

300405-0504290001



BWXT Technologies, Inc.

a McDermott company

BWXT of Ohio, Inc.

1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

ER-023/02
January 30, 2002

Mr. Richard B. Provencher, Director
Miamisburg Environmental Management Project
U. S. Department of Energy
P. O. Box 66
Miamisburg, OH 45343-0066

ATTENTION: Robert S. Rothman

SUBJECT: Contract No. DE-AC24-97OH20044
VARIOUS DOCUMENTS

REFERENCE: Statement of Work Requirement C.7.1d—Regulator Data Requests

Dear Mr. Provencher:

Rob Rothman from your office has approved the release of the following documents to the regulators for their review:

- PRS 276 VSAP, Final Revision 1
- ✓ • PRS 421 VSAP, Final
- Response to OEPA comments on PRS 421 VSAP
- PRS 280 Addendum 1
- PRS 72/73/87 FA Data Report, Final Revision 1
- Response to OEPA Comments on PRS 72/73/87 FA Data Report
- PRS 72/73/87 SAP, Final (submitted as Appendix to Data Report)
- PRS 76 FA Data Report, Final Revision 1
- Final Response to OEPA comments on PRS 76 FA Data Report

If you or members of your staff have any questions regarding the documents, or if additional support is needed, please contact Dave Rakel at extension 4203.

Sincerely,

Monte A. Williams
Project Manager, Environmental Restoration

MAW/DAR:jdg

Enclosures

- cc: Tim Fischer, USEPA, (1) w/attachments
 Brian Nickel, OEPA, (4) w/attachments
 Ruth Vandegrift, ODH, (1) w/attachments
 Paul Lucas, DOE/MEMP, (1) w/attachments
 Dave Rakel, BWXT of Ohio, (1) w/attachments
 Karen Arthur, BWXT of Ohio, (1) w/attachments
 Monte Williams, BWXT of Ohio, (2) w/attachment
 DCC

MAMISBURG
 LOG
 CODE
 E-00541
 10443 276
 72/73/87
 280
 421
 76

MAMISBURG ENVIRONMENTAL RESTORATION
 PROJECT
 02/01/02
 10:00 AM
 RCVD

PRS 421

VERIFICATION SAMPLING & ANALYSIS PLAN

Mound Plant
Miamisburg, OH

Final

January 2002



Department of Energy



BWXT of Ohio, Inc.

TABLE OF CONTENTS

Section	Page
1.0 PURPOSE	1
2.0 SAMPLING	1
2.1 Type	1
2.2 Location and Coordinates	1
2.3 Frequency	2
2.4 Analyte Justification	2
2.5 Designation	3
2.6 Procedures	4
2.7 QC Samples	4
2.8 Containers, Holding Times, Preservatives	5
2.9 Split Samples	5
3.0 ANALYSES	5
3.1 Onsite Gamma Spec (Not Required)	5
3.2 Onsite Alpha Spec	6
3.3 Offsite Alpha Spec	7
4.0 EVALUATION AND REPORTING	7
5.0 REFERENCES	7

Figures

Figure 1: Location of PRS 421	Appendix A
Figure 2: PRS 421 Sample Plan	Appendix A

Tables

Table 1: Contaminants of Concern	Appendix B
Table 2: Sample Coordinates	Appendix B
Table 3: Summary of Applicable SOPs	Appendix B
Table 4: Containers, Holding Times, and Preservatives	Appendix B
Table 5: Hot Spot Criteria	Appendix B

Appendices

Appendix A	Figures
Appendix B	Tables
Appendix C	Field Tracking Sheet

Acronyms

COC	contaminant of concern
DOT	Department of Transportation
DQO	Data Quality Objective
IATA	International Air Transport Association
MEIMS	Mound Environmental Information Management System
OEPA	Ohio Environmental Protection Agency
PRS	Potential Release Site
QC	quality control
RCT	Radiological Control Technician
SL	screening level
SOP	standard operating procedure
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
VSAP	Verification Sampling and Analysis Plan

1.0 PURPOSE

This Verification Sampling and Analysis Plan (VSAP) is prepared for Potential Release Site (PRS) 421. The purpose is to collect and evaluate data to support sufficient removal of contamination. The Data Quality Objective (DQO) is to demonstrate to the Core Team that the cleanup objectives have been met.

