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PRS 66
(Including PRS 80/40/38/39)

ACTION MEMO EE/CA

Mound Plant
Miamisburg, OH

Public Review Draft

October 2002

Department of Energy

BWXT of Ohio, Inc.

Executive Summary

I Action Memo EE/CA Overview

This Action Memorandum Engineering Evaluation/Cost Analysis (EE/CA) has been prepared by the U.S. Department of Energy (DOE) under authorities delegated by Executive Order 12580, Section 104 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and is consistent with 40 Code of Federal Regulations (CFR) Part 300.415 (Removal Action) of the National Oil and Hazardous Substance Pollution Contingency Plan (NCP). It has been completed to; 1) document the evaluation of site conditions and the Engineering Evaluation and Cost Analysis (EE/CA) process, 2) propose the action described therein, and 3) gather public input.

This removal action is proposed for Potential Release Site (PRS) 66 (also known as "The Ravine Fill or Area 7"), PRS 80 (adjacent to PRS 66), and PRS 40 (located within the PRS 66 limits) as one removal activity. These PRSs are located as shown in Figure 1 on Page 5. PRSs 38 and 39 (associated with Building 51 operations) will be closed out in conjunction with the PRS 66 Removal Action.

Historical records were reviewed and detailed field characterization was performed to identify the nature and extent of contamination at PRS 66, 80 and 40. Historical records indicate that the area received between 10,000 and 20,000 collapsed empty thorium-contaminated drums, a contaminated 1940s flatbed truck, an unknown amount of ventilation equipment from SW Building renovation, an old washing machine, and the potential for other contaminated debris and soil. Three different geophysical surveys have confirmed the presence of a subsurface anomaly indicating the presence of ferrous metal debris and concrete, consistent with the historical records.

From October 1999 through July 2002, characterization data from 2168 unique sample locations was gathered from the 397 boreholes drilled within the PRS 66/40/80 footprint. The samples were analyzed by a combination of on-site and off-site gamma and alpha spectroscopy techniques. Sampling and analysis results, which are discussed in Section 2, confirmed the presence of low-level radioactive soil contamination and debris within a contiguous area stretching from the northwest section of the PRS footprint down through the south end of the PRS boundary.

II PRS 66 Characterization Summary

The large amount of available radiological and chemical characterization data was fully analyzed across the entire PRS 66/40/80 footprint. Upon analyzing the data, four areas within the footprint were defined based upon the contiguous nature and extent of contamination found within the characterization data. Area I was designated as that area, which would not require excavation for the purpose of contaminated soil removal, since it contained no characterization data above the project cleanup objective. Area II was designated as that area within the northern-most section of the PRS footprint requiring removal due to contiguous contamination (behind Buildings 98 and 29). Area III was designated as that area within the southern-most section of the PRS footprint stretching from the southwest edge of the parking lot to the south of the former Building 51 location requiring removal due to contiguous contamination. Area IV was designated as an area containing sporadic locations of contamination above the cleanup objective.

The summarization of the radiological characterization data results by area for PRS 66/40/80 for the primary Contaminants of Concern (COCs) is as follows:

PRS 66/80/40
Radiological Characterization Summary

Primary Contaminant Of Concern	Area I			Area II			Area III			Area IV		
	Num. Samples	Detections > Cleanup Objective	Max Result (pCi/g)	Num. Samples	Detections > Cleanup Objective	Max Result (pCi/g)	Num. Samples	Detections > Cleanup Objective	Max Result (pCi/g)	Num. Samples	Detections > Cleanup Objective	Max Result (pCi/g)
Actinium 227 CO - 4.6 (pCi/g)	645	0	2.99	699	5	274.00	526	2	108.00	305	1	6.04
Cesium 137 CO - 3.8 (pCi/g)	645	0	0.65	699	5	34.12	526	1	22.00	305	0	1.31
Plutonium 238 CO - 55 (pCi/g)	645	0	27.36	699	10	12,000.00	526	23	2,433.00	305	0	26.86
Radium 226 CO - 2.9 (pCi/g)	645	0	2.75	689	9	17.65	525	7	7.37	305	0	2.56
Thorium 232 CO - 2.1 (pCi/g)	645	0	1.77	699	82	1,985.00	526	29	67.10	305	12	5.50

The summarization of the chemical characterization data by area is as follows:

PRS 66/80/40
Chemical Characterization Summary

Primary Contaminant Of Concern	Area I			Area II			Area III			Area IV		
	Num. Samples	Detections > Cleanup Objective	Max Result (ug/kg)	Num. Samples	Detections > Cleanup Objective	Max Result (ug/kg)	Num. Samples	Detections > Cleanup Objective	Max Result (ug/kg)	Num. Samples	Detections > Cleanup Objective	Max Result (ug/kg)
VOCs	111	0	na	132			45	0	na	48	0	na
Ethylbenzene		0	320		1	22,000		0	39		0	na
SVOCs	174	0	na	164	1		143	2		91	0	na
Benzo(a)pyrene		0	4,000		1	4,500		2	13,000		0	2,200
Metals	195	0	na	217	3		166	1		100	0	
Beryllium		0	1,400		2	27,500		1	226,000		0	1,100
Mercury		0	1,200		1	102,000		0	24,600		0	1,600
PCBs	84	0	na	116	2		29	0	na	21	0	
Aroclor-1248		0	260		1	13,000		0	1,700		0	na
Aroclor-1254		0	41		1	6,000		0	na		0	na

III Known Risk to the Public Health or the Environment

The known risks associated with the contamination area do not present an immediate threat to the public health or the environment. The DOE, along with the Ohio Environmental Protection Agency (OEPA) and the United States Environmental Protection Agency (USEPA), has determined that a non-time critical removal action, as specified in 40 CFR 300.415 of the NCP, is an appropriate response for PRS 66/40/80. This decision was based upon the characterization data obtained and the historical site knowledge pertaining to items and debris placed within the ravine over the course of several years.

