portion of the SWOU Remedial Action addressed in this RAWP will include excavating the SWOU "hot spots" per the Action Memorandum (DOE 2009a), post-excavation sampling, restoring the excavated area with clean clay and soil, and managing and properly disposing of remediation waste. Work will include mobilization; postings; excavation; post-excavation sampling; restoration; soil handling, transportation and disposal; and demobilization. Additional details are included in appendices to this RAWP:

- Appendix A provides a Scope of Work with information on the sequencing and types of construction activities that will be performed;

- Appendix B provides Design Drawings of the areas included in these removal actions;
- Appendix C contains the Environmental Safety and Health Plan for work to be performed;
- Appendix D provides the Waste Management Plan;
- Appendix E provides the Quality Assurance Project Pan;
- Appendix F provides the Sampling and Analysis Plan with information on the data quality objectives, sampling plans for the removal action support survey, and confirmation sampling in addition to basics; and
- Appendix G provides the Data Management Implementation Plan for these activities.

These plans will be supplemented by use of contractor standard operating procedures, contractor and subcontractor work packages and design drawings once implementation issues have been considered.

This action is consistent with and is the next step in a phased approach toward meeting the Remedial Action Objectives for the SWOU (On-Site), which include the following:

- Control sources early, focus resources at areas that warrant attention in the near-term, prioritizing actions within areas to address the greatest risks first;
- Minimize human exposure to contaminants, maximizing the effectiveness of institutional controls;
- Control further migration of contaminated sediment;[2]
- Reduce risk from contaminated sediment hot spots; and
- Reduce the risk, making progress toward the ultimate goal of protecting recreational users and industrial workers from exposure to contaminated surface water and sediment.

Upon completion of this interim action and in keeping with the phased approach, this action will be followed by the Comprehensive Site Operable Unit evaluation, with implementation of additional and final actions, as needed, to ensure long-term protectiveness (DOE 2009b).

[2] The SWOU SI determined that migration does not result in unacceptable risk; however, addressing of hot spots associated with on-site exposure will reduce the potential risks associated with any off-site migration.

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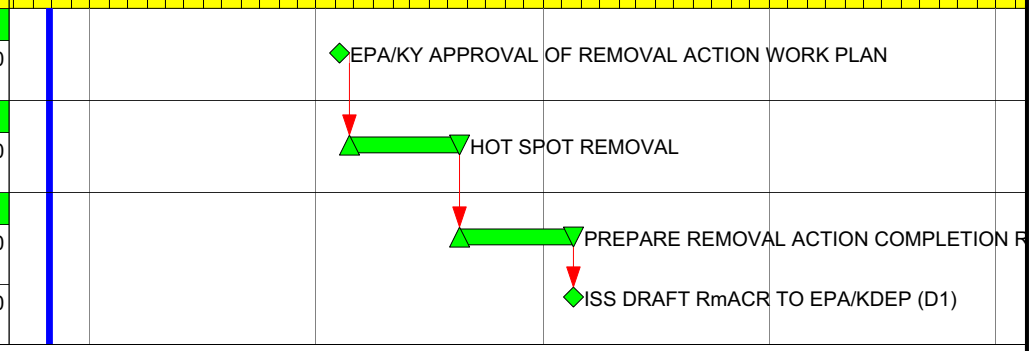
4. PROJECT SCHEDULE

The schedule for the removal action is detailed in Figure 6. It should be noted that these schedules are estimates for planning and are included for informational purposes only and are not intended to establish enforceable schedules or milestones. Enforceable milestones are contained in Appendix C of the FFA and Appendix 5 of the Site Management Plan (DOE 2009b). Also note that the schedule includes business days in lieu of calendar days.

Activity ID	Activity Description	Early Start	Early Finish	Orig Dur	Rem Dur	% Comp
04.11.04.02.02.05	SW Removal Action WP - Hot Spot Removal					
AN00002250	EPA/KY APPROVAL OF REMOVAL ACTION WORK PLAN		06NOV09	0	0	0
04.11.04.02.03.01	Hot Spot Removal					
AN00002319	HOT SPOT REMOVAL	23NOV09	18MAY10	120	120	0
04.11.04.02.04	Removal Action Completion Report					
AN02000000	PREPARE REMOVAL ACTION COMPLETION REPORT	19MAY10	18NOV10	128	128	0
AN02000015	ISS DRAFT RmACR TO EPA/KDEP (D1)		18NOV10	0	0	0



Start Date 01OCT02
Finish Date 27MAY11
Data Date 28JUL08
Run Date 22OCT09 10:38

Early Bar
Progress Bar

SWOU

Sheet 1 of 1

Paducah Remediation Services

PAD Surface Water OU

Figure 6. Schedule

Date	Revision	Checked	Approved

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5. PLANS

5.1 ENVIRONMENTAL, SAFETY, AND HEALTH

All work will be performed in a manner that minimizes the risk of bodily harm to employees, other project personnel and the general public, and avoids damage to property or the environment. Requirements will be followed for safe and compliant work associated with metals, radiological contamination, PCB contamination, and other identified or unidentified hazards associated with this removal action. In addition, federal and state ES&H regulations applicable to the removal action will be implemented during the course of this work. Proper ES&H controls and monitoring shall be in place for each activity. An ES&H Program Plan, which includes an Environmental Compliance Plan (ECP), has been developed to detail ES&H and compliance provisions, and is included as Appendix C.

5.2 WASTE MANAGEMENT

Soil and other waste materials generated as a result of this excavation and removal of contaminated media will be characterized properly and disposed of in accordance with the substantive provisions of ARARs/TBCs for low-level hazardous and PCB waste. All on-site management of such materials also will be conducted in accordance with the substantive provisions of ARARs/TBCs. A project-specific Waste Management Plan has been prepared that incorporates requirements for waste handling, transportation, and disposal. This waste management plan is included as Appendix D.

5.3 QUALITY ASSURANCE

An established QA program that defines the administrative procedures for implementing and integrating good quality practices will be provided throughout the work. Verification will be made that all activities affecting quality are performed in a controlled and consistent manner and in accordance with all applicable procedures and requirements. A QA Plan has been developed to detail QA requirements and is included as Appendix E.

5.3.1 Calculations

Calculations shall be used to document any type of technically required mathematical computation in which the results are used in a design, study, report, or evaluation. Calculations shall be sufficiently detailed as to purpose, methods, assumptions, design input, references, and units so that a person technically qualified in the subject can review and understand the documentation and verify the adequacy of the results without recourse to the originator. Complete identification of the version of any software used and the method of verification or validation of that software shall be included. Calculations shall be performed in accordance with PRS-WCE-1026, Project Calculations. In addition, QA packages shall be provided for any risk assessment calculations.

5.3.2 Software Quality Assurance

All calculations generated by software programs shall meet requirements of PRS-WCE-1026, Software Calculations, and DOE Order 414.1C.

5.4 SAMPLING

The DOE Prime Contractor prepared a sampling plan to address post-excavation sampling activities in excavated areas. The sampling plan identifies contaminants of concern (COCs), sampling requirements, and a sampling strategy to verify that remaining contamination levels meet cleanup levels established in the SWOU Action Memorandum (DOE 2009a). This sampling plan is included as Appendix F.

5.5 DATA MANAGEMENT

The DOE Prime Contractor prepared a Data Management Implementation Plan to identify and document data, management requirements and applicable procedures; expected data types and information flow; and roles and responsibilities for all data management activities associated with the removal action for the Surface Water OU (On-Site). This Data Management Implementation Plan is included as Appendix G.

6. OBJECTIVES ATTAINMENT

The objective of the interim removal action is to reduce the risk to current and future industrial workers and current and future recreational users from direct contact by removing known sources of contamination associated with Sections 3 and 5 of the NSDD and KPDES Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and areas. This objective will be attained through the removal of identified hot spots and verification of cleanup to a cumulative ELCR of 1E-05 and a cumulative HI of 1.0. This interim removal action is considered complete after the RAOs have been verified as achieved; verification or characterization sampling has been performed; engineering and temporary access controls have been evaluated and discontinued, as appropriate; the site has been restored and determined stable; and treatment, storage, or disposal of contaminated media and waste has been completed.

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7. APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The ARARs crosswalk is provided in Tables 2 and 3. The crosswalk lists each location-specific and action-specific ARAR identified for the design and implementation of the removal action and the measures required to meet the ARARs during the construction and operation phases of the removal action.

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Table 2. Summary of Location-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site)

LOCATION-SPECIFIC			
Location characteristic(s)	**Requirement(s)**	**Prerequisite**	**Citation(s)**
	Wetlands		
Presence of wetlands as defined in 10 *CFR* 1022.4	Avoid, to the extent possible, the long- and short-term adverse effects associated with destruction, occupancy, and modification of wetlands.	DOE actions that involve potential impacts to, or take place within, wetlands—**applicable**.	10 *CFR* 1022.3(a)
	Take action, to extent practicable, to minimize destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands.		10 *CFR* 1022.3(a)(7) and (8)
	Undertake a careful evaluation of the potential effects of any new construction in wetlands. Identify, evaluate, and, as appropriate, implement alternative actions that may avoid or mitigate adverse impacts on wetlands.		10 *CFR* 1022.3(b) and (d)
	Measures that mitigate the adverse effects of actions in a wetland including, but not limited to, minimum grading requirements, runoff controls, design and construction constraints, and protection of ecologically-sensitive areas.		10 *CFR* 1022.13(a)(3)
	If no practicable alternative to locating or conducting the action in the wetland is available, then before taking action design or modify the action in order to minimize potential harm to or within the wetland, consistent with the policies set forth in Executive Order 11990.		10 *CFR* 1022.14(a)
Location encompassing aquatic ecosystem as defined in 40 *CFR* 230.3(c)	Except as provided under section 404(b)(2), no discharge of dredged or fill material is permitted if there is a practicable alternative that would have less adverse impact on the aquatic ecosystem or if it will cause or contribute to significant degradation of the waters of the United States.	Action that involves the discharge of dredged or fill material into *waters of the United States*, including jurisdictional wetlands—**relevant and appropriate**.	40 *CFR* 230.10(a) and (c)

Table 2. Summary of Location-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

LOCATION-SPECIFIC			
Location characteristic(s)	**Requirement(s)**	**Prerequisite**	**Citation(s)**
	Except as provided under section 404(b)(2), no discharge of dredged or fill material shall be permitted unless appropriate and practicable steps have been taken that will minimize potential adverse impacts of the discharge on the aquatic ecosystem. 40 *CFR* 230.70 *et seq.* identifies such possible steps.		40 *CFR* 230.10(d)
Nationwide Permit Program	Must comply with the substantive requirements of the NWP 38, General Conditions, as appropriate.	Discharge of dredged or fill material into *waters of the United States*, including jurisdictional wetlands—**relevant and appropriate**.	Nation Wide Permit (38) Cleanup of Hazardous and Toxic Waste 33 *CFR* 323.3(b)
Floodplains			
Presence of floodplain as defined in 10 *CFR* 1022.4	Avoid, to the extent possible, the long- and short-term adverse effects associated with occupancy and modification of floodplains.	DOE actions that involve potential impacts to, or take place within, floodplains—**applicable**.	10 *CFR* 1022.3(a)
	Undertake a careful evaluation of the potential effects of any action taken in a floodplain. Identify, evaluate, and, as appropriate, implement alternative actions that may avoid or mitigate adverse impacts on floodplains.		10 *CFR* 1022.3(b) and (d)

Table 2. Summary of Location-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

LOCATION-SPECIFIC			
Location characteristic(s)	**Requirement(s)**	**Prerequisite**	**Citation(s)**
	Restore and preserve natural and beneficial values served by floodplains to the extent practicable.		10 *CFR* 1022.1(a)(3)
	Measures that mitigate the adverse effects of actions in a floodplain including, but not limited to, minimum grading requirements, runoff controls, design and construction constraints, and protection of ecologically-sensitive areas.		10 *CFR* 1022.13(a)(3)
	If no practicable alternative to locating or conducting the action in the floodplain is available, then before taking action design or modify its action in order to minimize potential harm to or within the floodplain, consistent with the policies set forth in E.O. 11988 and E.O. 11990.		10 *CFR* 1022.14(a)
Endangered, threatened, or rare species			
Presence of federally endangered or threatened species, as designated in 50 *CFR* 17.11 and 17.12 or critical habitat of such species	Actions that jeopardize the existence of a listed species or results in the destruction or adverse modification of critical habitat must be avoided or reasonable and prudent mitigation measures taken.	Action that is likely to jeopardize fish, wildlife, or plant species or destroy or adversely modify critical habitat—**applicable**.	16 *USC* 1531 *et. seq*., Sect. 7(a)(2)
Presence of migratory birds and their habitats	Then unlawful killing, taking, possession, and sale of almost all species of native birds in the U.S. is prohibited.	If action is likely to impact migratory birds—**applicable**.	16 *USC* 703-704

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Site preparation, construction, and excavation activities			
Activities causing fugitive dust emissions	No person shall cause, suffer, or allow any material to be handled, processed, transported, or stored; a building or its appurtenances to be constructed, altered, repaired, or demolished, or a road to be used without taking reasonable precaution to prevent particulate matter from becoming airborne. Such reasonable precautions shall include, when applicable, but not be limited to the following: • Use, where possible, of water or chemicals for control of dust in the demolition of existing buildings or structures, construction operations, the grading of roads or the clearing of land; • Application and maintenance of asphalt, oil, water, or suitable chemicals on roads, materials stockpiles, and other surfaces which can create airborne dusts; • Covering, at all times when in motion, open bodied trucks transporting materials likely to become airborne; • The maintenance of paved roadways in a clean condition; and • The prompt removal of earth or other material from a paved street which earth or other material has been transported thereto by trucking or earth moving equipment or erosion by water.	Fugitive emissions from land-disturbing activities (e.g., handling, processing, transporting or storing of any material, demolition of structures, construction operations, grading of roads, or the clearing of land, etc.)—**applicable**.	401 *KAR* 63:010 § 3(1)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	No person shall cause or permit the discharge of visible fugitive dust emissions beyond the lot line of the property on which the emissions originate.		401 *KAR* 63:010 § 3(2)
Activities causing radionuclide emissions	Emissions of radionuclides to the ambient air from DOE facilities shall not exceed those amounts that would cause any member of the public to receive in any year an EDE of 10 mrem/yr.	Radionuclide emissions at a DOE facility—**applicable**.	40 *CFR* 61.92 401 *KAR* 57:002
	Radioactive materials released to the atmosphere as a consequence of routine DOE activities shall not cause members of the public to receive, in a year, an EDE greater than 10 mrem per year.	Dose received from all sources of radionuclides via airborne emissions—**TBC**.	DOE O 5400.5(II)(1)(b)
Activities causing toxic substances or potentially hazardous matter emissions	Persons responsible for a source from which hazardous matter or toxic substances may be emitted shall provide the utmost care and consideration in the handling of these materials to the potentially harmful effects of the emissions resulting from such activities. No owner or operator shall allow any affected facility to emit potentially hazardous matter or toxic substances in such quantities or duration as to be harmful to the health and welfare of humans, animals and plants.	Potentially hazardous matter or toxic emissions—**applicable**.	401 *KAR* 63:020 § 3
Radiation protection of the public and the environment	Except as provided in 5400.1(II)(1)(a)(4), the exposure of members of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an EDE greater than 100 mrem per year. The ALARA process shall be implemented for all DOE activities and facilities that cause public doses.	Dose received from all exposure modes from all DOE activities (including remedial actions) at a DOE facility —**TBC**.	DOE O 5400.5(II)(1)(a) and (2)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
General Waste Management			
General PCB management requirements	Any person storing or disposing of PCB waste must do so in accordance with 40 *CFR* 761, Subpart D.	Storage or disposal of waste containing PCBs at concentrations ≥ 50 ppm—**applicable**.	40 *CFR* 761.50(a)
	Any person cleaning up and disposing of PCBs shall do so based on the concentration at which the PCBs are found.	Cleanup and disposal of PCB remediation waste as defined in 40 *CFR* 761.3—**applicable**.	40 *CFR* 761.61
Management of PCB/Radioactive waste	Any person storing such waste ≥ 50 ppm PCBs must do so taking into account both its PCB concentration and radioactive properties, except as provided in 40 *CFR* 761.65(a)(1), (b)(1)(ii) and (c)(6)(i).	Storage of PCB/Radioactive waste for a disposal—**applicable**.	40 *CFR* 761.50(b)(7)(i)
	Any person disposing of such waste must do so taking into account both its PCB concentration and its radioactive properties. If, taking into account only the properties of the PCBs in the waste, the waste meets the requirements for disposal in a non-hazardous waste landfill then the PCB/radioactive waste may be disposed without regard to the PCB component of the waste.	Disposal of PCB/ Radioactive waste for a disposal—**applicable**.	40 *CFR* 761.50(b)(7)(ii)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Waste Characterization			
Characterization of solid waste	Must determine if solid waste is excluded from regulation under 40 *CFR* 261.4.	Generation of solid waste as defined in 40 *CFR* 261.2—**applicable**.	40 *CFR* 262.11(a) 401 *KAR* 32:010 §2
	Must determine if waste is listed as a hazardous waste in subpart D of 40 *CFR* Part 261.	Generation of solid waste which is not excluded under 40 *CFR* 261.4—**applicable**.	40 *CFR* 262.11(b) 401 *KAR* 32:010 §2
	Must determine whether the waste is identified in subpart C of 40 *CFR* Part 261 by using prescribed testing methods or applying generator knowledge based on information regarding material or processes used.	Generation of solid waste that is not listed in subpart D of 40 *CFR* Part 261 and not excluded under 40 *CFR* 261.4—**applicable**.	40 *CFR* 262.11(c) 401 *KAR* 32:010 §2
	Must refer to Parts 261, 262, 264, 265, 266, 268, and 273 of Chapter 40 for possible exclusions or restrictions pertaining to management of the specific waste.	Generation of solid waste which is determined to be hazardous—**applicable**.	40 *CFR* 262.11(d) 401 *KAR* 32:010 §2
General waste analysis for treatment, storage, and disposal of hazardous waste	Must obtain a detailed chemical and physical analysis on a representative sample of the waste(s), which at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with pertinent sections of 40 *CFR* 264 and 268.	Treatment, storage, or disposal of RCRA-hazardous waste—**applicable**.	40 *CFR* 264.13(a)(1) 401 *KAR* 34:020 § 4

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Characterization of industrial wastewater	Industrial wastewater discharges that are point source discharges subject to regulation under section 402 of the Clean Water Act, as amended, are not solid wastes for the purpose of hazardous waste management.	Generation of industrial wastewater for discharge—**applicable**.	40 *CFR* 261.4(a)(2) 401 *KAR* 31:010 § 4
Determinations for land disposal of hazardous waste	Must determine the underlying hazardous constituents [as defined in 40 *CFR* 268.2(i)] in the waste.	Generation of RCRA characteristic hazardous waste (and is not D001 non-wastewaters treated by CMBST, RORGS, or POLYM of Section 268.42 Table 1) for storage, treatment or disposal—**applicable**.	40 *CFR* 268.9(a) 401 *KAR* 37:010 §8
	Must determine if the hazardous waste meets the treatment standards in 40 *CFR* 268.40, 268.45, or 268.49 by testing in accordance with prescribed methods or use of generator knowledge of waste.	Generation of hazardous waste—**applicable**.	40 *CFR* 268.7(a) 401 *KAR* 37:020 §7
	Must determine each EPA Hazardous Waste Number (Waste Code) to determine the applicable treatment standards under 40 *CFR* 268.40 *et. seq*.		40 *CFR* 268.9(a) 401 *KAR* 37:010 §8
Characterization of LLW	Shall be characterized using direct or indirect methods and the characterization documented in sufficient detail to ensure safe management and compliance with the WAC of the receiving facility.	Generation of DOE LLW—**TBC**.	DOE M 435.1-1(IV)(I)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	Characterization data shall, at a minimum, include the following information relevant to the management of the waste:		DOE M 435.1-1(IV)(I)(2)
	• physical and chemical characteristics;		DOE M 435.1-1(IV)(I)(2)(a)
	• volume, including the waste and any stabilization or absorbent media;		DOE M 435.1-1(IV)(I)(2)(b)
	• weight of the container and contents;		DOE M 435.1-1(IV)(I)(2)(c)
	• identities, activities, and concentration of major radionuclides;		DOE M 435.1-1(IV)(I)(2)(d)
	• characterization date;		DOE M 435.1-1(IV)(I)(2)(e)
	• generating source; and		DOE M 435.1-1(IV)(I)(2)(f)
	• any other information that may be needed to prepare and maintain the disposal facility performance assessment, or demonstrate compliance with performance objectives.		DOE M 435.1-1(IV)(I)(2)(g)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Waste Accumulation, Storage and Staging			
Temporary on-site storage of hazardous waste in containers	A generator may accumulate hazardous waste at the facility provided that	Accumulation of RCRA hazardous waste on-site as defined in 40 *CFR* 260.10—**applicable**.	40 *CFR* 262.34(a) 401 *KAR* 32:030 §5
	• waste is placed in containers that comply with 40 *CFR* 265.171-173;		40 *CFR* 262.34(a)(1)(i) 401 *KAR* 32:030 §5
	• the date upon which accumulation begins is clearly marked and visible for inspection on each container;		40 *CFR* 262.34(a)(2) 401 *KAR* 32:030 §5
	• container is marked with the words "hazardous waste."		40 *CFR* 262.34(a)(3) 401 *KAR* 32:030 § 5
Accumulation area	Container may be marked with other words that identify the contents.	Accumulation of 55 gal or less of RCRA hazardous waste or one quart of acutely hazardous waste listed in 261.33(e) at or near any point of generation—**applicable**.	40 *CFR* 262.34(c)(1) 401 *KAR* 32:030 §5

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Temporary on-site storage of remediation waste in staging piles (e.g., excavated soils/sediments, sludge)	May be temporarily stored, (including mixing, sizing, blending or other similar physical operations intended to prepare the wastes for subsequent management or treatment) at a facility if used only during remedial operations provided that the staging pile will be designed to	Accumulation of non-flowing hazardous remediation waste in staging pile (or remediation waste otherwise subject to land disposal restrictions)—**applicable**.	40 *CFR* 264.554(a)(1) 401 *KAR* 34:287 § 5
	• facilitate a reliable, effective and protective remedy;		40 *CFR* 264.554(d)(1)(i) 401 *KAR* 34:287 § 5
	• prevent or minimize releases of hazardous wastes and constituents into the environment, and minimize or adequately control cross-media transfer as necessary to protect human health and the environment (e.g., use of liners, covers, run-off/run-on controls, as appropriate).		40 *CFR* 264.554(d)(1)(ii) 401 *KAR* 34:287 § 5
	Must not place ignitable or reactive remediation waste in a staging pile unless the remediation waste has been treated, rendered, or mixed before placed in the staging pile so that	Storage of ignitable or reactive remediation waste in staging pile in—**applicable**.	40 *CFR* 264.554(e) 401 *KAR* 34:287 § 5
	• The remediation waste no longer meets the definition of ignitable or reactive under 401 *KAR* 31:030 § 2 and § 4; and		40 *CFR* 264.554(e)(1)(i) 401 *KAR* 34:287 § 5

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	• (ii) You have complied with 401 *KAR* 34:020 § 8, General Requirements for Ignitable, Reactive, or Incompatible Wastes.		40 *CFR* 264.554(e)(1)(ii) 401 *KAR* 34:287 § 5
	Must not place in the same staging pile unless you have complied with 40 *CFR* 264.17(b).	Storage of incompatible remediation waste in staging pile in—**applicable**.	40 *CFR* 264.554(f)(1) 401 *KAR* 34:287 § 5
	Must separate the incompatible materials or protect them from one another by using a dike, berm, wall or other device.		40 *CFR* 264.554(f)(2) 401 *KAR* 34:287 § 5
Use and management of containers holding hazardous waste	If container is not in good condition or if it begins to leak, must transfer waste into container in good condition.	Storage of RCRA hazardous waste in containers—**applicable**.	40 *CFR* 265.171 401 *KAR* 35:180 §2
	Use container made or lined with materials compatible with waste to be stored so that the ability of the container is not impaired.		40 *CFR* 265.172 401 *KAR* 35:180 §3
	Keep containers closed during storage, except to add/remove waste.		40 *CFR* 265.173(a) 401 *KAR* 35:180 §4

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	Open, handle and store containers in a manner that will not cause containers to rupture or leak.		40 *CFR* 265.173(b) 401 *KAR* 35:180 §4
Storage of PCB waste and/or PCB/radioactive waste in a RCRA-regulated container storage area	Does not have to meet storage unit requirements in 40 *CFR* 761.65(b)(1) provided unit	Storage of PCBs and PCB Items designated for disposal — **applicable**.	40 *CFR* 761.65(b)(2)
	• is permitted by EPA under RCRA §3004, or		40 *CFR* 761.65(b)(2)(i)
	• qualifies for interim status under RCRA §3005; or		40 *CFR* 761.65(b)(2)(ii)
	• is permitted by an authorized state under RCRA §3006; and,		40 *CFR* 761.65(b)(2)(iii)
	• PCB spills cleaned up in accordance with Subpart G of 40 *CFR* 761.		40 *CFR* 761.65(c)(1)(iv)
Storage of PCB waste and/or PCB/radioactive waste in non-RCRA regulated unit	Except as provided in 40 *CFR* 761.65 (b)(2), (c)(1), (c)(7), (c)(9), and (c)(10), after July 1, 1978, owners or operators of any facilities used for the storage of PCBs and PCB items designated for disposal shall comply with the storage unit requirements in 40 *CFR* 761.65(b)(1).	Storage of PCBs for disposal —**applicable**.	40 *CFR* 761.65(b)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	Storage facility must have or be • Adequate roof and walls to prevent rainwater from reaching stored PCBs and PCB items;		40 *CFR* 761.65(b)(1) 40 *CFR* 761.65(b)(1)(i)
	• Adequate floor that has continuous curbing with a minimum 6-inch high curb. Floor and curb must provide a containment volume equal to at least two times the internal volume of the largest PCB article or container or 25% of the internal volume of all articles or containers stored there, whichever is greater. *Note*: 6 inch minimum curbing not required for area storing PCB/radioactive waste;		40 *CFR* 761.65(b)(1)(ii)
	• No drain valves, floor drains, expansion joints, sewer lines, or other openings that would permit liquids to flow from curbed area;		40 *CFR* 761.65(b)(1)(iii)
	• Floors and curbing constructed of Portland cement, concrete, or a continuous, smooth, non-porous surface that prevents or minimizes penetration of PCBs; and		40 *CFR* 761.65(b)(1)(iv)
	• Not located at a site that is below the 100-year flood water elevation.		40 *CFR* 761.65(b)(1)(v)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Risk-based storage of PCBs	TSCA provides for risk-based storage of PCBs when the method will not pose an unreasonable risk of injury to health or the environment.	Storage of waste containing PCBs in a manner other than prescribed in 40 *CFR* 761.65(b) (see above) —**applicable**.	40 *CFR* 761.61(c)
Temporary storage of PCB waste (e.g., PPE, rags) in a container(s)	Container(s) shall be marked as illustrated in 40 *CFR* 761.45(a).	Storage of PCBs and PCB items in containers for disposal—**applicable**.	40 *CFR* 761.40(a)(1)
	Storage area must be properly marked as required by 40 *CFR* 761.40(a)(10).		40 *CFR* 761.65(c)(3)
	Any leaking PCB Items and their contents shall be transferred immediately to a properly marked nonleaking container(s).		40 *CFR* 761.65(c)(5)
	Container(s) shall be in accordance with requirements set forth in DOT HMR at 49 *CFR* 171-180.		40 *CFR* 761.65(c)(6)
Temporary storage of bulk PCB remediation waste in a waste pile	Waste must be placed in a pile that • is designed and operated to control dispersal by wind, where necessary, by means other than wetting;	Storage of PCB remediation waste or PCB bulk product waste in waste pile at cleanup site or site of generation—**applicable**.	40 *CFR* 761.65(c)(9)(i)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	• does not generate leachate through decomposition or other reactions;		40 *CFR* 761.65(c)(9)(ii)
	• is at a storage site with a liner designed, constructed, and installed to prevent any migration of wastes off or through liner into adjacent subsurface soil, groundwater or surface water.		40 *CFR* 761.65(c)(9)(iii)(A)
	Liner must be • constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure because of pressure gradients, physical contact with waste or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;		40 *CFR* 761.65(c)(9)(iii)(A)(*1*)
	• placed on foundation or base capable of providing support to liner and resistance to pressure gradients above and below the liner to present failure because of settlement compression or uplift;		40 *CFR* 761.65(c)(9)(iii)(A)(*2*)
	• installed to cover all surrounding earth likely to be in contact with waste.		40 *CFR* 761.65(c)(9)(iii)(A)(*3*)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	The storage site must have a cover that meets the above requirements and installed to cover all of the stored waste likely to be contacted by precipitation, and is secured so as not to be functionally disabled by winds expected under normal weather conditions; and		40 *CFR* 761.65(c)(9)(iii)(B)
	Have a run-on control system designed, constructed, operated and maintained such that it		40 *CFR* 761.65(c)(9)(iii)(C)
	• prevents flow on the stored waste during peak discharge from at least a 25-year storm.		40 *CFR* 761.65(c)(9)(iii)(C)(*1*)
	Collection and holding facilities (e.g., tanks or basins) must be emptied or otherwise managed expeditiously after storms to maintain design capacity of the system.		
	Requirements of 40 *CFR* 761.65(c)(9) may be modified under the risk-based disposal option of 40 *CFR* 761.61(c).		40 *CFR* 761.65(c)(9)(iv)
Staging of LLW	Shall be for the purpose of the accumulation of such quantities of wastes necessary to facilitate transportation, treatment, and disposal.	Management of LLW at a DOE facility—**TBC**.	DOE M 435.1-1 (IV)(N)(7)
Packaging of LLW	Shall be packaged in a manner that provides containment and protection for the duration of the anticipated storage period and until disposal is achieved or until the waste has been removed from the container.	Packaging of DOE LLW in containers **—TBC**.	DOE M 435.1-1(IV)(L)(1)(a)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	Vents or other measures shall be provided if the potential exists for pressurizing or generating flammable or explosive concentrations of gases within the waste container.		DOE M 435.1-1(IV)(L)(1)(b)
	Containers shall be marked such that their contents can be identified.		DOE M 435.1-1(IV)(L)(1)(c)
Waste Treatment			
Treatment of RCRA hazardous waste soil	Prior to land disposal, all "constituents subject to treatment" as defined in 40 *CFR* 268.49(d) must be treated as follows:	Treatment of restricted hazardous waste soils—**applicable**.	40 *CFR* 268.49(c)(1) 401 *KAR* 37:040 §10
	• **For non-metals** (except carbon disulfide, cyclohexanone, and methanol), treatment must achieve a 90 percent reduction in total constituent concentrations, except as provided in 40 *CFR* 268.49(c)(1)(C).		40 *CFR* 268.49(c)(1)(A) 401 *KAR* 37:040 §10
	• **For metals** and carbon disulfide, cyclohexanone, and methanol,), treatment must achieve a 90 percent reduction in total constituent concentrations as measured in leachate from the treated media (tested according to TCLP) or 90 percent reduction in total constituent concentrations (when a metal removal technology is used), except as provided in 40 *CFR* 268.49(c)(1)(C).		40 *CFR* 268.49(c)(1)(B) 401 *KAR* 37:040 §10

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	• When treatment of any constituent subject to treatment to a 90 percent reduction standard would result in a concentration less than 10 times the Universal Treatment Standard for that constituent, treatment to achieve constituent concentrations less than 10 times the universal treatment standard is not required. [Universal Treatment Standards are identified in 40 *CFR* 268.48 Table UTS].		40 *CFR* 268.49(c)(1)(C) 401 *KAR* 37:040 §10
	In addition to the treatment requirement required by paragraph (c)(1) of 40 *CFR* 268.49, soils must be treated to eliminate these characteristics.	Treatment of soils that exhibit the hazardous characteristic of ignitability, corrosivity, or reactivity—**applicable**.	40 *CFR* 268.49(c)(2) 401 *KAR* 37:040 §10
Treatment of collected wastewater	All tank systems, conveyance systems, and ancillary equipment used to treat, store or convey wastewater to an on-site KPDES-permitted wastewater treatment facility are exempt from the requirements of RCRA Subtitle C standards.	On-site wastewater treatment units subject to regulation under § 402 or § 307(b) of the CWA (KPDES-permitted) —**applicable**.	40 *CFR* 264.1(g)(6) 401 *KAR* 34:010 § 1
Treatment of LLW	Treatment to provide more stable waste forms and to improve the long-term performance of a LLW disposal facility shall be implemented as necessary to meet the performance objectives of the disposal facility.	Treatment of LLW for disposal at a LLW disposal facility—**TBC**.	DOE M 435.1-1(IV)(O)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Waste Disposal or Effluent Discharge			
Disposal of prohibited RCRA hazardous waste in a land-based unit	Are not prohibited if the wastes no longer exhibit a prohibited characteristic at the point of land disposal, unless the wastes are subject to a specified method of treatment other than DEACT in 40 *CFR* 268.40, or are D003 reactive cyanide.	Land disposal of restricted RCRA hazardous wastes that are hazardous only because they exhibit a hazardous characteristic—**applicable**.	40 *CFR* 268.1(c)(4)(iv) 401 *KAR* 37:010 §2
	May be land disposed if it meets the requirements in the table "Treatment Standards for Hazardous Waste" at 40 *CFR* 268.40 before land disposal.	Land disposal, as defined in 40 *CFR* 268.2, of prohibited RCRA waste—**applicable**.	40 *CFR* 268.40(a) 401 *KAR* 37:040 §2
	Must be treated according to the alternative treatment standards of 40 *CFR* 268.49(c) or according to the UTSs specified in 40 *CFR* 268.48 applicable to the listed and/or characteristic waste contaminating the soil prior to land disposal.	Land disposal, as defined in 40 *CFR* 268.2, of restricted hazardous soils—**applicable**.	40 *CFR* 268.49(b) 401 *KAR* 37:040 §10
Disposal of RCRA hazardous debris in a land-based unit	Must be treated prior to land disposal as provided in 40 *CFR* 268.45(a)(1)-(5) unless EPA determines under 40 *CFR* 261.3(f)(2) that the debris no longer contaminated with hazardous waste or the debris is treated to the waste-specific treatment standard provided in 40 *CFR* 268.40 for the waste contaminating the debris.	Land disposal, as defined in 40 *CFR* 268.2, of RCRA-hazardous debris—**applicable**.	40 *CFR* 268.45(a) 401 *KAR* 37:040 §7

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Disposal of RCRA characteristic waste that is managed in an CWA wastewater treatment unit	Are not prohibited, if the wastes are managed in a treatment system which subsequently discharges to waters of the U.S. under the CWA unless the wastes are subject to a specified method of treatment other than DEACT in 40 *CFR* 268.40, or are D003 reactive cyanide.	Restricted RCRA hazardous waste that are hazardous only because they exhibit a hazardous characteristic—**applicable**.	40 *CFR* 268.1(c)(4)(i) 401 *KAR* 37:010 §2
Disposal of bulk PCB remediation waste off-site (self-implementing)	May be sent off-site for decontamination or disposal provided the waste either is dewatered on-site or transported off-site in containers meeting the requirements of DOT HMR at 49 *CFR* parts 171-180.	Off-site disposal of bulk PCB remediation waste (as defined in 40 *CFR* 761.3)—**relevant and appropriate**.	40 *CFR* 761.61(a)(5)(i)(B)
	Must provide written notice including the quantity to be shipped and highest concentration of PCBs [using extraction EPA Method 3500B/3540C or Method 3500B/3550B followed by chemical analysis using Method 8082 in SW-846 or methods validated under 40 *CFR* 761.320-26 (Subpart Q)] before the first shipment of waste to each off-site facility where the waste is destined for an area not subject to a TSCA PCB Disposal Approval.	Off-site disposal of bulk PCB remediation waste (as defined in 40 *CFR* 761.3) to a facility not subject to a TSCA PCB Disposal Approval—**relevant and appropriate**.	40 *CFR* 761.61(a)(5)(i)(B)(2)*(iv)*
	Shall be disposed of in accordance with the provisions for cleanup wastes at 40 *CFR* 761.61(a)(5)(v)(A).	Off-site disposal of dewatered bulk PCB remediation waste with a PCB concentration < 50 ppm—**relevant and appropriate**.	40 *CFR* 761.61(a)(5)(i)(B)(2)*(ii)*
	Shall be disposed of •in a hazardous waste landfill permitted by EPA under §3004 of RCRA;	Off-site disposal of dewatered bulk PCB remediation waste with a PCB concentration ≥ 50 ppm—**relevant and appropriate**.	40 *CFR* 761.61(a)(5)(i)(B)(2)*(iii)*

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	• in a hazardous waste landfill permitted by a state authorized under §3006 of RCRA; or		
	• in a PCB disposal facility approved under 40 *CFR* 761.60.		
Disposal of PCB contaminated porous surfaces (self-implementing)	Shall be disposed off-site as bulk PCB remediation waste according to 40 *CFR* 761.61(a)(5)(i) or must meet the substantive requirements of these regulations for on-site disposal or decontaminated for use according to 40 *CFR* 761.79(b)(4).	PCB remediation waste porous surfaces (as defined in 40 *CFR* 761.3) **—relevant and appropriate**.	40 *CFR* 761.61(a)(5)(iii)
Disposal of liquid PCB remediation waste (self-implementing)	Shall either • decontaminate the waste to the levels specified in 40 *CFR* 761.79(b)(1) or (2); or	Liquid PCB remediation waste (as defined in 40 *CFR* 761.3)**— relevant and appropriate**.	40 *CFR* 761.61(a)(5)(iv) 40 *CFR* 761.61(a)(5)(iv)(A)
	• dispose of the waste in accordance with the substantive requirements of 40 *CFR* 761.61(b) or 40 *CFR* 761.61(c).		40 *CFR* 761.61(a)(5)(iv)(B)
Performance-based disposal of PCB remediation waste	May dispose by one of the following methods • in a high-temperature incinerator under 40 *CFR* 761.70(b);	Disposal of non-liquid PCB remediation waste (as defined in 40 *CFR* 761.3)**—applicable**.	40 *CFR* 761.61(b)(2) 40 *CFR* 761.61(b)(2)(i)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
	• by an alternate disposal method under 40 *CFR* 761.60(e);		
	• in a chemical waste landfill under 40 *CFR* 761.75;		
	• in a facility under 40 *CFR* 761.77; or		
	• through decontamination in accordance with 40 *CFR* 761.79.		40 *CFR* 761.61(b)(2)(ii)
	Shall be disposed according to 40 *CFR* 761.60(a) or (e), or decontaminate in accordance with 40 *CFR* 761.79.	Disposal of liquid PCB remediation waste—**applicable**.	40 *CFR* 761.61(b)(1)
Risk-based disposal of PCB remediation waste	May dispose of in a manner other than prescribed in 40 *CFR* 761.61(a) or (b) if method will not pose an unreasonable risk of injury to [sic] human health or the environment.	Disposal of PCB remediation waste—**applicable**.	40 *CFR* 761.61(c)
Disposal of PCB cleanup wastes (e.g., PPE, rags, non-liquid cleaning materials) (self- implementing option)	Shall be disposed of either • in a municipal solid waste facility under 40 *CFR* 258 or non-municipal, nonhazardous waste subject to 40 *CFR* 257.5 thru 257.30; or	Generation of non-liquid PCBs during and from the cleanup of PCB remediation waste—**relevant and appropriate**.	40 *CFR* 761.61(a)(5)(v)(A)
	• in a RCRA Subtitle C landfill; or		
	• in a PCB disposal facility; or		
	• through decontamination under 40 *CFR* 761.79(b) or (c).		