2.0 SAMPLING

Verification sampling is conducted to confirm that sufficient removal of soil has occurred and/or residual contamination, if any, is below acceptable levels. Cleanup objectives and Hot Spot criteria for contaminants of concern (COCs) are presented in Tables 1 and 5. Verification sampling will be conducted following the completion of removal activities and receipt of onsite screening results that support that verification sampling is appropriate. To expedite fieldwork, sampling may be performed in phases, as areas become ready for verification.

2.1 TYPE

Other than to support quality control (QC) requirements (field blanks, equipment rinses, etc.), all samples collected will be from surface soils.

2.2 LOCATION AND COORDINATES

PRS 421 is located in the south-central portion of the Mound Plant property as shown on Figure 1. Verification sampling will be employed across the entire limits of the PRS as shown on Figure 2. Three additional historic surface soil sample locations (S0724, 108CC, and S1002) located north of the roadway are accommodated within the sampling plan. A 30-foot by 30-foot grid (modeling the 10-meter square grids employed in PRS 407 verification effort) will be used. The corners of each grid designate the sample locations for that grid. Based on Figure 2, 140 samples will be collected. Sample locations that fall within the roadway will only be collected if and where the roadway requires remediation. If excavation exceeds the limits shown in Figure 2,

additional grids will be established to adequately cover the additional area. If excavation follows a drainage feature outside of the limits of the PRS, verification samples will be collected every 30 linear feet downslope from the point it exits the PRS limits. The number and location of additional grids and samples, if any, will be made in coordination with Ohio EPA (OEPA) and USEPA.

Sample coordinates for proposed locations are presented in Table 2. Prior to the start of the field activities, the sampling locations will be surveyed, staked, and identified at the site. Horizontal locations will be reported in the Ohio State Plane Coordinate System. If any sampling locations are moved during the field effort (due to utility, obstructions, etc.), the actual location will be resurveyed and presented in the Data Report. If additional grids and/or sample locations are established, they will be graphically represented in the Data Report, as well as the associated sample coordinates.

2.3 FREQUENCY

Grid sizing is consistent with PRS 407 verification sampling. Frequency of samples (how many grids need to be sampled) was calculated for PRS 407. For PRS 421, all grids will be sampled to provide a uniform distribution of verification samples.

2.4 ANALYTE JUSTIFICATION

PRS 421 was identified as a PRS based on historic sample data for plutonium-238 (396.4 pCi/g), thorium-228 (15.6 pCi/g), and thorium-232 (32.6 pCi/g) at unacceptable levels. These COCs are based on the Core Team PRS Package recommendation for PRS 421 removal action. Thorium-230 was added as a COC because it was identified during a removal action (PRS 407) that was performed north and upgradient of PRS 421.

The contaminants of concern for PRS 421 include Th-228, Th-230, Th-232, and Pu-238. The source of the contamination is believed to be surface sediment runoff from the Building 21 (PRS 407) area. The COC list for PRS 421 differs from the analytes reported in the PRS 407/281 removal action OSC Report for the following reasons.

Other radionuclide results were reported in the OSC Report, which the onsite gamma spec lab includes in their standard reports, but the actual contaminants of concern for PRS 407 were Th-228, Th-230, and Pu-238.

Even though not listed as contaminants of concern for PRS 407, randomly selected locations were analyzed for semi-volatile organic compounds, TAL inorganics, cyanide, and common anions to confirm the absence of chemical contamination.

The PRS 281 potential contaminants of concern was a historical isolated waste oil spill which previous sampling results could not confirm and elevated levels of Ra-226. A review of sampling data in MEIMS indicated no Ra-226 results within the PRS 421 boundary that exceeds the soil screening level (SL) of 2.1 pCi/g.

The MEIMS database was researched to locate any historical sampling detections of gamma emitters that would not be detected by the proposed alpha spec procedure. This included Co-60, Cs-137, Am-241, Ra-226, Pb-210, and U-238. The search indicated one surface sample location with results above the soil screening level (Cs-137 at 1.15 pCi/g, SL – 0.76 pCi/g).