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Disposal of PCB cleaning solvents, abrasives, and equipment (self-implementing option)	May be reused after decontamination in accordance with 40 *CFR* 761.79; or For liquids, disposed in accordance with 40 *CFR* 761.60(a).	Generation of PCB wastes from the cleanup of PCB remediation waste—**relevant and appropriate**.	40 *CFR* 761.61(a)(5)(v)(B) 40 *CFR* 761.60(b)(1)(i)(B)
Disposal of PCB decontamination waste and residues	Shall be disposed of at their existing PCB concentration unless otherwise specified in 40 *CFR* 761.79(g).	PCB decontamination waste and residues for disposal—**applicable**.	40 *CFR* 761.79(g)
Disposal of LLW	LLW shall be certified as meeting waste acceptance requirements before it is transferred to the receiving facility.	Disposal of LLW at a DOE facility—**TBC**.	DOE M 435.1-1(IV)(J)(2)
Disposal of waste with residual radioactive material off-site	If residual radioactive material is released to a non-DOE or non-NRC licensed facility, the waste must achieve authorized limits in accordance with DOE Order 5400.5(IV)(4)(a) before that release.	Release of residual radioactive material to a non-DOE or non-NRC licensed facility for disposal—**TBC**.	DOE O 5400.5(II)(5)(c)(6) and 5400.5(IV)(5)(a)
On-site disposal of waste with residual radioactive Material	Disposal of residual radioactive material must achieve the authorized limits in accordance with DOE Order 5400.5 (IV)(4)(a).	Release of residual radioactive material for disposal on-site—**TBC**.	DOE O 5400.5(IV)(5)(a)
Decontamination/Cleanup			
Decontamination of movable equipment contaminated by PCBs (self-implementing option)	May decontaminate by • swabbing surfaces that have contacted PCBs with a solvent;	Decontaminating movable equipment contaminated by PCB, tools and sampling equipment—**applicable**.	40 *CFR* 761.79(c)(2)
	• a double wash/rinse as defined in 40 *CFR* 761.360-378; or		
	• another applicable decontamination procedure under 40 *CFR* 761.79.		

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Decontamination of PCB Containers (self-implementing option)	Must flush the internal surfaces of the container three times with a solvent containing < 50 ppm PCBs. Each rinse shall use a volume of the flushing solvent equal to approximately 10% of the PCB container capacity.	Decontaminating a PCB Container as defined in 40 *CFR* 761.3—**applicable**.	40 *CFR* 761.79(c)(1)
Decontamination of PCB contaminated water	The decontamination standard for water containing PCBs is less than or equal to 0.5 µg/L (i.e., approximately ≤0.5 ppb PCBs) for unrestricted use.	Water containing PCBs regulated for disposal—**applicable**.	40 *CFR* 761.79(b)(1)(iii)
Release of property having residual radioactive material to an off-site commercial facility	Prior to being released, property shall be surveyed to determine whether both removable and total surface contamination (including contamination present on and under any coating) are in compliance with the standards set forth in DOE O 5400.5.	Release of materials and equipment with surface residual radioactive contamination—**TBC**.	DOE O 5400.5(II)(5)(c)(1) and 5400.5(IV)(5)(d)
Unit Closure			
Closure of RCRA container management unit	Generators must close the container management unit in a manner that • Minimizes the need for further maintenance; • Controls, minimizes or eliminates, to the extent necessary to protect human health and environment, postclosure escape of hazardous waste, hazardous constituents, contaminated runoff or hazardous waste decomposition products to ground or surface waters or to the atmosphere; and • Complies with closure requirements of 40 *CFR* 265.111 and 40 *CFR* 265.114.	Management of RCRA hazardous waste in containers—**applicable**.	40 *CFR* 262.34(a)(1)(iv)(B) 401 *KAR* 32:030 § 5 (1)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Unit Closure			
Closure of staging piles of remediation waste	Must be closed by removing or decontaminating all remediation waste, contaminated containment system components, and structures and equipment contaminated with waste and leachate.	Storage of remediation waste in staging pile located in previously contaminated area—**relevant and appropriate**.	40 *CFR* 264.554(j)(1) 401 *KAR* 34:287 § 5
	Must decontaminate contaminated sub-soils in a manner that will protect human and the environment.		40 *CFR* 264.554(j)(2) 401 *KAR* 34:287 § 5
	Must be closed according to substantive requirements in 40 CFR 264.258(a) and 264.111.	Storage of remediation waste in staging pile located in uncontaminated area—**relevant and appropriate**.	40 *CFR* 264.554(k) 401 *KAR* 34:287 § 5
Waste Transportation			
Transportation of PCB wastes off-site	Must comply with the manifesting provisions at 40 *CFR* 761.207 through 218.	Relinquishment of control over PCB wastes by transporting, or offering for transport—**applicable**.	40 *CFR* 761.207(a)
Transportation of radioactive waste	Shall be packaged and transported in accordance with DOE Order 460.1B and DOE Order 460.2.	Preparation of shipments of radioactive waste—**TBC**.	DOE M 435.1-(I)(1)(E)(11)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Waste Transportation			
Transportation of RCRA hazardous waste on-site	The generator manifesting requirements of 40 *CFR* 262.20–262.32(b) do not apply.	Transportation of hazardous wastes on a public or private right-of-way within or along the border of contiguous property under the control of the same person, even if such contiguous property is divided by a public or private right-of-way—**applicable**.	40 *CFR* 262.20(f) 401 *KAR* 32:020 § 1
Transportation of RCRA hazardous waste off-site	Must comply with the generator requirements of 40 *CFR* 262.20–23 for manifesting, Sect. 262.30 for packaging, Sect. 262.31 for labeling, Sect. 262.32 for marking, Sect. 262.33 for placarding, Sect. 262.40, 262.41(a) for record keeping requirements, and Sect. 262.12 to obtain EPA ID number.	Preparation and offering of hazardous waste for transport off-site—**applicable**.	40 *CFR* 262.10(h) 401 *KAR* 32:010 § 1
Transportation of LLW	To the extent practical, the volume of the waste and the number of the shipments shall be minimized.	Preparation of shipments of LLW—**TBC**.	DOE M 435.1-1(IV)(L)(2)
Transportation of hazardous materials	Shall be subject to and must comply with all applicable provisions of the HMR at 49 *CFR* 171–180 related to marking, labeling, placarding, packaging, emergency response, etc.	Any person who, under contract with a department or agency of the federal government, transports "in commerce," or causes to be transported or shipped, a hazardous material—**applicable**.	49 *CFR* 171.1(c)

Table 3. Summary of Action-Specific ARARs/TBCs for the Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) (Continued)

ACTION-SPECIFIC			
Action	**Requirements**	**Prerequisite**	**Citation(s)**
Transportation of hazardous materials on-site	Shall comply with 49 *CFR* Parts 171-174, 177, and 178 or the site- or facility-specific Operations of Field Office approved Transportation Safety Document that describes the methodology and compliance process to meet equivalent safety for any deviation from the Hazardous material Regulations [i.e., Transportation Safety Document for On-Site Transport within the Paducah Gaseous Diffusion Plant, PRS-WSD-0661, (PRS 2007b)].	Any person who, under contract with the DOE, transports a hazardous material on the DOE facility—**TBC**.	DOE O 460.1B(4)(b)
Transportation of hazardous materials off-site	Off-site hazardous materials packaging and transfers shall comply with 49 *CFR* Parts 171-174, 177, and 178 and applicable tribal, State, and local regulations not otherwise preempted by DOT and special requirements for Radioactive Material Packaging.	Preparation of off-site transfers of LLW—**TBC**.	DOE O 460.1B(4)(a)

ALARA = as low as reasonably achievable
CFR = Code of Federal Regulations
CWA = Clean Water Act
DOE = U.S. Department of Energy
DOT = U.S. Department of Transportation
EDE = effective dose equivalent
HMR = Hazardous Materials Regulations
KPDES = Kentucky Pollutant Discharge Elimination System
LLW = low-level waste
PCB = polychlorinated biphenyl
PPE = personal protective equipment
RCRA = Resource Conservation and Recovery Act
TBC = to be considered
TCLP = Toxicity Characteristic Leaching Procedure
TSCA = Toxic Substances Control Act
UTS = Universal Treatment Standard
WAC = waste acceptance criteria

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APPENDIX A

SCOPE OF WORK

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CONTENTS

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ACRONYMS

ARAR	applicable or relevant and appropriate requirement
BMP	Best Management Practice
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	contaminant of concern
DOE	U.S. Department of Energy
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
ES&H	Environmental, Safety, and Health
EU	Exposure Unit
HI	Hazard Index
KAR	*Kentucky Administrative Regulation*
KPDES	Kentucky Pollutant Discharge Elimination System
NSDD	North-South Diversion Ditch
OSHA	U.S. Occupational Safety and Health Administration
OU	Operable Unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
RA	Removal Action
RAO	Removal Action Objective
RAWP	Removal Action Work Plan
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SI	Site Investigation
SOW	statement of work
SWMU	solid waste management unit
SWOU	Surface Water Operable Unit
TBC	to be considered
TCA	1,1,1-trichloroethane
TCE	trichloroethene
WMP	Waste Management Plan

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A. SCOPE OF WORK

A.1 GENERAL

The objective of this action is to remove identified "hot spots" located within North-South Diversion Ditch (NSDD) Sections 3 and 5 and Kentucky Pollutant Discharge Elimination Systems (KPDES) Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and areas at the Paducah Gaseous Diffusion Plant (PGDP) in Paducah, Kentucky.

NSDD Sections 3 and 5 and KPDES Outfalls 001, 008, 010, 011, and 015, and their associated internal ditches have been characterized in several previous investigations. These included the Phase I and Phase II Site Investigations (SIs) (CH2M HILL 1991; CH2M HILL 1992); various Waste Area Group and Solid Waste Management Unit (SWMU) remedial investigations, site evaluations, and removal actions (RAs); and a 1996 PCB Study by the U.S. Army Corps of Engineers (COE 1996). In 2005, the SI for the Surface Water Operable Unit (SWOU) (On-Site) was conducted and focused on the first sequenced response action for on-site portions of the SWOU at PGDP (DOE 2008b). The investigation involved the collection of surface soil and sediment samples from various outfalls and their associated internal ditches and storm sewer discharge water to evaluate areas within the SWOU having the greatest potential for contaminant discharge to creeks surrounding PGDP.

This Scope of Work (SOW) is subject to change or modification as a result of the final regulator approval process for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) activity that this SOW is intended to support.

The description of sites including location and contamination present is described below. Areas are approximate.

A.1.1 OUTFALL 001 EU 15

Outfall 001 Exposure Unit (EU) 15 is located west of 10th Street and east of Buildings C-746-A and C-746-B as shown on drawing C7DC375W9A001. There are two soil removal areas. One of the soil removal areas is approximately 200 ft^2 and is contaminated with polychlorinated biphenyls (PCBs). The other soil removal area is broken up into smaller areas, with a total area of approximately 10,690 ft^2, and is contaminated with uranium.

A.1.2 OUTFALL 008 EU 11

Outfall 008 EU 11 is located east of 6th Street and north of Tennessee Avenue as shown on drawing C7DC375W7A001. The soil removal area is approximately 1,740 ft^2 and is contaminated with PCBs.

A.1.3 OUTFALL 010 EU 10

Outfall 010 EU 10 is located between 14th Street and 16th Street and between Tennessee Avenue and the railroad tracks as shown on drawing C7DC375E3A001. The soil removal area is approximately 5,310 ft^2 and is contaminated with PCBs.

A.1.4 OUTFALL 011 EU 01

Outfall 011 EU 01 is located east of PGDP and west of Dyke Road as shown on drawing C7DC375E4A001. The soil removal area is approximately 16,330 ft^2 and is contaminated with uranium.

A.1.5 OUTFALL 015 EU 02

Outfall 015 EU 02 is located north of Virginia Avenue as shown on drawing C7DC375W8A001. The soil removal area is broken into two parts totaling approximately 26,520 ft^2 and exceeds 1E-5 total excess lifetime cancer risk (ELCR). Two soil removal areas are included in the 26,520 ft^2 and are contaminated with cesium-137. These areas are approximately 820 ft^2 and 1,130 ft^2.

A.1.6 OUTFALL 015 EU 03

Outfall 015 EU 03 is located north of Virginia Avenue near 6th Street as shown on drawing C7DC375W8A002. The soil removal area is approximately 23,890 ft^2 and is contaminated with uranium.

A.1.7 OUTFALL 015 EU 04

Outfall 015 EU 04 is located north of Virginia Avenue west of 10th Street as shown on drawing C7DC375W8A003. The three soil removal areas all exceed 1E-5 total ELCR, major contributors are cesium-137, arsenic, and Total PCBs. One soil removal area is approximately 1,470 ft^2. The other soil removal areas are separated by a railroad track and total approximately 6,080 ft^2.

A.1.8 OUTFALL 015 EU 07

Outfall 015 EU 07 is located north of Virginia Avenue and south of facilities C-745-B and C-745-C as shown on drawing C7DC375W8004. The soil removal area is approximately 21,100 ft^2 and is contaminated with uranium.

A.1.9 OUTFALL 015 EU 08

Outfall 015 EU 08 is located south of Virginia Avenue and adjacent to 4th Street as shown on drawing C7DC375W8A005. The soil removal area is approximately 1,067 ft^2 and is contaminated with PCBs.

A.1.10 NSDD 3 EU 01 AND 02

NSDD 3 EU 01 and 02 is located north of PGDP and is south of Kentucky State Highway 358 as shown on drawing C7DC90000A025. There are two soil removal areas for NSDD 3 EU 01. One soil removal area is approximately 1,490 ft^2 and is contaminated with PCBs. The other soil removal area is approximately 9,200 ft^2 and is contaminated with uranium. There are three soil removal areas for NSDD 3 EU 02. One of the soil removal areas is approximately 9,400 ft^2 and is contaminated with thorium-230. The other two soil removal areas exceed 1E-5 total ELCR and have areas of approximately 4,270 ft^2 and 4,470 ft^2.

A.1.11 NSDD 3 EU 03

NSDD 3 EU 03 is located north of PGDP and is south of Kentucky State Highway 358 as shown on

drawing C7DC90000A026. There are two soil removal areas. One soil removal area is approximately 4,140 ft^2 and exceeds 1E-5 total ELCR. The other soil removal area is broken into three areas with a total of approximately 10,270 ft^2 and is contaminated with uranium.

A.1.12 NSDD 5 EU 08

NSDD 5 EU 08 is located north of PGDP and Kentucky State Highway 358 as shown on drawing C7DC90000A027. The soil removal area is approximately 2,510 ft^2 and exceeds 1E-5 total ELCR.

A.2 SCOPE

The SWOU (On-Site) RA will include implementation of one or more engineered controls to prevent transport of contaminated soil and sediment; temporary access controls, such as exclusion fencing and hazard postings will be used as required; complete removal of identified "hot spots" within NSDD Sections 3 and 5 and KPDES Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and areas; post-excavation sampling; and managing and properly disposing of remediation waste. Work will include mobilization; fence installation with hazard postings; installation of Best Management Practice (BMP) controls; excavation; post-excavation sampling; restoration; soil handling, transportation and disposal; and demobilization. The following outlines the specific details of the activities included in the RA; however, it should be noted that specifics of certain construction and disposition activities are not supplied so as to provide flexibility when performing the work:

- Establish construction site access control (as needed) such as exclusion zones, fencing, and hazard postings to exclude unauthorized personnel from entering the contamination areas (i.e., "hot spot") and provide directions should access to the area be required by authorized personnel. Decisions regarding where postings will be placed will be made by the Certified Industrial Hygienist.

- Excavate the hot spots depicted in maps in Appendix B to a depth of 2 ft to eliminate the risk of human receptors contacting contaminated sediment. Hot spots under this action were identified using a cumulative ELCR of 1E-05 and a cumulative hazard index (HI) of 1.0 based upon the information presented in Appendix F, "Risk-Based Cost-Benefit Analysis" of the Engineering Evaluation/Cost Analysis. Any residual contamination located outside or underneath the indentified hot spots after excavation is complete that is at concentrations greater than those acceptable for unrestricted use/unlimited exposure will be addressed as part of future remedial investigation activities [e.g., SWOU (Off-Site), Soils Operable Unit (OU), Comprehensive Site OU, etc.)].

- Collect samples from the bottom of the hot spot to confirm that the risk-based targets of a cumulative ELCR of 1E-05 and a cumulative HI of 1.0 have been achieved, subsequently meeting the project Removal Action Objectives (RAOs). If RAOs are not initially met, additional excavation may be required as described in Appendix F.

- Consistent with the results of the risk-based cost-benefit analysis, verification of cleanup to the cumulative ELCR of 1E-05 and a cumulative HI of 1.0 following excavation will be based upon comparisons between sampling results and chemical-specific ELCR-based and HI-based cleanup levels. The ELCR target used in deriving the cleanup levels will be 5E-06. The HI target used in deriving the cleanup levels will be 1.0. The cleanup goals under this action are presented in Table A.1.

- Methods to validate the achievement of the chemical-specific cleanup levels (See Appendix F) will be implemented similar to the NSDD Sections 1 and 2 remediation.

Table A.1. Cleanup Levels Based on Carcinogenic Risk and Hazard

COC	**Risk-Based Concentration**	
Arsenic	27	mg/kg
Beryllium	50,000	mg/kg
Total PCB	16	mg/kg
Americium-241	115	pCi/g
Cesium-137	8	pCi/g
Neptunium-237	22	pCi/g
Plutonium-239/240	108	pCi/g
Technetium-99	3825	pCi/g
Thorium-230	147	pCi/g
Thorium-232	129	pCi/g
Uranium-234	188	pCi/g
Uranium-235	30	pCi/g
Uranium-238	94	pCi/g
COC	**Hazard-Based Concentration**	
Uranium	227	mg/kg

COC = contaminant of concern
PCB = polychlorinated biphenyl compound

- Install temporary localized sediment control measures such as small stormwater retention areas, silt fencing, or rock check dams during excavation activities, as needed. Installation will control sediment and contaminant migration from the action and will be dependent upon the site conditions at the time of excavation.

- Survey the excavation limits, all sample points and elevations, then restore (i.e., backfill with clean soil, reseeding, etc.) disturbed acreage to prevent erosion, migration and recontamination.

- Characterize (to the extent necessary per waste acceptance criteria of disposition facility), containerize, transport, and dispose of all equipment and contaminated soil/sediment at an appropriate on- or off-site disposal/storage facility.

- Assess temporary localized sediment control measures and interim institutional controls (if applied) and discontinue as appropriate.

- Continue inspection and site maintenance during and after excavation and restoration to control erosion and until the excavated/restored area is stable.

The impact to vulnerable or sensitive populations, habitats, or natural resources (i.e., critical or aquatic habitat, migratory birds, wetlands, streams, and floodplains) has been identified. These impacts have been evaluated and the necessary mitigation measures required to meet applicable or relevant and appropriate requirements (ARARs) will be implemented during the construction

and operation phases of this RA [see tables 2 through 4 of the main text of the Removal Action Work Plan (RAWP)].

Mobilization will include, but is not limited to, participation in the Readiness Assessment process, delivery of all necessary construction and environmental, safety, and health (ES&H) equipment, setup of any temporary facilities, establishment of a trained and qualified workforce on the job site, and delivery of construction materials required for starting work. All work shall be performed in strict compliance with U.S. Occupational Safety and Health Administration (OSHA) 29 *CFR* 1910 and 1926. An experienced worker with excavation competent person training in accordance with OSHA 29 *CFR* 1926 subpart P shall supervise excavation and backfill activities.

Storm water and erosion control will be implemented as described in the BMP Plan, PRS/PROG/0017. The BMP plan will be implemented to minimize and/or eliminate the potential that contaminants associated with the NSDD Sections 3 and 5 and KPDES Outfalls 001, 008, 010, 011, and 015 and their associated internal ditches and areas might migrate beyond their current boundaries. These BMPs may include use of dust mitigation/suppression, diversion of run-on/run-off around the project area, and/or installation of small storm water retention areas, silt fencing, or rock check dams as localized sediment control measures, as required. Any containers of oil or oil products will be inventoried in accordance with PRS/ENM/0037, April 2008, *Spill Prevention, Control, and Countermeasure Plan*, for the U.S. Department of Energy (DOE) Paducah Site. If volumes equal or exceed 55 gal, plans for controls will be set in place.

Excavation and removal activities will be conducted in a manner that will limit fugitive dust emissions and will provide sedimentation controls, thereby limiting potential impacts due to airborne particulates and suspended solid loading. Fuel and oils also will be properly stored at secure locations away from storm water access.

The RA will generate approximately 7,000 yd^3 of soil/sediment and waste materials requiring off-site disposal and 6,300 yd^3 requiring on-site disposal. Sediment and other waste will be characterized, managed, transported, and disposed of in accordance with the ARARs/to be considered (TBCs) for low-level radioactive, Resource Conversation Recovery Act (RCRA), Toxic Substances and Control Act, or industrial waste in the approved EE/CA. DOE will manage/store PCB remediation wastes in risk-based storage instead of storage meeting 40 *CFR* 761.61(b)(1) requirements pursuant to 40 *CFR* 761.65(b)(2)(vi) and 761.65(c)(9)(iv). Such wastes may be stored up to 180 days in drums, B-12 boxes, B-25 boxes, intermodal containers, and/or sealand containers, provided that the containers are sealed when not adding/removing materials. Storing PCB remediation wastes in this manner provides a level of protectiveness that is similar to storing PCB remediation wastes in piles under 40 *CFR* 761.65(c)(9). DOE will perform disposal [in accordance with 40 *CFR* § 761.61(a)(5)(v)] of soil containing equal to or less than 49 ppm PCBs at the C-746-U solid waste landfill. The Environmental Performance Standard in 401 *Kentucky Administrative Regulation* (*KAR*) 47:030, Section 8, and Condition Number ACTV0006, "Standard Requirement 1" of Solid Waste Permit No. 073-00014/073-00015/073-00045 currently allow such disposal. PCB remediation waste requiring off-site disposal (i.e., greater than 49 ppm) will be disposed of in accordance with 40 *CFR* § 761.61(a), (b), or (c) in a RCRA permitted landfill, in a landfill with a coordinated approval, in a chemical waste landfill, or in a facility with approval from U. S. Environmental Protection Agency (EPA). The contractor will follow applicable state and federal requirements including DOE Orders in addition to the facility WAC..

Water may be treated and disposed of on- or off-site and will meet facility WAC.

Off-site transfer of any hazardous substance, pollutant, or contaminant generated during this action will be sent to a facility that complies with applicable federal and state laws and has been approved by U.S. Environmental Protection Agency (EPA) for acceptance of CERCLA waste. Accordingly, DOE will verify with the appropriate EPA regional contact that any needed off-site facility is acceptable for receipt of CERCLA wastes prior to transfer in accordance with the requirements of the Off-Site Rule in 40 *CFR* § 300.440(a)(4).

Post-excavation soil sampling activities will be conducted following excavations. All post-excavation sampling will be conducted in accordance with the Sampling and Analysis Plan (SAP) found in Appendix F. Sampling locations will be surveyed upon completion of sampling activities.

Upon completion of fieldwork, demobilization will occur. Demobilization includes decontamination and removal of all construction and health and safety equipment, dismantlement and removal of temporary structures and storm water controls, removal of excess construction materials, removal of all personnel, and preparation of a post construction completion report.

All work shall be performed in accordance with the RAWP, this SOW (Appendix A); the design drawings (Appendix B); ES&H Plan (Appendix C); WMP (Appendix D); Quality Assurance Project Plan (Appendix E); SAP (Appendix F); and the Data Management Implementation Plan (Appendix G).

A.3 WORK INCLUDED

A.3.1 MOBILIZATION

A. Mobilization shall include, but is not limited to, participation in the Readiness Review process; delivery of all necessary construction and health & safety equipment; setup of any temporary facilities; maintenance of temporary facilities; establishment of the total required workforce on the job site; completion of site specific training; delivery of all construction materials required to start work and establishment of construction site access controls. It also includes the submittal of all documentation required prior to the start of fieldwork.

A.3.2 SEDIMENT CONTROL MEASURES

A. Construct and maintain, at a minimum, storm water and erosion management controls, including, but not limited to, diversion ditches, diversion dams, silt fence, silt socks, erosion control blankets or mats, and rock check dams. Storm water and erosion control will be implemented as described in the BMP Plan, PRS/PROG/0017.

B. Install erosion and sediment control measures. All erosion and sediment control measures shall be maintained throughout the construction period. Weekly checks will be made to ensure erosion controls are in place during project downtime. Erosion and sediment controls will be put in place at the end of each day's activities.

C. If feasible, disturbed areas shall be securely covered with an impermeable liner during extended periods of time where no excavation/sampling work is required or when inclement weather is forecast. Transfer water collected in the work area into liquid storage containers. A pump (i.e., trash pump) would be used to transfer rainwater. A low

point would be created when placing the liner over the excavation to allow for the water to collect. The water would be pumped into a mobile poly tank and disposed of in an appropriate manner.

D. BMPs shall be implemented as outlined in the *Best Management Practices Plan*, PRS/PROG/0017.

A.3.3 OUTFALL 001 EU 15

A. Refer to drawing C7DC375W9A001 located in Appendix B related to the RA at Outfall 001 EU 15.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. The culverts to be plugged are shown on the referenced drawing (Appendix B, C7DC375W9A001).

G. Install earth berms and/or silt fence (sock), if required, as shown on the referenced drawing (Appendix B, C7DC375W9A001).

H. Ensure that the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC375W9A001).

I. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375W9A001).

J. Take special care during excavation near utilities, roads, culverts, or any structure.

K. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

L. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

M. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

N. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

O. Backfill the excavated area with clean, compacted soil.

A.3.4 OUTFALL 008 EU 11

A. Refer to drawing C7DC375W7A001 located in Appendix B related to the RA at Outfall 008 EU 11.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC375W7A001).

G. Ensure the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC375W7A001).

H. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375W7A001).

I. Take special care during excavation near utilities, roads, culverts, or any structure.

J. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

K. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

L. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

M. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

N. Backfill the excavated area with clean, compacted soil.

A.3.5 OUTFALL 010 EU 10

A. Refer to drawing C7DC375E3A001 located in Appendix B related to the RA at Outfall 010 EU 10.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. Install sediment control measures as shown on the referenced drawing (Appendix B, C7DC375E3A001)

G. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375E3A001).

H. Take special care during excavation near utilities, roads, culverts, or any structure.

I. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

J. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

K. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

L. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

M. Backfill the excavated area with clean, compacted soil.

A.3.6 OUTFALL 011 EU 01

A. Refer to drawing C7DC375E4A001 located in Appendix B related to the RA at Outfall 011 EU 01.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. The culverts to be plugged are shown on the referenced drawing (Appendix B, C7DC375E4A001).

G. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375E4A001).

H. Take special care during excavation near utilities, roads, culverts, or any structure.

I. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

J. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

K. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

L. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

M. Backfill the excavated area with clean, compacted soil.

A.3.7 OUTFALL 015 EU 02

A. Refer to drawing C7DC375W8A001 located in Appendix B related to the RA at Outfall 015 EU 02.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. The culverts to be plugged are shown on the referenced drawing (Appendix B, C7DC375W8A001).

G. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC375W8A001).

H. Ensure the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC375W8A001).

I. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375W8A001).

J. Take special care during excavation near utilities, roads, culverts, or any structure.

K. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

L. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

M. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

N. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

O. Backfill the excavated area with clean, compacted soil.

A.3.8 OUTFALL 015 EU 03

A. Refer to drawing C7DC375W8A002 located in Appendix B related to the RA at Outfall 015 EU 03.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC375W8A002).

G. Ensure the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC375W8A002).

H. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375W8A002).

I. Take special care during excavation near utilities, roads, culverts, or any structure.

J. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

K. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

L. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

M. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

N. Backfill the excavated area with clean, compacted soil.

A.3.9 OUTFALL 015 EU 04

A. Refer to drawing C7DC375W8A003 located in Appendix B related to the RA at Outfall 015 EU 04.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. The culverts to be plugged are shown on the referenced drawing (Appendix B, C7DC375W8A003).

G. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC375W8A003).

H. Ensure the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC375W8A003).

I. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375W8A003).

J. Take special care during excavation near utilities, roads, culverts, or any structure.

K. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

L. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

M. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

N. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

O. Backfill the excavated area with clean, compacted soil.

A.3.10 OUTFALL 015 EU 07

A. Refer to drawing C7DC375W8004 located in Appendix B related to the RA at Outfall 015 EU 07.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC375W8004).

G. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375W8004).

H. Take special care during excavation near utilities, roads, culverts, or any structure.

I. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

J. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

K. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

L. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

M. Backfill the excavated area with clean, compacted soil.

A.3.11 OUTFALL 015 EU 08

A. Refer to drawing C7DC375W8A005 located in Appendix B related to the RA at Outfall 015 EU 08.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC375W8A005).

G. Ensure the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC375W8A005).

H. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC375W8A005).

I. Take special care during excavation near utilities, roads, culverts, or any structure.

J. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

K. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

L. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

M. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

N. Backfill the excavated area with clean, compacted soil.

A.3.12 NSDD SECTION 3 EUs 01 AND 02

A. Refer to drawing C7DC90000A025 located in Appendix B related to the RA at NSDD Section EUs 01 and 02.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC90000A025).

G. Install silt fence (sock) as shown on the referenced drawing (Appendix B, C7DC90000A025).

H. Ensure the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC90000A025).

I. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC90000A025).

J. Take special care during excavation near utilities, roads, culverts, or any structure.

K. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

L. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

M. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

N. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

O. Backfill the excavated area with clean, compacted soil.

A.3.13 NSDD SECTION 3 EU 03

A. Refer to drawing C7DC90000A026 located in Appendix B related to the RA at NSDD Section 3 EU 03.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. The culverts to be plugged are shown on the referenced drawing (Appendix B, C7DC90000A026).

G. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC90000A026).

H. Ensure the pumps necessary to reroute the water are available as shown on the referenced drawing (Appendix B, C7DC90000A026).

I. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC90000A026).

J. Take special care during excavation near utilities, roads, culverts, or any structure.

K. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

L. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

M. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

N. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

O. Backfill the excavated area with clean, compacted soil.

A.3.14 NSDD SECTION 5 EU 08

A. Refer to drawing C7DC90000A027 located in Appendix B related to the RA at NSDD Section 5 EU 08.

B. Obtain excavation/penetration permit prior to excavation work.

C. Setup working zones near the excavation area in accordance with the ES&H Plan (Appendix C).

D. Locate utilities by hand excavation methods.

E. Field verify the location of all utilities by vacuum or hand excavation and determine the proper action (capping, relocating, or plugging) of all utilities prior to continuation of work. Utilities and locations shown in Appendix B are from the PGDP utility maps.

F. Place pumps necessary to reroute water, or if conditions warrant, temporarily relocate NSDD as shown on the referenced drawing (Appendix B, C7DC90000A027).

G. Install earth berms and/or sediment control measures as shown on the referenced drawing (Appendix B, C7DC90000A027).

H. Excavate the hot spot as shown on the referenced drawing (Appendix B, C7DC90000A027).

I. Take special care during excavation near utilities, roads, culverts, or any structure.

J. The excavated soil and sediments shall be managed in accordance with the WMP (Appendix D).

K. Characterize the waste, as necessary, and dispose of according to the WMP (Appendix D).

L. Collect soil samples from the bottom of the hot spot location to confirm the risk-based targets have been achieved as described in the SAP (Appendix F).

M. If confirmation samples do not meet the risk-based target levels, proceed with further excavation as described in the SAP (Appendix F).

N. Backfill the excavated area with clean, compacted soil.

A.4 WASTE MANAGEMENT AND DISPOSAL

A. Manage waste generated under the WMP (Appendix D). Ship waste to the appropriate licensed disposal facility after receiving acceptance of waste characterization sampling results. Waste includes, but is not limited to, accumulated stormwater and soil/sediments.

B. Provide weekly inspections and maintenance of the waste staging areas, waste materials, and temporarily staged excavated materials until they are approved for disposal.

A.5 DEMOBILIZATION

Demobilization shall include, but not be limited to, backfill and restoration in accordance with design drawings; decontamination of equipment; removal of all construction and health & safety equipment; dismantlement and removal of all temporary structure; and removal of all excess construction materials.

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APPENDIX B

DESIGN DRAWINGS

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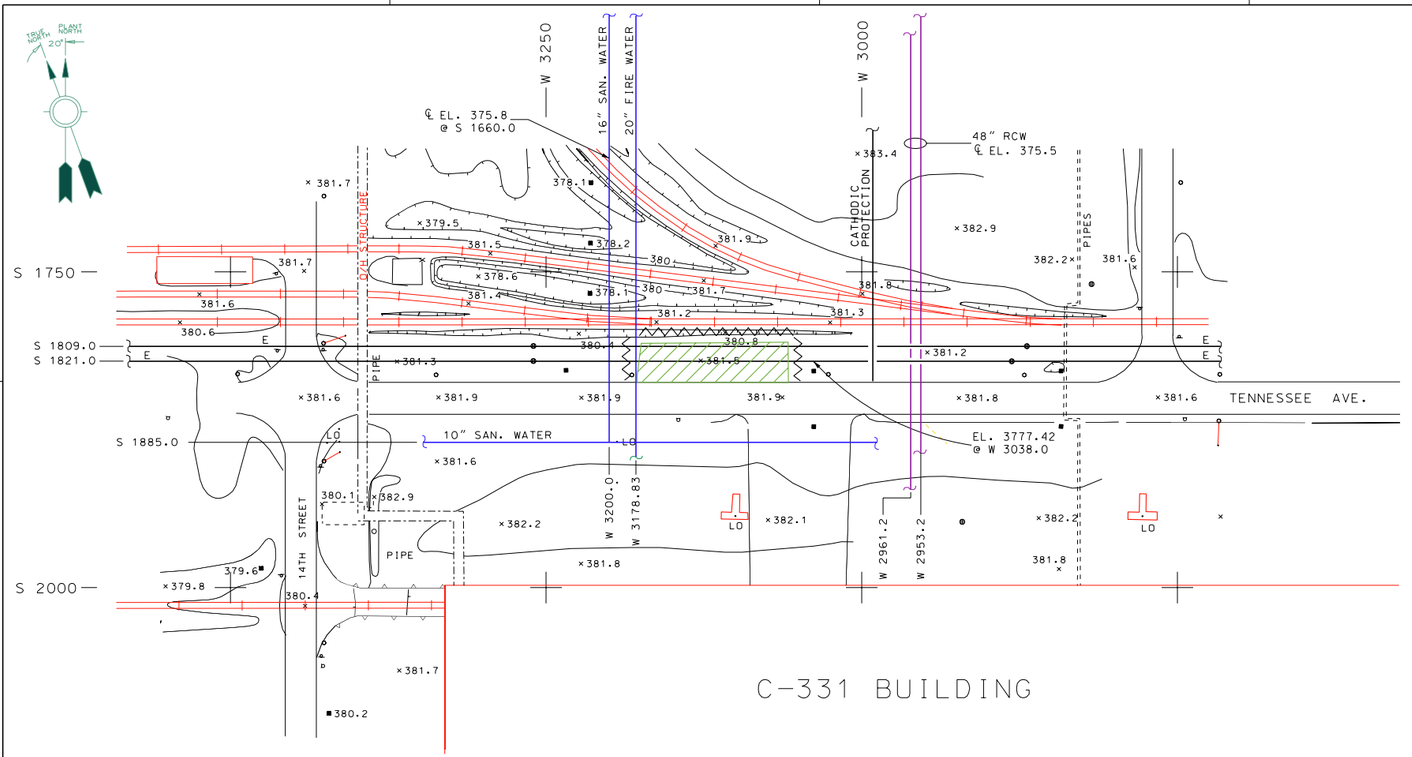

OUTFALL 010 EU 10 (C-375-E3) SITE PLAN

GRAPHIC SCALE

60 0 60 120

1" = 60'

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

2. BEST MANAGEMENT PRACTICES SHALL BE IMPLEMENTED AS OUTLINED IN THE "BEST MANAGEMENT PRACTICES PLAN, PADUCAH GASESOUS DIFFUSION PLANT, PADUCAH, KENTUCKY, PRS/PROG/0017, MAY, 2007".

3. ALL WORK SHALL BE PERFORMED IN STRICT COMPLIANCE WITH OSHA 29 CFR 1910 AND 1926. AN EXPERIENCED WORKER WITH EXCAVATION COMPETENT PERSON TRAINING IN ACCORDANCE WITH OSHA 29 1926 SUBPART P SHALL SUPERVISE EXCAVATION AND BACKFILL ACTIVITIES.

4. UPON COMPLETION OF THE WORK, ALL DISTRURBED SOIL AREAS SHALL BE RESTORED TO PRE-EXISTING CONDITIONS.

5. DIMENSIONS, COORDINATES, AND ELEVATIONS ARE APPROXIMATE AND SHALL BE FIELD VERIFIED PRIOR TO THE START OF WORK.

6. LOCATION AND STATUS OF ALL UTILITIES AND STRUCTURES ARE APPROXIAMTE AND SHALL BE FIELD VERIFIED BY VACUUM OR HAND EXCAVATION PRIOR TO THE START OF WORK. UTILITIES AND LOCATIONS SHOWN ARE FROM THE PGDP UTILITY MAPS.

7. CARE SHALL BE TAKEN WHILE WORKING AROUND UTILITIES.

8. ANY WATER THAT HAS ACCUMULATED WITHIN THE EXCAVATION SHALL BE REMOVED, TRANSPORTED, AND DISPOSED IN ACCORDANCE WITH THE REMOVAL ACTION WORK PLAN APPENDIX D WASTE MANAGEMENT PLAN.

9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- SILT FENCE OR SOCK
- PCBs
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION AND DETAIL KEY

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PROFESSIONAL SEAL

U.S. DEPARTMENT OF ENERGY

PADUCAH, PORTSMOUTH PROJECT OPERATIONS, PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

managed for the DEPARTMENT OF ENERGY under U.S. GOVERNMENT contract DE-AC30-06EW05001
Paducah, Kentucky

Tetra Tech, Inc
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 010 EU 10
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
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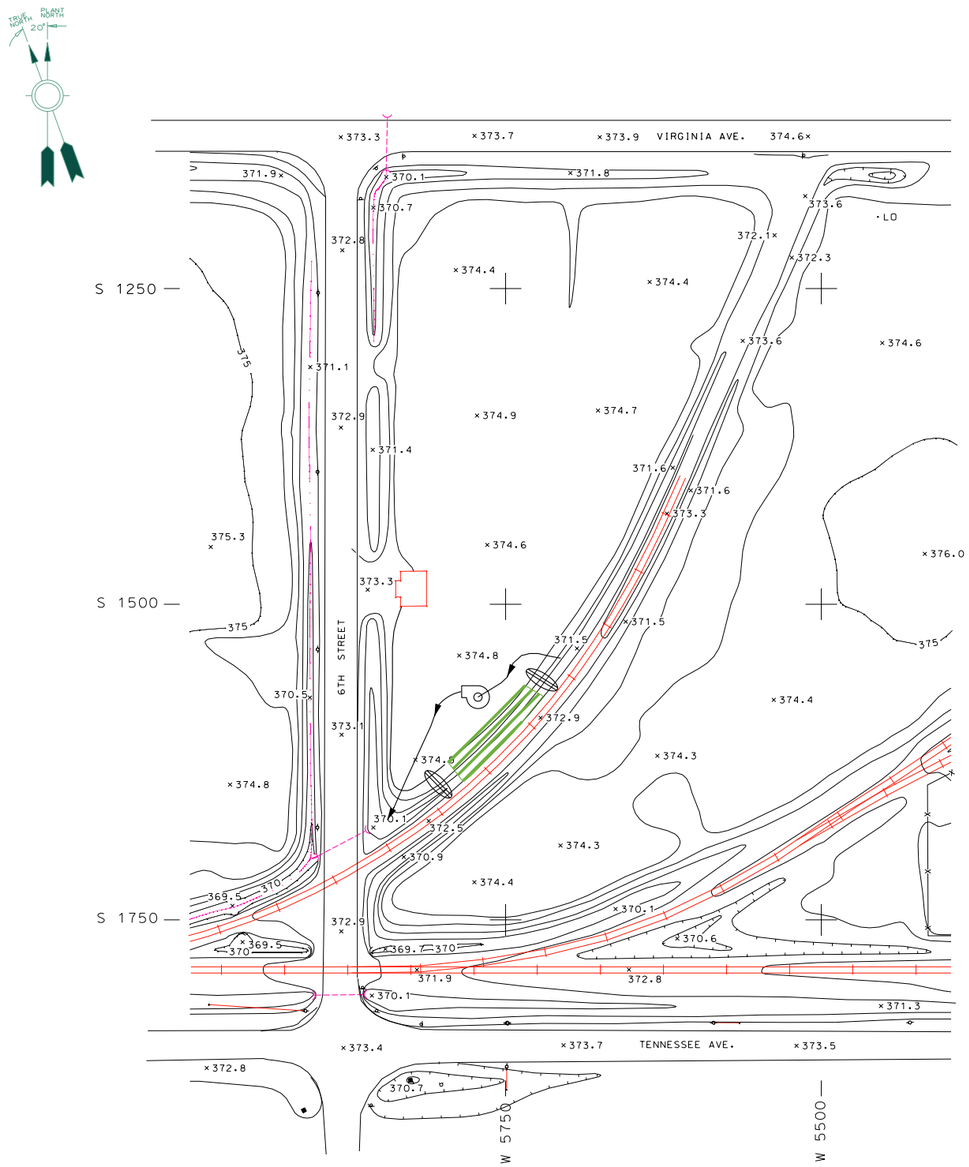
SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375E3A001	A



OUTFALL 008 EU 11 (C-375-W7) SITE PLAN

GRAPHIC SCALE
60 0 60 120
1" = 60'

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

2. BEST MANAGEMENT PRACTICES SHALL BE IMPLEMENTED AS OUTLINED IN THE "BEST MANAGEMENT PRACTICES PLAN, PADUCAH GASESOUS DIFFUSION PLANT, PADUCAH, KENTUCKY, PRS/PROG/0017, MAY, 2007".