2.5 DESIGNATION

Soil and QC samples will be identified and labeled according to procedures in Method: S-028, Sample Control and Documentation, of the Methods Compendium (Reference 2). Sample identification labels will be used for each sample container. Sample containers will be sealed immediately after sample collection. Labels will be completed, when possible, prior to fieldwork to minimize the handling of the sample containers. Each label will include the following information:

- Sample identification
- Time and date of collection
- Parameters to be analyzed
- Sampler's initials

Collected samples will be uniquely identified according to the system 421V-W-XXXXXX, where:

421V = Mound Environmental Information Management System (MEIMS) Project Code
(PRS 421 Verification samples)

W = QC sample where:

- 0 = no QC sample
- 1 = field duplicate
- 2 = equipment rinsate
- 3 = trip blank

XXXXXX = a sequential, six digit sample identifier (i.e., 000001, 000002, etc.) to be used on the laboratory chain of custody for incorporation of the data into MEIMS.

Matrix Spike, Matrix Spike Duplicate, and any Split Samples will be identified on the field tracking sheet (Appendix C), but no unique QC code will be used for these samples.

2.6 PROCEDURES

All verification samples will be collected from surface soils. Field activities will follow standard operating procedures (SOPs) presented in the Methods Compendium (Reference 2). Each soil sample will be field screened for radiological activities using a FIDLER and alpha scintillometer probe (or equivalents) by a Radiological Control Technician (RCT). These radiological activities will be appropriately documented in accordance with MD-80036.

Applicable SOPs are summarized in Table 3, along with any planned additions or deviations.

2.7 QC SAMPLES

QC samples (calculated for offsite-analyzed samples only) will be collected as follows:

- field duplicates: 1 for every 10 soil samples
- equipment rinses: 1 for every 20 soil samples
- matrix spike: 1 for every 20 soil samples
- matrix spike duplicates: 1 for every 20 soil samples

2.8 CONTAINERS, HOLDING TIMES, AND PRESERVATIVES

Table 4 presents the bottle requirements, preservatives, and holding times for the offsite analyses required for the PRS 421 verification sampling.

2.9 SPLIT SAMPLES

It is anticipated that OEPA will require split sampling, and schedules will be coordinated to facilitate a smooth collection of samples.

The state may collect split samples (at locations already being sampled per the VSAP) and identify the analytical parameters whether or not they are COCs. The number, location, analyses, and priorities related to these split samples will be discussed at a pre-job meeting to include contractor, state, and project representation.

The state may also request up to five additional surface soil samples anywhere within the PRS at any time prior to or during the sample event. These samples are to be analyzed for COCs unless field conditions such as soil staining, suggest otherwise. Identification and communication of these biased locations will be made to DOE/contractor as soon as possible to minimize disruption of the fieldwork.

All state-requested samples will be collected and containerized by the contractor sample technician. Sufficient sample volume required to accommodate state sampling is not anticipated to be a concern because all samples are collected from surface soil.

Actual splitting of samples will be performed in the onsite lab as discussed below. Final coordinates for split samples will be provided electronically to OEPA.

3.0 ANALYSES

3.1 ONSITE GAMMA SPEC (NOT REQUIRED)

RadCon has concluded that characterization data for PRS 421 supports that short count gamma spec screening for shipping purposes is not necessary. FIDLER readings will be obtained prior to sample shipment to confirm characterization data. Onsite alpha

spec analysis will serve as the screening for offsite shipment of samples. Sample shipment will be performed in accordance with applicable Department of Transportation (DOT) and International Air Transport Association (IATA) regulations.

3.2 ONSITE ALPHA SPEC

Since COCs are limited to plutonium and thorium isotopes, onsite gamma screening will not be required. Instead, all soil samples collected will be screened by onsite alpha spec analysis (MD-80030). If results confirm that levels are within acceptable limits to qualify for verification, samples will be containerized for shipment by the onsite lab and forwarded for offsite analysis. Sample volume from locations designated by OEPA as splits will be divided by the onsite lab and containerized for OEPA. This streamlined approach provides the following advantages:

1. Given that OEPA split samples are collected for the purpose of comparing offsite data, processing and splitting the samples onsite in the lab will provide a more homogenized, representative sample. A split of processed soil will provide more assurance that offsite results will be comparable. It is a better starting point given the nature of radionuclide contamination.
2. OEPA can perform field oversight rather than being sample technicians. They can monitor collection etc. but not have to perform the fieldwork.
3. Only one set of samples is analyzed onsite, saving time and effort, and reducing possible error in paperwork.
4. If onsite alpha spec reveals contamination at unacceptable levels, additional excavation may be performed and another sample collected, rather than negotiating borderline levels of contamination. It reduces the potential for unnecessary offsite analyses.
5. It eliminates potential error caused by variations in sample collection methods/techniques.

3.3 OFFSITE ALPHA SPEC

All (100%) of verification samples will be analyzed offsite for isotopic plutonium and thorium by alpha spec (Method A-012).

4.0 EVALUATION AND REPORTING

Documentation of verification activities and evaluation of associated data is performed to demonstrate that the cleanup goals have been met. A Data Report will be prepared to include:

- variances, if any, from the VSAP,
- presentation of data that is consistent with the cleanup objectives and hot spot criteria,
- a summary of data review and validation, and
- 95% upper confidence limit (UCL) calculations.

Hot spot criteria are detailed in the VSAP per the Action Memorandum for Contingent Removal Action for Contaminated Soil (Reference 1). Hot spot criteria are presented in Table 5. If any verification sample exceeds the hot spot criteria, additional soil removal is required.

Within the entire verification area (including hot spots), the 95% UCL of the verification results for each COC will not exceed its cleanup objective.

Since multiple contaminants are present at the PRS, the data will be reviewed to determine if cumulative risk is acceptable.

Ten-percent data validation of the offsite analytical results will be performed as well as a general review of all of the data not validated.

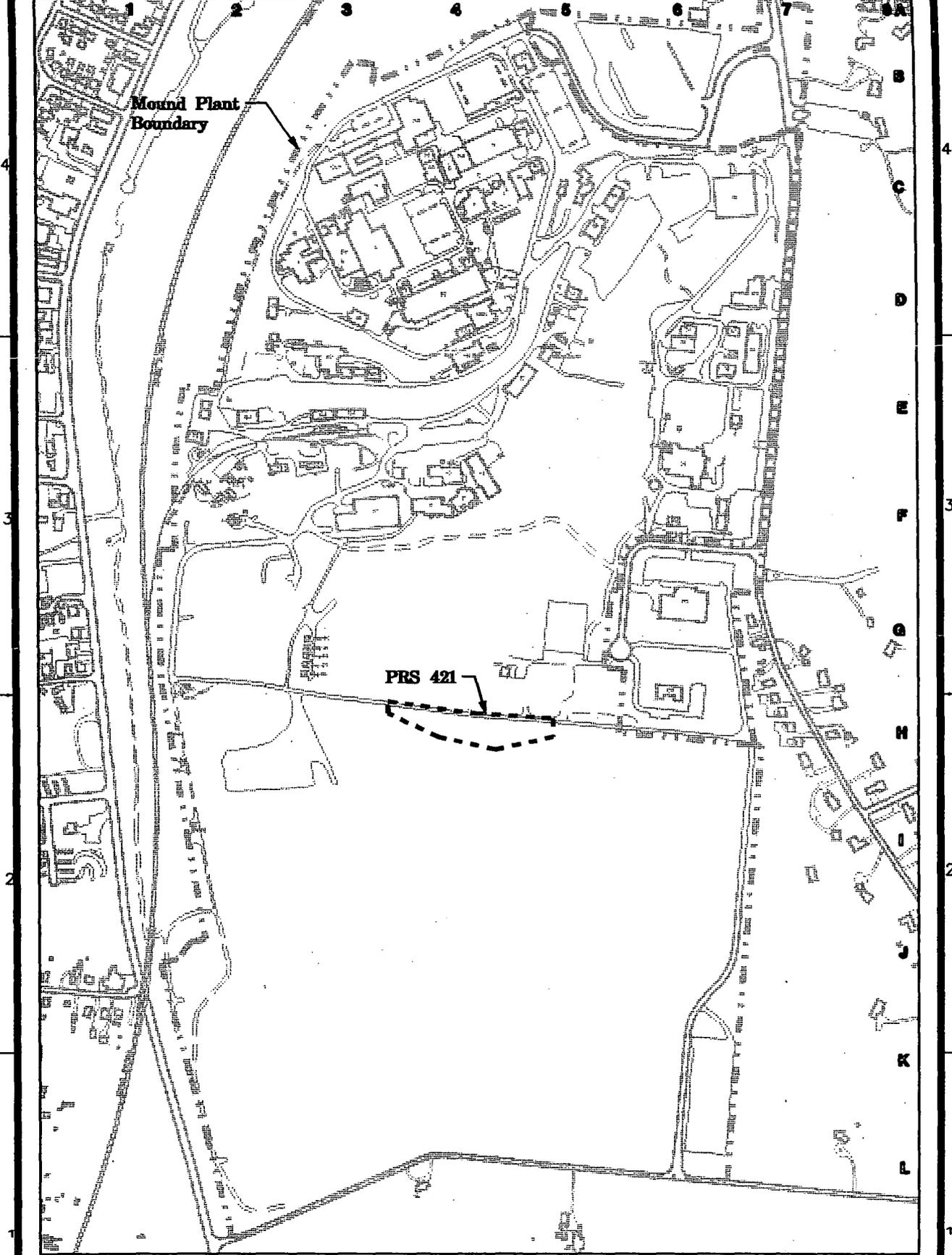
5.0 REFERENCES

- Reference 1 Action Memorandum for Contingent Removal Action for Contaminated Soil, Public Review Draft, September 2001
- Reference 2 Technical Manual MD-80045, Issue 1, Methods Compendium, 27 April 2000

APPENDIX A

FIGURES

A B C D



Mound Plant Boundary

PRS 421

Legend

- Structure
- Paved roadway
- Unpaved roadway
- Railroad
- Water course
- Fence
- Mound Plant boundary
- Contour line

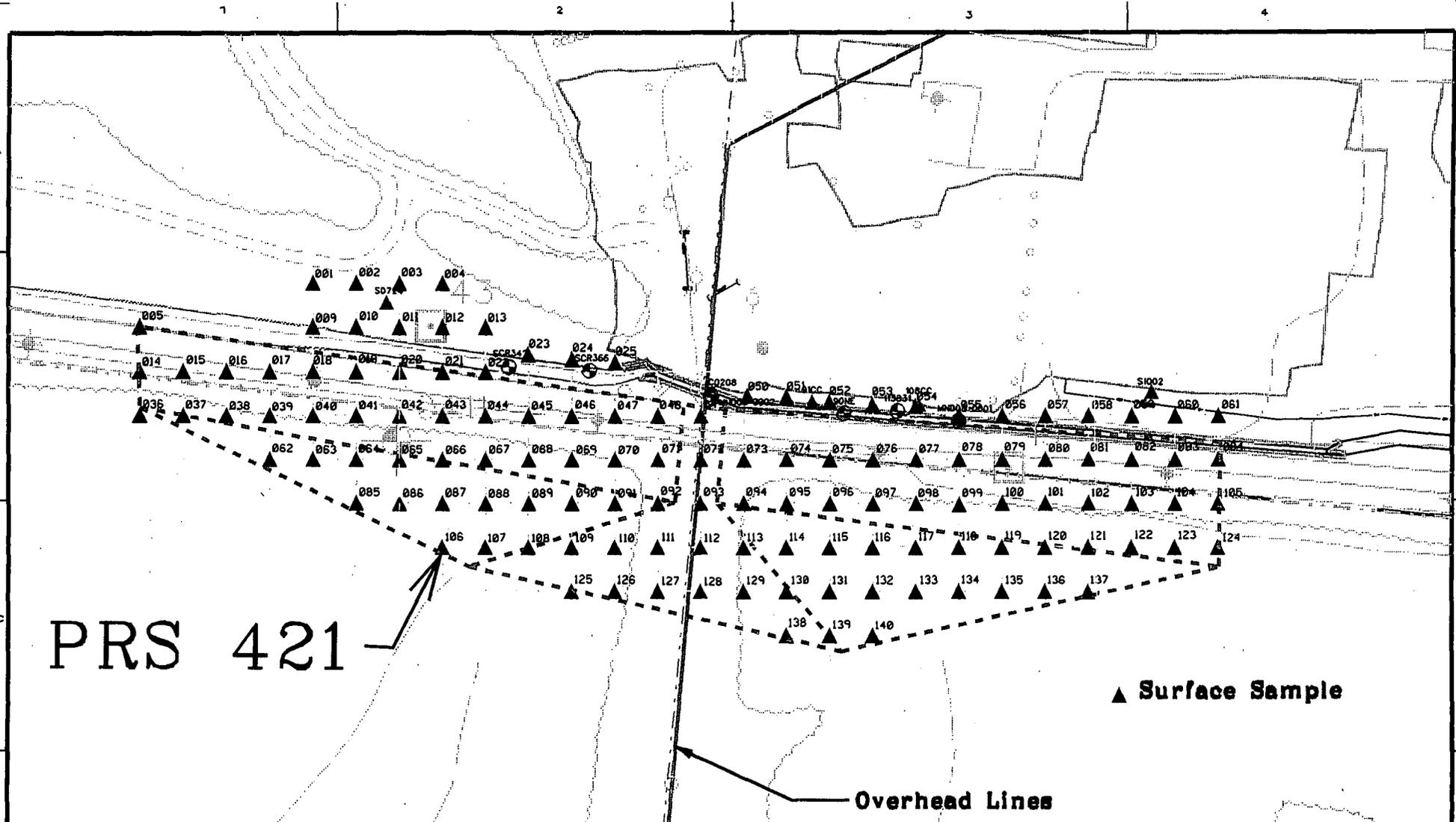
0 100 200 400 600 800 1000
Scale in Feet