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7. CARE SHALL BE TAKEN WHILE WORKING AROUND UTILITIES.

8. ANY WATER THAT HAS ACCUMULATED WITHIN THE EXCAVATION SHALL BE REMOVED, TRANSPORTED, AND DISPOSED IN ACCORDANCE WITH THE REMOVAL ACTION WORK PLAN APPENDIX D WASTE MANAGEMENT PLAN.

9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- PCBs
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION AND DETAIL KEY

SECTION NUMBER OR DETAIL LETTER
DRAWING ON WHICH SECTION OR DETAIL IS TAKEN
DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

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U.S. DEPARTMENT OF ENERGY
PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company
managed for the DEPARTMENT OF ENERGY under U.S. GOVERNMENT contract DE-AC30-06EW05001
Paducah, Kentucky

TETRA TECH, INC
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

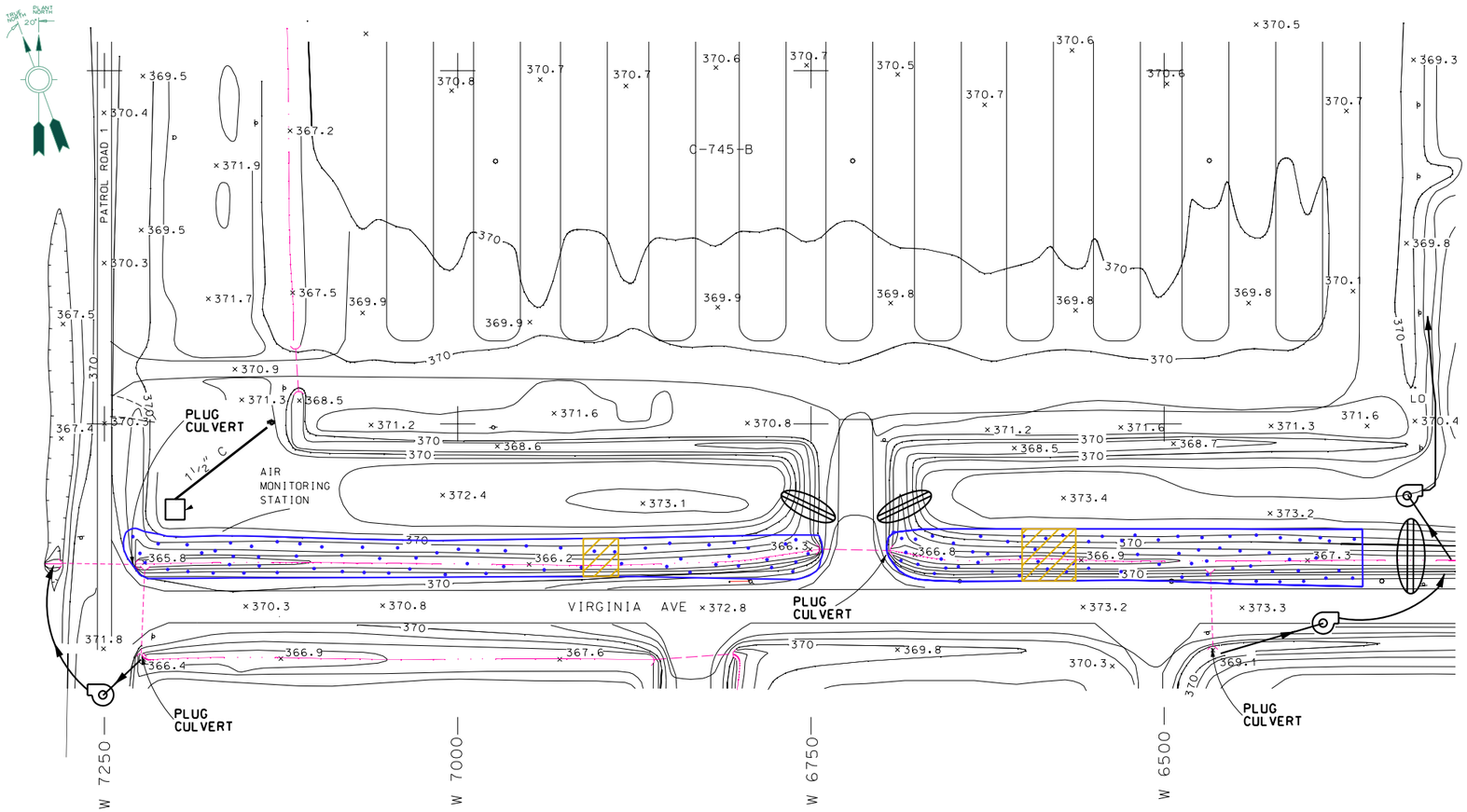
DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 008 EU 11
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC375W7A001 REV 0.DGN	C-375-W7	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375W7A001	A



(OUTFALL 015 EU 02 C-375-W8) SITE PLAN

GRAPHIC SCALE

50 0 50 100

1" = 50'

NOTES

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8. ANY WATER THAT HAS ACCUMULATED WITHIN THE EXCAVATION SHALL BE REMOVED, TRANSPORTED, AND DISPOSED IN ACCORDANCE WITH THE REMOVAL ACTION WORK PLAN APPENDIX D WASTE MANAGEMENT PLAN.

9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- TOTAL ELCR
- CESIUM-137
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION AND DETAIL KEY

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DATE

PROFESSIONAL SEAL

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U.S. DEPARTMENT OF ENERGY

PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

managed for the DEPARTMENT OF ENERGY under U.S. GOVERNMENT contract DE-AC30-06EW05001
Paducah, Kentucky

Tetra Tech, Inc
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 015 EU 02
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
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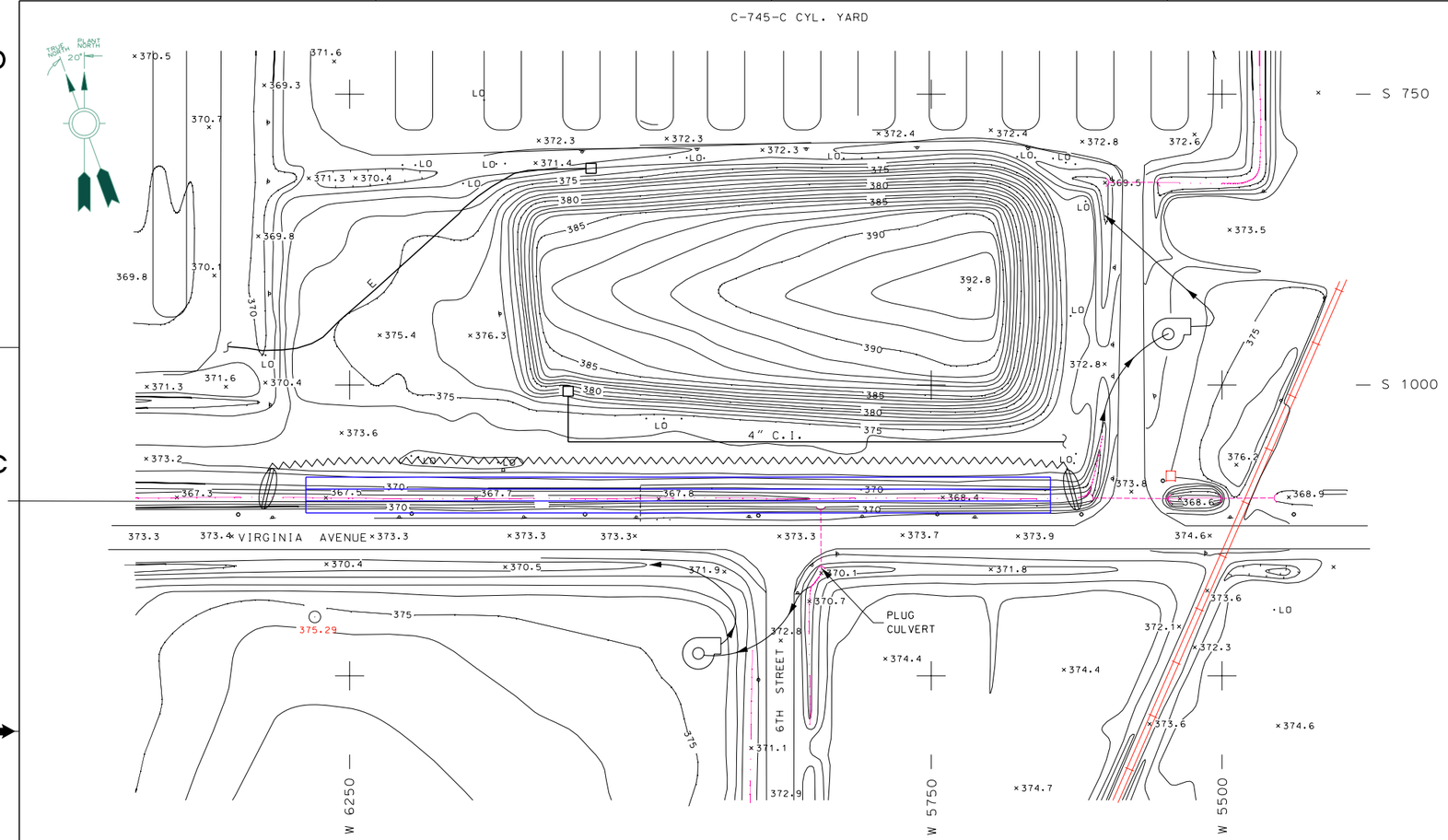

OUTFALL 015 EU 03 (C-375-W8) SITE PLAN

GRAPHIC SCALE

60 0 60 120

1" = 60'

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

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9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- URANIUM
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION AND DETAIL KEY

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

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PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

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Paducah, Kentucky

TETRA TECH, INC
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 015 EU 03
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
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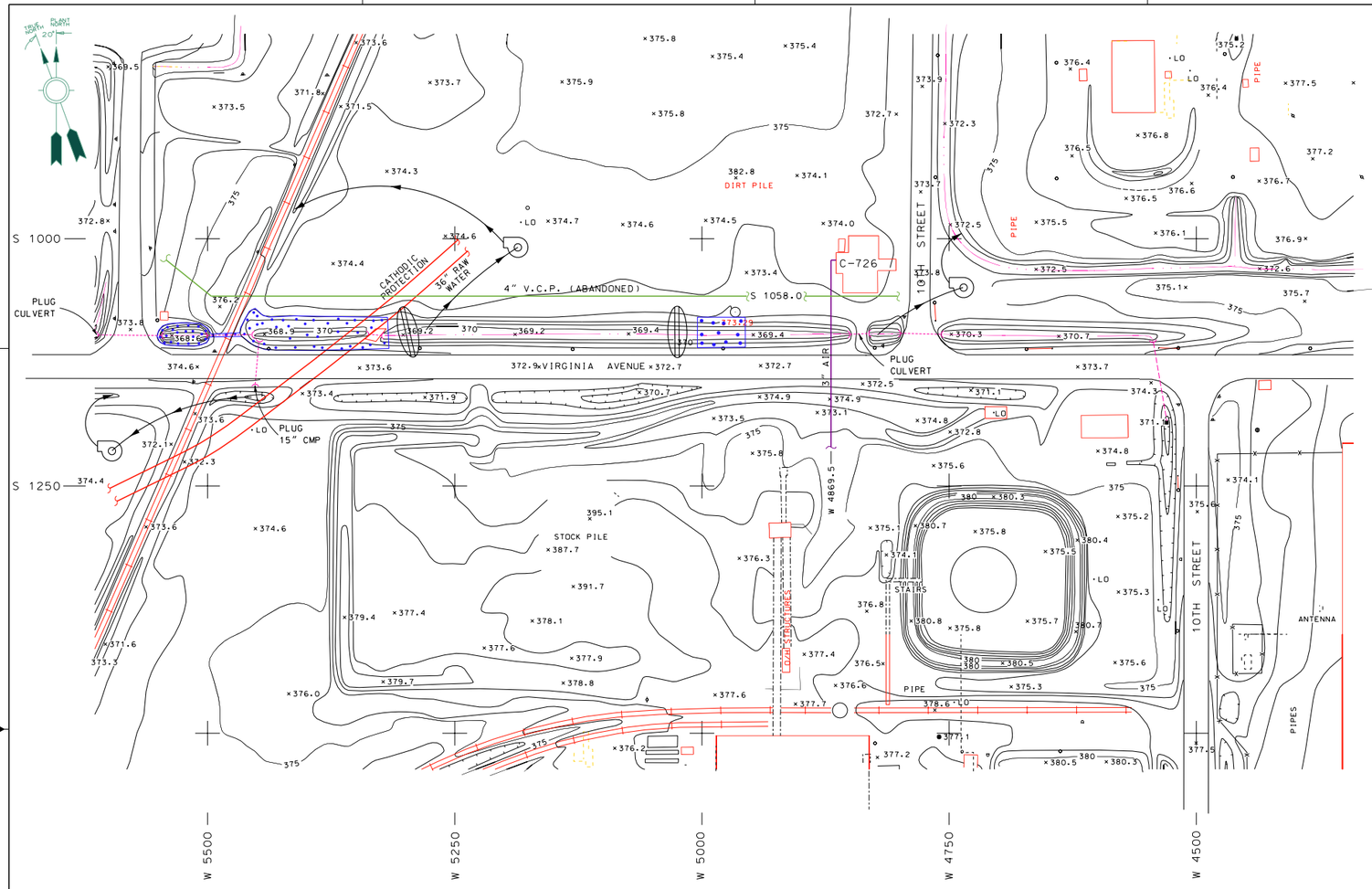
SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375W8A002	A



OUTFALL 015 EU 04 (C-375-W8) SITE PLAN

GRAPHIC SCALE

70 0 70 140

1" = 70'

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

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9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- TOTAL ELCR
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION AND DETAIL KEY

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

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PROFESSIONAL SEAL

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR
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U.S. DEPARTMENT OF ENERGY
PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
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Paducah, Kentucky

Tetra Tech, Inc
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

DOE CONTRACT NO. DE-AC30-06EW05001

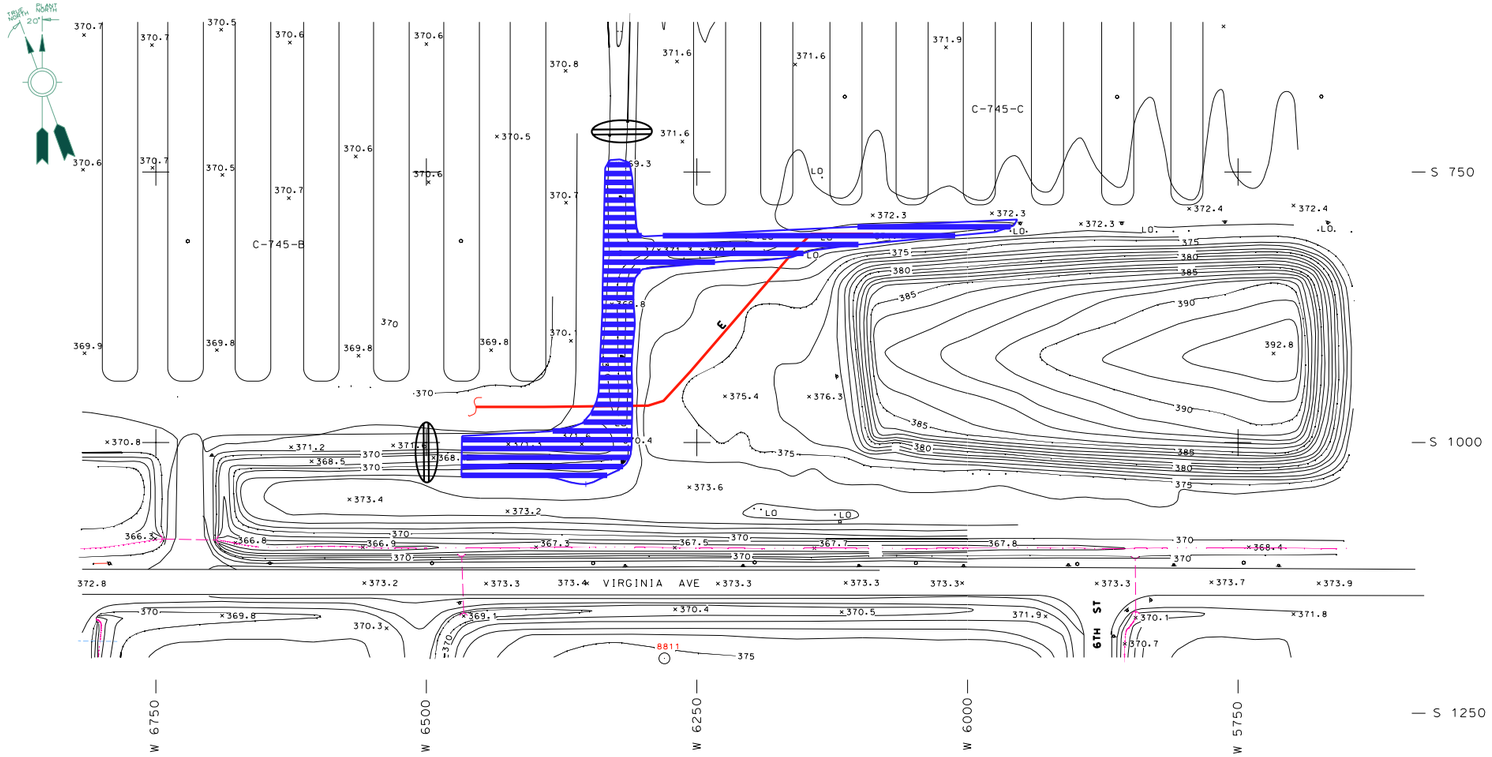
PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 015 EU 04
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC375W8A003 REV 0.DGN	C-375-W8	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375W8A003	A

OUTFALL 015 EU 07 (C-375-W8) SITE PLAN



GRAPHIC SCALE

70 0 70 140

1" = 70'

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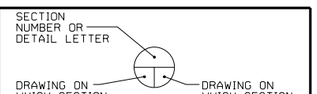
8. ANY WATER THAT HAS ACCUMULATED WITHIN THE EXCAVATION SHALL BE REMOVED, TRANSPORTED, AND DISPOSED IN ACCORDANCE WITH THE REMOVAL ACTION WORK PLAN APPENDIX D WASTE MANAGEMENT PLAN.

9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- URANIUM
- TOTAL ELCR
- **EARTHEN BERM**
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION AND DETAIL KEY



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DATE

PROFESSIONAL SEAL

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR
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U.S. DEPARTMENT OF ENERGY
PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

managed for the DEPARTMENT OF ENERGY under U.S. GOVERNMENT contract DE-AC30-06EW05001
Paducah, Kentucky

Tetra Tech, Inc
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

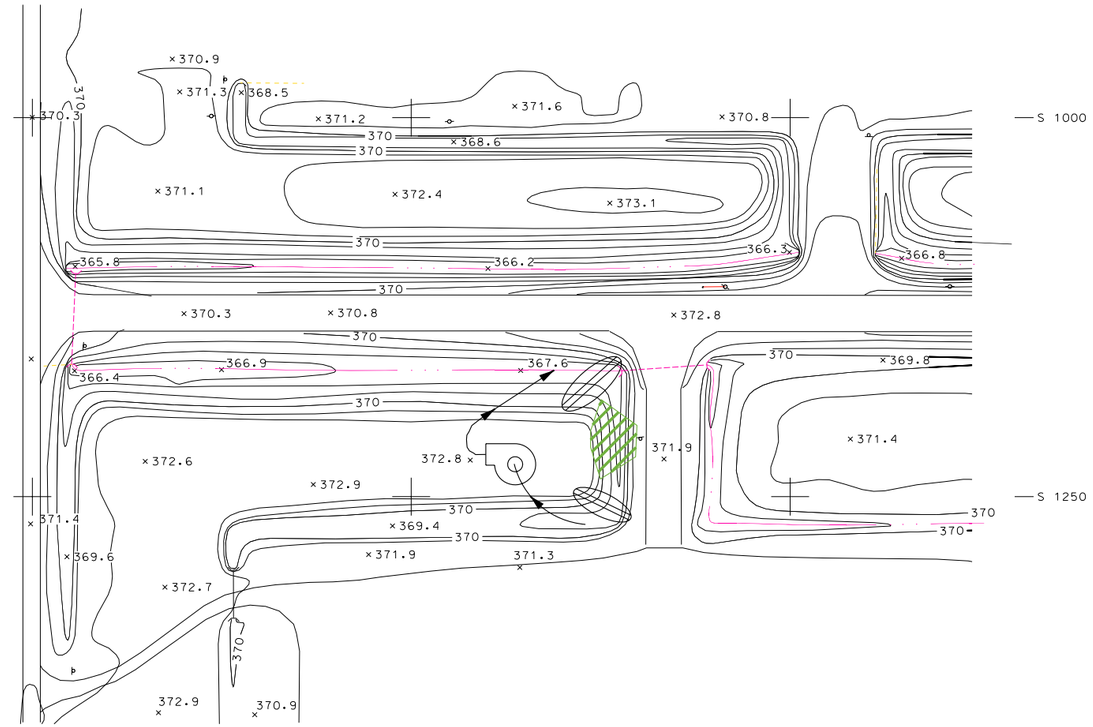
DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 015 EU 07
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC375W8A004 REV 0.DGN	C-375-W8	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375W8A004	A



OUTFALL 015 EU 08 (C-375-W8) SITE PLAN

GRAPHIC SCALE

50 0 50 100

1" = 50'

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

2. BEST MANAGEMENT PRACTICES SHALL BE IMPLEMENTED AS OUTLINED IN THE "BEST MANAGEMENT PRACTICES PLAN, PADUCAH GASESOUS DIFFUSION PLANT, PADUCAH, KENTUCKY, PRS/PROG/0017, MAY, 2007".

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4. UPON COMPLETION OF THE WORK, ALL DISTRURBED SOIL AREAS SHALL BE RESTORED TO PRE-EXISTING CONDITIONS.

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9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- PCBs
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION AND DETAIL KEY

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

LPE

DATE

PROFESSIONAL SEAL

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR
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U.S. DEPARTMENT OF ENERGY
PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

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Paducah, Kentucky

Tetra Tech, Inc
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

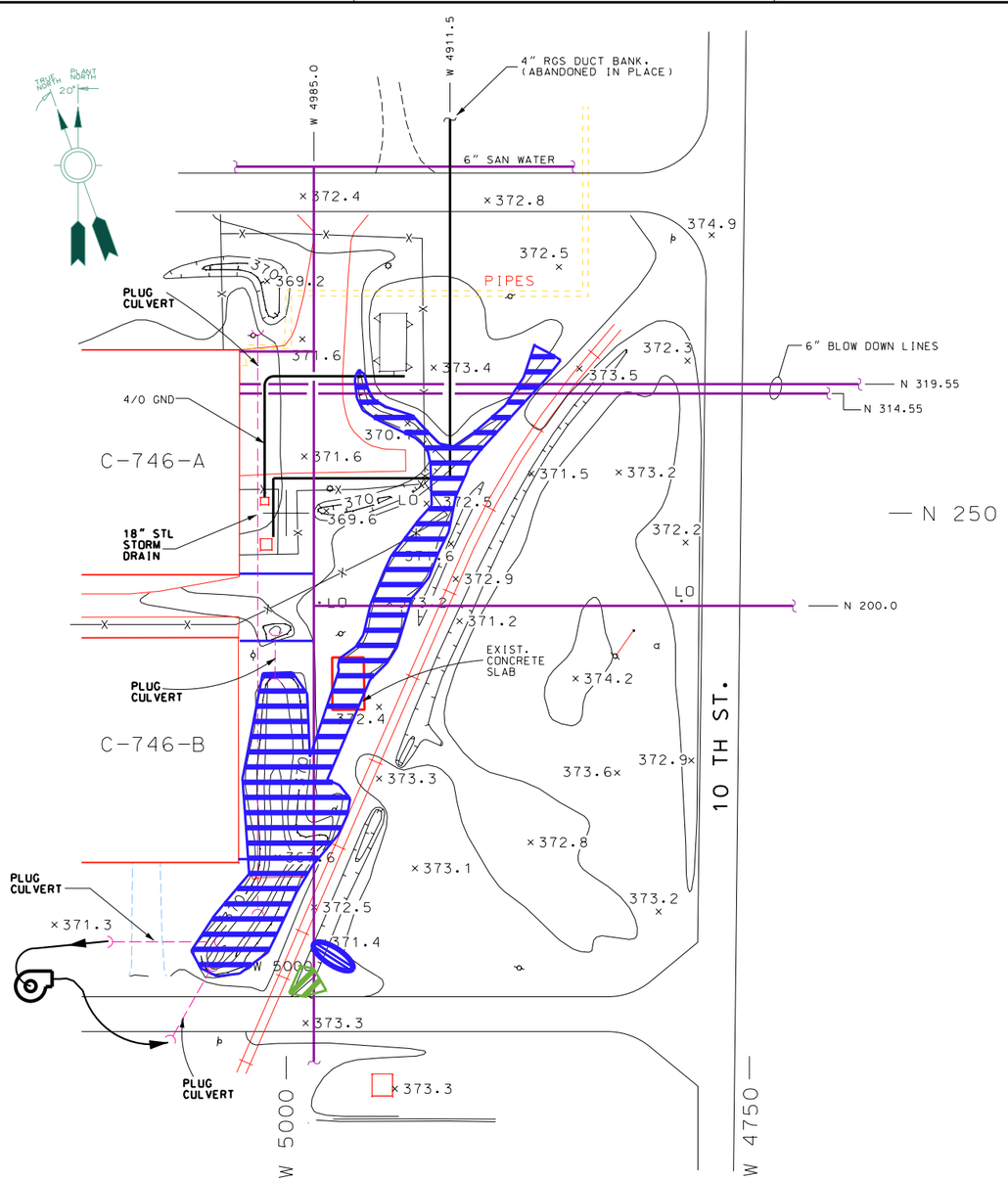
DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 015 EU 08
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC375W8A005 REV 0.DGN	C-375-W8	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375W8A005	A



OUTFALL 001 EU 15 (C-375-W9) SITE PLAN

GRAPHIC SCALE

40 0 40 80

1" = 40'

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

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9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- URANIUM
- PCBs
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION AND DETAIL KEY

LPE

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DATE

PROFESSIONAL SEAL

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR.
A		ISSUED FOR DRAFT									

DRAWING REVISIONS

U.S. DEPARTMENT OF ENERGY
PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

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Paducah, Kentucky

Tetra Tech, Inc
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

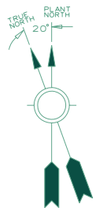
DOE CONTRACT NO. DE-AC30-06EW05001

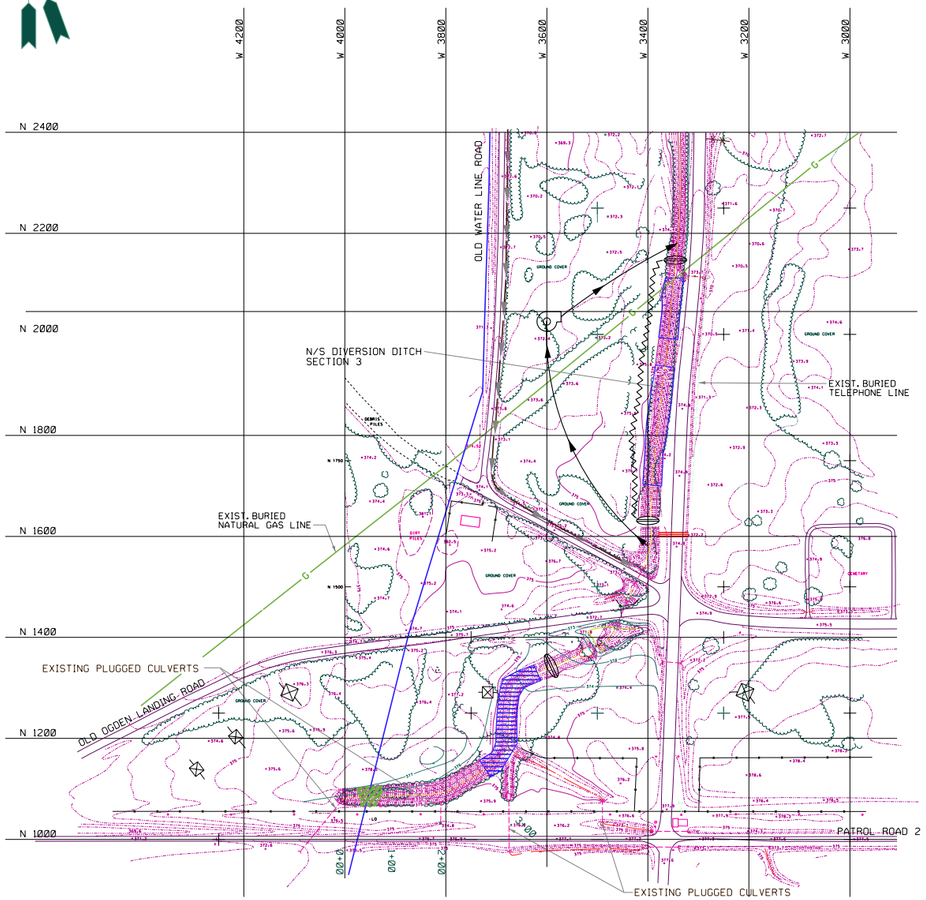
PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL UNIT

TITLE:
OUTFALL 001 EU 15
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC375W9A001 REV 0.DGN	C-375-W9	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375W9A001	A



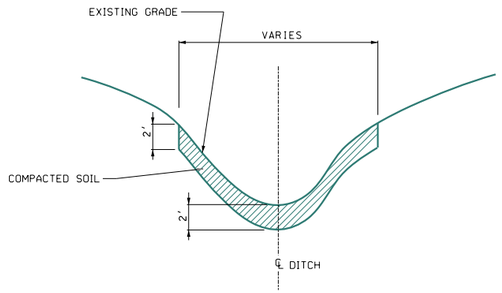


NSDD SECTION 3 EUs 01 AND 02 SITE PLAN

GRAPHIC SCALE

150 0 150 300

1" = 150'



TYPICAL EXCAVATION AND BACKFILL DETAIL

N.T.S.

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

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9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- SILT FENCE OR SOCK
- URANIUM
- TOTAL ELCR
- PCBs
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION AND DETAIL KEY

LPE

DATE

PROFESSIONAL SEAL

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR
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DRAWING REVISIONS

U.S. DEPARTMENT OF ENERGY

PADUCAH, PORTSMOUTH PROJECT OPERATIONS, PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

managed for the DEPARTMENT OF ENERGY under U.S. GOVERNMENT contract DE-AC30-06EW05001
Paducah, Kentucky

Tetra Tech, Inc
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

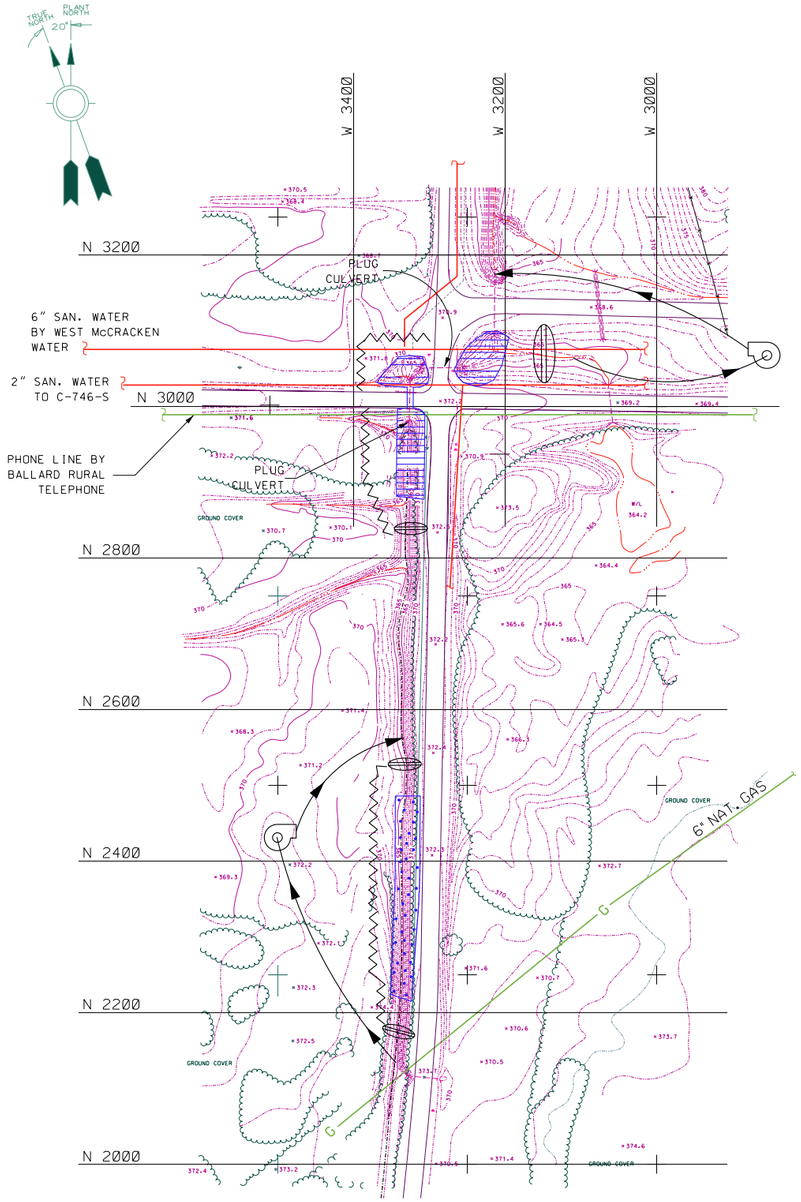
DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
NSDD SECTION 3 EUs 01 AND 02, SITE PLAN AND DETAILS

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC90000A025 REV 0.DGN	AREA	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC90000A025	A



NSDD SECTION 3 EU 03 SITE PLAN

GRAPHIC SCALE

100 0 100 200

1" = 100'

NOTES

1. INSTALL EROSION AND SEDIMENT CONTROL MEASURES AT LOCATIONS SHOWN. ALL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED THROUGHOUT THE CONSTRUCTION PERION.

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9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

LEGEND

- URANIUM
- TOTAL ELCR
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

SECTION AND DETAIL KEY

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR
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DATE

PROFESSIONAL SEAL

U.S. DEPARTMENT OF ENERGY
PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

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Paducah, Kentucky

TETRA TECH, INC
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

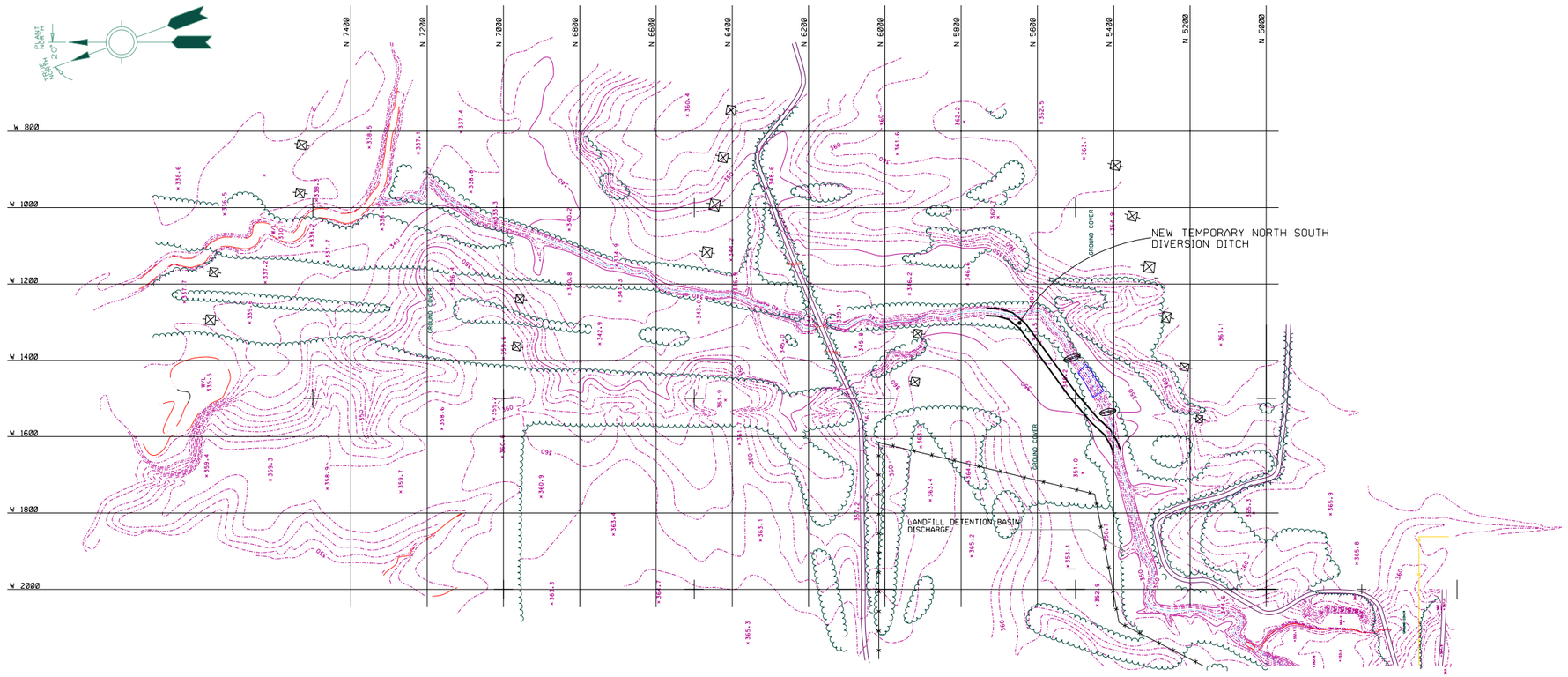
DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
NSDD SECTION 3 EU 03, SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC90000A026 REV 0.DGN	AREA	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC90000A026	A



NOTES

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9. ALL EXCAVATION WORK SHALL BE PERFORMED IN SEQUENCE FROM UPSTREAM TO DOWNSTREAM.