SHEET	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
ISSUE	1	2	3	4	5	6	TITLE CLASSIFICATION														
ISSUE	A	Figure 1 Location of PRS 421																			
PROJECT CLASSIFICATION		UNCLASSIFIED		D		gen_site_plan.dgn		DATE													
DATE	10/23/01	ISSUE FOR GENERAL USE	SSP	SCALE Graphic																	
STATE	MO	CDL	09/14/09	POSITION	STATION /																

gen_site_plan.dgn

A B C D



PRS 421

▲ Surface Sample

Overhead Lines

GRAPHIC SCALE



SCALE: 1" = 100'



MOUND
 Environmental
 Restoration
 Geographic
 Information
 System

SHEET	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
ISSUE	1	2	3	4	5	6															
ISSUE	A																				
PART CLASSIFICATION																					
UNCLASSIFIED																FIGURE 2 PRS 421 SAMPLE PLAN					
FILE	grid.layout.dgn															JOB NUMBER		*			
DWG TYPE	SITE		PRG		ER-015		DATE		SCALE		GRAPHIC		SHEET 1 OF 1								
STATUS	MD-REL-11/15/01										ORIGIN		MSTATION / J								

A	11/15/01	ISSUE FOR SAMPLE PLAN	KRM	#	#		
ISS	DATE	REVISION	BY	CHKD	DATE	APPROV	#

APPENDIX B

TABLES

Table 1: Contaminants of Concern (pCi/g)

COC	Bkgd.	Guideline Value (10 ⁻⁵)	Cleanup Objective	Onsite Analysis	Offsite Analysis	CRDL (offsite)
Plutonium-238	0.13	55 ⁽³⁾	55 ⁽²⁾	100% of samples get screened by onsite alpha spec (MD-80030)	100% of samples go to offsite alpha spec (isotopic Pu & Th) by Method A-012	0.01
Thorium-228+D	1.5	1.1 ⁽¹⁾	2.6 ⁽⁴⁾			0.1
Thorium-230+D	1.9	0.9 ⁽¹⁾	2.8 ⁽²⁾			0.1
Thorium-232+D	1.4	0.7 ⁽¹⁾	2.1 ⁽²⁾			0.1

Radionuclides labeled with a "+ D" indicate that pertinent daughters are included within the risk calculation.

CRDL: contract required detection limit.

- (1) These guideline values are based on the more restrictive of the Construction Worker and Site Employee Values. These values were calculated using the methodology contained in Risk-Based Guideline Values, Mound Plant, Miamisburg, Ohio, March 1997, Final (Revision 4)(DOE 1997) but were performed using April 2001 HEAST slope factors.
- (2) Cleanup objective as specified in the Contingent Removal Action for Contaminated Soil, Public Review Draft, September 2001.
- (3) Based on April 2001 HEAST slope factors, the 10⁻⁶ RBGV for Pu-238 is 61 pCi/g; however, 55 pCi/g was retained because of its familiarity to the public.
- (4) Sum of 10⁻⁵ GV and background.