NSDD SECTION 5 EU 08 SITE PLAN

GRAPHIC SCALE

175 0 175 350

1" = 175'

LEGEND

TOTAL ELCR

EARTHEN BERM

SECTION AND DETAIL KEY

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

LPE

DATE

PROFESSIONAL SEAL

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR
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U.S. DEPARTMENT OF ENERGY

PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
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Paducah, Kentucky

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KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

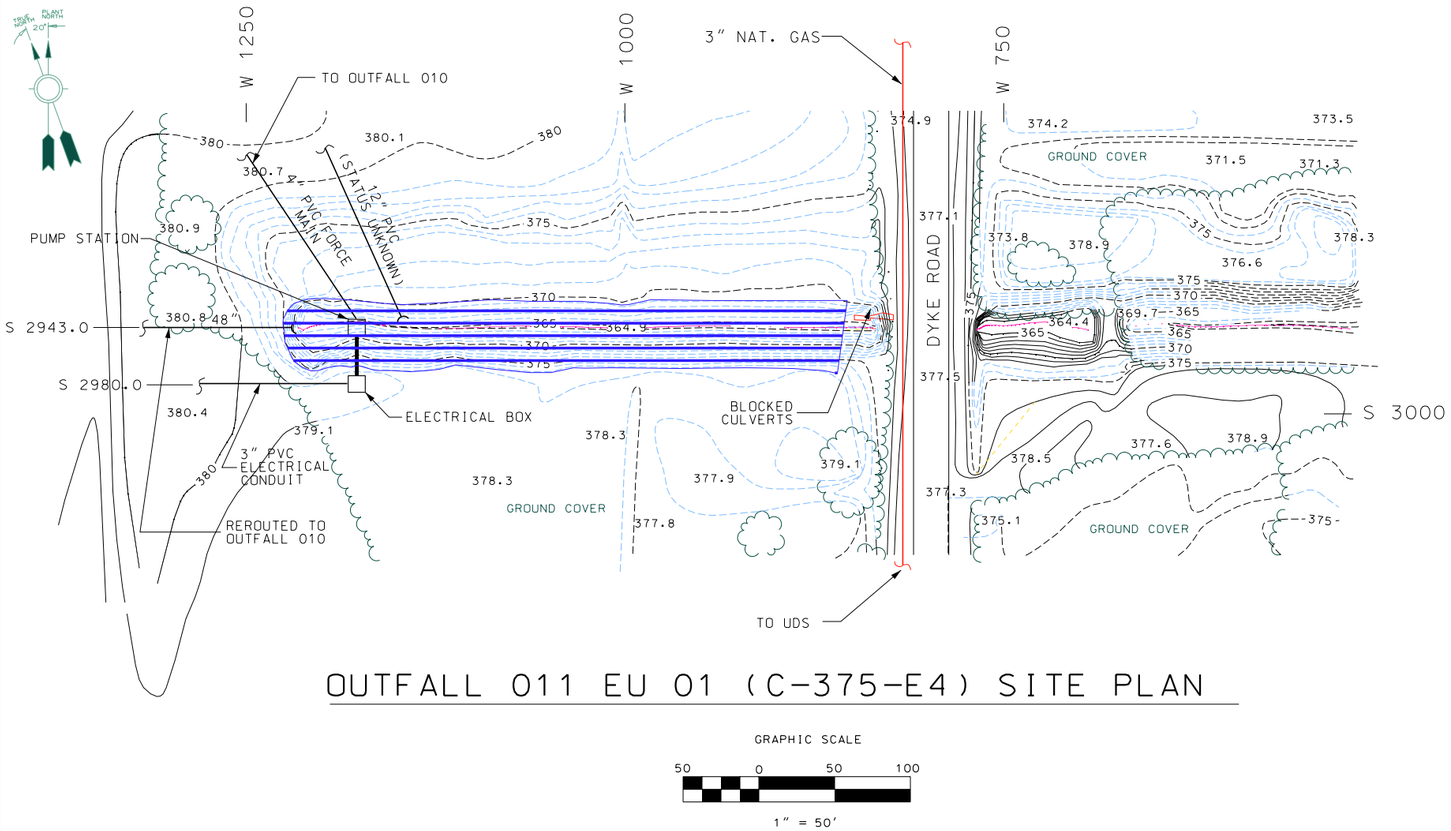
DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
NSDD SECTION 5 EU 08,
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC90000A027 REV 0.DGN	AREA	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC90000A027	A



OUTFALL 011 EU 01 (C-375-E4) SITE PLAN

GRAPHIC SCALE

50 0 50 100

1" = 50'

NOTES

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LEGEND

- URANIUM
- EARTHEN BERM
- CENTRIFICAL WATER PUMP
- RAILROAD
- OVERHEAD ELECTRIC LINE
- CATCH BASIN
- LIGHT POLE

SECTION AND DETAIL KEY

SECTION NUMBER OR DETAIL LETTER

DRAWING ON WHICH SECTION OR DETAIL IS TAKEN

DRAWING ON WHICH SECTION OR DETAIL IS SHOWN

LPE

DATE

PROFESSIONAL SEAL

REV.	DATE	DESCRIPTION	DRAWN BY	DRAFT CHK	ENGR CHK	ORG/ ENGR	LEAD ENGR	QA	CONF CTRL/ NUCL SFTY	FAC MGR	PROJ ENGR
A	/ /	ISSUED FOR DRAFT									

DRAWING REVISIONS

U.S. DEPARTMENT OF ENERGY
PADUCAH, PORTSMOUTH PROJECT OPERATIONS,
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

managed for the DEPARTMENT OF ENERGY under U.S. GOVERNMENT contract DE-AC30-06EW05001
Paducah, Kentucky

TETRA TECH, INC
KEVIL, KENTUCKY
(270) 462-4600
FAX (270) 462-4601

DOE CONTRACT NO. DE-AC30-06EW05001

PROJECT NAME:
SURFACE WATER OPERABLE UNIT REMOVAL ACTION

TITLE:
OUTFALL 011 EU 01
SITE PLAN

CAD FILE NAME	BUILDING	PLANT	CLASS
C7DC375E4A001 REV 0.DGN	C-375-E4	PGDP	U

SCALE:	DRAWING NUMBER	REV
NOTED	C7DC375E4A001	A

APPENDIX C

ENVIRONMENT, SAFETY, AND HEALTH PLAN

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CONTENTS

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ACRONYMS

ACGIH	American Conference of Gevernment Industrial Hygienists
AHAs	Activity Hazard Assessments
AIHA	American Industrial Hygiene Association
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
CRZ	contamination reduction zone
DOE	U.S. Department of Energy
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
ES&H	Environmental, Safety, and Health
EZ	exclusion zone
FS	Field Superintendent
H&S	health and safety
HASPs	Health and Safety Plans
ISMS	Integrated Safety Management System
NIOSH	National Institute for Occupational Safety and Health
OSHA	U.S. Occupational Safety and Health Administration
PEL	permissible exposure limit
PGDP	Paducah Gaseous Diffusion Plant
PPE	personal protective equipment
PSS	Plant Shift Superintendent
RCT	Radiological Control Technician
RAWP	Removal Action Work Plan
RWP	Radiological work permits
SHS	Saftey and Health Specialist
SWOU	Surface Water Operable Unit
SZ	support zone
TLD	thermo luminescent dosimeter
TLV	threshold limit value

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C.1. INTRODUCTION

This Environmental, Safety, and Health (ES&H) Plan has been developed to discuss the general ES&H requirements associated with the Surface Water Operable Unit (SWOU) (On-Site) Removal Action Work Plan (RAWP) and identify some potential hazards. Site specific hazards and controls will be established for each task and location prior to performing work. These hazards and controls will be documented in the form of Site Specific Health and Safety Plans (HASPs), Activity Hazard Assessments (AHAs), work packages, and procedures. Personnel will be familiar with these work control documents prior to performing work in the affected areas.

C.2. INTEGRATED SAFETY MANAGEMENT/ENVIRONMENTAL MANAGEMENT

The SWOU (On-Site) Project will utilize an Integrated Safety Management System (ISMS), which integrates the Safety Management Systems, the Environmental Management System (EMS), and Quality Management System, to ensure personnel and environmental safety and quality are integrated into management and work practices at all levels so that missions are accomplished while protecting the public, the workers, and the environment. The concepts of the ISMS/EMS will be utilized to provide a formal, organized process to ensure the safe performance of work. The ISMS/EMS Plan identifies the methodologies that will be used to address previously recognized hazards and how the hazards are mitigated using contractor-accepted ES&H practices.

The core functions and guiding principles of ISMS/EMS will be implemented by incorporating applicable programs, policies, technical specifications, and procedures from the U.S. Department of Energy (DOE), U.S. Occupational Safety and Health Administration (OSHA), U.S. Environmental Protection Agency (EPA), and other applicable regulatory guidance. Brief descriptions of the five ISMS/EMS core functions are provided below.

C.2.1 DEFINE SCOPE OF WORK

Defining and understanding the scope of work is the first critical step in successfully performing any specific activity in a safe and compliant manner. Each member of the project team will participate in discussions conducted to understand the scope and contribute to the planning of the work. The SWOU (On-Site) project team will meet with personnel to ensure that everyone understands the scope of work and the technical and safety issues involved. These meetings are conducted to ensure that all parties are in agreement on the scope and approach to complete the work.

C.2.2 ANALYZE HAZARDS

In the course of planning the work, the project team will identify hazards including personnel safety and environmental risks associated with the performance of the work. Hazards may be identified and assessed by performing a site visit, reviewing lessons learned, and reviewing project plans or historical data. The hazard assessment process will be prescribed by the DOE Prime Contractor procedures and policies.

Once the hazards have been identified and assessed, measures will be identified to minimize risks to workers, the public, and the environment. These measures are described in the project-specific AHAs,

which serve to provide a control mechanism for all work activities. AHAs are detailed, activity-specific evaluations that address each step of the task and/or activity that will be performed. The AHA development process entails a detailed evaluation of each task to identify specific activities or operations required to successfully complete the scope of work and define the potential chemical, environmental, physical, radiological, and/or biological hazards that may be encountered; the media and manner in which they may occur; and how they are to be recognized, mitigated, and controlled. Appropriate hazard controls may include engineering controls, administrative controls, and the use of personal protective equipment (PPE). The SWOU (On-Site) project team is responsible for the preparation, revision, and implementation of AHAs.

Applicable AHAs will be reviewed with the personnel who will perform the work. Participants in this review will sign and date the AHA to signify that they understand all hazards, controls, and requirements in the AHAs. Copies of the AHAs with appropriate signatures shall be maintained at the work location.

C.2.3 DEVELOP/IMPLEMENT CONTROLS

The primary mechanisms used to flow down ISMS/EMS controls to the project team are project-specific plans and technical procedures. Other mechanisms include program/project management systems, employee training, communication, work site inspections, independent assessments, and audits. These mechanisms are communicated in the following:

- Pre-Job meetings
- Orientations
- Training
- Plan-of-the-day/pre-job briefings
- AHAs
- Radiological work permits (RWP)

The plan-of-the-day/pre-job briefing incorporates the principles of ISMS/EMS. The specific steps within ISMS/EMS are emphasized to each employee. It is emphasized that no employee will be directed or forced to perform any task that he/she believes is unsafe, puts health at risk, or that could endanger the public or the environment. One of the key elements of ISMS/EMS is that all personnel have “stop work authority” and are encouraged to use this authority whenever there is a reasonable belief that the task poses an imminent risk of death, serious physical harm, or other serious hazard to workers or the environment.

Employee involvement is emphasized in all training sessions, beginning with initial orientation training, and is then periodically reinforced in refresher training, as applicable, and in ES&H briefings/meetings. Employees are encouraged to participate in the selection, development, and presentation of training/meeting topics and their full and constructive input is encouraged in all communication sessions.

C.2.4 PERFORM WORK

After the project team has been given approval to proceed, the project-specific plans will be implemented. The SWOU (On-Site) project team will verify that all applicable plans, forms, and records are contained in the project files and accessible by approved personnel. Actions that will be taken during the performance of the work to incorporate ISMS/EMS principles include the following:

- Plan-of-the-day/pre-job briefings

- Monthly project safety meetings
- ES&H oversight/inspections
- Safety inspections
- Equipment inspection
- Stop work authority

C.2.5 FEEDBACK/IMPROVEMENT

Feedback and improvement is accomplished through several channels, including ISMS/EMS audits, self-assessments, employee suggestions, lessons learned, and post-job briefings.

SWOU (On-Site) project management will encourage employees to submit freely any suggestions that offer opportunities for improvement and constructive criticism on the program. Project management will conduct periodic inspections and meetings with project personnel at the work site to discuss safety issues, environmental issues, and/or concerns as well as other relevant topics.

During field activities, meetings and briefings will provide opportunities for project personnel to communicate the following:

- Lessons learned and any other topics relevant to the work performed
- How work steps/procedures could be modified to promote a safer working environment
- How communications could be improved within the project team
- Overall issues or concerns they may have regarding how the work was performed

C.3. FLOWDOWN TO SUBCONTRACTORS

The ISMS/EMS approach to ES&H ensures that personnel, including subcontractors, are aware of their roles, responsibilities, and authorities for worker/public safety and protection of the environment. All organizations will be responsible for compliance with the Prime Contractor's Worker Safety and Health Program, ISMS/EMS Program, Radiation Protection Program, and Quality Assurance Program. In addition, subcontract requirements will flow down to lower-tier subcontractors, as applicable. Personnel will have the appropriate health and safety training required in accordance with OSHA 29 *CFR* 1910 and 1926, but also will undergo site-specific pre-job training including safety and environmental to ensure that ES&H issues related to the activities to be performed or specific to the work site are clearly understood. Documentation of training will be available for review prior to starting work.

C.4. SUSPENDING/STOPPING WORK

In accordance with 10 *CFR* 851.20 and the DOE Prime Contractor's Worker Safety and Health Program and procedures, employees and subcontractors have suspend/stop-work authority. Individuals involved in any aspect of the project have the authority and responsibility to suspend or stop work for any perceived threat to the health and safety (H&S) of the workers, the public, or to the environment. Concerns shall be brought to the attention of the Field Superintendent (FS), and Safety and Health Specialist, (SHS) they

will be evaluated by project management personnel, and actions will be taken to rectify or control the situation. In the case of imminent danger or emergency situations, personnel should halt activities immediately and instruct other affected workers to pull back from the hazardous area. The FS and/or SHS should be notified immediately, and, at that time, Management and/or emergency responders will be notified.

C.5. ISMS/EMS BRIEFINGS AND ORIENTATIONS

Plan-of-the-day/pre-job briefings detailing the specific hazards of the work to be performed and safety precautions and procedures specific for the job shall be conducted by the FS and/or Safety and Health Specialist (SHS) at the beginning of each shift. During these briefings, work tasks and the associated hazards (personnel safety and environmental risks) and mitigating controls will be discussed using task-specific AHAs, project documents, and/or Lessons Learned as guidance.

Prior to performing work on the site, personnel shall be required to read or be briefed on the DOE Prime Contractor's Worker Safety and Health Program, applicable AHAs, the work package, and other applicable documents. This shall be documented as required reading, acknowledgement forms, or briefing sheets. Visitors also will be oriented to the applicable plans and potential hazards that they may encounter.

C.6. KEY PROJECT PERSONNEL AND RESPONSIBILITIES

One of the primary underlying principles of a successful project organization is the establishment of clearly defined roles and responsibilities and effective lines of communication among employees and the Prime Contractor, subcontractors, and other organizations involved in the project. Ensuring that personnel fully understand their roles and responsibilities and that they have a thorough understanding of the scope of work and other project requirements will provide the foundation for successful and safe completion of the project.

The roles and responsibilities of key field team members are briefly described as follows:

- The Environmental Restoration Project Director oversees the implementation of the project plans and provides the resources for the project.

- The SWOU (On-Site) Project Manager oversees the project plans and work activities while ensuring that operations are conducted in accordance with the DOE Prime Contractor procedures, regulatory requirements and Worker Safety and Health Program and is responsible for coordinating and assigning resources needed for the project. The SWOU (On-Site) Project Manager also performs management audits and inspections.

- The FS coordinates field activities and logistics and provides the communications between the project team and the field team as well as other support groups. The FS also ensures that on-site personnel comply with the Worker Safety and Health Program, work packages, and applicable procedures.

- The SHS provides H&S support and oversight to the project to ensure that work is being performed safely and in accordance with the Worker Safety and Health Program, applicable regulations, 10 *CFR* 851, DOE directives, and applicable plans and procedures.

- The Quality Assurance Specialist provides support and oversight to the project to ensure that work is performed in accordance with the work package and other applicable plans and procedures.

- The Radiological Control Group provides support and guidance to the project and assists the FS and SHS with implementation of radiological controls and as-low-as-reasonably-achievable (ALARA) principles. The Radiological Control Technician (RCT) observes the work area before/during activities for radiological hazard and authorizes entry into and exit from the radiological work area.

- Environmental Compliance organization provides environmental support and oversight to the project to ensure that the planning and field work is being performed properly and in accordance with all applicable regulations, DOE directives, and relevant plans and procedures.

- The Waste Management Coordinator provides waste management support to the project to coordinate waste containers and removal of waste from the worksite while complying with the Worker Safety and Health Program, as well as with ES&H and work control requirements.

- Field Technical Staff/Subcontractors–Samplers, drillers, operators, and maintenance perform work as specified in work packages, adhering to the Worker Safety and Health Program, HASP, RWPs, project procedures, and AHAs. Field Team personnel also participate in the identification of the hazards and development of the work controls to be utilized during the work.

C.7. SITE CONTROL

C.7.1 WORK SITE CONTROL ZONES

Work zones will be utilized to control access. These areas will be controlled by the FS, SHS, and/or RCT to minimize the number of individuals potentially exposed to site hazards and to ensure that individuals who enter follow the required procedures. The following is a description of the different types of zones that may be established at the site

C.7.1.1 Exclusion Zone

The exclusion zone (EZ) is the immediate area around an excavation or remedial action activity where there is potential for personal exposure to hazardous materials. The exclusion zone will be marked, and entry and exit points will be established to regulate movement of personnel and equipment to reduce the potential of the spread of contamination.

C.7.1.2 Contamination Reduction Zone

The contamination reduction zone (CRZ) is the transition area between the EZ and construction zone or support zone. This area will provide a buffer area to reduce the probability that contamination will leave the EZ. The CRZ is designed for the following activities:

- Decontamination of equipment, workers, and sample containers;
- Staging of emergency response equipment and supplies (e.g., first-aid, fire equipment);
- Scanning of personnel, materials, and equipment;
- Sample packing and preparation; and
- Worker rest area.

The CRZ is designed to reduce the possibility of the clean area becoming contaminated by site hazards. The degree of contamination in the CRZ decreases as the distance from the contaminants increases.

C.7.1.3 Construction Zone

The construction zone is the area outside of potential contamination, but still encompassing work activities and possible hazards associated with fieldwork activities. Entry into this area is controlled and the area clearly marked with barrier tape, rope, or flagging.

C.7.1.4 Support Zone

The support zone (SZ) is the outermost area of the site. This area is uncontaminated where workers provide operational and administrative support. The support zone is clean and will not be entered by contaminated equipment or personnel, unless properly controlled or except under emergency or evacuation conditions. Normal work clothes are appropriate within this zone.

C.7.1.5 Site Communications

Paducah Gaseous Diffusion Plant (PGDP) plant radios, plant phones and cell phones will be used for on-site and off-site communications. Project personnel will be orientated to the use of plant radios and emergency numbers. Hand signals may also be utilized; these will be covered with project personnel if necessary.

C.7.1.6 Authorization to Enter

Personnel shall adhere to site entry and control procedures identified in the RWP AHAs and this site-specific HASP; personnel must wear the appropriate PPE and enter the work area only after receiving permission of the FS, SHS, and RCT. The FS (or designee) will verify that the appropriate training and briefing requirements are met prior to entry.

As a requirement for work on this project, workers entering the EZ or CRZ will be required to take the appropriate level of HAZWOPER training. This training must cover the requirements in 29 *CFR* 1910.120, HAZWOPER. As applicable, workers must receive annual 8-hour refresher training (if applicable) and 1 or 3-day on-site supervision under a trained, experienced supervisor. The FS shall receive additional 8-hour training in hazardous waste operations supervision. Workers and visitors entering the EZ or CRZ will be briefed in the provisions of this HASP and be required to sign the HASP Acknowledgment Form. Workers entering radiological posted work areas also will be required to complete Radworker II training.

C.7.1.7 Visitors

Visitors to the site shall abide by the following:

- "Visitor" means persons not involved in routine site work activities.

- Visitors shall be instructed to stay outside of the EZ and CRZ and remain within the SZ during the extent of their stay.

Visitors requesting to observe work conducted in the EZ must wear appropriate PPE prior to entry into that zone. Visitors who with to enter the EZ must produce evidence that they have medical clearance, and appropriate HAZWOPER training that is up-to-date. Visitors also must have received the required training for the tasks being performed and entry must be approved by the FS, SHS, and/or RCT.

C.8. PERSONAL PROTECTIVE EQUIPMENT

When engineering controls are not feasible, when the administrative controls in place are not adequate or when otherwise indicated (such as for ALARA), PPE will be specified by the AHA and/or RWP. At a minimum, personnel performing work in work zones may be required to wear the following standard safety apparel:

- Hard hats meeting the requirements of American National Standards Institute (ANSI) Z89.1 as prescribed in 29 *CFR* 1910.135, Head Protection. Hard hats will be worn with the suspension properly installed. Hard hats will not be damaged, painted or deformed.

- Safety glasses with firm side shields will meet the requirements of ANSI Z87.1 as prescribed in 29 *CFR* 1910.133, Eye and Face Protection. Prescription glasses will also meet the ANSI standard and be provided with fixed or firm clip-on side shields. Cover glasses used over prescription glasses will be permitted. Safety glasses will be worn in any area where construction activities are taking place. Face shields will not be worn in lieu of safety glasses.

- Sturdy safety toed work shoes or boots meeting the requirements of ANSI Z41, as prescribed in 29 *CFR* 1910.136, Foot Protection, shall be worn.

The required level of protection is specific to the activity being conducted. The levels of PPE apply only to activities conducted inside an established EZ. Work conducted within CRZs will vary, but are generally one level of protection lower than the EZ. Activities conducted within SZs should require normal work clothes and PPE unless specified by the FS or SHS.

C.8.1 TASK-SPECIFIC LEVELS OF PROTECTION

The levels of protection will be determined by the task and/or proximity of the task being performed and will be identified in the task specific AHAs and RWPs.

C.8.2 RESPIRATORY PROTECTION

Respiratory protection requirements will be determined by air monitoring and survey results. Personnel required to wear respiratory protection will be trained and quantitatively fit-tested prior to use of the respirator, as prescribed in accordance with DOE Prime Contractor procedure and 29 *CFR* 1910.134, Respiratory Protection. Personnel required to wear respirators will inspect their respirators before and after each use and any deficiencies will be reported to the FS or SHS immediately. Respirators will be properly stored in a bag in a clean, dry environment and routinely cleaned. Damaged respirators shall not be used.

C.9. MEDICAL SURVEILLANCE

The medical surveillance program provides for baseline, annual, and termination medical examinations for the following employees in accordance with 29 *CFR* 1910.120, HAZWOPER. Each employee who is or may be exposed to hazardous substances or health hazards at or above the permissible exposure limit (PEL) for 30 days or more per year, and each employee who wears a respirator for 30 days or more per year will receive a medical examination before assignment, approximately 12 months later, and at termination of employment or at reassignment. Employees who develop signs or symptoms indicating overexposure or are injured or exposed above the PEL in an emergency situation will be examined medically as soon as possible following the incident

Personnel performing HAZWOPER activities on this project must complete an annual HAZWOPER physical. The examining physician will document the worker's fitness for work and ability to wear a respirator.

Radiation workers working under an RWP may be required to submit a baseline bioassay, periodic bioassay during the project, and exit bioassay at the end of the project.

C.9.1 EXPOSURE MONITORING

Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on-site.

C.9.2 ROUTINE AIR MONITORING REQUIREMENTS

Air monitoring will be performed during the following activities:

- Intrusive activities such as soil excavation;
- Activities where there is a potential for exposure to heavy metals (lead, arsenic, beryllium, etc.) and silica dust; and
- Personnel are opening waste containers that contain potentially contaminated material.

C.10. INDUSTRIAL HYGIENE MONITORING

Industrial Hygiene monitoring and sampling will be performed by assigned project H&S support personnel. Monitoring will use direct-reading instruments, air-sampling equipment, environmental-monitoring equipment, and assessment techniques as determined appropriate by the H&S Group based on professional judgment and in accordance with OSHA, National Institute for Occupational Safety and Health (NIOSH), and American Conference of Government Industrial Hygienists (ACGIH).

Personnel sampling will be conducted to assess the potential exposure to individual employees and to ensure that the proper level of PPE has been selected for the assigned task(s). Samples will be collected in the employee’s breathing zone using personnel sampling pumps and the appropriate collection media. For

tasks with the potential for exposure to significantly elevated chemical concentration, it is expected that the sampling frequency will increase.

If direct reading instruments indicate levels of vapors or particulates that exceed the action level for over 15 minutes in the work area, then personnel sampling will be initiated immediately. Sampling will be conducted, at a minimum, on the worker with the highest expected exposure. Monitoring will continue until levels recorded by direct reading instruments return below the action level.

Once initiated, sampling always will continue for a period long enough to collect a volume of air sufficient to allow the laboratory to achieve an analytical detection limit no greater than one-half the OSHA PEL or ACGIH threshold limit value (TLV), whichever is the more stringent of the two. The samples will be collected in accordance with the approved NIOSH or OSHA methodology and analyzed for the appropriate contaminant(s) of concern. All personnel exposure samples shall be analyzed by a laboratory accredited by American Industrial Hygiene Association (AIHA) in accordance with the appropriate NIOSH or OSHA methodology.

C.10.1 RADIOLOGICAL MONITORING

Radiological Control will perform personnel air monitoring during work in contamination areas and potentially at the boundary. Scanning of equipment and personnel also will be performed to minimize the possibility of the spread of contamination. Personnel working on the SWOU (On-Site) project also will be monitored through Dosimetry and required to wear a thermo luminescent dosimeter (TLD) when working in radiological zones and submit bioassays as required.

C.11. EMERGENCY RESPONSE

C.11.1 RESPONSIBILITIES

The PM, FS, and SHS are responsible for the SWOU (On-Site) project emergency management program and ensuring that the appropriate emergency response equipment is readily available at the work site and in proper working order.

In the event of an emergency, all site personnel shall follow the requirements and provisions of the PGDP Emergency Management Plan. Emergency response shall be provided by the PGDP emergency response organization. The SHS will be in charge of personnel accountability during emergency activities. All personnel working on-site will be trained to recognize and report emergencies to the SHS or the FS. The SHS or FS will be responsible for notifying the PGDP emergency response organization.

The PGDP emergency response organization will be contacted for emergency response to all medical emergencies, fires, spills, or other emergencies. The Plant Shift Superintendent (PSS) will coordinate 24-hour emergency response coverage. The requirements of this section will be communicated to site workers. Any new hazards or changes in the plan also will be communicated to site workers.

The DOE on-scene coordinator will provide oversight on an ongoing basis for emergency management/recovery activities.

C.11.2 REPORTING AN EMERGENCY

C.11.2.1 Discovery

The person who discovers an emergency should immediately report it, then attempt to establish control ONLY if the incident is minor in magnitude (e.g., using a fire extinguisher to put out an incipient fire if trained to do so and extinguishment can be accomplished in a safe manner). Where such measures are obviously inadequate or not successful in controlling the incident or for emergency conditions, personal injuries, or other unusual events with potential for causing personal injury, environmental releases, or property damage, the employee will initiate notification of appropriate emergency response personnel.

SWOU (On-Site) project personnel will maintain a radio, telephone, or other reliable means of notifying emergency response personnel and the PSS.

C.11.2.2 Emergency Contacts

- ***Fire:*** Fire alarm pull box, plant telephone Bell System 333, or plant radio channel 16
- ***Medical:*** Plant telephone Bell System 333 or plant radio channel 16
- ***Security:*** Plant telephone Bell System 6246 or plant radio channel 16
- ***PSS:*** Plant telephone Bell System 6211 or plant radio channel 16.

If using a cell phone: 270-441-6333 for emergency, for NON-emergency use 270-441-6211.

C.11.3 INITIAL EMERGENCY RESPONSE

When an emergency occurs, the SHS or FS will assume responsibility for the management of the scene and the protection of the personnel. Personnel are to be evacuated from the immediate danger area, as appropriate. Depending on the degree of emergency, RADCON controls may need to be adhered to during the emergency. For personnel injury or illness, there should be an adequate amount of personnel with current training in first aid and cardiopulmonary resuscitation present on-site during all field activities. This individual will provide minor first aid until other emergency personnel arrive and assume emergency response duties or it is determined to transport the injured to the hospital or medical provider.

C.11.4 PADUCAH GASEOUS DIFFUSION PLANT ALARMS

The alarms can be heard by calling 6161 on a Bell phone. These include the following:

***Radiation Emergency/CAAS*:**	Continuous blast on a high-pitched air whistle or electronic horn **ACTION**: Evacuate area immediately and stay away from effected building, Report to an assigned plant assembly point.
Attack Warning/Tornado Warning:	Intermittent 2-second blast on plant horns **ACTION:** Take cover.

Evacuate Signal:	Continuous blast on plant horns **ACTION:** Evacuate building.
Plant Emergency:	Hi-Lo Tones **ACTION:** Listen to plant public address system/radio for instructions.
Cascade Buildings:	Three blasts on building horns or howlers **ACTION:** Call area control room.
Other Buildings:	One 10-second blast on building horns or sirens **ACTION:** Follow local emergency procedures.

During field activities all personnel must participate in all PGDP accountability/assembly drills by sending all on-site project personnel to the appropriate assembly station for accountability. The FS, SHS, or designee will be responsible for accounting for all field personnel (including sub-tier subcontractor personnel) and reporting any unaccounted-for personnel to the emergency coordinator.

C.11.5 REPORTING A SPILL

When a spill is discovered, the FS or SHS will immediately contact the PSS, Environmental Compliance, and the PM and convey as much information as possible (e.g., material involved, estimated quantity spilled/affected, location, affected personnel, other hazardous conditions).

C.11.5.1 Protective Actions for Spill

An effort will be made to stop the release and contain the spill using materials in the on-site spill response kit, only if it is safe to do so and if no unprotected exposures occur. A telephone contact list will be available for emergency notification.

In the event that personnel are exposed to hazardous chemicals or radioactive materials, appropriate emergency response action will be taken to remove the contaminated clothing. An emergency shower and eyewash station will be used to flush exposed skin and eyes, respectively. This emergency equipment will be maintained in a readily accessible location adjacent to the active work area.

If an acute exposure to airborne chemicals occurs or is suspected and the affected personnel are unable to escape the work zone, the FS or SHS will immediately contact PSS for assistance. Rescue operations will not be performed unless the rescuers are dressed in the appropriate protective equipment.

SWOU (On-Site) Project Management will be responsible for ensuring all spills of hazardous materials are properly cleaned up and disposed of, including any material generated from the spill, unless otherwise directed.

The FS or SHS has the following responsibilities:

- Ensure that spill containment is performed safely;

- Provide all known information to PSS to ensure proper response;

- Ensure that decontamination measures for exposed personnel are conducted safely and promptly;

- Ensure that, if personnel are exposed to airborne chemicals and are unable to escape the work zone, rescue is not attempted unless rescue personnel are dressed in the appropriate protective equipment; and

- Notify Environmental Compliance for spill reporting and cleanup requirements.

During field activities all personnel must participate in all PGDP accountability/assembly drills by sending all on-site project personnel to the appropriate assembly station for accountability. The FS, SHS, or designee will be responsible for accounting for all field personnel (including sub-tier subcontractor personnel) and reporting any unaccounted-for personnel to the emergency coordinator directing the drill.

APPENDIX D

WASTE MANAGEMENT PLAN

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D.1. OVERVIEW

This Waste Management Plan (WMP) is the primary document for management and final disposition of waste material that will be generated as a result of the removal of contaminated soil under the execution of the *Surface Water Operable Unit (On-Site) Removal Action Work Plan*.

The Surface Water Operable Unit SWOU (On-Site) Removal Action (RA) will include exclusion fencing and hazard postings, excavation of contaminated soil "hot spots" to a depth of 2 ft., post excavation sampling, restoration of excavated area with clean clay and soil, and management of the remediation waste.

This WMP addresses the management of remediation waste from the point of generation through final disposition. The SWOU (On-Site) RA is part of U.S. Department of Energy (DOE) Prime Contractor Environmental Restoration program and Paducah Remediation Services, LLC. (PRS) shall be responsible for all waste management activities. Standard practices and procedures outlined in this WMP pertaining to the generation, handling, transportation and storage of waste will comply with all DOE, Resource Conservation and Recovery Act (RCRA) and Toxic Substances Control Act (TSCA) requirements.

Copies of this WMP will be available during fieldwork. The PRS Waste Management Coordinator (WMC) will be responsible for implementing all procedures and requirements of this WMP.

The WMP for the SWOU (On-Site) RA underscores the following objectives:

- Management of project waste in a manner that is protective of human health and the environment
- Minimization of waste generation
- Compliance with federal, state, and DOE requirements
- Selection of storage and disposal alternatives

All waste management activities must comply with this WMP; applicable procedures the C-746-U Landfill Waste Acceptance Criteria (WAC) found in *Waste Acceptance Criteria for the Treatment, Storage and Disposal Facilities at the Paducah U. S. Department of Energy Site,* PRS-WSD-0011/,R0*;* and WACs for off-site treatment, storage, and disposal facilities designated to receive waste.

During the course of the project, additional Paducah Gaseous Diffusion Plant (PGDP) and DOE waste management requirements may be identified. It should be noted that specifics of construction and disposition activities are not yet available; therefore, in some cases, specific details are not provided herein to allow flexibility when performing the work.

D.2. WASTE GENERATION

D.2.1 WASTE GENERATION

Several waste streams will be generated by the SWOU (On-Site) RA. The largest of these waste streams will be the excavated soil that comprises the major portion of the RA. Work packages will be developed to present appropriate details such as waste storage areas, the route the waste will follow upon arriving at

these locations, the route the waste will take exiting the facility, and information regarding traffic control and traffic control implementation.

Limited quantities of investigation-derived waste (IDW) from the verification sampling also will be generated. The IDW could include personal protective equipment (PPE), sampling returns, sampling equipment or decontamination water. Wastes generated from field activities have the potential to contain contaminants related to known or suspected past operational or disposal practices and must be stored and disposed of in accordance with applicable state and federal guidelines. Waste generated will be stored in Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) on-site waste storage areas (i.e. C-745-C, C-760, C-761, or other CERCLA storage facility) or within the RCRA area of contamination during the characterization period prior to disposal, when practical. CERCLA on-site waste storage areas will be operated in compliance with applicable or relevant and appropriate waste storage requirements. Wastewater will be transferred to storage pending characterization and treatment. Wastewaters will be treated and/or disposed of through an existing KPDES permitted waste water treatment facility (WWTF) prior to discharge through outfall 001. Treatment of excavated materials and wastewater would depend on the WAC for whatever facility is used for disposal. Table 1 shows estimated quantities of waste that are expected to be generated during the implementation of the SWOU (On-Site) RA Work Plan.

Table D.1. Estimation of RA/IDW Waste

Waste Stream	Volume	Container Type and Quantity
Excavated Soil	13,300 yd^3	Approx. 500 Dump Truck Loads
Personal Protective Equipment, Plastic	20 ft^3	3 1A2X 55-gal drums
Sample Residuals, Returns	5 ft^3	1 1A2X 55-gal drum
Sampling Equipment	25 ft^3	4 1A2X 55-gal drums[a, b]
Decontamination Water	300 gal	1,000-gal poly tanks

[a] It is yet to be determined whether sampling equipment will be decontaminated and reused or disposed of as waste.
[b] This does not allow for decontamination of excavation equipment.

Contractor waste management procedures and protocols will be followed, and work packages will be developed to present appropriate details such as how the excavated soil and waste materials will be stored and managed, with decision criteria to be applied if more than one alternative is proposed.

D.3. WASTE MANAGEMENT ROLES AND RESPONSIBILITIES

D.3.1 WASTE MANAGEMENT TRACKING RESPONSIBILITIES

Waste generated during SWOU (On-Site) RA activities will require a comprehensive waste-tracking system capable of maintaining an accurate inventory of waste. To prevent inappropriate disposal of waste, all generation, storage and characterization information must be included in the tracking system. Specifically, the waste inventory must include the following information:

- Generation date
- Request for Disposal (RFD) number
- Waste origination location
- Waste matrix (solid, liquid)
- Waste description (soil, PPE, etc.)
- Quantity

- Storage location
- Sampling status
- Sampling results status
- Date of disposal

The Contractor will perform weekly inspections and maintenance of the waste staging areas, waste materials, and temporarily staged excavated materials.

D.3.2 WASTE MANAGEMENT COORDINATOR

The WMC will manage all waste according to PGDP facility requirements and this WMP. WMC responsibilities include coordinating daily activities with field personnel, overseeing daily waste management operations and maintaining a waste management logbook. The waste management log contains a complete history of waste generated and current status of SWOU (On-Site) RA waste containers. A designated waste operator also may make entries in the waste management logbook.

The WMC will ensure that procurement and inspection of equipment, material or services critical to the shipment of waste to off-site treatment, storage and disposal facilities complies with procedure PRS-WSD-3012, *Procurement, Inspection and Management of Items Critical for Paducah Off-site Waste Shipments.* Additionally, the WMC will ensure that wastes to be disposed of in the C-746-U Landfill are packaged and managed according to the on-site landfill's WAC.

Additional responsibilities of the WMC include the following:

- Maintaining an adequate supply of container labels;
- Maintaining drum inventories;
- Interfacing with all necessary personnel;
- Preparing RFDs;
- Tracking SWOU (On-Site) RA waste;
- Ensuring waste containers are labeled according to procedure and WAC;
- Coordinating waste disposal or transfers;
- Coordinating container sampling for characterization; and
- Ensuring that temporary container storage areas are properly established, maintained, and inspected and inspection records are properly managed.

D.3.3 COORDINATION WITH FIELD CREWS

The WMC is responsible for advising field crew personnel who generate and containerize waste to meet the requirements of PRS-WSD-3015, *Waste Packaging,* for ensuring compliance with this WMP. The WMC will interface with PRS Materials Disposition personnel to coordinate waste handling activity and waste container characterization sampling, if required.

D.3.4 COORDINATION WITH ON-SITE TREATMENT, STORAGE AND DISPOSAL FACILITIES

The WMC will document all waste streams generated on RFD forms and individual containers on Waste Item Container Logs. RFD documentation of all waste must be included as part of a landfill package for RA wastes that is designated for disposal at the C-746-U Landfill. Landfill packages must be compiled and approved per procedure PRS-WSD-3025, April 2008, *Preparation and Processing of Paducah Landfill Packages.* For waste that is designated for off-site disposal, the RFD must be submitted to the materials disposition group to facilitate the placement of the container in the designated storage facility. The container will remain in storage during characterization and until a viable disposal alternative is identified.

D.3.5 CHARACTERIZATION OF WASTE FOR DISPOSAL

As discussed in Section 3, the SWOU soils and sediments have been characterized in previous investigations. Sampling and analysis data from these investigations will be examined to determine if it is sufficient to characterize waste generated during the removal action for disposal at the C-746-U Landfill, off-site disposal, or treatment prior to disposal (i.e., wastewater). For those wastes identified as having sufficient characterization, no additional sampling and analysis will be required. For those materials with insufficient data to allow disposal, additional characterization will be performed through sampling and analysis. Samples may be obtained *in situ* or from the containerized material after excavation. The number of samples and sampling strategies necessary will be dependent upon the volume of waste to be characterized, potential on-site or off-site disposal or treatment facilities, and contaminants of concern. Procedures and strategies for additional characterization will be consistent with those identified in Appendix F, with waste stream-specific DQOs and sampling and analysis plans developed as needed for each waste stream.

D.4. TRANSPORTATION OF WASTE

Transportation of SWOU (On-Site) RA waste will comply with PRS-WSD-0661/R0, September 2007, *Transportation Safety Document for On-site Transport within the Paducah Gaseous Diffusion Plant, Paducah, Kentucky.* Since the majority of the RA waste will be disposed of in the C-746-U Landfill, transportation of this waste will be by dump truck. The WMC will arrange for movement of drummed waste by Materials Disposition United Steelworker craft personnel. Waste material designated for off-site disposal will be shipped per PRS-WSD-3028, *Off-site Shipping.*

D.5. WASTE CHARACTERIZATION AND DISPOSAL

As discussed in Section 3, the SWOU hot spot locations have been characterized in previous investigations. Sampling and analysis data from these investigations will be examined to determine if it is sufficient to characterize waste generated during excavation and remediation for disposal at the C-746-U Landfill, off-site disposal, or treatment prior to disposal (i.e., wastewater). For those wastes identified as having sufficient characterization, no additional sampling and analysis will be required. For those materials with insufficient data to allow disposal, additional characterization will be performed through sampling and analysis. Samples may be obtained *in situ,* taking into account expected excavation limits, during excavation (e.g., from backhoe buckets), or after excavation on the containerized material. The number of samples and sampling strategies necessary will be dependent upon the volume of waste to be

characterized, potential on-site or off-site disposal or treatment facilities, and contaminants of concern. Procedures and strategies for additional characterization will be consistent with those identified in Appendix F, with waste-stream specific DQOs and sampling and analysis plans developed as needed for each waste stream. All waste (i.e., excavated soils, PPE, etc.) containers, including IDW, will be stored at the CERCLA storage area until waste characterization is completed and an appropriate disposal alternative is identified.

Wastewaters will be treated and/or disposed through on-site wastewater treatment units for discharge to Outfall 001.

D.6. WASTE MINIMIZATION

Waste minimization requirements that will be implemented, as appropriate, including those established by the 1984 Hazardous and Solid Waste Amendments of RCRA; DOE orders 5400.1, 5400.3 and 435.1; and the DOE Prime Contractor. Requirements specified in the PRS WMP, PRS-CDL-0029, *Waste Management Plan for the Paducah Environmental Remediation Project,* concerning waste generation, tracking, and reduction techniques will be followed.

To support the DOE Prime Contractor commitment to waste reduction, an effort will be made during all field activities to minimize waste generation, largely through ensuring that potentially contaminated waste material is localized and is not allowed to come into contact with clean material. Such an event could create more contaminated waste. Waste minimization also will be facilitated through waste segregation, selection of PPE, and waste handling practices.

Solid wastes such as Tyvek coveralls and packaging materials will be segregated. An attempt will be made to separate visibly soiled coveralls from clean coveralls. In some instances, partially soiled coveralls can be cut up and segregated. Other solid waste will not be allowed to contact potentially contaminated soil waste. Efforts will be made to keep Tyvek coveralls clean, reuse clean coveralls, and use coveralls only when necessary. Proper waste handling and spill control techniques will help minimize waste, particularly around decontamination areas where water must be containerized. The contractor will follow the WAC for whatever facility is used for disposal.

D.7. HEALTH AND SAFETY ISSUES RELATED TO IDW ACTIVITIES

Waste management activities will be conducted in compliance with health and safety procedures documented in the Environmental, Safety, and Health Plan, included as Appendix D of this work plan.

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APPENDIX E

QUALITY ASSURANCE PROJECT PLAN

Based on the Intergovernmental Data Quality Task Force Uniform Federal Policy for Quality Assurance Project Plans (Final Version 1, March 2005)

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CONTENTS

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QAPP WORKSHEETS

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DOECAP	DOE Consolidated Audit Program
EDD	Electronic Data Deliverable
EE/CA	Engineering Evaluation/Cost Analysis
EPA	U. S. Environmental Protection Agency
FFA	Federal Facility Agreement
MDL	method detection limit
OU	operable unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QAPP	Quality Assurance Project Plan
QREIS	Paducah Oak Ridge Environmental Information System
QL	quantitation limit
RAO	Removal Action Objective
RAWP	Removal Action Work Plan
SAP	Sampling and Analysis Plan
SWMU	solid waste management unit
SWOU	Surface Water Operable Unit
UFP	Uniform Federal Policy for Quality Assurance Project Plans
XRF	x-ray fluoroscopy

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QAPP Worksheet #1
Title Page

UFP-QAPP Manual Section 2.1:

Document Title: *Quality Assurance Project Plan (QAPP) for the) Removal Action Work Plan (RAWP) for the Surface Water Operable Unit (SWOU) (On-Site)Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Lead Organization: Contractor

Preparer's Name and Organizational Affiliation: Contractor

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

Preparation Date (Month/Year) 08/2009

Document Control Number:
N/A

QAPP Worksheet #2
QAPP Identifying Information

UFP-QAPP Manual Section 2.2.4:
Site Name/Project Name: Paducah Surface Water Operable Unit On-Site Removal Action Project
Site Location: Paducah Gaseous Diffusion Plant
Site Number/Code: N/A
Operable Unit: Surface Water Operable Unit
Contractor Name: Paducah Remediation Services, LLC
Contractor Number: DE-AC30-06EW05001 (DOE-PRS contract)
Contract Title: Paducah Gaseous Diffusion Plant Remediation Subcontract
Work Assignment Number: N/A

1. Identify guidance used to prepare QAPP: Uniform Federal Policy for Quality Assurance Project Plans, DOE Order 414.1C, 10 *CFR* 830, NQA-1
2. Identify regulatory program: CERCLA and Federal Facilities Compliance Agreement for the Paducah Gaseous Diffusion Plant (DOE/OR/07-1707)
3. Identify approval entity: U. S. EPA, DOE, Commonwealth of Kentucky
4. Indicate whether the QAPP is a generic or a project-specific QAPP. (circle one)

5. List dates of scoping sessions that were held: 11/24/08

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

Title	Approval Date
Title: Title: Work Plan for the Burial Grounds Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (Quality Assurance Plan is Section 11) (DOE/OR/07-2179&D2/R1)	Approval Date: 11/13/2006 (Latest Date of regulatory approval)
Remedial Design Report, Certified for Construction Design Drawings and Technical Specifications Package, for the Groundwater Operable Unit for Volatile Organic Compound Contamination at the C-400 Cleaning Building at The Paducah Gaseous Diffusion Plant, Paducah, Kentucky (Quality Assurance/Quality Control and Data Management is Section 8) (DOE/LX/07-0005&D2/R1)	Approval Date: 7/16/2008 (Latest date of regulatory approval)
Construction Quality Control Plan for the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning Building at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0031&D2/R1)	Approval Date: 11/7/08 (Latest Date of regulatory approval)
Remedial Action Work Plan for the Interim Remedial Action for the Volatile Organic Compound Contamination at the C-400 Cleaning at the Paducah Gaseous Diffusion Plant, at Paducah, Kentucky (Quality Assurance Plan is Section 9) (DOE/LX/07-0004&D2/R1	Approval Date: 10/23/08 (Latest date of regulatory approval)

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

7. List organizational partners (stakeholders) and connection with lead organization:
DOE Prime Contractor at the Paducah Gaseous Diffusion Plant

8. List data users: DOE, Contractor, U.S. EPA, Commonwealth of Kentucky

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

QAPP elements and required information that are not applicable to the project are circled and an explanation is provided in the QAPP.

Note: Information is only entered in the "Crosswalk to Related Documents" if the information is not contained in the QAPP worksheets as indicated in first two columns. Also, if the required QAPP element fulfills other quality requirements, that requirement is noted in the "Crosswalk to Related Documents" column.

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	
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	
2.3 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	
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	DOE O 414.1C/10 *CFR* § 830.120 Criterion 1– Management Program; Criterion 2 Training and Qualification;

QAPP Worksheet #2 QAPP Identifying Information (Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
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)	DOE O 414.1C/10 *CFR* § 830.120 Criterion 6–Design
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	
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	The project schedule is contained in section 4 of the project RAWP.
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/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	DOE O 414.1C/10 *CFR* § 830.120 Criterion 5–Work Processes; Criterion 6–Design Project Sampling and Analysis Plan (SAP)

QAPP Worksheet #2 QAPP Identifying Information (Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
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	DOE O 414.1C/10*CFR* § 830.120 Criterion 8– Inspection and Acceptance Testing
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	DOE O 414.1C/10 *CFR* § 830.120 Criterion 4– Documents and Records
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	
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	DOE O 414.1C/10 *CFR* § 830.120 Criterion 4– Documents and Records
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	DOE O 414.1C/10 *CFR* § 830.120 Criterion 3– Quality Improvement; Criterion 9 – Management Assessment; Criterion 10 –Independent Assessment
4.2 QA Management Reports	- QA Management Reports Table	
4.3 Final Project Report		
Data Review		
5.1 Overview		

QAPP Worksheet #2 QAPP Identifying Information (Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
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	
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		

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 SWOU (On-Site) RAWP; thus it will be included on the RAWP distribution list.	N/A	N/A	N/A	N/A	N/A	N/A

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 (Interim)		Personnel will read the QAPP prior to mobilization	
Contractor	Project Manager		Personnel will read the QAPP prior to mobilization	
Contractor	Quality Assurance Manager		Personnel will read the QAPP prior to mobilization	
Contractor	Environmental Engineer		Personnel will read the QAPP prior to mobilization	
Contractor	Environmental Engineer		Personnel will read the QAPP prior to mobilization	
Contractor	Environmental Compliance and Protection Lead		Personnel will read the QAPP prior to mobilization	
Contractor	Environmental Sampling Lead		Personnel will read the QAPP prior to mobilization	
Contractor	QA Specialist		Personnel will read the QAPP prior to mobilization	
Contractor	S&H Specialist		Personnel will read the QAPP prior to mobilization	
Contractor	Waste Coordinator		Personnel will read the QAPP prior to mobilization	

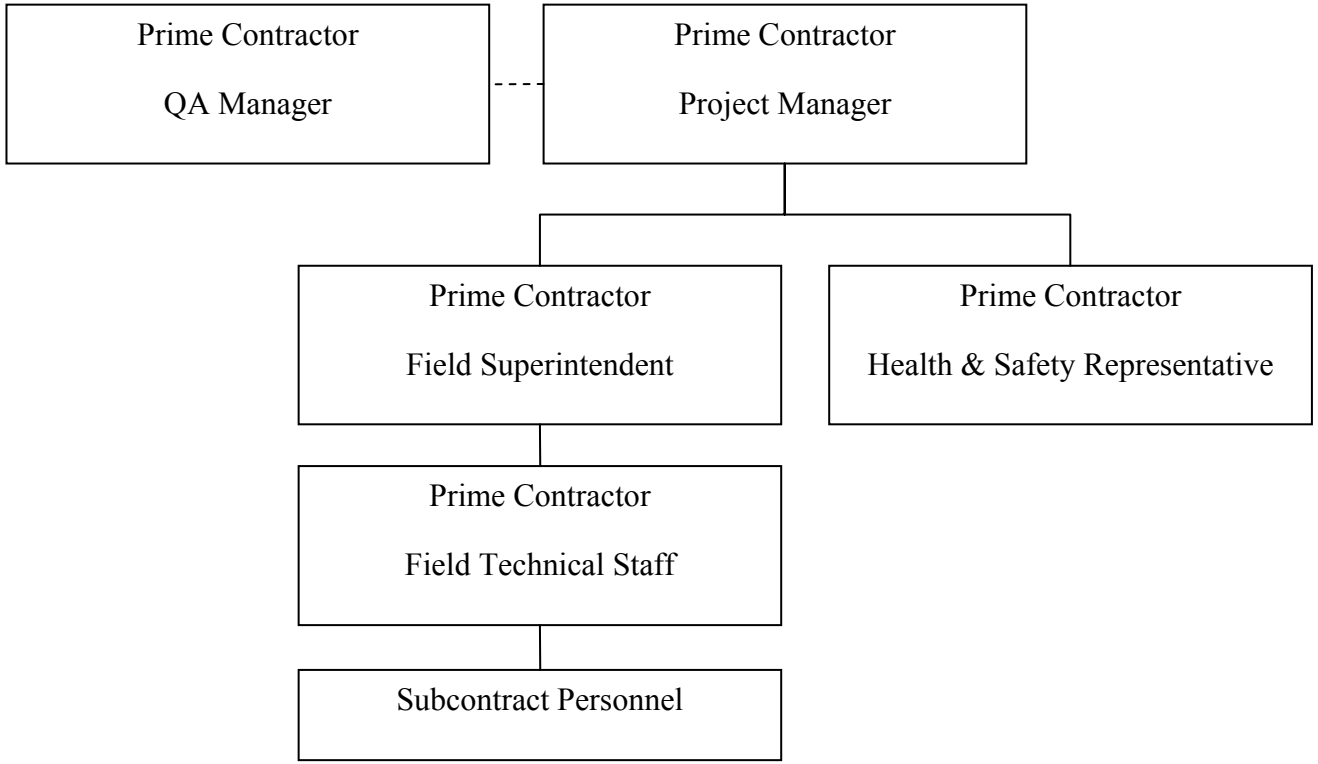
QAPP Worksheet #4-2
Project Personnel Sign-Off Sheet

Organization: Contractor

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Field project personnel will read and sign that they have read the QAPP at mobilization or during pre-job kickoffs.	N/A	N/A	N/A	N/A

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			All formal communication among DOE, EPA and the Kentucky Department for Environmental Protection
All Project Requirements	Contractor Site Manager			All formal communication between Contractor and DOE
All Project Requirements	Contractor ER/EM Director			All communications between the project and the Site Manager
All Project Requirements	Contractor ER/EM Deputy Director			All communications between the project and the Site Manager
All Project Requirements	Contractor Project Manager			All communication between the project and the ER/EM Director
Project Quality Assurance Requirements	Contractor QA Manager			All quality related communications
Project Quality Assurance Requirements	Contractor QA Specialist			All quality related communications
FFA Compliance	Contractor FFA Project Manager			All internal communication regarding FFA compliance
Sampling Requirements	Contractor Environmental Sampling Lead			All internal communication regarding field sampling
Analytical Laboratory Interface	Contractor Lab Coordinator			All communication between Contractor and analytical laboratory
Waste Management Requirements	Contractor Waste Coordinator			All internal communication regarding waste project waste management
Environmental Compliance Requirements	Contractor Environmental Compliance Lead			All internal correspondence regarding environmental requirements and compliance
Subcontractor Requirements (if applicable)	Contractor Senior Subcontract Administrator			All correspondence between the project and subcontractors, if applicable
Health and Safety requirements	Contractor Health and Safety Representative			All internal communication regarding safety and health requirements

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

UFP-QAPP Manual Section 2.4.3:

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
	Paducah Site Lead	DOE	Overall site responsibility – liaison with EPA	
	Paducah Site Manager	Contractor	Contractor lead responsible for site	
	ER/EM Director	Contractor	Overall ER/EM project responsibility	
	Project Manager	Contractor	Overall soils/surface water responsibility	
	Quality Assurance Manager	Contractor	Overall project QA responsibility	
	Environmental Engineer	Contractor	Project responsibility	
	Environmental Engineer	Contractor	Project SAP	
	Environmental Compliance and Protection Lead	Contractor	Project Environmental Compliance Protection responsibility	
	Environmental Sampling Lead	Contractor	Project Sampling responsibility	
	QA Specialist	Contractor	Project QA responsibility	
	Health and Safety Representative	Contractor	Project Safety and Health Responsibility	
	Waste Coordinator	Contractor	Overall Project waste management responsibility	

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	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.

QAPP Worksheet #9
Project Scoping Session Participants Sheet

UFP-QAPP Manual Section 2.5.1:

Project Name Surface Water Operable Unit (On-Site) **Projected Date(s) of Sampling** TBD **Project Manager** Craig Jones	**Site Name** Paducah Gaseous Diffusion Plant **Site Location** Paducah, Kentucky

Date of Session: January, 2009
Scoping Session Purpose: Kickoff scoping session for SWOU (On-Site) Removal Project

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Doug Jones	QA Specialist	PRS	270-441-5089	Dj1@prs-llc.net	QA
Craig Jones	Project Manager	PRS	270-4415114	N8e@prs-llc.net	PM
Ken Alkema	EREM Director (acting)	PRS	270-441-5167	Ka1@prs-llc.net	Manager
Lisa Crabtree	Sample/Data Management	PRS	270-441-5135	tvg@prs-llc.net	Sample/Data
Jana White	Task Lead	PRS	270-441-5185	fmt@prs-llc.net	Task Lead
LeAnne Garner	Engineer	Tetra Tech	270-441-5436	yln@prs-llc.net	Project
Myrna Redfield	EREM Deputy Director	PRS	270-441-5113	mxn@prs-llc.net	Manager
Elizabeth Wyatt	Project Engineer	PRS	270-441-5034	Ew2@prs-llc.net	Project
Clint Dietsch	Engineer	PRS	270-441-5254	idf@prs-llc.net	Project
Jennifer Watson	Sample/Data Management	PRS	270-441-5293	oxn@prs-llc.net	Sample/Data

Comments/Decisions: This kick-off scoping session was held in conjunction with the second Soils Inactive Facilities Removal Action scoping session.

Action Items: Develop an incomplete (empty) SWOU (On-Site) QAPP for submittal to meet deadline.

Consensus Decisions:

QAPP Worksheet #10
Problem Definition

UFP-QAPP Manual Section 2.5.2:

The problem to be addressed by the project: Remove previously identified contaminated (PCBs and rad) soils/sediment as part of the SWOU (On-Site) project.

The environmental questions being asked: Once the contaminated soils/sediment have been removed, does the direct contact risk for the current industrial worker fall within the EPA risk range?

Observations from any site reconnaissance reports: It is estimated that approximately 12,000 cubic yards will need to be removed to achieve the project objectives [as noted in previous CERCLA documentation – EE/CA and Action Memorandum (AM)].

A synopsis of secondary data or information from site reports: The SWMUs/AOCs to be addressed as part of this removal are contaminated with PCBs and radiological contamination and in some cases, may have to be shipped off-site for disposal in lieu of on-site disposal.

The possible classes of contaminants and the affected matrices: As noted above, chemical- (primarily PCBs) and radiological- (primarily uranium) contaminated soil/sediment are to be removed as a result of previous PGDP discharges throughout the PGDP drainage system.

The rationale for inclusion of chemical and nonchemical analyses: Verification of removal action has been completed is an objective for the chemical and radiological analyses.

Information concerning various environmental indicators: Environmental indicators for PGDP contamination for on-site ditches include: Total PCB, cesium 137, uranium 238, and uranium. Environmental indicators for NSDD include: Total PCB, thorium 230 and uranium. These have been utilized as indicators for the SWOU (On-Site) project.

Project decision conditions ("If..., then..." statements): If the cumulative ELCR is greater than 1E-5 and the HI is greater than 1.0 within the SWOU (On-site) Solid Waste Management Units (SWMUs)/Area of Concerns (AOCs), then the soils/sediment will be removed.

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

UFP-QAPP Manual Section 2.6.1:

Who will use the data? DOE, EPA, and the Commonwealth of Kentucky will use the environmental sampling data obtained subsequent to the Removal Action.

What will the data be used for? To determine if the Removal Action Objectives (RAOs) have been met.

What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) Target analytes for each removal action location are listed on worksheet #10. Subsequent to the removal action, representative samples will be obtained from each location and analyzed in a Department of Energy Consolidated Audit Program (DOECAP) certified laboratory.

Note that the soil results will be reported on as "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 confirm that the RAOs have been met. Cleanup levels are listed in Appendix F, Sampling and Analysis Plan (SAP), of the Removal Action Work Plan (RAWP).

How much data are needed? (number of samples for each analytical group, matrix, and concentration) This information is detailed in Appendix F, SAP, of the RAWP.

Where, when, and how should the data be collected/generated? For each cleanup area, two sampling activities will be performed: a removal action support survey that will be completed using screening-level analysis [i.e., the use of radiological walk-overs, x-ray fluoroscopy (XRF) field screening, and PCB test kits] and post-excavation sampling to confirm that the cleanup levels have been achieved. Coordinates for removal action support survey sample locations (Activity I) will be obtained using a global positioning system. Each sample point from the post-excavation sampling (Activity II) will be surveyed for its horizontal and vertical location using the State Plane Coordinates for horizontal control.

Who will collect and generate the data? A sampling team will collect the soil samples following Appendix F, SAP, of the RAWP and PRS sampling procedures. A DOE certified laboratory will generate the data results.

How will the data be reported? Field data will be recorded on chain-of-custody forms, in field logbooks, and field data sheets. The field laboratory and the fixed-base laboratory will provide data in an Electronic Data Deliverable (EDD). 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. Data will be archived for 30 years.

QAPP Worksheet #12-1
Measurement Performance Criteria Table

UFP-QAPP Manual Section 2.6.2:

Matrix	Soil/sediment
Analytical Group[1]	Metals (beryllium)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3]	**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)**
See Worksheet #21, Ref. #6	SW846-6010	Precision – Lab	RPD – 35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

QAPP Worksheet #12-2
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Metals (arsenic and uranium)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3]	**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)**
See Worksheet #21, Ref. #6	SW846-6020	Precision – Lab	RPD – 35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

QAPP Worksheet #12-3
Measurement Performance Criteria Table

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

Sampling Procedure[2]	**Analytical Method/SOP**[3]	**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)**
See Worksheet #21, Ref. #6	SW846-8082	Precision – Lab	RPD – 43%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

QAPP Worksheet #12-4
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]	**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)**
See Worksheet #21, Ref. #6	Alpha spectroscopy	Precision – Lab	RPD – 20%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

QAPP Worksheet #12-5
Measurement Performance Criteria Table

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

Sampling Procedure[2]	**Analytical Method/SOP**[3]	**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)**
See Worksheet #21, Ref. #6	Alpha spectroscopy	Precision – Lab	RPD – 50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

QAPP Worksheet #12-6
Measurement Performance Criteria Table

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

Sampling Procedure[2]	**Analytical Method/SOP**[3]	**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)**
See Worksheet #21, Ref. #6	Gamma spectroscopy	Precision – Lab	RPD – 50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

QAPP Worksheet #12-7
Measurement Performance Criteria Table

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

Sampling Procedure[2]	**Analytical Method/SOP**[3]	**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)**
See Worksheet #21, Ref. #6	Liquid scintillation	Precision – Lab	RPD – 50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

QAPP Worksheet #12-8
Measurement Performance Criteria Table

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

Sampling Procedure[2]	**Analytical Method/SOP**[3]	**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)**
See Worksheet #21, Ref. #6	SW846-6200	Precision – Lab	RPD – 20%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[4]	90%	Data completeness check	S&A

[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]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that are not rejected.

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 and historical use	DOE, EE/CA, July 2008	DOE; previous analytical sampling/analysis results; contaminant conclusions based historical use and process knowledge	To determine risk to human health and provide input to the removal action alternatives	N/A

QAPP Worksheet #14
Summary of Project Tasks

UFP-QAPP Manual Section 2.8.1:

Sampling Tasks: From SAP

Analysis Tasks: From SAP

Quality Control Tasks: From SAP

Secondary Data: From SAP

Data Management Tasks: From SAP

Documentation and Records: Documentation and Records will be per DOE Prime Contractor procedure PRS-DOC-1009, *Documents and Records*.

Assessment/Audit Tasks: Assessments and audits will be per DOE Prime Contractor procedure PRS-ENM-5003, *Quality Assured Data*.

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

QAPP Worksheet #15-1
Activity II Reference Limits and Evaluation Table

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

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Quantitation Limit (mg/kg)	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Arsenic	7440-38-2	27.4	1	1	N/A	1	N/A
Beryllium	7440-41-7	50,000	0.5	0.5	N/A	0.5	N/A
Uranium	7440-61-1	227	1	1	N/A	1	N/A

[1]Analytical MDLs and QLs are those documented in validated methods.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.
N/A = not available

QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: soil/sediment
Analytical Group: radionuclides
Concentration Level: low

Analyte	CAS Number	Project Action Limit (pCi/g)	Project Quantitation Limit (pCi/g)	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Americium-241	14596-10-2	115	3	3	N/A	3	N/A
Cesium-137	10045-97-3	7.6	0.5	0.5	N/A	0.5	N/A
Neptunium-237	13994-20-2	21.65	3	3	N/A	3	N/A
Plutonium-239/240	N/A	107.5	4	4	N/A	4	N/A
Technetium-99	14133-76-7	3825	8	8	N/A	8	N/A
Thorium-230	14269-63-7	146.5	4	4	N/A	4	N/A
Thorium-232	N/A	128.5	3	3	N/A	3	N/A
Uranium-234	13966-29-5	188	3	3	N/A	3	N/A
Uranium-235	15117-96-1	30.25	2	2	N/A	2	N/A
Uranium-238	24678-82-8	94	2	2	N/A	2	N/A

[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.
N/A = not available

QAPP Worksheet #15-3
Reference Limits and Evaluation Table

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

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Quantitation Limit (mg/kg)	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Total PCBs	1336-36-3	15.95	16	1	N/A	1	N/A

N/A = not available

QAPP Worksheet #15-4
Reference Limits and Evaluation Table

Matrix: soil/sediment
Analytical Group: metal
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)	Project Quantitation Limit (mg/kg)	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Uranium	7440-61-1	227	230	20	N/A	20	N/A

[1]Analytical MDLs and QLs are those documented in validated methods.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.
N/A = not available

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)	Project Quantitation Limit (mg/kg)	Analytical Method[1]		Achievable Laboratory Limits[2]	
				MDLs	Method QLs	MDLs	QLs
Total PCBs	1336-36-3	16	10	non-quantitative	N/A	non-quantitative	N/A

[1]Analytical MDLs and QLs are those documented in validated methods.
[2]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.
N/A = not applicable

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		
*See below	N/A	N/A	N/A	N/A	N/A

*The project schedule is contained in section 4 of the project RAWP.

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):

Cleanup areas will be sampled in an established grid system.

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]:

Soil/sediment will be sampled from all cleanup areas following excavation. Cleanup areas will undergo a 100% radiological scan. Measurement of indicator chemicals will be performed to determine if action levels have been achieved. If action levels have not been achieved, the areas will be further excavated. If action levels have been achieved, final verification samples will be collected. Additional information is available in Worksheet #18 and in Appendix F "Sampling and Analysis Plan."

QAPP Worksheet #18
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
Activity I Samples							
Outfall 001, EU 15 (area 1)	Soil	surface	PCBs (test kit)	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 1)	Soil	surface	Uranium	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 1)	Soil	surface	Cs-137, Th-230, and U-238	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 2)	Soil	surface	PCBs (test kit)	low	36 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 2)	Soil	surface	Uranium	low	36 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 2)	Soil	surface	Cs-137, Th-230, and U-238	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 008, EU 11	Soil	surface	PCBs (test kit)	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 008, EU 11	Soil	surface	Uranium	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 008, EU 11	Soil	surface	Cs-137, Th-230, and U-238	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 010, EU 01	Soil	surface	PCBs (test kit)	low	16 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 010, EU 01	Soil	surface	Uranium	low	16 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 010, EU 01	Soil	surface	Cs-137, Th-230, and U-238	low	16 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 011, EU 01	Soil	surface	PCBs (test kit)	low	56 grab samples, plus 3 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table (Continued)

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
Outfall 011, EU 01	Soil	surface	Uranium	low	56 grab samples, plus 3 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 011, EU 01	Soil	surface	Cs-137, Th-230, and U-238	low	56 grab samples, plus 3 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 02	Soil	surface	PCBs (test kit)	low	88 grab samples, plus 5 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 02	Soil	surface	Uranium	low	88 grab samples, plus 5 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 02	Soil	surface	Cs-137, Th-230, and U-238	low	88 grab samples, plus 5 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 03	Soil	surface	PCBs (test kit)	low	80 grab samples, plus 4 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 03	Soil	surface	Uranium	low	80 grab samples, plus 4 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 03	Soil	surface	Cs-137, Th-230, and U-238	low	80 grab samples, plus 4 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 1)	Soil	surface	PCBs (test kit)	low	20 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 1)	Soil	surface	Uranium	low	20 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 1)	Soil	surface	Cs-137, Th-230, and U-238	low	20 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 2)	Soil	surface	PCBs (test kit)	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 2)	Soil	surface	Uranium	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table (Continued)

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
Outfall 015, EU 04 (area 2)	Soil	surface	Cs-137, Th-230, and U-238	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 07	Soil	surface	PCBs (test kit)	low	72 grab samples, plus 4 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 07	Soil	surface	Uranium	low	72 grab samples, plus 4 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 07	Soil	surface	Cs-137, Th-230, and U-238	low	72 grab samples, plus 4 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 08	Soil	surface	PCBs (test kit)	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 08	Soil	surface	Uranium	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 08	Soil	surface	Cs-137, Th-230, and U-238	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 1)	Soil	surface	PCBs (test kit)	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 1)	Soil	surface	Uranium	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 1)	Soil	surface	Cs-137, Th-230, and U-238	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 2)	Soil	surface	PCBs (test kit)	low	32 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 2)	Soil	surface	Uranium	low	32 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 2)	Soil	surface	Cs-137, Th-230, and U-238	low	32 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 1)	Soil	surface	PCBs (test kit)	low	32 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table (Continued)

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
NSDD Section 3 EU 02 (area 1)	Soil	surface	Uranium	low	32 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 1)	Soil	surface	Cs-137, Th-230, and U-238	low	32 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 2)	Soil	surface	PCBs (test kit)	low	16 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 2)	Soil	surface	Uranium	low	16 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 2)	Soil	surface	Cs-137, Th-230, and U-238	low	16 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EUs 02 and 03 (areas 3 and 1)	Soil	surface	PCBs (test kit)	low	32 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EUs 02 and 03 (areas 3 and 1)	Soil	surface	Uranium	low	32 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EUs 02 and 03 (areas 3 and 1)	Soil	surface	Cs-137, Th-230, and U-238	low	32 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 03 (area 2)	Soil	surface	PCBs (test kit)	low	36 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 03 (area 2)	Soil	surface	Uranium	low	36 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 03 (area 2)	Soil	surface	Cs-137, Th-230, and U-238	low	36 grab samples, plus 2 field duplicates	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 5 EU 08	Soil	surface	PCBs (test kit)	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 5 EU 08	Soil	surface	Uranium	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 5 EU 08	Soil	surface	Cs-137, Th-230, and U-238	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table (Continued)

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
Activity II							
Outfall 001, EU 15 (area 1)	Soil	surface	PCBs	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 1)	Soil	surface	Metals	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 1)	Soil	surface	Radionuclides	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 2)	Soil	surface	PCBs	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 2)	Soil	surface	Metals	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 001, EU 15 (area 2)	Soil	surface	Radionuclides	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 008, EU 11	Soil	surface	PCBs	low	2 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 008, EU 11	Soil	surface	Metals	low	2 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 008, EU 11	Soil	surface	Radionuclides	low	2 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 010, EU 01	Soil	surface	PCBs	low	4 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 010, EU 01	Soil	surface	Metals	low	4 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 010, EU 01	Soil	surface	Radionuclides	low	4 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 011, EU 01	Soil	surface	PCBs	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 011, EU 01	Soil	surface	Metals	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table (Continued)

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
Outfall 011, EU 01	Soil	surface	Radionuclides	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 02	Soil	surface	PCBs	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 02	Soil	surface	Metals	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 02	Soil	surface	Radionuclides	low	8 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 03	Soil	surface	PCBs	low	8 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 03	Soil	surface	Metals	low	8 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 03	Soil	surface	Radionuclides	low	8 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 1)	Soil	surface	PCBs	low	5 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 1)	Soil	surface	Metals	low	5 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 1)	Soil	surface	Radionuclides	low	5 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 2)	Soil	surface	PCBs	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 2)	Soil	surface	Metals	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 04 (area 2)	Soil	surface	Radionuclides	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 07	Soil	surface	PCBs	low	8 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 07	Soil	surface	Metals	low	8 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table (Continued)

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
Outfall 015, EU 07	Soil	surface	Radionuclides	low	8 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 08	Soil	surface	PCBs	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 08	Soil	surface	Metals	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
Outfall 015, EU 08	Soil	surface	Radionuclides	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 1)	Soil	surface	PCBs	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 1)	Soil	surface	Metals	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 1)	Soil	surface	Radionuclides	low	1 grab sample	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 2)	Soil	surface	PCBs	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 2)	Soil	surface	Metals	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 01 (area 2)	Soil	surface	Radionuclides	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 1)	Soil	surface	PCBs	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 1)	Soil	surface	Metals	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 1)	Soil	surface	Radionuclides	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 2)	Soil	surface	PCBs	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 02 (area 2)	Soil	surface	Metals	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17

QAPP Worksheet #18 Sampling Locations and Methods/SOP Requirements Table (Continued)

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
NSDD Section 3 EU 02 (area 2)	Soil	surface	Radionuclides	low	4 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EUs 02 and 03 (areas 3 and 1)	Soil	surface	PCBs	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EUs 02 and 03 (areas 3 and 1)	Soil	surface	Metals	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EUs 02 and 03 (areas 3 and 1)	Soil	surface	Radionuclides	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 03 (area 2)	Soil	surface	PCBs	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 03 (area 2)	Soil	surface	Metals	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 3 EU 03 (area 2)	Soil	surface	Radionuclides	low	7 grab samples	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 5 EU 08	Soil	surface	PCBs	low	2 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 5 EU 08	Soil	surface	Metals	low	2 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17
NSDD Section 5 EU 08	Soil	surface	Radionuclides	low	2 grab samples, plus 1 field duplicate	See Worksheet #21, Ref. #6	See Worksheet #17

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

QAPP Worksheet #19
Analytical SOP Requirements Table

UFP-QAPP Manual Section 3.1.1:

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
soil	PCBs (test kit)	low		[2]	[2]	cool 4° C	14 days until extraction/40 days
soil	Uranium	low	6200			cool 4° C	180 days
soil	PCBs	low	8082			cool 4° C	14 days until extraction/40 days
soil	metals	low	6010/6020			cool 4° C	180 days
soil	radionuclides	low	see Worksheet #12			cool 4° C	180 days

[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[1]	No. of Sampling Locations[2]	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	PCBs	low	Test kits	548	28	N/A	28	28	0	0
Soil	Uranium	low	XRF	548	28	0	28	28	0	0
Soil	PCBs	low	SW846-8082	137	12	N/A	12	12	0	173
Soil	Metals	low	SW846-6010/6020	137	12	0	12	12	0	173
Soil	radionuclides	low	see Worksheet #12	137	12	0	12	12	0	173

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
[2]If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location or station.
N/A = not applicable

QAPP Worksheet #21
Project Sampling SOP References Table

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	PRS-RAD-0506 Rev. 0, *Radiological Instrumentation Guide*	RADCON	All radiological field instruments	N	N/A
2	PRS-RAD-1336 Rev. 0, *Operability Tests–Field Instruments*	RADCON	All radiological field instruments	N	N/A
3	PRS-RAD-1310 Rev. 0, *Calibration of Genie-2000 Based HPGE Gamma Spectroscopy System*	RADCON	ISOCS	N	N/A
4	PRS-RAD-1311 Rev. 0, *Operation of Genie-2000 Based HPGE Gamma Spectroscopy System*	RADCON	ISOCS	N	N/A
5	PRS-ENM-2708 Rev. 0, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*	ER/EM	Samples	N	N/A
6	PRS-ENM-2300 Rev. 0, *Collection of Soil Samples*	ER/EM	Sampling instruments	N	N/A
7	PRS-ENM-2702 Rev. 0, *Decontamination of Sampling Equipment*	ER/EM	Sampling instruments	N	N/A
8	PRS-ENM-2704 Rev. 0, Trip, Equipment and Field Blank Preparation	ER/EM	Samples	N	N/A
9	PRS-ENM-5004 Rev. 0, Sample Tracking, Lab Coordination, & Sample Handling Guidance	ER/EM	Samples	N	N/A

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 instrumentation	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 instrumentation	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 instrumentation	1, 2
Canberra Inspector Gamma Spectrometer	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 instrumentation	1, 2, 3, 4

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 instrumentation	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

UFP-QAPP Manual Section 3.2.1:

Reference Number	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
6010	Inductively Coupled Plasma-Atomic Emission Spectrometry	Definitive	Metals	ICP	TBD	TBD
6020	Inductively Coupled Plasma-Mass Spectrometry	Definitive	Metals	ICP-MS	TBD	TBD
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	Definitive	PCBs	GC	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

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

QAPP Worksheet #24
Analytical Instrument Calibration Table

UFP-QAPP Manual Section 3.2.2:

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
* See below.						

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
* 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. Laboratory contracting will be subsequent to the completion of the RAWP. Field survey/sampling instrumentation will be calibrated according to manufacturer's instructions.

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

UFP-QAPP Manual Section 3.2.3:

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
*See below								

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
* 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. Laboratory contracting will be subsequent to the completion of the RAWP. Field survey/sampling instrumentation will be maintained, tested, and inspected according to manufacturer's instructions.

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
Sample Custody and Storage (Personnel/Organization):	Sample Management/Contracted Laboratory
Sample Preparation (Personnel/Organization):	Analysts/Contracted Laboratory
Sample Determinative Analysis (Personnel/Organization):	Analysts/Contracted Laboratory
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection):	See Worksheet #17
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	See Worksheet #17
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

QAPP Worksheet #27
Sample Custody Requirements

UFP-QAPP Manual Section 3.3.3:

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 the Data Management Implementation 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.*

QAPP Worksheet #28
QC Samples Table

UFP-QAPP Manual Section 3.4:

Matrix	Soil/water
Analytical Group	SMO
Concentration Level	TBD
Sampling SOP	See #21
Analytical Method/ SOP Reference	EPA methods
Sampler's Name	TBD
Field Sampling Organization	DOE/PRS
Analytical Organization	SMO
No. of Sample Locations	See RAWP 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 PRS-ENM-5003 Rev. 0, Quality Assured Data Procedure
Field Blanks	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PRS-ENM-5003 Rev. 0, Quality Assured Data Procedure
Trip Blanks	Minimum 5%	N/A	N/A	/NA	Accuracy/Bias (Contamination)	See PRS-ENM-5003 Rev. 0, Quality Assured Data Procedure
Equipment Rinseates	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PRS-ENM-5003 Rev. 0, Quality Assured Data Procedure

QAPP Worksheet #29
Project Documents and Records Table

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 & associated data packages	OREIS database & associated data packages	Data Assessment Packages	N/A

QAPP Worksheet #30
Analytical Services Table

UFP-QAPP Manual Section 3.5.2.3:

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	8082	28-day	TBD	TBD
Soil	Metals	low	See Worksheet #18	6010	28-day	TBD	TBD
Soil	Metals	low	See Worksheet #18	6020	28-day	TBD	TBD
Soil	Rads	low	See Worksheet #18	Alpha Spec*	28-day	TBD	TBD
Soil	Rads	low	See Worksheet #18	Gamma Spec*	28-day	TBD	TBD
Soil	Rads	low	See Worksheet #18	Liquid Scintillation*	28-day	TBD	TBD

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

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	TBD	Internal	Prime Contractor QA	QA Specialists, Contractor	Project Manager, Contractor	Project Management/QA Specialist, Contractor	QA Specialist, Contractor
Laboratory Audit	Annual	External	DOE Consolidated Audit Program (DOECAP)	Laboratory Assessor	Laboratory	Laboratory	DOECAP
Management Assessments	TBD	Internal	Prime Contractor Project Management	Project Management, Contractor	Project Management, Contractor	Project Management/QA Specialist, Contractor	QA Specialist, Contractor
Management By Walking Around (MBWA)	TBD	Internal	Prime Contractor Project Management	Project Management, Contractor	Project Management, Contractor	Project Management/QA Specialist, Contractor	QA Specialist, Contractor
MBWA Follow-up surveillances	Quarterly	Internal	Prime Contractor Project Management	EREM Director, Project Management or designee, Contractor	Project Management/Designee, Contractor	Project Management/QA Specialist, Contractor	QA Specialist, Contractor

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses

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-F-004, *Management/ Independent Assessment Report,* and QAP-F-0710, *Issue Identification Form*	Project Management, Issue Owner, Contractor	Upon issuance of Form QAP-F-004, *Management/ Independent Assessment Report,* form F-QAP-0710, *Issue Identification Form* will be completed and attached to the assessment report.	F-QAP-0710, *Issue Identification Form* documents the issue response and/or corrective actions.	Action owner as designated by issue owner, Contractor	Fifteen days for initial issue response, corrective action schedule determined by issue owner, as per PRS-QAP-1210

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)
Performance Summary Report	Monthly	By the 12th of each month	ER PM, Contractor	Management, Contractor

QAPP Worksheet #34
Verification (Step I) Process Table

UFP-QAPP Manual Section 5.2.1:

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

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

UFP-QAPP Manual Section 5.2.2:

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Data Deliverables, Analytes, and Holding Times	The documentation from the contractual screening 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

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

UFP-QAPP Manual Section 5.2.2:

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa/IIb	Soil/Sediment	Metals	Low	DOE prime contractor procedure PRS-ENM-5107, *Inorganic Data Verification and Validation*	TBD
IIa/IIb	Soil/Sediment	Radionuclides	Low	DOE prime contractor procedure PRS-ENM-5102, *Radiochemical Data Verification and Validation*	TBD
IIa/IIb	Soil/Sediment	PCBs	Low	DOE prime contractor procedure PRS-ENM-5103, *Polychlorinated Dibenzodioxins/Polychlorinated Dibenzofurans Data Verification and Validation*	TBD

QAPP Worksheet #37
Usability Assessment

UFP-QAPP Manual Section 5.2.3:

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 data quality objectives 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 also will include documentation of QC exceedances, trends, and/or bias in the data set. Data assessment will 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.