Table 2: Sample Coordinates

Sample Location	Survey Coordinate (X)	Survey Coordinate (Y)
001	1465018.742	596916.199
002	1465048.742	596916.199
003	1465078.742	596916.199
004	1465108.742	596916.199
005	1464898.742	596886.199
006	1464928.742	596886.199
007	1464958.742	596887.208
008	1464988.742	596887.208
009	1465018.742	596887.208
010	1465048.742	596887.208
011	1465078.742	596887.208
012	1465108.742	596887.208
013	1465138.742	596887.208
014	1464898.742	596856.199
015	1464928.742	596856.199
016	1464958.742	596856.199
017	1464988.742	596856.199
018	1465018.742	596856.199
019	1465048.742	596856.199
020	1465078.742	596856.199
021	1465108.742	596856.199
022	1465138.742	596856.199
023	1465168.742	596856.199
024	1465198.742	596856.199
025	1465228.742	596856.199
026	1465258.742	596856.199
027	1465288.742	596856.199
028	1465318.742	596856.199
029	1465348.742	596856.199
030	1465378.742	596856.199
031	1465408.742	596856.199
032	1465558.742	596856.199
033	1465588.742	596856.199
034	1465618.742	596856.199
035	1465648.742	596856.199
036	1464898.742	596826.199
037	1464928.742	596826.199
038	1464958.742	596826.199

Table 2: Sample Coordinates

Sample Location	Survey Coordinate (X)	Survey Coordinate (Y)
039	1464988.742	596826.199
040	1465018.742	596826.199
041	1465048.742	596826.199
042	1465078.742	596826.199
043	1465108.742	596826.199
044	1465138.742	596826.199
045	1465168.742	596826.199
046	1465198.742	596826.199
047	1465228.742	596826.199
048	1465258.742	596826.199
049	1465288.742	596826.199
050	1465318.742	596826.199
051	1465348.742	596826.199
052	1465378.742	596826.199
053	1465408.742	596826.199
054	1465438.742	596826.199
055	1465468.742	596826.199
056	1465498.742	596826.199
057	1465528.742	596826.199
058	1465558.742	596826.199
059	1465588.742	596826.199
060	1465618.742	596826.199
061	1465648.742	596826.199
062	1464988.742	596796.199
063	1465018.742	596796.199
064	1465048.742	596796.199
065	1465078.742	596796.199
066	1465108.742	596796.199
067	1465138.742	596796.199
068	1465168.742	596796.199
069	1465198.742	596796.199
070	1465228.742	596796.199
071	1465258.742	596796.199
072	1465288.742	596796.199
073	1465318.742	596796.199
074	1465348.742	596796.199
075	1465378.742	596796.199
076	1465408.742	596796.199

Table 2: Sample Coordinates

Sample Location	Survey Coordinate (X)	Survey Coordinate (Y)
077	1465438.742	596796.199
078	1465468.742	596796.199
079	1465498.742	596796.199
080	1465528.742	596796.199
081	1465558.742	596796.199
082	1465588.742	596796.199
083	1465618.742	596796.199
084	1465648.742	596796.199
085	1465048.742	596766.199
086	1465078.742	596766.199
087	1465108.742	596766.199
088	1465138.742	596766.199
089	1465168.742	596766.199
090	1465198.742	596766.199
091	1465228.742	596766.199
092	1465258.742	596766.199
093	1465288.742	596766.199
094	1465318.742	596766.199
095	1465348.742	596766.199
096	1465378.742	596766.199
097	1465408.742	596766.199
098	1465438.742	596766.199
099	1465468.742	596766.199
011	1465498.742	596766.199
101	1465528.742	596766.199
102	1465558.742	596766.199
103	1465588.742	596766.199
104	1465618.742	596766.199
105	1465648.742	596766.199
106	1465108.742	596736.199
107	1465138.742	596736.199
108	1465168.742	596736.199
109	1465198.742	596736.199
110	1465228.742	596736.199
111	1465258.742	596736.199
112	1465288.742	596736.199
113	1465318.742	596736.199
114	1465348.742	596736.199