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APPENDIX F

SAMPLING AND ANALYSIS PLAN

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CONTENTS

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FIGURES

TABLES

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ACRONYMS

COC	contaminant of concern
CFR	*Code of Federal Regulations*
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	data quality objective
EE/CA	Engineering Evaluation and Cost Analysis
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
EU	exposure unit
FSP	field sampling plan
FTM	field team manager
HI	hazard index
HPGe	High Purity Germanium
NSDD	North-South Diversion Ditch
OREIS	Oak Ridge Environmental Information System
PCB	polychlorinated biphenyl
PEMS	Project Environmental Measurements System
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QC	quality control
RAWP	Removal Action Work Plan
RTL	ready-to-load
RU	remediation unit
SU	survey unit
SWOU	Surface Water Operable Unit
XRF	x-ray fluoroscopy

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F.1. INTRODUCTION

The Removal Action Work Plan (RAWP) for Contaminated Sediment Associated with the Surface Water Operable Unit (SWOU) (On-Site) addresses the potential threat to human health and the environment from direct contact with contaminated soil and sediments located within Paducah Gaseous Diffusion Plant (PGDP) Outfalls 001, 008, 010, 011, and 015, and their associated internal ditches and within the North-South Diversion Ditch (NSDD) Sections 3, 4, and 5. As described by the Action Memorandum (DOE 2008a), this threat from contact is addressed by performing excavation of the SWOU "hot spots" to a depth of 2 ft. The RAWP also includes provisions for exclusion fencing and hazard postings, post-excavation sampling, restoring the excavated area with clean clay and soil, and managing and properly disposing of removed waste.

The purpose of this appendix is to present the sampling plan for the support survey and the post-excavation sampling of soil and sediment for the SWOU "hot spots" to demonstrate attainment of cleanup levels for the SWOU (On-Site). [Note that the removal action support survey and post-excavation sampling approach to prove the cleanup criteria are met is based upon methods found in the *Sampling Plan for the Remedial Action for Section 1 and 2 of the North-South Diversion Ditch to Address Near Surface Soil Contamination at the Paducah Gaseous Diffusion Plant Paducah, Kentucky* (BJC 2003) and the Real Time Technology Application Demonstration Project (Volpe, Hampson, and Johnson 2008).]

The remainder of this section discusses the scope and objectives of the sampling plan. The other sections that comprise the sampling plan address the following topics:

Section F.2: Data Quality Objectives. This section provides the data quality objectives (DQOs) for the sampling and decision rules for the excavation.

Section F.3: Field Sampling Plan. This section details the field sampling strategy and design for the removal action support survey and post-excavation sampling.

Section F.4: Sampling Procedures. This section presents a summary of some of the field procedures for the sampling activities for both screening and definitive sampling. Additional details concerning these procedures and procedures for decontamination, waste management, data management, and heath and safety are presented in the RAWP.

Section F.5: Documentation. This section presents a summary of some of the documentation required for the sampling activities.

Section F.6: Sample Location Survey. This section presents the requirements for the sample location survey.

Section F.7: References

F.1.1 PROJECT SCOPE AND APPROACH

This sampling plan will detail the sampling approach for the attainment of cleanup levels selected for the SWOU "hot spots" (see Table F.1). According to the Risk Assessment in Appendix E of the Engineering Evaluation/Cost Analysis (EE/CA) (DOE 2008b), no COCs had a concentration that exceeded either the 25 mrem/yr-based cleanup level or a lower 15 mrem/yr-based value for any of the outfalls, while several

chemicals exceeded the 1E-04, 1E-05, and 1E-06 risk-based benchmarks. Section 5 of the EE/CA states "Consistent with the results of the risk-based cost-benefit analysis (Appendix F of the EE/CA), verification of cleanup to the cumulative ELCR of 1E-05 following excavation will be based upon comparisons between sampling results and chemical-specific ELCR-based cleanup levels. The ELCR target used in deriving the cleanup levels will be 5E-06." Appendix F of the EE/CA presents the risk-based cost-benefit analysis used to select the cumulative excess lifetime cancer risk (ELCR) and hazard cleanup level targets for the SWOU (On-Site) EE/CA and details how different risk targets are related to the size of the area that might be excavated under the recommended alternative and the cost of excavation.

As discussed in the EE/CA, the cleanup of the SWOU "hot spots" consists of excavation of contaminated soils and sediments along the on-site ditches and NSDD Sections 3 and 5 to achieve cleanup levels. This sampling plan addresses any excavation of potentially contaminated soil in either Phase I or II. As a part of any excavation of potentially contaminated soil, decisions will be made to support the excavation activities, and verify whether cleanup levels have been achieved.

Table F.1. Selected Cleanup Levels for COCs for Contaminated Soil Associated with the SWOU (On-Site)

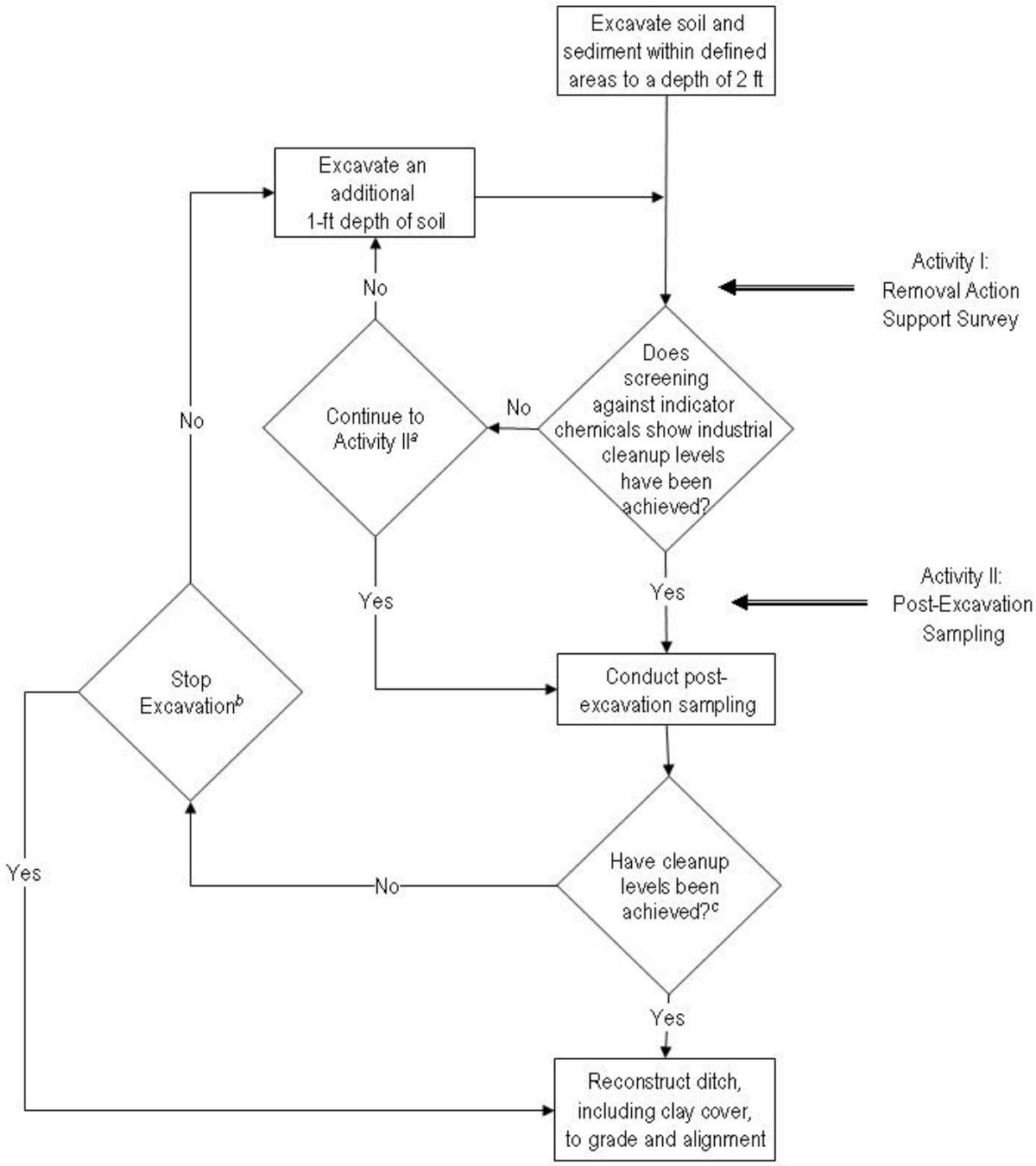
ELCR-driven COCs		
Arsenic	27.4	mg/kg
Beryllium	50,000	mg/kg
Total PCB	16	mg/kg
Americium-241	115	pCi/g
Cesium-137	8	pCi/g
Neptunium-237	22	pCi/g
Plutonium-239/240	108	pCi/g
Technetium-99	3,825	pCi/g
Thorium-230	147	pCi/g
Thorium-232	129	pCi/g
Uranium-234	188	pCi/g
Uranium-235	30	pCi/g
Uranium-238	94	pCi/g
HI-driven COC		
Uranium	227	mg/kg

COC = contaminant of concern
ELCR = excess lifetime cancer risk
HI = hazard index
PCB = Polychlorinated Biphenyl

The information required to support these decisions will be collected in the following two distinct sampling activities (Figure F.1).

The first activity is a removal action support survey that will be completed using screening level analysis, including field detectors and analytical kits. This activity will support the excavation activities and will provide data to verify that action levels have been achieved for indicator chemicals. Additionally, these data will provide data that can be used to update planning for the post-excavation sampling.

The second sampling activity consists of the post-excavation sampling. Results from this activity will confirm that the cleanup levels for all contaminants of concern (COCs) have been achieved.



[a]During Activity I, the decision to continue to Activity 2 will be made by the Prime Contractor Task Lead in consultation with the DOE Project Manager.
[b]During Activity II, the decision to stop excavation will be made by the Prime Contractor Task Lead in consulation with the DOE Project Manager who will confer with the regulatory agencies.
[c]Please see Section F.2 for a discussion of these comparisons.

Figure F.1. Removal Action Support Survey and Post-Excavation Sampling

F.1.2 PROJECT OBJECTIVES

The project objectives are consistent with those established in the SWOU (On-Site) decision documents (DOE 2008a, 2008b, and 2008c). The goal of this sampling plan is to provide a framework that will yield data in a form that can support the removal action of soil and sediment excavation within the identified hot spots of the SWOU (On-Site) and the subsequent post-decision analysis, presented in the Removal Action Completion Report, that will verify that cleanup levels were attained. The objectives of this sampling plan are to provide the following data:

- Support survey data to be used during excavation to determine if cleanup levels for selected indicator chemicals (See Section F.2.1) have been achieved. These indicator chemicals were selected after an assessment for co-contamination. This assessment is presented in Attachment F1.

- Post-excavation sampling data to verify that the cleanup levels for all COCs have been achieved.

F.2. DATA QUALITY OBJECTIVES

The U.S. Environmental Protection Agency (EPA) DQOs (EPA 2000) are qualitative and quantitative statements, which are established prior to data collection and specify the quality of the data required to support decisions during response activities. The DQOs for a particular site might vary according to the end use of the data (i.e., whether the data are collected to support preliminary assessments/site inspections, remedial investigations/feasibility studies, remedial designs, or removal/remedial actions).

The data requirements for this sampling plan include the collection of both support-survey field measurements and verification sampling fixed-laboratory results to support the removal action of soil and sediment excavation. The data will be collected in such a manner to support the following decision rules.

F.2.1 DECISION RULES

F.2.1.1 Removal Action Support Survey–Activity I

- If the concentration of any indicator chemical detected during a walkover survey or of a grab sample collected from a location near the center of a survey unit (SU) is greater than the action level (see Table F.2), then excavate an additional 1 ft of soil from the SU. Survey units will be placed so that four approximately equal-area units are located within a 1,225 ft^2 RU. Additional excavation will be performed at direction of the DOE Prime Contractor Task Lead after consultation with the DOE Project Manager. Table F.3 shows the relationship between different types of units.[1]

[1] If an unexpected deviation to the site conceptual model is identified, such as contamination extending to greater depths than anticipated, then the project may continue to Activity 2 sampling. The deviation in the site conceptual model and the results of the Activity 2 sampling will be used in decision making, in consultation with the regulatory agencies, as discussed in Section F.2.1.2.

Table F.2. Indicator Chemicals and Action Levels[a]

On-Site Ditches		
Total PCB	10	mg/kg
Cesium-137	5	pCi/g
Uranium-238	65	pCi/g
Uranium	150	mg/kg
NSDD		
Total PCB	10	mg/kg
Thorium-230	100	pCi/g
Uranium	150	mg/kg

PCB = polychlorinated biphenyl
[a] Action Levels are roughly equivalent to two-thirds of the cleanup levels listed in Table G.1.

- If all the indicator concentrations in the sample collected from an SU are less than or equal to the action level, then proceed to post-excavation sampling.

Table F.3. Unit Relationships

	EU	RU	SU
	~21780 ft^2	~1225 ft^2	~269 ft^2
	(0.5 Acres)	(~100 m^2)	(~25 m^2)
Activity I Samples		4 grab samples	1 grab sample

F.2.1.2 Post-Excavation Sampling–Activity II

- If the average concentration[2] of each COC analyzed in an area designated for cleanup is less than its cleanup level, then declare cleanup level attained.

- If the average concentration(s)[1] of contaminants analyzed in an area designated for cleanup is (or are) greater than the cleanup level(s), then evaluate results to determine if an additional 1 ft of soil should be excavated from the appropriate RU. [Additional excavation may be performed at direction of the Prime Contractor Task Lead after consulting with the U.S. Department of Energy (DOE) Project Manager who may consult with the regulatory agencies].

[2]The use of concentrations averaged over all samples collected to ascertain attainment of cleanup levels is consistent with agreements reached for implementation of the NSDD Sections 1 and 2 Remedial Action (BJC 2003). Additionally, the use of averages is consistent with guidance in Methods for Evaluating Attainment of Cleanup Standards, Volume 1: Soil and Solid Media (EPA 1989).

F.3. FIELD SAMPLING PLAN

The field sampling plan (FSP) details the sampling strategy and design that will be employed for the sampling plan investigation performed after excavation of the SWOU "hot spots." This FSP includes a general discussion of the project-specific sampling strategy and a description of the various sampling and analysis activities that will comprise the sampling plan. The FSP does not include discussion of surveys done for Health and Safety purposes prior to excavation. This information is in the RAWP.

F.3.1 FIELD SAMPLING STRATEGY AND DESIGN

The cleanup levels for SWOU were established in the EE/CA and are based on an industrial worker scenario. As discussed in "Co-Contamination Study for the Removal of Contaminated Soil and Sediment Associated with the Surface Water Operable Unit (On-Site)" (see Attachment F1), there are 3 inorganic, 1 organic, and 10 radiological COCs driving the action in the contaminated soil and sediment of the SWOU.

Surrogate COCs (i.e., indicator chemicals) will be used during the removal action support surveys. This decision is supported by "Co-Contamination Study for the Removal of Contaminated Soil and Sediment Associated with the Surface Water Operable Unit (On-Site)" (see Attachment F1). This document indicates that the surrogate use of the chemicals and action levels listed in Table F.2 during removal action support surveys will yield an acceptably low-level of failure during the final status surveys to be performed. (Failure is defined as the chance that post-excavation samples will contain COCs at concentrations that exceed cleanup levels.)

The field sampling strategy was developed to support the project in two parts: the removal action support survey (Activity 1) and the post excavation sampling (Activity II). The SWOU (On-Site) was initially divided into many exposure units (EUs), which were approximately 0.5 acres each (0.5 acres is the EU size used for the industrial worker in DOE 2001). Of the initial EUs, cleanup areas were defined for areas within the EUs requiring excavation. The cleanup areas within the EUs are further divided into RUs. Finally, the RUs each are divided into four SUs. Each SU is approximately 25 m^2 (269 ft^2). Initial sampling and decisions for additional excavation will be performed for the SU. RUs define the areas at which removal decisions will be made during the final removal action process (Figures F.21 and F.3).

The removal action support survey (Activity I) will be performed following the excavation of soil from SWOU (On-Site). After the planned excavation of soil is performed for each RU and the RU is subdivided into SUs, measurements of indicator chemicals will be performed to determine if action levels have been achieved or if further excavation of soil is necessary. During this portion of the project, uranium-238 (^{238}U), cesium-137 (^{137}Cs), uranium (metal), and total polychlorinated biphenyls (PCBs) for the on-site ditches and thorium-230 (^{230}Th), uranium (metal), and total PCBs for the NSDD will be used as indicator chemicals for measurement purposes (action levels are listed in Table F.2). This is proposed because it is anticipated that the removal of these COCs to below the action levels—"Co-Contamination Study for the Removal of Contaminated Soil and Sediment Associated with the Surface Water Operable Unit (On-Site)" (Attachment F1)—will ensure the attainment of cleanup levels for all other COCs pending the results of the final status survey/post excavation sampling. If the removal action support survey results for any of the COCs for an SU fails the Decision Rules (see Section F.2.1), then additional excavation of soil might be performed for the "hot spot" portion of that SU at the direction of the DOE Prime Contractor Task Lead after consultation with the DOE Project Manager, followed by another removal action support survey.

The post-excavation sampling will be performed for each cleanup area after the support survey is completed. During this activity, each RU will be sampled and analyzed for all COCs using fixed-base laboratory methods capable of measuring the COCs at detection limits below the respective cleanup levels.

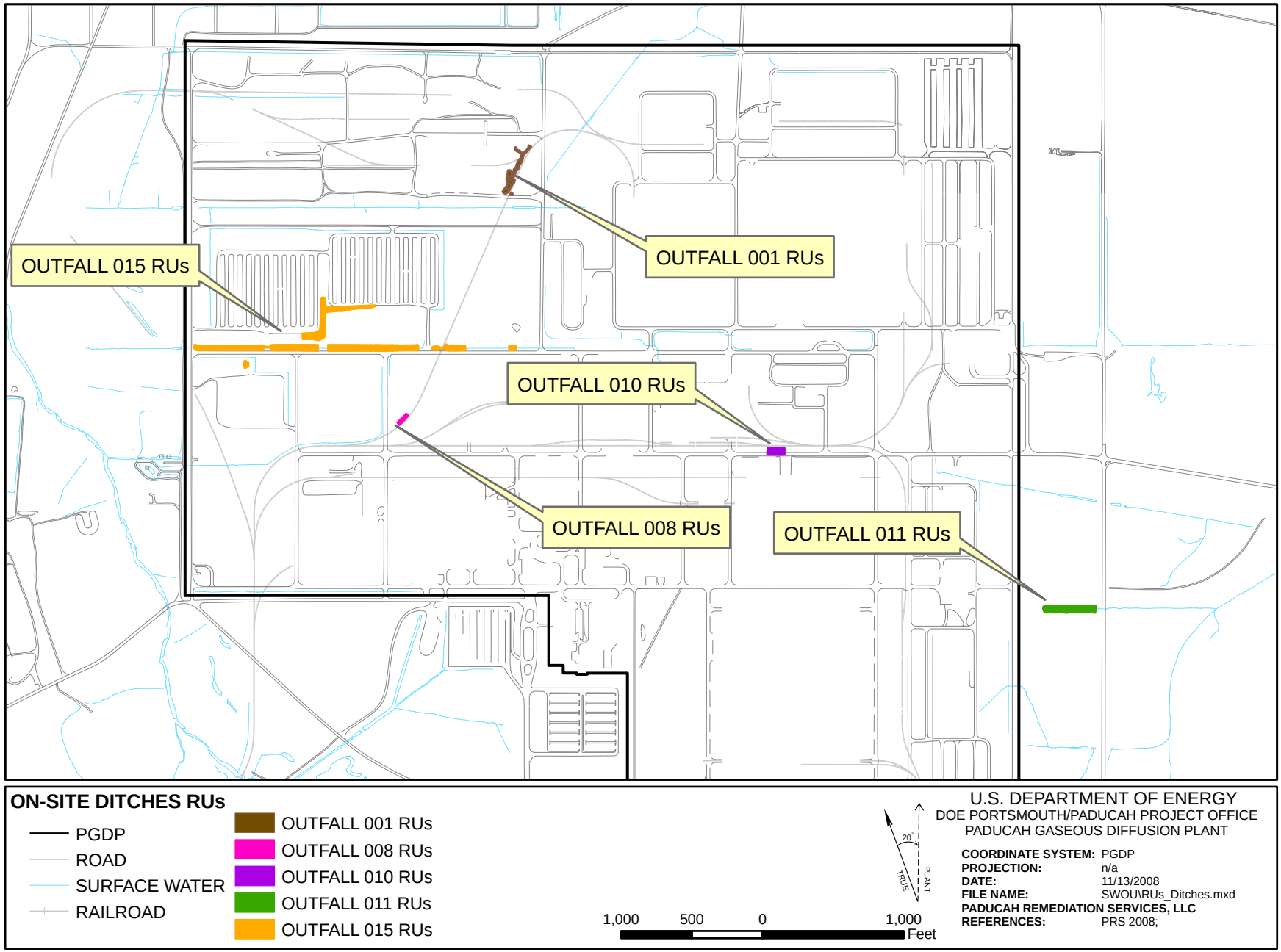


Figure F.2. Location of RUs for On-Site Ditches

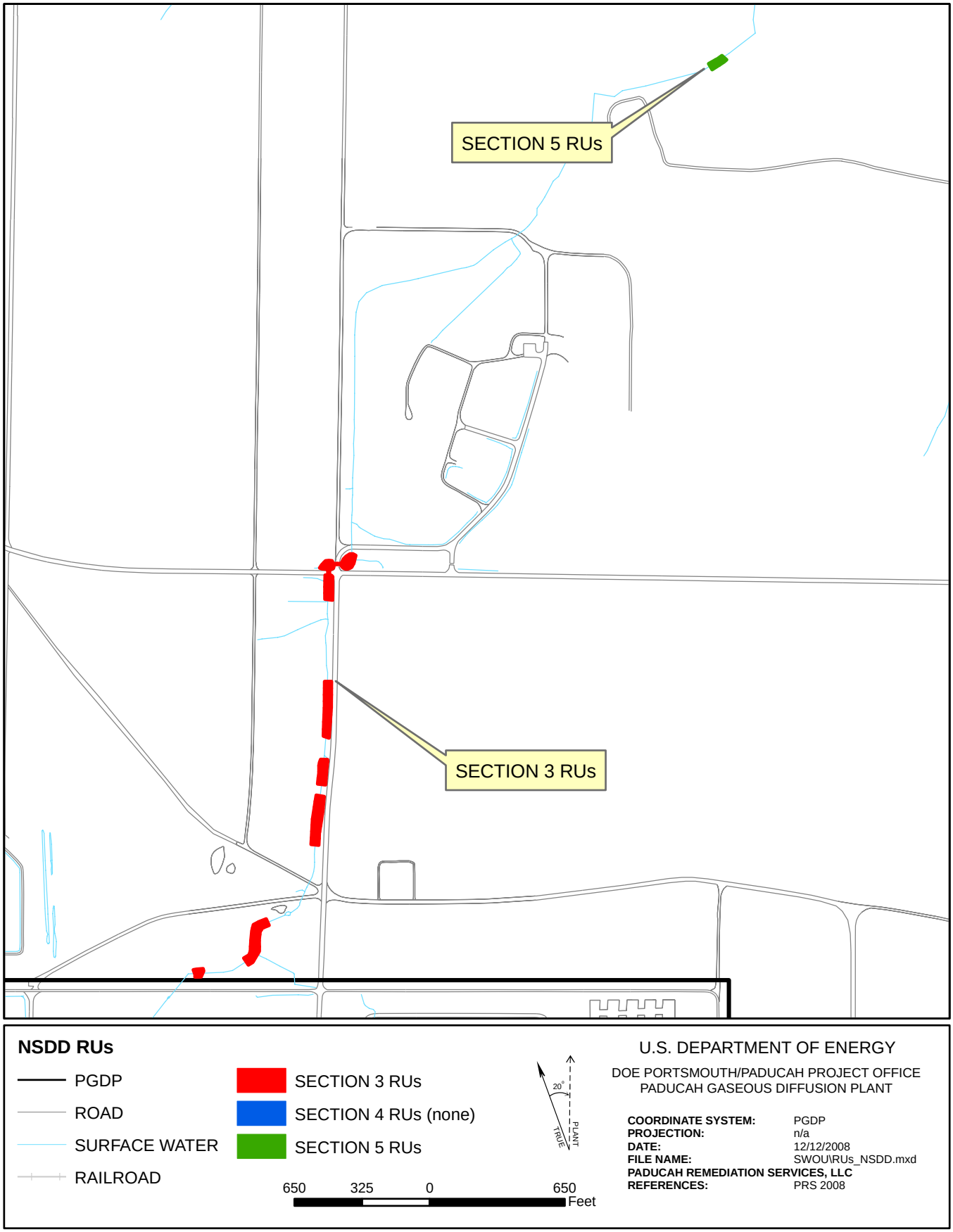


Figure F.3. Location of RUs for NSDD Sections 3, 4, and 5

F.3.1.1 Removal Action Support Survey–Activity I

As previously mentioned, it was determined that ^{238}U, ^{137}Cs, uranium (metal), and total PCBs for the on-site ditches and ^{230}Th, uranium (metal), and total PCBs for the NSDD would be used as indicator chemicals for all other COCs for the response support phase of the project ["Co-Contamination Study for the Removal of Contaminated Soil and Sediment Associated with the Surface Water Operable Unit (On-Site)]. (See Attachment F1.) During this activity, the goal is to reduce the average concentrations of indicator chemicals within RUs to levels equal to or less than the action levels. The on-site ditches requiring cleanup are composed of areas from 11 EUs (Outfall 001, EU 15 and Outfall 015, EU 04 each contained two separated areas for excavation, so the separated areas will be considered separate cleanup areas). Each cleanup area having between 1 and 22 RUs. The NSDD Sections 3 and 5 contains 7 separate areas for cleanup within 4 EUs, each area having between 1 and 9 RUs. There is a total of 137 RUs (Table F.4), which are shown individually on Figures F.4 through F.11. Each RU is approximately 1,225 ft^2. [The size of the RU is consistent with that selected for the NSDD Sections 1 and 2 Remedial Action (BJC 2003) and is roughly equivalent to 100 m^2.]

Table F.4. RU Assignment to EUs for On-Site Ditches and Sections 3, 4, and 5 of the NSDD

Outfall	EU (from Site Investigation)	Cleanup Unit	RU[a]	Area Requiring Cleanup (ft^2)
001	15	Area 1	01	202.8
001	15	Area 2	02-10	10,691.4
008	11		01-02	1,742.5
010	10		01-04	5,308.5
011	01		01-14	16,333.0
015	02		01-22	26,520.1
015	03		01-20	23,892.9
015	04	Area 1	01-05	6,083.4
015	04	Area 2	06	1,472.4
015	07		01-18	21,097.8
015	08		01	1,067.2
TOTAL			**97**	**114,412.0**
NSDD Section	**EU (from Site Investigation)**	**Cleanup Unit**	**RU[a]**	**Area Requiring Cleanup (ft^2)**
Section 3	01	Area 1	01	1,490.3
Section 3	01	Area 2	02-09	9,196.7
Section 3	02	Area 1	01-08	9,395.6
Section 3	02	Area 2	09-12	4,471.2
Section 3	02	Area 3[b]	13-16	4,270.5
Section 3	03	Area 1[b]	01-04	4,144.4
Section 3	03	Area 2	05-13	10,269.6
Section 5	08		01-02	2,509.7
TOTAL			**40**	**45,748.0**
GRAND TOTAL			**137**	**160,160.0**

EU = exposure unit RU = remediation unit

[a] Each RU is an area of approximately 1,225 ft^2 , consistent with the NSDD Sections 1 and 2 Remedial Action. Some RUs may be more or less and 1,225 ft^2 in order to most efficiently characterize the area for cleanup.

[b] Section 3 EU 02 (area 3) and EU 03 (area 1) are contiguous and will be considered one unit for assessing cleanup.