Table 2: Sample Coordinates

Sample Location	Survey Coordinate (X)	Survey Coordinate (Y)
115	1465378.742	596736.199
116	1465408.742	596736.199
117	1465438.742	596736.199
118	1465468.742	596736.199
119	1465498.742	596736.199
120	1465528.742	596736.199
121	1465558.742	596736.199
122	1465588.742	596736.199
123	1465618.742	596736.199
124	1465648.742	596736.199
125	1465198.742	596706.199
126	1465228.742	596706.199
127	1465258.742	596706.199
128	1465288.742	596706.199
129	1465318.742	596706.199
130	1465348.742	596706.199
131	1465378.742	596706.199
132	1465408.742	596706.199
133	1465438.742	596706.199
134	1465468.742	596706.199
135	1465498.742	596706.199
136	1465528.742	596706.199
137	1465558.742	596706.199
138	1465348.742	596676.199
139	1465378.742	596676.199
140	1465408.742	596676.199

Table 3: Summary of Applicable SOPs

SOP No. and Title	Procedure Description	Deviations
S-001: General Instructions for Field Personnel	<ul style="list-style-type: none"> • Follow procedures outlined in the SOP. 	<ul style="list-style-type: none"> • None.
S-002: Soil Sampling with a Spade and Scoop	<ul style="list-style-type: none"> • Follow procedures outlined in the SOP. 	<ul style="list-style-type: none"> • None.
S-004: Guide to Management of Collected Investigative-Derived Material	<ul style="list-style-type: none"> • Follow procedures outlined in the SOP. 	<ul style="list-style-type: none"> • None.
S-020: General Equipment Decontamination	<ul style="list-style-type: none"> • All sampling equipment will be decontaminated between sampling locations. 	<ul style="list-style-type: none"> • Methanol and hexane rinses for the decontamination of sampling equipment will not be used.
S-028: Sample Control and Documentation	<ul style="list-style-type: none"> • Follow procedures outlined in the SOP. 	<ul style="list-style-type: none"> • None.
S-029: Guide to Handling, Packaging, and Shipping of Samples	<ul style="list-style-type: none"> • Follow procedures outlined in the SOP. 	<ul style="list-style-type: none"> • None.
MD-80036, operation 30004: Performance Testing and Operation of NE Electra	<ul style="list-style-type: none"> • Mound RCT will use instruments per SOP and record field measurements on radiological safety data sheet (RSDS) form. 	<ul style="list-style-type: none"> • None.
MD-80036, operation 30005: Operation of the Bicorn FIDLER	<ul style="list-style-type: none"> • Mound RCT will use instruments per SOP and record field measurements on RSDS form. 	<ul style="list-style-type: none"> • None.

Table 4: Containers, Holding Times, and Preservatives

Analysis	Method	Matrix	Bottle Type	Bottle Size	Number of Bottles	Preservative	Holding Time
Onsite Alpha Spectrometry	MD-80030	Soil	as lab specified	as lab specified	1	None	None
Offsite Alpha Spectrometry	Compendium A-012	Soil	Qorpak, provided by onsite lab	250 ml	1	None	None
	Compendium A-012	Water	Plastic Cubetainer	4 liters	2	pH <2 with HNO ₃	None

Table 5: Hot Spot Criteria (pCi/g)

COC	Bkgd.	Guideline Value (10^{-5})	Cleanup Objective	Hot Spot Criteria
Plutonium-238	0.13	55 ⁽³⁾	55 ⁽²⁾	165
Thorium-228+D	1.5	1.1 ⁽¹⁾	2.6 ⁽⁴⁾	4.8
Thorium-230+D	1.9	0.9 ⁽¹⁾	2.8 ⁽²⁾	4.6
Thorium-232+D	1.4	0.7 ⁽¹⁾	2.1 ⁽²⁾	3.5

COC: contaminant of concern

Radionuclides labeled with a "+ D" indicate that pertinent daughters are included within the risk calculation.

- (1) These guideline values are based on the more restrictive of the Construction Worker and Site Employee Values. These values were calculated using the methodology contained in Risk-Based Guideline Values, Mound Plant, Miamisburg, Ohio, March 1997, Final (Revision 4)(DOE 1997) but were performed using April 2001 HEAST slope factors.
- (2) Cleanup objective as specified in the Contingent Removal Action for Contaminated Soil, Public Review Draft, September 2001.
- (3) Based on April 2001 HEAST slope factors, the 10^{-6} RBGV for Pu-238 is 61 pCi/g; however, 55 pCi/g was retained because of its familiarity to the public.
- (4) Sum of 10^{-5} GV and background.

Hot Spot Criteria = 10^{-5} GV x 3 + Bkgd.

APPENDIX C

FIELD TRACKING SHEET