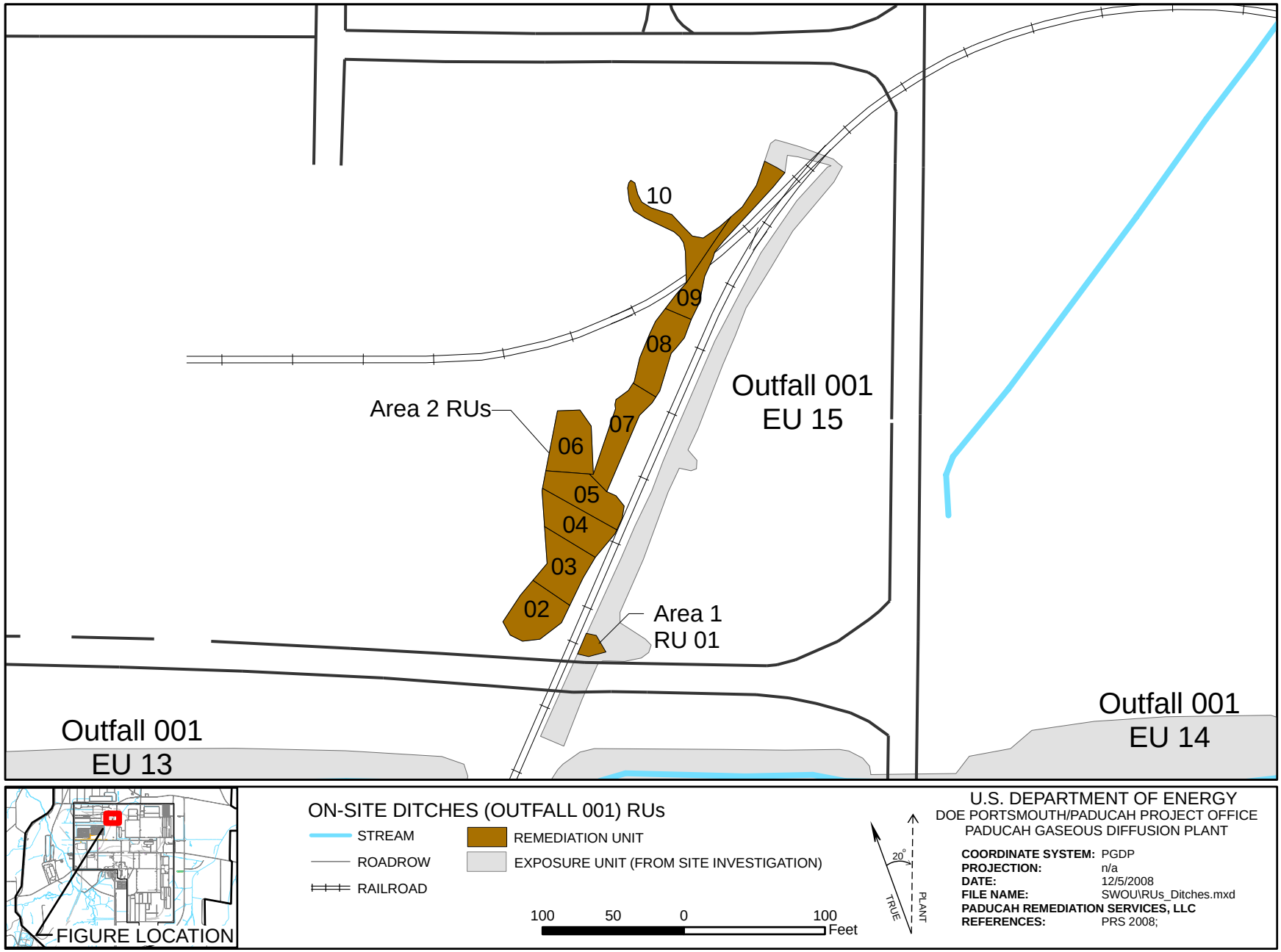


Figure F.4. Location of RUs for Outfall 001

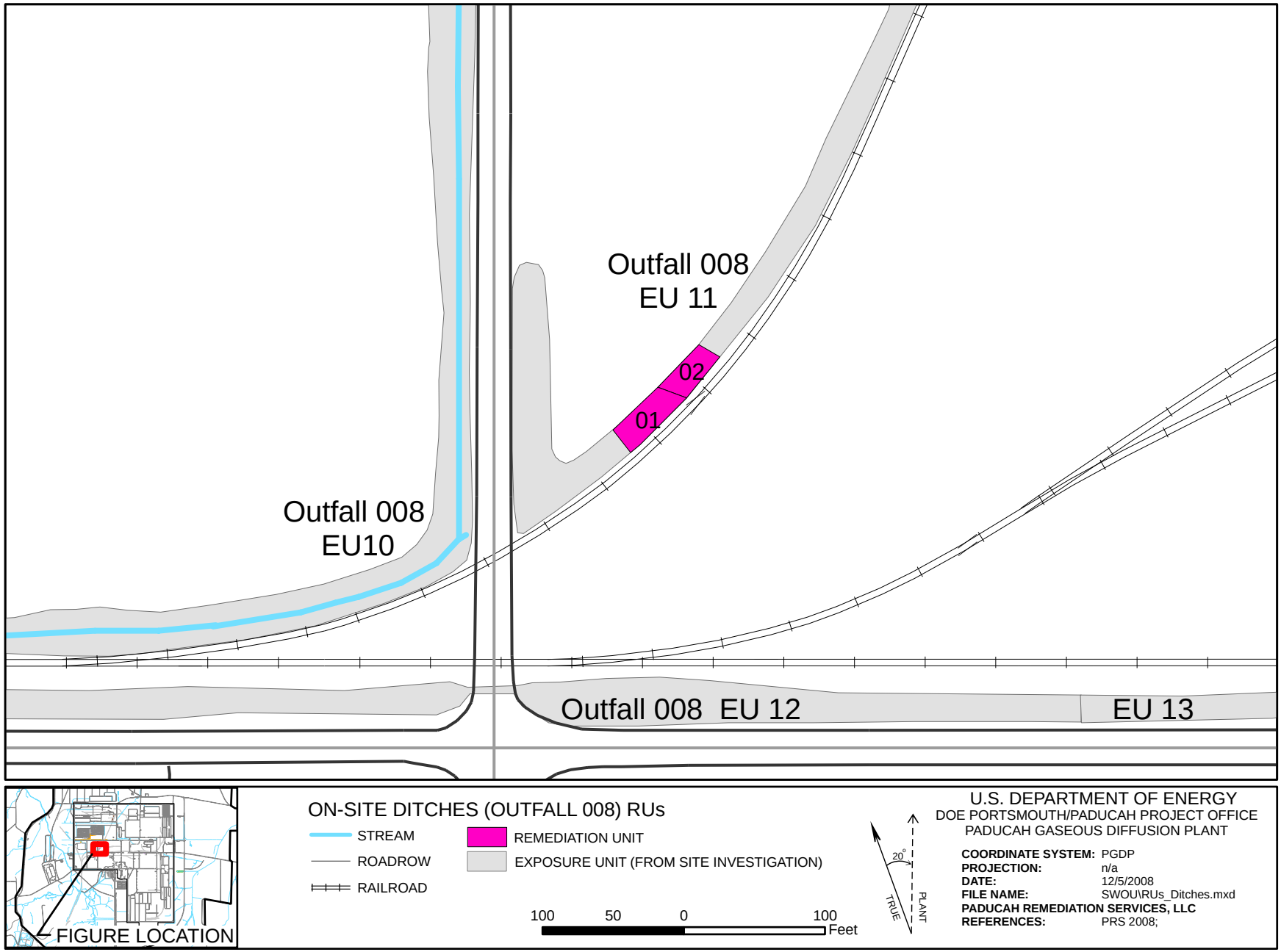


Figure F.5. Location of RUs for Outfall 008

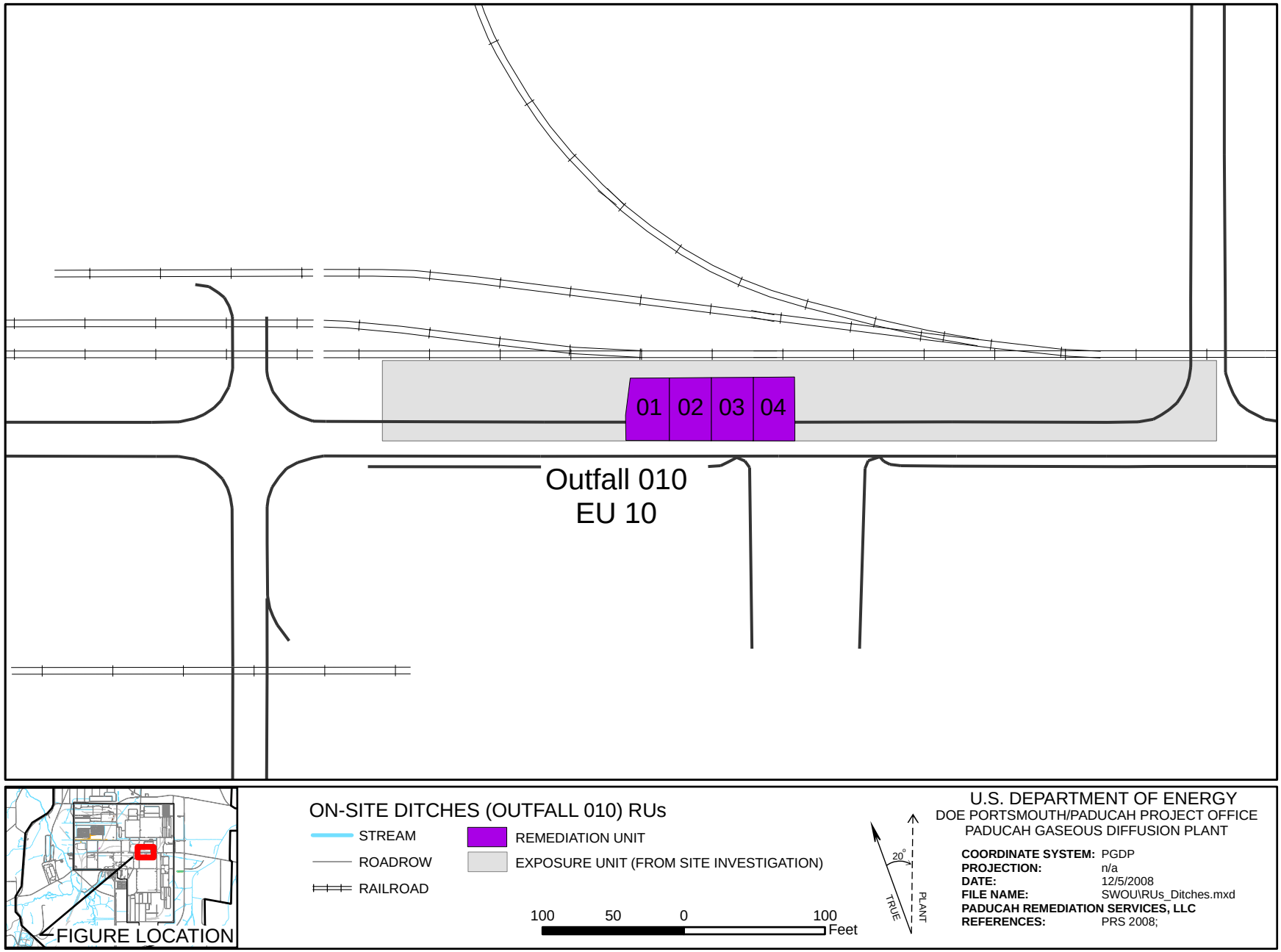


Figure F.6. Location of RUs for Outfall 010 EU 10

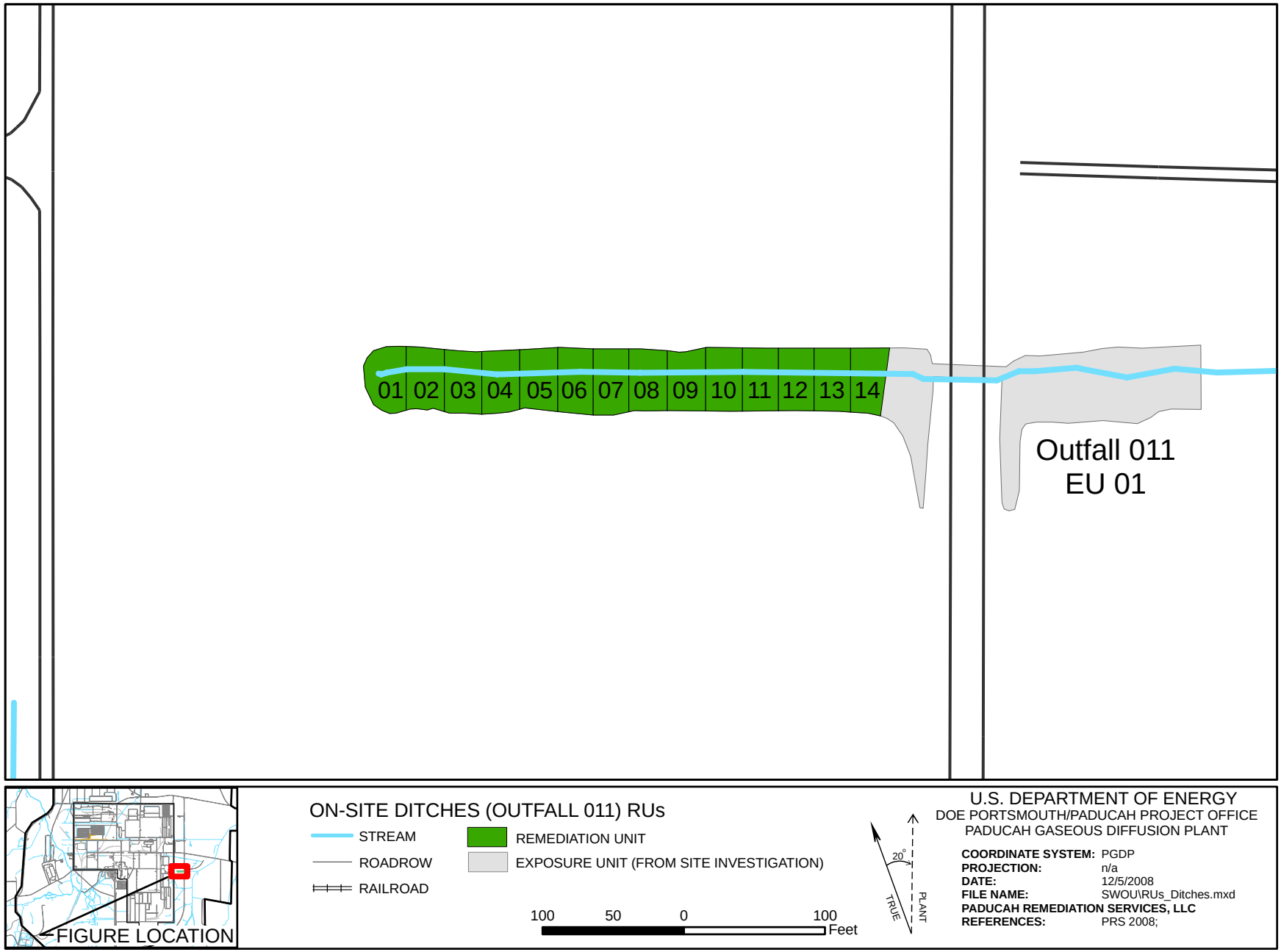


Figure F.7. Location of RUs for Outfall 011 EU 01

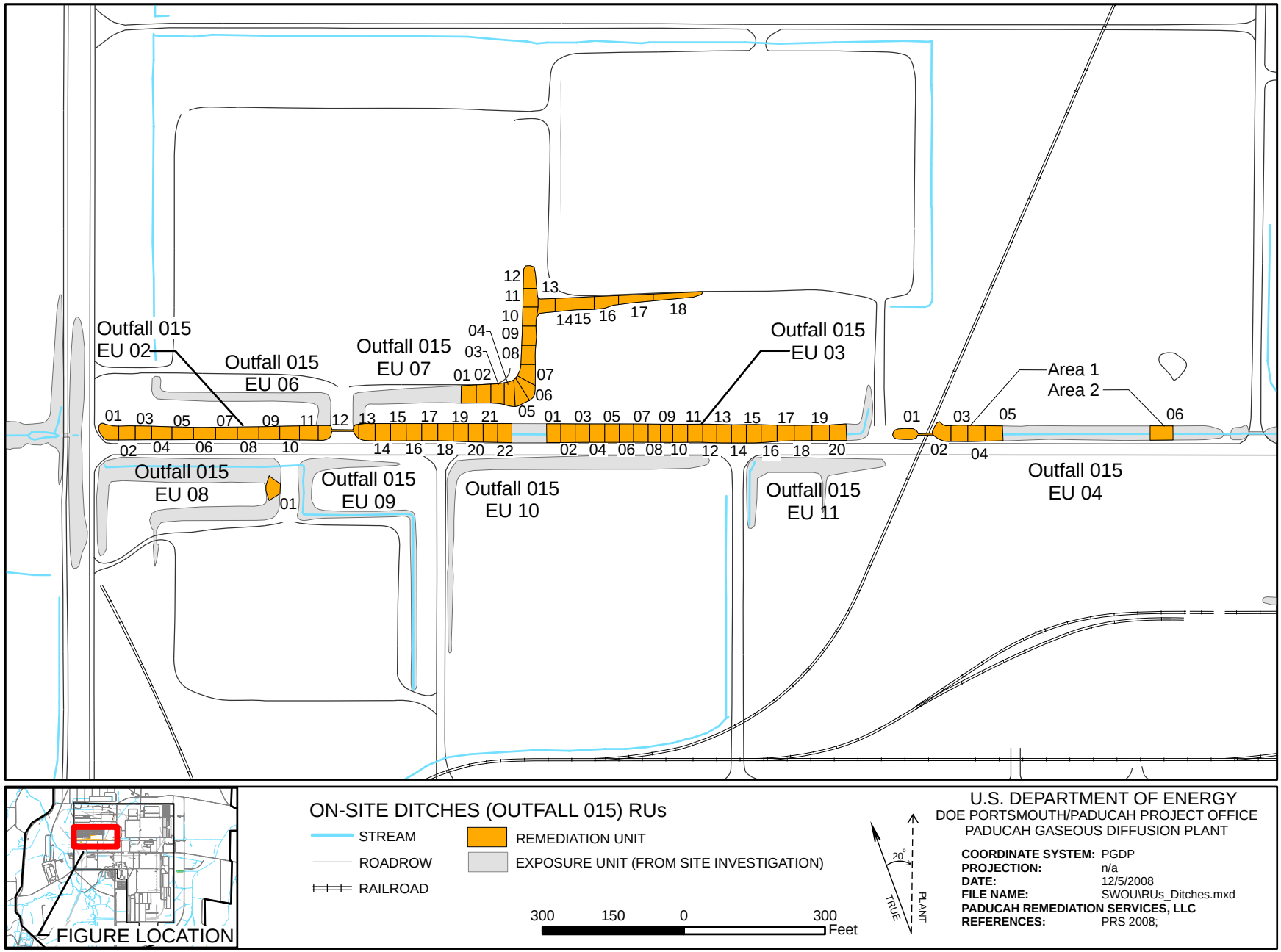


Figure F.8. Location of RUs for Outfall 015

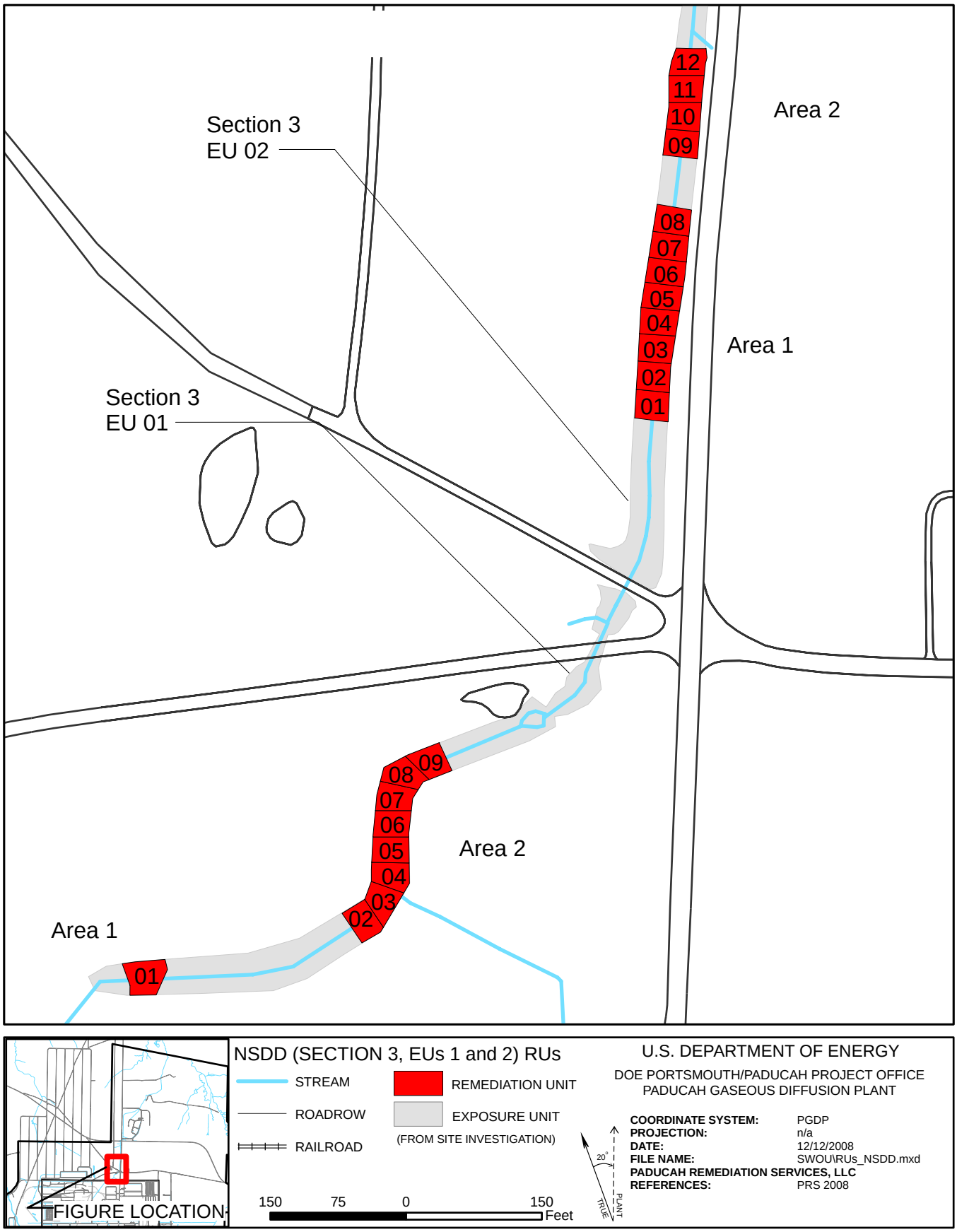


Figure F.9. Location of RUs for NSDD Section 3 EUs 1 and 2

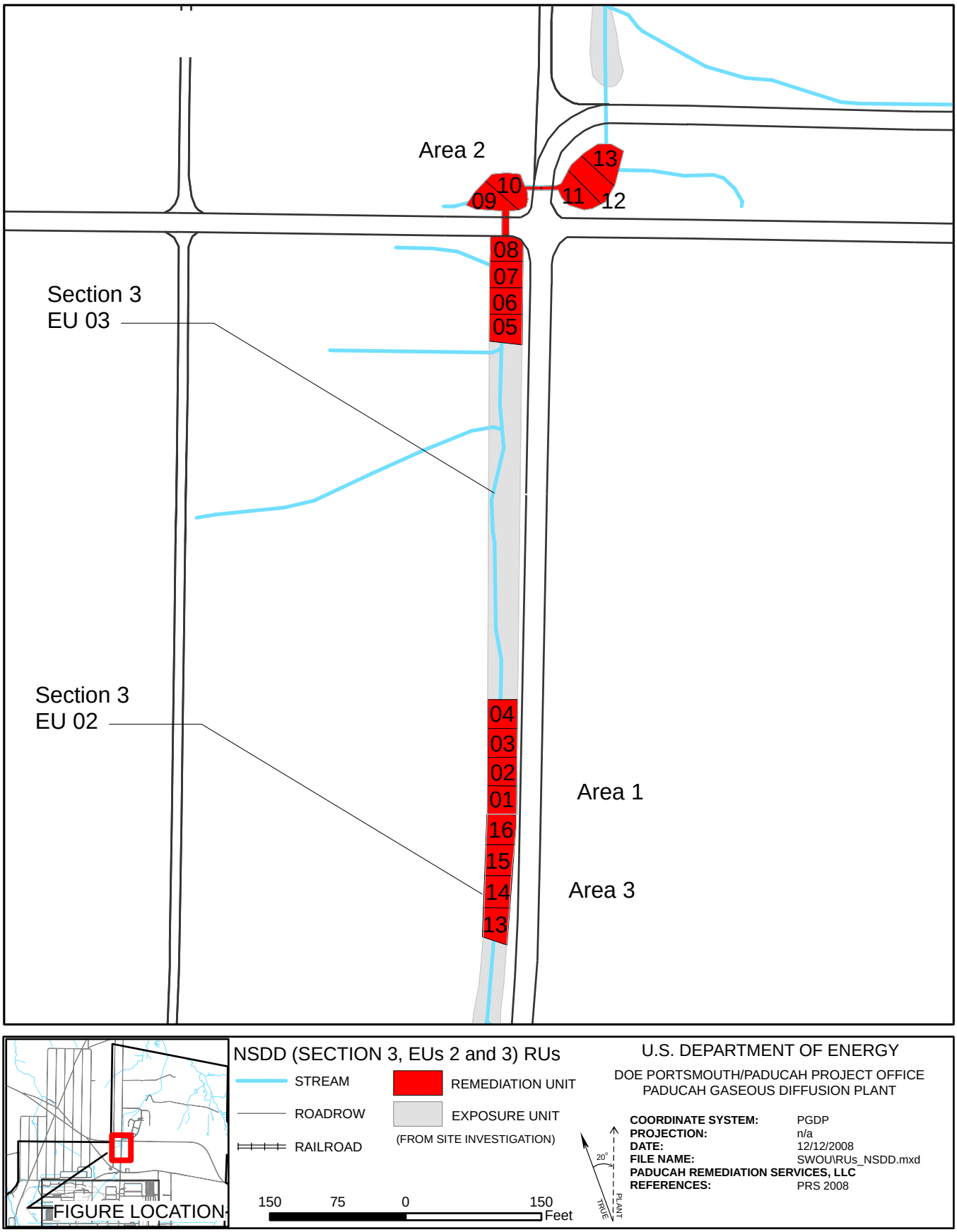


Figure F.10. Location of RUs for NSDD Section 3 EUs 2 and 3

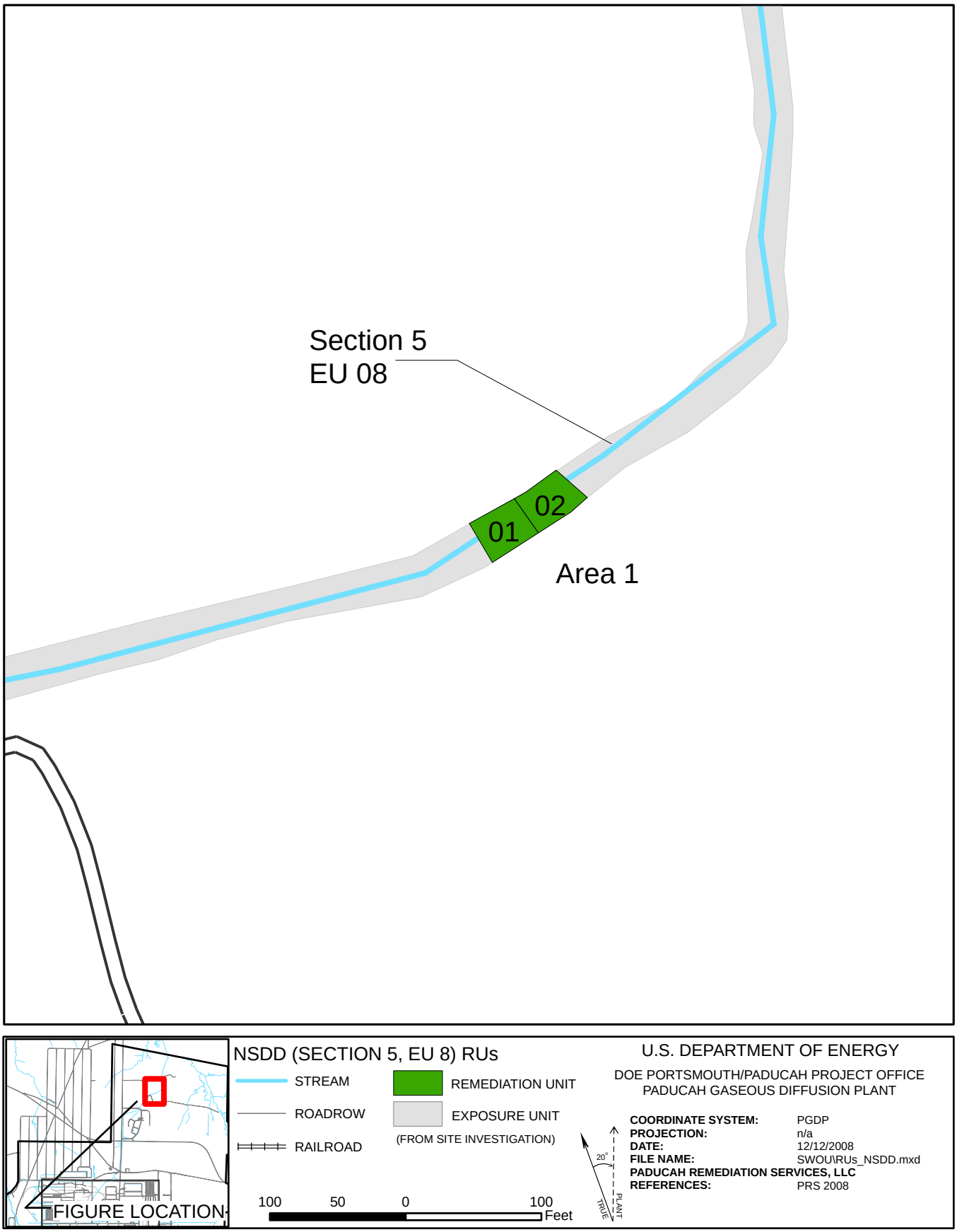


Figure F.11. Location of RUs for NSDD Section 5

After the initial excavation to a depth of 2 ft, a walkover survey will be performed over the excavated areas to determine if any "hot spots" of residual radioactivity remain prior to the start of the final status survey and sampling. Instrumentation or a combination of instrumentation capable of detecting a minimum of 65 pCi/g ^{238}U and 5 pCi/g ^{137}Cs during a walkover scan will be used for the on-site ditches. Any location found exceeding the 65-pCi/g ^{238}U or 5-pCi/g ^{137}Cs criteria will be marked for possible additional sampling and for potential additional removal. Excavation may cease at the discretion of the contractor and U. S. Department of Energy (DOE), even though the screening level has not been met, because of changed conditions such as site safety or other technical or non-technical factors. For the NSDD, instrumentation capable of detecting a minimum of 100 pCi/g ^{230}Th during a walkover scan will be used. Any location found exceeding the 100-pCi/g ^{230}Th criteria will be marked for possible additional sampling and for potential additional removal.

A recent demonstration project at PGDP utilized a High Purity Germanium (HPGe) detector to take *in situ* measurements of soil and achieved detection limits of 1.2 pCi/g ^{238}U and 0.02 pCi/g ^{137}Cs. This instrument is also capable of detecting ^{230}Th (Volpe, Hampson, and Johnson 2008).

As noted previously, additional excavation of marked areas will be determined by the DOE Prime Contractor in consultation with the DOE Project Manager. Issues to be considered in this consultation will be the current depth of the excavation, the estimated ^{238}U or ^{230}Th concentration present, and the possibility of a failure following Activity II post-excavation sampling.

Following the walkover survey, one grab sample will be collected from a location near the center of each SU and field-screened for uranium and total PCBs. Uranium analysis will be performed using x-ray fluoroscopy (XRF) capable of detecting the chemical to at least a level of 150 mg/kg. Total PCB will be analyzed using colormetric kits with a detection level of 10 mg/kg.

If the average concentrations over an RU (i.e., the arithmetic mean of the untransformed sampling results) exceed the action levels of any of the indicator chemicals (Table F.2), then the "hot spot" portions of the RUs may have an additional 1 ft of soil removed and resampled (Figure F.1). If any single sample exceeds the cleanup level, then the "hot spot" portion of the RU may have an additional 1 ft of soil removed and resampled. In either case, the additional excavation will be at the discretion of the DOE Prime Contractor Task Lead after consultation with the DOE Project Manager. During this consultation, the factors discussed previously will be considered. This process will be repeated as many times as necessary until the average concentrations are below the action levels or until a decision is made to discontinue excavation for the particular RU. (Note, however, that before deeper excavations are initiated, the DOE Prime Contractor Task Lead and the DOE Project Manager have to approve).

If after a total of 3 ft of soil is removed and the analytical results indicate that cleanup levels have not been met, then DOE will consult with regulators on a path forward.

If there are any problems with sample collection at a particular sample location, the sampling personnel should exercise judgment and perform a field modification to collect the sample near the location designated, if possible. If a field modification is performed, the actual location where the sample is collected should be communicated to DOE Prime Contractor Task Lead and documented in field logbooks. Additional soil samples might be collected based upon the results of the scanning radiological survey and analyzed for radiological constituents.

F.3.1.2 Post-Excavation Sampling–Activity II

Based upon results documented in the SWOU EE/CA, COCs driving cleanup for the on-site ditches and NSDD Sections 3 and 5 include 3 metals, 1 organic, and 10 radiological parameters. Sampling will be performed over the excavated areas to determine if the cleanup levels have been met.

Collection of a discrete surface soil sample is proposed from within each RU for each cleanup area. Sampling locations within each RU will be located in the approximate center of the RU as determined in the field. If there are any problems with sample collection at a particular sample location, the sampling personnel should exercise judgment and perform a field modification to collect the sample near the location designated, if possible. If a field modification is performed, the actual location where the sample is collected should be communicated to project personnel and documented in field logbooks. Additional soil samples might be collected (based upon the results of the scanning radiological survey) and analyzed for radiological constituents.

If analytical results indicate that the cleanup levels have been met, then work will stop. If analytical results indicate that cleanup levels have not been met, then DOE will consult with regulators on a path forward.

A total of 137 post-excavation samples (97 from the on-site ditches and 40 from the NSDD) will be collected for analysis confirming cleanup of the contaminated soil associated with the SWOU (On-Site). Analysis of these samples will be as specified in Table F.5. Sampling containers and hold times are located in Appendix E, Worksheet # 19.

Table F.5. Analyses and Reporting Limits for SWOU On-Site Post-Excavation Verification Soil Sampling

Reporting Limit (mg/kg)	**Metals SW-846, 6010/6020**		
0.5	Beryllium		
1	Arsenic	Uranium	
(mg/kg)	**TCL PCBs SW-846, 8082**		
0.1	Aroclor-1016 Aroclor-1221 Aroclor-1232	Aroclor-1242 Aroclor-1248	Aroclor-1254 Aroclor-1260 Total PCBs
(pCi/g)	**Radionuclides, Alpha Spec**		
3	Americium-241 Uranium-234	Neptunium-237	Thorium-232
4	Plutonium-239/240	Thorium-230	
2	Uranium-235	Uranium-238	
(pCi/g)	**Radionuclides, Gamma Spec**		
0.5	Cesium-137		
(pCi/g)	**Radionuclides, Liquid Scintillation**		
8	Technetium-99		

F.4. SAMPLING PROCEDURES

Fieldwork and sampling at PGDP will be conducted in accordance with DOE Prime Contractor-approved medium-specific work instructions or procedures consistent with *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual* (EPA 2001). DOE or its Prime Contractor will approve any deviations from these work instructions and procedures. The DOE Prime Contractor will document changes on Field Change Request forms as detailed in the Quality Assurance Project Plan.

Table F.6 provides an example list of investigation activities that may require work instructions or procedures.

Table F.6. Example Fieldwork and Sampling Activities Requiring Work Instructions or Procedures

Investigation Activity
Field Logbooks
Labeling, Packaging, and Shipping of Environmental Field Samples
Collection of Soil Samples
Decontamination of Sampling Equipment and Devices
Trip, Equipment, and Field Blank Preparation
Chain of Custody Protocol for Environmental Sampling
Sampling of Containerized Wastes
Opening Containerized Waste
On-Site Handling and Disposal of Waste Materials
Identification and Management of Waste Not from a Radioactive Material Management Area
Records Management, Including Document Control
Quality Assured Data
Data Management Coordination
Sample Tracking, Laboratory Coordination, and Sample Handling Guidance
Equipment Decontamination
Off-Site Decontamination Pad Operating Procedures
Environmental Radiological Screening
Archival of Environmental Data within the ER Program
Data Entry
Data Validation
Field Portable X-Ray Fluorescence Spectrometry for the Determination of Elemental Concentrations in Soil and Sediment
PCB Immunoassay Method
Operation and Calibration of HPGe Gamma Spectroscopy System

F.5. DOCUMENTATION

Field documentation will be maintained throughout the SWOU Removal Action in various types of documents and formats, including the field logbooks, sample labels, sample tags, chain-of-custody forms, and field data sheets. The following general guidelines for maintaining field documentation will be implemented. Additional information is contained in the "Data Management Implementation Plan." Documentation requirements are listed below. Entries will be written clearly and legibly using indelible ink.

- Corrections will be made by striking through the error with a single line that does not obliterate the original entry. Corrections will be dated and initialed.

- Dates and times will be recorded using the format "mm/dd/yy" for the date and the military (i.e., 24-hour) clock for the time.

- Zeroes will be recorded with a slash (/) to distinguish them from letter Os.

- Blank lines are prohibited. Information should be recorded on each line or a blank line should be lined out, initialed, and dated.

- No documents will be altered, destroyed, or discarded, even if they are illegible or contain inaccuracies that require correction.

- Information blocks on field data forms will be completed or a line will be drawn through the unused section, and the area will be dated and initialed.

- Unused logbook pages will be marked with a diagonal line drawn from corner to corner and a signature and date must be placed on the line.

- Security of logbooks will be maintained by storing them in a secured (e.g., locked) area when not in use.

- Photocopies of logbooks, field data sheets, and chain-of-custody forms will be made weekly and stored in the project file.

F.5.1 FIELD LOGBOOKS

Field team personnel will use bound field logbooks with sequentially numbered pages for the maintenance of field records and for documenting any information pertinent to field activities. Field forms will be numbered sequentially or otherwise controlled. A designated field team member will record in the field logbooks sampling activities and information from site exploration and observation. Field documentation will conform to approved procedures for use of field logbooks. An integral component of Quality Assurance (QA)/Quality Control (QC) for the field activities will be the maintenance of accurate and complete field records and the collection of appropriate field data forms. The primary purpose of the logbook is to document each day's field activities; the personnel on each sampling team; and any administrative occurrences, conditions, or activities that may have affected the fieldwork or data quality of any environmental samples for any given day. The level of detail of the information recorded in the field logbook should be such that an accurate reconstruction of the field events can be created from the logbook. The project name, logbook number, client, contract number, task number, document control number, activity or site name, and the start and completion dates will be listed on each logbook's front cover. Important phone numbers, radio call numbers, emergency contacts, and a return address should be recorded on the inside of the front cover.

F.5.2 SAMPLE LOG SHEETS

A sample log sheet will contain sample-specific information for each field sample collected, including field QC samples. Generally, sample log sheets will be preprinted from the data management system with the following information:

- Name of sampler;
- Project name and number;
- Sample identification number;
- Sampling location, station code, and description;
- Sample medium or media;
- Sample collection date;
- Sample collection device;
- Sample visual description;
- Collection procedure;
- Sample type;
- Analysis; and
- Preservative.

In addition, specific analytical requests will be preprinted from the data management system and will include the following for each analytical request:

- Analysis/method,
- Container type,
- Number of containers,
- Container volume,
- Preservative (type/volume), and
- Destination laboratory.

During sample collection, a field team member will record the remaining required information and will sign and date each sample log sheet. The following information will be recorded for each sample, whether or not the sample was collected:

- The date and time of collection;
- The name of the collector;
- Collection methods and/or procedures;
- Required field measurements and measurement units;
- Instrumentation documentation, including the date of last calibration;
- Adherence to, or deviation from, the procedure and the RAWP;
- Weather conditions at the time of sample collection;
- Activities in the area that could impact subsequent data evaluation;
- General field observations that could assist in subsequent data evaluation;
- Lot number of the sample containers used during sample collection;
- Sample documentation and transportation information, including unique chain-of-custody form number, airbill number, and container lot number; and
- Relevant and associated field QC samples (for each sample).

If preprinted sample log sheets are not used, information will be recorded manually. A member of the field sampling team (other than the recorder) will perform a QA review of each sample log sheet and document the review by signing and dating the log sheet. Notations of deviations will be initialed by the field team manager (FTM) as part of his/her review of the logbook.

F.5.3 FIELD DATA SHEETS

Field data sheets will be maintained, as appropriate, for the following types of data:

- Sample log sheets,
- Chain-of-custody forms,
- Instrument calibration logs,
- Temperature monitoring sheets, and
- Volatile organic compound concentrations and radiological values recorded for each sample collected.

Data to be recorded will include such information as the location, sampling depth, sampling station, and applicable sample analysis to be conducted. Field-generated data forms will be prepared, if necessary, based on the appropriate requirements. The same information may be included in the field logbook or, if not, the field logbook should reference the field data sheet. If preprinted field data sheets are not used, information will be recorded manually in the field logbook.

F.5.4 SAMPLE IDENTIFICATION, NUMBERING, AND LABELING

In addition to field logbooks and field data sheets, the sampling team will use labels to track sample holding times, to provide sample traceability, and to initiate the chain-of-custody record for the environmental samples. A pressure-sensitive gummed label (or equivalent) will be secured to each sample container at the time of collection, including duplicates and trip or field blanks, at or before the completion of sample collection.

Sample labels will be waterproof or will be sealed to the sample container with clear acetate tape after all information has been recorded on the label. Generally, sample labels will be preprinted with information from the data management system and will contain the following information:

- Station name,
- Sample identification number,
- Sample matrix,
- Sample type (grab or composite),
- Type or types of analysis required,
- Sample preservation (if required), and
- Destination laboratory.

A field sampling team member will complete the remaining information during sample collection, including these items:

- Date and time of collection and
- Initials of sampler.

The sample numbers will be recorded in the field logbook along with the time of collection and descriptive information previously discussed.

F.5.5 SAMPLE CHAIN-OF-CUSTODY

Chain-of-custody procedures will document sample possession from the time of collection, through transfers of custody, to receipt at the laboratory and subsequent analysis. Chain-of-custody records will accompany each packaged lot of samples; the laboratory will not analyze samples that are not accompanied by a correctly prepared chain-of-custody record. A sample will be considered under custody if it is (1) in the possession of the sampling team; (2) in view of the sampling team; or (3) transferred to a secured (i.e., locked) location. Chain-of-custody records will follow the requirements as specified in a DOE Prime Contractor-approved procedure for keeping records. This form will be used to collect and track samples from collection until transfer to the laboratory. Copies of the signed chain-of-custody records will be faxed or delivered to the DOE Prime Contractor Sample Management Office within three days of sample delivery.

The Sampling Team Leader is responsible for reviewing and confirming the accuracy and completeness of the chain-of-custody form and for the custody of samples in the field until they have been properly transferred to the Sample Coordinator. The Sample Coordinator is responsible for sample custody until the samples are

properly packaged, documented, and released to a courier or directly to the analytical laboratory. If samples are not immediately transported to the analytical laboratory, they will remain in the custody of the Sample Coordinator, where they will be refrigerated and secured either by locking the refrigerator or by placing custody seals on the individual containers.

Each chain-of-custody form will be identified by a unique number located in the upper-right corner and recorded on the sample log sheet at the time of sample collection. The laboratory chain-of-custody will be the "official" custody record for the samples. Each chain-of-custody form will contain the following information:

- The sample identification for each sample;
- Collection data for each sample;
- Number of containers of each sample,;
- Description of each sample (i.e., environmental matrix/field QC type),;
- Analyses required for each sample; and
- Blocks to be signed as custody is transferred from one individual to another.

The airbill number will be recorded on the chain-of-custody form, if applicable. The laboratory chain-of-custody form will be sealed in a resealable plastic bag and taped to the inside of the cooler lid if the samples are to be shipped off-site. A copy will be retained in the laboratory, and the original will be returned to the Sample Manager with the completed data packages.

At each point of transfer, the individuals relinquishing and receiving custody of the samples will sign in the appropriate blocks and record the date and time of transfer. When the laboratory sample custodian receives the samples, he or she will document receipt of the samples, record the time and date of receipt, and note the condition of the samples (e.g., cooler temperature, whether the seals are intact) in the comments section. The laboratory then will forward appropriate information to the Sample Manager. This information may include the following:

- A cover memo stating sample receipt date and any problems noted at the time of receipt and

- A report showing the field sample identification number, the laboratory identification number, and the analyses scheduled by the laboratory for each sample.

F.5.6 SAMPLE SHIPMENT

Aliquots of investigative samples will be screened by an on-site laboratory before shipment to an off-site laboratory. Results from the screening process will be recorded in Paducah's Project Environmental Measurements System (PEMS) and will be reviewed prior to preparation for sample shipment off-site. Sample containers will be placed in the shipping container and packed with ice and absorbent packing for liquids. The completed chain-of-custody form will be placed inside the shipping container, unless otherwise noted. The container then will be sealed. In general, sample containers will be packed according to the following procedures:

- Glass sample containers will be wrapped in plastic insulating material to prevent contact with other sample containers or the inner walls of the container.

- Logbook entries, sample tags and labels, and chain-of-custody forms will be completed with sample data collection information and names of persons handling the sample in the field before packaging.

- Samples, temperature blanks, and trip blanks will be placed in a thermal-insulated cooler along with ice that is packed in resealable plastic bags. After the cooler is filled, the appropriate chain-of-custody form will be placed in the cooler in a resealable plastic bag attached to the inside of the cooler lid.

- Samples will be classified according to U.S. Department of Transportation (DOT) regulations pursuant to 49 *CFR* 173. All samples will be screened for radioactivity to determine that DOT limits of 2.0 nCi/mL for liquid waste and 2.0 nCi/g for solid waste are not exceeded.

F.5.7 FIELD PLANNING MEETING

A field planning meeting will occur before work begins at the site, so that all involved personnel will be informed of the requirements of the fieldwork associated with the project. Additional planning meetings will be held whenever new personnel join the field team or if the scope of work changes significantly. Each meeting will have a written agenda and attendees must sign an attendance sheet, which will be maintained on-site and in the project files. The following example topics will be discussed at these meetings:

- Project- and site-specific health and safety
- Objectives and scope of the fieldwork
- Equipment and training requirements
- Procedures
- Required QC measures and
- Documents covering on-site fieldwork.

F.5.8 READINESS CHECKLIST

Before implementation of the field program, project personnel will review the work control documents to identify field activities and materials required to complete the activities, including the following items:

- Task deliverables
- Required approvals and permits
- Personnel availability
- Training
- Field equipment
- Sampling equipment
- Site facilities and equipment and
- Health and safety equipment

Before fieldwork begins, appropriate DOE Prime Contractor personnel will concur that readiness has been achieved.

F.6. SAMPLE LOCATION SURVEY

Surveying of sampling locations will be conducted upon completion of sampling activities. Where possible, temporary markers consisting of flagging or of wooden or metal stakes will be used to mark sample locations.

A member of the field sampling crew will accompany the survey crew to provide information regarding the location of sampling points.

Coordinates for support survey sample locations (Activity I) will be obtained using a global positioning system. Each sample point from the post-excavation final status survey (Activity II) will be surveyed for its horizontal and vertical location using the PGDP coordinate system for horizontal control. Additionally, State Plane Coordinates will be provided using the U.S. Coast and Geodetic Survey North American Datum of 1983. The datum for vertical control will be the U.S. Coast and Geodetic Survey North American Vertical Datum of 1988. Accuracy for this work will be that of a Class 1 First Order survey. Work will be performed by or under responsible charge of a Professional Land Surveyor registered in the Commonwealth of Kentucky. Coordinates will be entered into Paducah PEMS and will be transferred with the station's ready-to-load (RTL) file to Paducah Oak Ridge Environmental Information System (OREIS).

F.7. REFERENCES

BJC (Bechtel Jacobs Company LLC) 2003. *Sampling Plan for the Remedial Action for Sections 1 and 2 of the North-South Diversion Ditch to Address Near-Surface Soil Contamination at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, BJC/PAD-400 Final, Paducah, KY, February.

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DOE 2008a. *Action Memorandum for Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0119&D1, U.S. Department of Energy, Paducah, KY, November.

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ATTACHMENT F1

CO-CONTAMINATION STUDY FOR THE REMOVAL OF CONTAMINATED SOIL AND SEDIMENT ASSOCIATED WITH THE SURFACE WATER OPERABLE UNIT (ON-SITE)

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CO-CONTAMINATION STUDY FOR THE REMOVAL OF CONTAMINATED SOIL AND SEDIMENT ASSOCIATED WITH THE SURFACE WATER OPERABLE UNIT (ON-SITE)

F1.1 INTRODUCTION

This information sheet describes a study performed to determine if co-contamination is present in the contaminated surface soil and sediments to be addressed by the Surface Water Operable Unit (SWOU) on-site removal action. The results in this sheet are subsequently used to propose indicator chemicals and screening concentrations that can be used to determine quickly if excavation has adequately removed contamination above the clean-up criteria. Note that this information sheet does not select the final analyte list for verification samples that will be collected during the SWOU on-site removal action. The final analyte list for the verification samples is discussed in the sampling and analysis plan.

Clean-up levels were established for contaminants of concern (COCs) identified as driving cancer risk [arsenic, beryllium, total polychorinated biphenyls (PCBs), and the following radionuclides: americium-241 (^{241}Am), cesium-137 (^{137}Cs), neptunium-237 (^{237}Np), plutonium-239/240 ($^{239/240}$Pu), technetium-99 (^{99}Tc-99), thorium-230 (^{230}Th), thorium-232 (^{232}Th), uranium-234 (^{234}U), uranium-235 (^{235}U), and uranium-238 (^{238}U)] and for uranium metal, which is a hazard risk as part of the SWOU EE/CA (DOE 2008). These clean-up levels are used in support of the co-contamination study and are listed in Table F1.1.

Table F1.1. Clean-Up Levels for COCs Driving Excavation

ELCR-driven COCs		
Arsenic	27.4	mg/kg
Beryllium	50,000	mg/kg
Total PCB	15.95	mg/kg
Americium-241	115	pCi/g
Cesium-137	7.6	pCi/g
Neptunium-237	21.65	pCi/g
Plutonium-239/240	107.5	pCi/g
Technetium-99	3825	pCi/g
Thorium-230	146.5	pCi/g
Thorium-232	128.5	pCi/g
Uranium-234	188	pCi/g
Uranium-235	30.25	pCi/g
Uranium-238	94	pCi/g
HI-driven COC		
Uranium	227	mg/kg

ELCR = excess lifetime cancer risk
HI = hazard index

F1.2 MATERIALS AND METHODS

To investigate the hypothesis of the presence of co-contamination, analytical results for soil and sediment samples taken in the SWOU ditches were extracted from the SWOU Site Investigation dataset. Only data from Activity 2 and historical replacement samples were used in this analysis. Further, only those samples collected from within an area planned for excavation were considered. In the statistical analysis, if an analyte had more than one result for a sample location, the maximum detected value or one-half the result for nondetected values were used.

The data set was evaluated by three methods: the Pearson correlation, the Spearman rank correlation, and direct comparison. The Pearson correlation was used initially to look at correlation among the analytes. Nondetect results were set to one-half their value when deriving the correlation. The maximum value for each location was used in the correlation. The relationship among analyte concentrations would have to be consistent (i. e., large values for first analyte matching up with large values for the second analyte) for this correlation to produce results useful in selecting indicator chemicals. Generally, for the data set in use, this is not the case.

For the Spearman rank correlation, nondetect results were set to zero when deriving the rank correlations so that all nondetects would be tied with the lowest rank. Spearman rank correlation coefficients were used in this step rather than Pearson correlation coefficients because the relationship among analyte concentrations was assumed to be nonlinear. The relationships were assumed to be nonlinear because analytes were released over many years, and migration of analytes from areas of initial deposition was assumed to differ markedly between analytes due to varying chemical fates in the environment. Additionally, use of the Spearman rank correlation minimized the influence of analytical outliers (i.e., extremely small or large concentrations) on the correlation statistics. Generally, using these rank correlations allowed for the identification of analytes that were present at similar concentration ranks while ignoring the actual magnitude of the analytes' concentrations.

Lastly, a direct comparison between the clean-up levels and the maximum detected values of the contaminated soils and sediments was made. Because many of the areas require clean-up based on cumulative risks, key individual chemicals may be of use in determining whether clean-up objectives for the area have been achieved.

F1.3 RESULTS AND DISCUSSION

The co-contaminant analyses were performed using data from portions of the interior ditches requiring excavation and from the North-South Diversion Ditch (NSDD) Sections 3, 4, and 5 requiring excavation separately.

Pearson and Spearman rank correlation coefficients were calculated between each pair of analytes. The results of these calculations are shown in Tables F1.2 through F1.5. Correlation coefficients that are greater than 0.8 are indicated in bold, those greater than 0.9 are indicated in bold, italicized font. The results in the tables show that some radionuclides correlate well among themselves, but do not correlate well with other analytes.

Table F1.2. SWOU (On-Site) Pearson Correlation for Areas for Excavation

	Ar	Be	Total PCB	^{241}Am	^{137}Cs	^{237}Np	$^{239/240}$Pu	^{99}Tc	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U	U
Arsenic	NA	0.793	-0.116	0.579	0.518	0.312	0.674	0.341	0.000	0.039	0.116	0.029	0.029	0.031
Beryllium	0.793	NA	0.107	0.534	0.489	0.294	0.488	0.243	0.088	0.054	0.395	0.336	0.290	-0.147
Total PCB	-0.116	0.107	NA	-0.126	-0.105	-0.130	-0.171	-0.063	-0.153	-0.356	0.034	-0.054	-0.110	-0.202
Am-241	0.579	0.534	-0.126	NA	***0.992***	0.000	**0.835**	0.460	0.448	0.528	0.274	0.003	0.021	-0.194
Cs-137	0.518	0.489	-0.105	***0.992***	NA	-0.090	0.772	0.395	0.420	0.574	0.274	-0.016	0.018	-0.205
Np-237	0.312	0.294	-0.130	0.000	-0.090	NA	0.230	0.684	0.378	0.126	0.235	0.352	0.429	0.337
Pu-239/240	0.674	0.488	-0.171	**0.835**	0.772	0.230	NA	0.607	0.339	0.474	0.186	-0.022	-0.036	-0.218
Tc-99	0.341	0.243	-0.063	0.460	0.395	0.684	0.607	NA	0.095	0.049	0.398	0.363	0.420	0.304
Th-230	0.000	0.088	-0.153	0.448	0.420	0.378	0.339	0.095	NA	0.728	-0.041	-0.070	-0.124	-0.231
Th-232	0.039	0.054	-0.356	0.528	0.574	0.126	0.474	0.049	0.728	NA	-0.118	-0.100	-0.149	-0.336
U-234	0.116	0.395	0.034	0.274	0.274	0.235	0.186	0.398	-0.041	-0.118	NA	***0.955***	**0.854**	0.280
U-235	0.029	0.336	-0.054	0.003	-0.016	0.352	-0.022	0.363	-0.070	-0.100	***0.955***	NA	***0.971***	0.339
U-238	0.029	0.290	-0.110	0.021	0.018	0.429	-0.036	0.420	-0.124	-0.149	**0.854**	***0.971***	NA	0.412
Uranium	0.031	-0.147	-0.202	-0.194	-0.205	0.337	-0.218	0.304	-0.231	-0.336	0.280	0.339	0.412	NA

Ar = Arsenic Be = Beryllium U = Uranium NA = not applicable
Correlation coeffiecents greater than 0.8 are shown in bold. Those greater than 0.9 are shown in bold italics.

Table F1.3. NSDD Pearson Correlation for Areas for Excavation

	Ar	Be	Total PCB	^{241}Am	^{137}Cs	^{237}Np	$^{239/240}$Pu	^{99}Tc	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U	U
Arsenic	NA	0.023	0.251	0.157	0.241	-0.096	0.292	0.023	0.028	0.090	0.052	0.047	0.047	0.063
Beryllium	0.023	NA	0.263	0.180	0.369	0.390	0.345	0.193	0.226	0.119	0.248	0.237	0.233	0.119
Total PCB	0.251	0.263	NA	0.498	0.605	0.281	0.663	0.038	0.720	0.655	**0.822**	**0.820**	**0.831**	0.068
Am-241	0.157	0.180	0.498	NA	**0.879**	0.626	***0.918***	0.421	**0.802**	**0.805**	0.698	0.699	0.694	0.428
Cs-137	0.241	0.369	0.605	**0.879**	NA	0.679	**0.892**	0.323	0.724	0.638	0.634	0.641	0.621	0.280
Np-237	-0.096	0.390	0.281	0.626	0.679	NA	0.648	**0.807**	0.403	0.303	0.372	0.374	0.377	0.315
Pu-239/240	0.292	0.345	0.663	***0.918***	**0.892**	0.648	NA	0.412	**0.862**	**0.845**	**0.800**	**0.804**	**0.801**	0.434
Tc-99	0.023	0.193	0.038	0.421	0.323	**0.807**	0.412	NA	0.084	0.075	0.097	0.096	0.131	0.545
Th-230	0.028	0.226	0.720	**0.802**	0.724	0.403	**0.862**	0.084	NA	***0.967***	***0.947***	***0.946***	***0.932***	0.172
Th-232	0.090	0.119	0.655	**0.805**	0.638	0.303	**0.845**	0.075	***0.967***	NA	***0.911***	***0.910***	***0.903***	0.200
U-234	0.052	0.248	**0.822**	0.698	0.634	0.372	**0.800**	0.097	***0.947***	***0.911***	NA	***0.999***	***0.997***	0.158
U-235	0.047	0.237	**0.820**	0.699	0.641	0.374	**0.804**	0.096	***0.946***	***0.910***	***0.999***	NA	***0.997***	0.149
U-238	0.047	0.233	**0.831**	0.694	0.621	0.377	**0.801**	0.131	***0.932***	***0.903***	***0.997***	***0.997***	NA	0.191
Uranium	0.063	0.119	0.068	0.428	0.280	0.315	0.434	0.545	0.172	0.200	0.158	0.149	0.191	NA

Ar = Arsenic Be = Beryllium U = Uranium NA = not applicable
Correlation coeffiecents greater than 0.8 are shown in bold. Those greater than 0.9 are shown in bold italics.

Table F1.4. SWOU (On-Site) Spearman Correlation for Areas for Excavation

	Ar	Be	Total PCB	^{241}Am	^{137}Cs	^{237}Np	$^{239/240}$Pu	^{99}Tc	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U	U
Arsenic	**NA**	0.618	0.160	0.607	0.443	0.358	0.531	0.438	0.289	-0.053	0.230	-0.037	-0.037	0.197
Beryllium	0.618	**NA**	0.187	0.431	0.444	0.269	0.486	0.272	0.242	0.115	0.375	0.038	0.382	-0.052
Total PCB	0.160	0.187	**NA**	0.209	0.141	0.222	0.217	0.215	0.209	-0.032	0.006	-0.166	-0.178	-0.045
Am-241	0.607	0.431	0.209	**NA**	0.661	0.733	***0.939***	0.772	0.793	0.366	0.507	0.313	0.470	0.250
Cs-137	0.443	0.444	0.141	0.661	**NA**	0.304	0.773	0.524	0.710	0.797	0.314	0.039	0.309	-0.033
Np-237	0.358	0.269	0.222	0.733	0.304	**NA**	0.684	0.681	0.695	0.106	0.447	0.640	0.426	0.391
Pu-239/240	0.531	0.486	0.217	***0.939***	0.773	0.684	**NA**	0.775	**0.817**	0.463	0.645	0.386	0.613	0.226
Tc-99	0.438	0.272	0.215	0.772	0.524	0.681	0.775	**NA**	0.668	0.064	0.550	0.375	0.565	0.449
Th-230	0.289	0.242	0.209	0.793	0.710	0.695	**0.817**	0.668	**NA**	0.624	0.373	0.397	0.294	0.182
Th-232	-0.053	0.115	-0.032	0.366	0.797	0.106	0.463	0.064	0.624	**NA**	0.023	0.038	0.021	-0.058
U-234	0.230	0.375	0.006	0.507	0.314	0.447	0.645	0.550	0.373	0.023	**NA**	0.704	**0.851**	0.297
U-235	-0.037	0.038	-0.166	0.313	0.039	0.640	0.386	0.375	0.397	0.038	0.704	**NA**	0.701	0.519
U-238	-0.037	0.382	-0.178	0.470	0.309	0.426	0.613	0.565	0.294	0.021	**0.851**	0.701	**NA**	0.474
Uranium	0.197	-0.052	-0.045	0.250	-0.033	0.391	0.226	0.449	0.182	-0.058	0.297	0.519	0.474	**NA**

Ar = Arsenic Be = Beryllium U = Uranium NA = not applicable
Correlation coeffiecents greater than 0.8 are shown in bold. Those greater than 0.9 are shown in bold italics.

Table F1.5. NSDD Spearman Correlation for Areas for Excavation

	Ar	Be	Total PCB	^{241}Am	^{137}Cs	^{237}Np	$^{239/240}$Pu	^{99}Tc	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U	U
Arsenic	**NA**	-0.153	0.282	0.219	0.180	-0.014	0.292	0.391	0.063	0.155	0.050	0.059	0.059	0.050
Beryllium	-0.153	**NA**	0.608	0.305	0.261	0.494	0.366	0.238	0.393	0.267	0.525	0.492	0.525	0.223
Total PCB	0.282	0.608	**NA**	0.683	0.631	0.568	**0.857**	0.375	0.731	0.720	0.799	0.767	0.799	0.430
Am-241	0.219	0.305	0.683	**NA**	**0.864**	0.687	***0.907***	0.578	0.731	0.749	0.674	0.663	0.674	0.480
Cs-137	0.180	0.261	0.631	**0.864**	**NA**	**0.828**	**0.882**	0.499	0.775	0.643	0.657	0.661	0.657	0.311
Np-237	-0.014	0.494	0.568	0.687	**0.828**	**NA**	0.695	0.567	0.573	0.398	0.545	0.516	0.545	0.351
Pu-239/240	0.292	0.366	**0.857**	***0.907***	**0.882**	0.695	**NA**	0.513	**0.839**	**0.821**	0.771	0.757	0.771	0.446
Tc-99	0.391	0.238	0.375	0.578	0.499	0.567	0.513	**NA**	0.170	0.268	0.241	0.231	0.241	**0.838**
Th-230	0.063	0.393	0.731	0.731	0.775	0.573	**0.839**	0.170	**NA**	***0.921***	***0.918***	***0.921***	***0.918***	0.232
Th-232	0.155	0.267	0.720	0.749	0.643	0.398	**0.821**	0.268	***0.921***	**NA**	**0.889**	**0.893**	**0.889**	0.411
U-234	0.050	0.525	0.799	0.674	0.657	0.545	0.771	0.241	***0.918***	**0.889**	**NA**	***0.996***	***1.000***	0.311
U-235	0.059	0.492	0.767	0.663	0.661	0.516	0.757	0.231	***0.921***	**0.893**	***0.996***	**NA**	***0.996***	0.296
U-238	0.059	0.525	0.799	0.674	0.657	0.545	0.771	0.241	***0.918***	**0.889**	***1.000***	***0.996***	**NA**	0.311
Uranium	0.050	0.223	0.430	0.480	0.311	0.351	0.446	**0.838**	0.232	0.411	0.311	0.296	0.311	**NA**

Ar = Arsenic Be = Beryllium U = Uranium NA = not applicable
Correlation coeffiecents greater than 0.8 are shown in bold. Those greater than 0.9 are shown in bold italics.

Table F1.6 shows the direct comparison between the clean-up levels driving excavation and the maximum detected values in the interior ditches and the NSDD. Data in the table indicates that only Total PCB, ^{137}Cs, ^{238}U, and uranium were detected above clean-up levels in the interior ditches. Within the NSDD excavation areas, only Total PCB, ^{230}Th, and uranium were detected above clean-up levels. Use of Table F1.6 provides the best group of indicator chemicals.

Table F1.6. Clean-Up Levels and Maximum Detected Values for COCs Driving Excavation

ELCR-driven COC	Clean-up Level	Units	Maximum Detection On-Site Ditches	Maximum Detection NSDD
Arsenic	27.4	mg/kg	19.7	8.14
Beryllium	50,000	mg/kg	0.861	1.48
Total PCB	15.95	mg/kg	**102**	**20**
Americium-241	115	pCi/g	1.6	4.39
Cesium-137	7.6	pCi/g	**181**	4.16
Neptunium-237	21.65	pCi/g	1.01	5.3
Plutonium-239/240	107.5	pCi/g	27.1	20.6
Technetium-99	3825	pCi/g	55.3	596
Thorium-230	146.5	pCi/g	84.1	**497**
Thorium-232	128.5	pCi/g	1.09	5.07
Uranium-234	188	pCi/g	24.9	31.2
Uranium-235	30.25	pCi/g	3.11	1.94
Uranium-238	94	pCi/g	**132**	40
HI-driven COC				
Uranium	227	mg/kg	**920**	**328**

ELCR = excess lifetime cancer risk
HI = hazard index
Maximum detections greater than the clean-up levels are shown in bold.

Tables F1.7 and F1.8 list the detected values from each of the excavated areas with the clean-up values for the interior ditches and the NSDD, respectively. These tables indicate that the only significant detected results (i.e., results greater than the clean-up criteria) are capable of serving as field screening indicators. The significant detected COCs are Total PCBs and uranium metal for both the NSDD and the on-site ditches, ^{137}Cs and ^{238}U for the on-site ditches, and ^{230}Th for the NSDD.

Table F1.7. Results from On-Site Ditches Compared to Clean-Up Levels

	Ar	Be	Total PCB	^{241}Am	^{137}Cs	^{237}Np	$^{239/240}$Pu	^{99}Tc	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U	U
Units	mg/kg	mg/kg	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	mg/kg
Clean-Up Level	27.4	50,000	15.95	115	7.6	21.65	107.5	3,825	146.5	128.5	188	30.25	94	227
004-005	13.8	0.71	0.898	6.5	**181**	ND	27.1	39.3			11.7	ND	21.6	34
OF01B-15-02	2.42	ND	ND	0.127	0.009	0.0749	0.564	13.2	3.12	0.176	11.4	0.592	11.5	**642**
OF01B-15-03	2.52	ND	ND	ND	0.176	ND	ND	8.34	1.59	0.288	0.499	0.044	1.28	7.68
OF01B-15-04	5.64	ND	**41.1**	0.102	0.681	0.335	0.625	36.5	4.32	0.198	1.79	0.118	4.97	38.2
OF08B-11-04	ND	ND	1.08	0.132	0.421	0.619	0.838	10.2	84.1	0.761	3.8	0.273	6.04	118
OF10B-10-03	2.67	0.478	**102**	ND	0.169	0.0419	0.0423	6.56	0.427	0.108	7.42	0.427	8.81	26.4
OF11B-01-01	ND	ND	9.12	ND	0.212	ND	ND	10.3	1.6	0.321	0.568	0.045	1.57	**611**
OF11B-01-03	6.13	ND	0.54	ND	ND	ND	ND	ND	0.259	0.187	0.822	0.077	3.05	9.11
OF11B-01-04	ND	ND	0.66	ND	0.586	ND	0.0344	4.31	0.383	0.381	0.999	0.116	3.59	**504**
OF15B-02-01	5.07	ND	0.66	1.6	**30**	0.476	24.5	50.4	47.1	1.01	6.74	0.513	11.5	160
OF15B-02-03	4.35	0.498	2.54	0.678	**11.2**	0.334	4.66	9.07	78.2	1.09	2.15	0.182	5.46	36
OF15B-02-04	9.53	ND	0.36	0.85	**19**	0.316	11.9	21.1	13.3	0.51	2.96	0.268	7.76	39.9
OF15B-03-01	6.14	0.578	ND	0.117	1.88	0.471	0.778	27	4.25	0.367	24.9	3.11	**132**	**395**
OF15B-03-02	ND	ND	ND	ND	0.735	ND	0.0918	5.88	1.53	0.746	2.17	0.133	3.75	11.9
OF15B-03-03	ND	ND	ND	ND	1.55	ND	0.359	9.63	7.64	0.874	2.81	0.285	12.6	135
OF15B-04-03	19.7	0.861	0.25	0.989	**10.8**	0.792	14.1	26.6	9.69	0.456	1.79	0.17	8.12	175
OF15B-07-01	2.33	ND	ND	ND	0.236	ND	ND	ND	0.462	0.354	0.905	0.083	3.48	26.2
OF15B-07-02	1.48	ND	0.35	0.243	0.217	1.01	1.35	55.3	2.97	0.174	7.3	0.968	65.6	**920**
OF15B-07-03	ND	ND	ND	ND	0.148	ND	0.0271	4.29	0.338	0.32	1.8	0.202	11.7	**270**

Ar = Arsenic Be = Beryllium U = Uranium ND = not detected
Sample results greater than the clean-up level are shown in red bold font.

Table F1.8. Results from NSDD Compared to Clean-Up Levels

	Ar	Be	Total PCB	^{241}Am	^{137}Cs	^{237}Np	$^{239/240}$Pu	^{99}Tc	^{230}Th	^{232}Th	^{234}U	^{235}U	^{238}U	U
Units	mg/kg	mg/kg	mg/kg	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	pCi/g	mg/kg
Clean-Up Level	27.4	50,000	15.95	115	7.6	21.65	107.5	3,825	146.5	128.5	188	30.25	94	227
NSD026	ND	0.671	1.9	4.26	3.51	2.41	15.9	122	**410**	4.36	17.3	1.06	20.3	50
NSD027	6.48	ND	**20**	4.09	4.16	2.65	20.6	131	**497**	5.07	31.2	1.94	40	73.2
NSD028	ND	0.568	0.5	2.19	2.38	2.68	8.77	46.8	**205**	2.04	13.4	0.824	16.2	50
NSD029	7.31	1.48	9.7	2.08	3.91	3	15.1	148	**203**	1.85	12.8	0.792	16	50
NSD030	6.15	0.5	1.4	0.883	1.04	1.22	10.1	153	**193**	2.16	11	0.683	14.4	**234**
NSDDB-01-03	5.44	ND	ND	ND	0.347	ND	0.027	ND	0.625	0.448	1.65	0.091	1.71	6.3
NSDDB-01-05	7.52	0.584	0.54	0.958	0.706	0.981	4.32	162	79.3	1.05	6.6	0.318	7.6	133
NSDDB-01-08	7.42	0.53	5.02	4.39	4.01	2.54	16.1	268	**199**	2.38	9.67	0.577	13	**328**
NSDDB-01-09	ND	0.648	1.83	2.26	1.78	5.3	10.2	596	105	1.27	8.17	0.489	11.5	149
NSDDB-02-01	5.29	ND	0.3	ND	0.445	ND	0.0305	ND	0.474	0.311	0.552	0.026	0.636	3.25
NSDDB-02-04	5.12	ND	ND	1.89	2.02	1.64	7.24	205	111	1.29	7.77	0.521	10.9	91.2
NSDDB-02-05	7.94	ND	0.42	3.02	4.1	3.96	13.5	301	124	1.25	4.16	0.259	4.35	103
NSDDB-03-01	5.25	ND	0.25	1.58	1.76	2	7.79	109	129	1.61	3.26	0.177	3.98	45.5
NSDDB-08-012	ND	ND	ND	nD	0.507	ND	0.0477	2.94	0.844	0.322	0.475	ND	0.53	2.07
NSDDB-08-07	8.14	ND	0.7	2.73	1.55	0.928	12.8	177	**164**	3.07	9.97	0.618	13.4	109

Ar = Arsenic Be = Beryllium U = Uranium ND = not detected
Sample results greater than the clean-up level are shown in red bold font.

F1.4 CONCLUSION

In summary, co-contamination may be present in the data set developed for the portions of the on-site ditches and NSDD planned for excavation; however, it was not determined by this assessment. If the presence of significantly detected COCs is used to determine if other analytes are present (i.e., used as indicator chemicals), then virtually all locations containing other analytes above their characterization levels or whose cumulative excess lifetime cancer risk (ELCR) greater than 1E-5 would be identified as well. Similarly, if the absence of these analytes is used as an indicator of the absence of other analytes, then, in most cases, the other analytes can be assumed to be absent above their characterization levels or the cumulative ELCR is below 1E-5.

The selected indicator chemicals are listed in Table F1.9. It must be noted; however, that the use of indicator chemicals for other analytes is not perfect, it is possible that some areas may be missed. This possibility can be reduced by choosing indicator levels for the indicator chemicals that are less than the indicator chemicals' cleanup levels. A protection factor of approximately 2/3 has been added to the cleanup levels to reduce this risk. Indicator levels are shown in Table F1.9.

Table F1.9. Indicator Chemicals and Levels

On-Site Ditches		
Total PCB	10	mg/kg
Cesium-137	5	pCi/g
Uranium-238	65	pCi/g
Uranium	150	mg/kg
NSDD		
Total PCB	10	mg/kg
Thorium-230	100	pCi/g
Uranium	150	mg/kg

APPENDIX G

DATA MANAGEMENT IMPLEMENTATION PLAN

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CONTENTS

ACRONYMS

COC	chain-of-custody
DCC	Document Control Center
DMIP	Data Management Implementation Plan
DOE	U.S. Department of Energy
EDD	electronic data deliverables
EE/CA	Engineering Evaluation and Cost Analysis
GIS	geographic information system
OREIS	Oak Ridge Environmental Information System
PEMS	Project Environmental Measurements System
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QC	quality control
RA	removal action
RTL	ready-to-load
SMO	sample management office
SOW	statement of work
SWMU	Solid Waste Management Units
SWOU	Surface Water Operable Unit
XRF	x-ray fluoroscopy

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G.1. INTRODUCTION

The purpose of this Data Management Implementation Plant (DMIP) is to identify and document data management requirements and applicable procedures, expected data types and information flow, and roles and responsibilities for all data management activities associated with the removal action (RA) for Contaminated Sediment Associated with the Surface Water Operable Unit (SWOU) (On-Site) at the Paducah Gaseous Diffusion Plant (PGDP). Data management provides a system for efficiently generating and maintaining technically and legally defensible data that provide the basis for making sound decisions regarding the environmental and waste characterization at PGDP.

Data management for this project is implemented throughout the life cycle for environmental measurements data. This life cycle occurs from the planning of data for environmental and waste characterization, through the collection, review, and actual usage of the data for decision-making purposes, to the long-term storage of data.

Data types to be managed for the project include field data and analytical data. Historical data has been downloaded from Paducah Oak Ridge Environmental Information System (OREIS) and is available with the SWOU (On-Site) Engineering Evaluation and Cost Analysis (EE/CA) (DOE 2008). Field data are collected in field logbooks or field data forms and are entered into Paducah PEMS, as appropriate, for storage. Analytical data are planned and managed through Paducah PEMS and transferred to Paducah OREIS for long-term storage and reporting.

To meet current regulatory requirements for U.S. Department of Energy (DOE) environmental management projects, complete documentation of the information flow is established. Each phase of the data management process (planning, collecting, analyzing, managing, verifying, validating, assessing, reporting, consolidating, and archiving) must be appropriately planned and documented. The SWOU (On-Site) RA team is responsible for data collection and data management for this project.

The scope of this DMIP is limited to environmental information generated under the SWOU (On-Site) RA. This information includes electronic and/or hard copy records obtained by the project that describe environmental conditions. Information generated by the project (e.g., laboratory analytical results from samples collected) and obtained from sources outside the project (e.g., historical data) falls within the scope of this DMIP. Certain types of information, such as personnel or financial records, are outside the scope of this DMIP.

G.2. PROJECT MISSION

Requirements and responsibilities described in this plan apply to activities conducted by the project team in support of the SWOU (On-Site) RA. Specific activities involving data include, but are not limited to, sampling of sediment and soil; storing, analyzing, and shipping samples, when applicable; and evaluation, verification, validation, assessment, and reporting of analytical results.

G.3. DATA MANAGEMENT ACTIVITIES

Data management will be implemented throughout the life cycle of the SWOU (On-Site) RA. This life cycle occurs from the planning of data for environmental and waste characterization, through the collection, review, and actual usage of the data for decision-making purposes, to the long-term storage of data. Data management activities include the following:

- Acquire existing data
- Plan data collection
- Prepare for sampling activities
- Collect field data
- Collect field samples
- Submit samples for analysis
- Process field measurement and laboratory analytical data
- Laboratory Contractual Screening
- Verify data
- Validate data
- Assess data
- Consolidate, analyze, and use data and records
- Submit data to the Paducah OREIS

Section G.8 contains a detailed discussion of the activities listed above.

G.4. DATA MANAGEMENT INTERACTIONS

The Data Manager interfaces with the Data Coordinator to oversee the use of Paducah PEMS and to ensure that data deliverables meet DOE's standards. The Data Coordinator enters information into Paducah PEMS related to the fixed-base laboratory data once the samples have been delivered and the Lab Coordinator has verified receipt of the samples. The fixed-base laboratory hard-copy data and the electronic data deliverables (EDDs) are loaded into Paducah PEMS by the Data Coordinator. The SWOU (On-Site) RA project team is responsible for data verification and assessment. The Data Coordinator is responsible for preparing the data for transfer from Paducah PEMS to Paducah OREIS. The Data Manager is responsible for transferring the data from the ready-to-load (RTL) files to the Paducah OREIS database.

The Lab Coordinator develops the statement of work (SOW) to be performed by an analytical laboratory in the form of a project-specific laboratory SOW. Analytical methods, laboratory quality control (QC) requirements, and deliverable requirements are specified in this SOW.

The Lab Coordinator receives EDDs, performs contractual screenings, and distributes data packages. The Lab Coordinator interacts with the Data Manager to ensure that hard copy and electronic-deliverable formats are properly specified and interfaces with the contract laboratory to ensure that the requirements are understood and met.

G.4.1 DATA NEEDS AND SOURCES

Multiple data types will be generated and/or assessed during this project. These data types include field data, analytical data (including environmental data), and geographic information system (GIS) data.

G.4.2 HISTORICAL DATA

Historical data that are available electronically will be downloaded from Paducah OREIS as needed. Historical data available in electronic format has been made available with the SWOU (On-Site) EE/CA (DOE 2008) and will be evaluated when necessary.

G.4.3 FIELD DATA

Field data for the project includes sample collection information and field screen measurement results, such as polychlorinated biphenyl (PCB) field test kits and field x-ray fluoroscopy (XRF).

G.4.4 ANALYTICAL DATA

Analytical data for the project consist of laboratory analyses for environmental and waste characterization.

G.4.5 GIS COVERAGE

The Paducah GIS network is used for preparing maps used in data analysis and reporting of both historical and newly generated data. Coordinates will be recorded as State Plane Coordinates. Coverage for use during the project is as follows:

- Stations (station coordinates are downloaded from Paducah OREIS)
- Facilities
- Plant roads
- Plant fences
- Streams
- Topographic contours

G.5. DATA FORMS AND LOGBOOKS

Field logbooks, site logbooks, chain-of-custody (COC) forms, data packages with associated quality assurance/quality control (QA/QC) information, and field forms are maintained according to the requirements defined in procedure PRS-DOC-1009, *Records Management, Administrative Records, and Document Control*.

Duplicates of field records are maintained until the completion of the project. Logbooks and field documentation are copied periodically. The originals are forwarded to the Document Control Center (DCC) and copies are maintained in the field office.

G.5.1 FIELD FORMS

Sample information is environmental data describing the sampling event and consists of the following: station (or location), date collected, time collected, and other sampling conditions. This information is recorded in logbooks, COC forms, or sample labels. This information is entered directly into Paducah PEMS by the Data Coordinator.

Sample COC forms contain sample-specific information recorded during collection of the sample. Any deviations from the sampling plan are noted on the sample COC form or logbook. The Sampling Team Leader reviews each sample COC form for accuracy and completeness as soon as practical following sample collection.

Sample COC forms are generated from Paducah PEMS with the following information.

Information that is preprinted:	**Information that is entered manually:**
- Lab COC number	- Sample date and time
- Project name or number	- Sample comments (optional)
- Sample ID number	
- Sampling location	
- Sample type (e.g., REG = regular sample)	
- Sample matrix (e.g., SO = soil)	
- Analysis (e.g., PCB)	
- Sample container (volume, type)	

Sample identification numbers are identified in Paducah PEMS and are assigned by the Data Coordinator. An example of the sample numbering schemes used for the SWOU (On-Site) RA project is provided below.

LLLLee-ssA00

where

LLLL	Identifies the location being sampled (i.e., NSDD or OF)
ee	Identifies the exposure unit
ss	Identifies the survey unit
A	Identifies the activity (A for Activity 1 and B for Activity 2)
00	Identifies the depth of the sample in ft bgs (the first samples will be taken at 02 ft bgs, after initial excavation)

G.5.2 LITHOLOGIC DESCRIPTION FORMS

Lithologic description forms will be used as necessary for this project.

G.5.3 WELL CONSTRUCTION DETAIL FORMS

These forms are not necessary for use during this project.

G.5.4 LOGBOOK SAMPLE COLLECTION SHEETS

Sample collection sheets are utilized as an aid for recording sampling information in the field. Logbooks are kept in accordance with PRS-ENM-2700, *Logbooks and Data Forms*.

G.6. DATA AND DATA RECORDS TRANSMITTALS

G.6.1 PADUCAH OREIS DATA TRANSMITTALS

Data to be stored in Paducah OREIS is submitted to the Data Manager prior to reporting. Official data reporting will be generated from data stored in Paducah OREIS.

G.6.2 DATA RECORDS TRANSMITTALS

The SWOU (On-Site) RA project personnel will make records transfers to the DCC.

G.7. DATA MANAGEMENT SYSTEMS

G.7.1 PADUCAH PEMS

Paducah PEMS is the data management system that supports the project's sampling and measurement collection activities and generates Paducah OREIS RTL files. The data management staff access Paducah PEMS throughout the life cycle of the project. The project uses Paducah PEMS to support the following functions:

- Initiate the project
- Plan for sampling
- Record sample collection and field measurements
- Record the dates of sample shipments to the laboratory (if applicable)
- Receive and process analytical results
- Verify data
- Access and analyze data
- Transfer project data (in RTL format) to Paducah OREIS

Paducah PEMS is used to generate sample COC forms; import laboratory-generated data; update field and laboratory data based on data verification; data validation if applicable; data assessment; and transfer data to Paducah OREIS. Requirements for addressing the day-to-day operations of Paducah PEMS include backups, security, and interfacing with the Sample Management Office (SMO).

The Information Technology group performs system backups daily. The security precautions and procedures implemented by the data management team are designed to minimize the vulnerability of the data to unauthorized access or corruption. Only members of the data management team have access to the project's Paducah PEMS and the hard-copy data files. Members of the data management team have installed password-protected screen savers.

G.7.2 PADUCAH OREIS

Paducah OREIS is the centralized, standardized, quality assured, and configuration-controlled data management system that is the long-term repository of environmental data (measurements and geographic) for Paducah environmental management projects. Paducah OREIS is comprised of hardware, commercial software, customized integration software, an environmental measurements database, a geographic database, and associated documentation. The SWOU (On-Site) RA project will use Paducah OREIS for the following functions:

- Access to existing data
- Spatial analysis
- Report generation
- Long-term storage of project data (as applicable)

G.7.3 PADUCAH ANALYTICAL PROJECT TRACKING SYSTEM

The Paducah Analytical Project Tracking System is the business management information system that manages analytical sample analyses for Paducah environmental projects. The Paducah Analytical Project Tracking System provides cradle-to-grave tracking of sampling and analysis activities. The Paducah Analytical Project Tracking System generates the SOW, tracks collection and receipt of samples by the laboratory, flags availability of the analytical results, and allows invoice reconciliation. The Paducah Analytical Project Tracking System interfaces with Paducah PEMS (output from the Paducah Analytical Project Tracking System is automatically transferred to Paducah PEMS).

G.8. DATA MANAGEMENT TASKS AND ROLES AND RESPONSIBILITIES

G.8.1 DATA MANAGEMENT TASKS

The following data management tasks are numbered and grouped according to the activities summarized in Section G.1.2. An explanation of the data review process is provided in the following sections.

G.8.1.1 Acquire Existing Data

The primary background data for this project consists of historical analytical data from previous sampling events in the SWOU (On-Site) exposure units. This data is available in the SWOU (On-Site) EE/CA (DOE 2008)

G.8.1.2 Plan Data Collection

Other documents for this project provide additional information for the tasks of project environmental data collection, including sampling and analysis planning, quality assurance, waste management, and health and safety. Also, a laboratory SOW will be developed for this project.

G.8.1.3 Prepare for Sampling Activities

The data management tasks involved in sample preparation include identifying all sampling locations, preparing descriptions of these stations, identifying sample containers and preservation, developing field logbooks, preparation of sample kits and COCs, and coordinating sample delivery to the laboratory. The Lab Coordinator conducts activities associated with the analytical laboratories. Coordinates for support survey sample locations (Appendix F) will be obtained using a global positioning system. Coordinates for post-excavation final verification sampling will be obtained from a Class 1 First Order survey (Appendix F).

G.8.1.4 Collect Field Data and Samples

Paducah PEMS is used to identify, track, and monitor each sample and associated data from the point of collection through final data reporting. Project documentation includes field logbooks, COC records, and hard-copy analytical results.

Data management requirements for field logbooks and field forms specify that (1) sampling documentation must be controlled from initial preparation to completion, (2) sampling documentation generated must be maintained in a project file, and (3) modifications to planned activities and deviations from procedures shall be recorded.

Before the start of sampling, the Lab Coordinator specifies the contents of sample kits, which includes sample containers provided by the laboratories, labels, preservatives, and COC records. Sample labels and COCs are completed according to PRS-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*.

The SWOU (On-Site) RA project field team will collect samples for the project. The field team will record pertinent sampling information on the COC and in the field logbook. The Data Coordinator enters the information from the COC forms into Paducah PEMS.

G.8.1.5 Submit Samples for Analysis

Before the start of field sampling, the Field Superintendent or designee coordinates the delivery of samples with the Lab Coordinator who, in turn, coordinates with the analytical laboratories. The Lab Coordinator presents a general sampling schedule to the analytical laboratories. The Lab Coordinator also coordinates the receipt of samples and containers with the laboratories. The Lab Coordinator ensures that hard-copy deliverables and EDDs from the laboratories contain the appropriate information and are in the correct format.

G.8.1.6 Process Field Measurement and Laboratory Analytical Data

Data packages and EDDs received from the laboratory are tracked, reviewed, and maintained in a secure environment. Paducah PEMS is used for tracking project-generated data. The following information is tracked, as applicable: sample delivery group number, date received, number of samples, sample analyses,

receipt of EDD, and comments. The laboratory EDDs are checked as specified in PRS-ENM-5007, *Data Management Coordination*.

The field screen measurement data will be provided by the SWOU (On-Site) RA project team to the Data Manager for loading into Paducah PEMS. This data will be provided in a format specified by the Data Manager. Once this data has been loaded to Paducah PEMS, it will be compared to the original files submitted by the project to ensure that it was loaded correctly.

G.8.1.7 Laboratory Contractual Screening

Laboratory contractual screening is the process of evaluating a set of data against the requirements specified in the analytical SOW to ensure that all requested information is received. The contractual screening includes, but is not limited to, the analytes requested, total number of analyses, method used, EDDs, units, holding times, and reporting limits achieved. Contractual screening is performed for 100 percent of the data. The Lab Coordinator is primarily responsible for the contractual screening upon receipt of data from the analytical laboratory. During contractual screening, the analytical method requested on the laboratory statement of work is compared to the analytical method received from the laboratory to ensure that contract requirements were met.

G.8.1.8 Data Verification

Data verification is the process for comparing a data set against a set standard or contractual requirement. Verification is performed by the Data Coordinator electronically, manually, or by a combination of both. Verification is performed for 100 percent of data. Data verification includes contractual screening and criteria specific to the SWOU (On-Site) RA. Data is flagged as necessary. Verification qualifiers are stored in Paducah PEMS and transferred with the data to Paducah OREIS.

G.8.1.9 Data Validation

Data validation is the process performed by a third-party qualified individual. Third-party validation is defined as validation performed by persons independent from sampling, laboratory, and decision making for the program/project (i.e., not the program/project manager). Data validation evaluates the laboratory adherence to analytical-method requirements. Data validation is managed and coordinated with the data management team. The Data Validator performs data validation according to approved procedures. Data validation is documented in a formal deliverable from the data validator. Validation qualifiers are input and stored in Paducah PEMS and transferred to Paducah OREIS.

A minimum of 10 percent of the total number of samples will be validated for this project. Data validation will apply only to the definitive data. Data packages chosen for data validation will be validated at 100 percent.

G.8.1.10 Data Assessment

Data assessment is the process for assuring that the type, quality, and quantity of data are appropriate for their intended use. It allows for the determination that a decision (or estimate) can be made with the desired level of confidence, given the quality of the data set. Data assessment follows data verification and data validation (if applicable) and must be performed at a rate of 100 percent to ensure data is useable. Per contractor procedure, data validation can be performed concurrently with data verification and data assessment. Data assessment is not finalized until data validation is complete, if applicable, and the data validation qualifiers have been evaluated. Data assessment is performed on 100% of the data set, even when data validation is not required.

The data assessment is conducted by the SWOU (On-Site) RA project according to PRS procedure, PRS-ENM-5003, *Quality Assured Data*. Assessment qualifiers are stored in Paducah PEMS and transferred with the data to Paducah OREIS. Any problems found during the review process are resolved and documented in the data assessment package.

G.8.1.11 Data Consolidation and Usage

The data consolidation process consists of the activities necessary to prepare the evaluated data for the users. The Data Coordinator prepares files of the assessed data from Paducah PEMS to Paducah OREIS for future use. The Data Manager is responsible for transferring the data to Paducah OREIS. Data used in reports distributed to external agencies is obtained from data in Paducah OREIS and has been through the data review process. All data reported has the approval of the Data Manager.

G.8.2 DATA MANAGEMENT ROLES AND RESPONSIBILITIES

The following project roles are defined, and the responsibilities are summarized for each data management task described in the previous subsection.

G.8.2.1 Project Manager

The Project Manager is responsible for the day-to-day operation of the SWOU (On-Site) RA project. The Project Manager ensures the requirements of policies and procedures are met. The project manager or designee assesses data in accordance with PRS procedure, PRS-ENM-5003, *Quality Assured Data*. The Project Manager is responsible to flow down data management requirements to subcontractors as required.

G.8.2.2 Project Team

The project team consists of the technical staff and support staff (including the data management team) that conducts the various tasks required to successfully complete the project.

G.8.2.3 Data User

Data users are members of the project team who require access to project information to perform reviews, analyses, or ad hoc queries of the data. The data user determines project data usability by comparing the data against predefined acceptance criteria and assessing that the data are sufficient for the intended use.

G.8.2.4 Data Coordinator

The Data Coordinator enters the data into Paducah PEMS, including COC information, field data, data assessment and data validation qualifiers, and any pertinent sampling information. After receiving a notification that a fixed-base laboratory EDD is available to download, the Data Coordinator loads the EDD to Paducah PEMS, performs electronic verification of the data, and then compiles the data assessment package. The Data Coordinator also prepares data for transfer from Paducah PEMS to Paducah OREIS.

G.8.2.5 Document Control Center Manager

The DCC Manager is responsible for the long-term storage of project records. The SWOU (On-Site) RA project team will interface with the DCC Manager and will transfer documents and records in accordance with DOE requirements.

G.8.2.6 QA Specialist

The QA Specialist is part of the project team and is responsible for reviewing project documentation to determine if the project team followed applicable procedures.

G.8.2.7 Data Manager

The Data Manager is responsible for long-term storage of project data and for transmitting data to external agencies according to the *Data and Documents Management and Quality Assurance Plan for Paducah Environmental Management and Enrichment Facilities,* DOE/OR/07-1595&D2, and the Paducah Data Management Policy. The Data Manager ensures compliance to procedures relating to data management with respect to the project and that the requirements of PRS procedure, PRS-ENM-5003, *Quality Assured Data* are followed.

G.8.2.8 Lab Coordinator

The Lab Coordinator is responsible for contracting any fixed-base laboratory utilized during the sampling activities. The Lab Coordinator also provides coordination for sample shipment to the laboratory, contractual screening of data packages, and transmittal of data packages to the Paducah DCC.