IV Potential Remedial Alternatives

Per the CERCLA EE/CA process, a screening of the various removal action alternatives and potentially applicable technologies was performed utilizing the guidance as contained within the "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA". In addition, an independent evaluation of the PRS was performed by the U.S Department of Energy Office of Environmental Management Innovative Treatment and Remediation Demonstration Program (ITRD group).

The technology screening stage of the EE/CA process identified only a limited number of technologies (see Table 8 on Page 44), which would be applicable to contaminated soils contained within PRS 66. Those that were not applicable to PRS 66 were eliminated. In the past few years, research and development has advanced the treatment of radiologically contaminated soils for some radionuclides, however none of these efforts were found to be feasible for the COCs within PRS 66. Additionally, although Institutional Controls and Containment technologies were found to be technically feasible, they were screened from a detailed analysis since they did not remove the contamination from the Mound site per the project's Removal Action Objectives (RAOs).

Of the remedial technologies screened, only *Conventional Excavation With Off-Site Disposal Technology* and *Precision Excavation With Off-Site Disposal* were analyzed in detail within the EE/CA, since they alone were fully capable of meeting the project's RAOs.

Included within the EE/CA detailed analysis were the following alternatives:

- No action
- Full excavation, removal and off-site shipment of all soils within the PRS 66/40/80 footprint
- Full excavation and removal of all soils within the footprint with shipment of only the segregated contaminated soil
- Precision excavation, removal and shipment of all contiguous soil above the cleanup objective level based upon characterization data, field screening and/or sampling utilizing a "hot spot criteria" to leave lower risk soils within areas of PRS footprint behind
- Precision excavation, removal and shipment of all soil within the PRS footprint above the cleanup objective level based upon characterization data, field screening and/or sampling.

V EE/CA Process Conclusion and Recommendation

The four potential excavation alternatives and the "No Action" alternative were evaluated in a more detailed analysis according to the nine criteria specified in the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 CFR 300.430(e)(2)]. These criteria include the following: Overall Protection of Human Health and the Environment, Compliance with ARARs, Long-term Effectiveness and Permanence, Reduction in Toxicity, Mobility, or Volume Through Treatment, Short-term Effectiveness, Implementability, State/Support Agency Acceptance, and Community Acceptance. This detailed analysis can be found within Section 6.7 on Page 49.

Based upon the qualitative evaluation and comparison of the alternatives analyzed, the removal action alternative recommended as the most appropriate for PRS 66/80/40 is the precision excavation, removal and shipment of all soil above the cleanup objective level based upon characterization data and field screening and/or sampling.

VI Recommended Alternative Implementation

The implementation of the recommended alternative would incorporate slopebacks, which would be necessary to insure soil stability and worker safety, that extend beyond the contaminated excavation area footprint into the non-contaminated areas. All soil and debris within the contaminated areas as defined by the characterization data is assumed contaminated and would be treated as waste. Once all known contamination is removed from the contaminated excavation area, any residual contamination remaining would be "chased" and removed in all lateral and vertical directions until the remaining surface areas are verified to be below the project cleanup objective levels.

Overburden and slopeback soil, which is not contaminated based upon characterization results, would be screened during removal utilizing field instrumentation and sampling, as necessary, prior to stockpiling for later backfill. Any soils and debris within the characterized non-contaminated overburden and slopeback areas would be removed and shipped as waste, should field instrumentation and/or sampling reveal contamination above the project cleanup objectives. Non-contaminated debris

discovered in the non-contaminated overburden and slopeback areas would be handled per agreement of the OEPA/USEPA permissible backfill guidelines (see Appendix G).

The excavation would proceed in stages of 5-foot excavation intervals, based upon the characterization results and extrapolated into the field using precision surveying techniques and real time ongoing monitoring throughout the excavation process. Contaminated material would be hauled to the site's railroad load-out facility for offsite disposal. Upon reaching the characterization defined extent and obtaining acceptable radiological cleanup results through field screening methods and on-site sampling analysis, as required, verification samples would be secured and analyzed per an approved PRS 66 Verification Sampling and Analysis Plan (VSAP).

Table of Contents

Section **Page**

1.0 PURPOSE OF THE ACTION MEMO EE/CA 1

2.0 SITE CONDITIONS AND BACKGROUND 2
2.1 National Priorities List Status 3
2.2 PRS Site Characteristics 3
2.2.1 Addition of PRS 80 7
2.2.2 Addition of PRS 40 8
2.2.3 PRS 66/80/40 Site Geology and Hydrogeology 8
2.3 Current and Historical Analytical Data 9
2.3.1 Previous Investigations 10
2.3.2 Current PRS 66/80/40 Characterization Effort 11
2.3.3 Further Assessment Data Reports 12
2.3.4 DOE Mound Risk-Based Guideline Values 13
2.3.5 PRS 66/80/40 Radiological and Chemical Assessment 13
2.3.5.1 Contaminants of Concern 13
2.3.5.2 Cleanup Objectives 13
2.3.5.3 Radiological Data Preparation 15
2.3.5.4 Chemical Data Preparation 16
2.3.5.5 PRS 66/80/40 Working Area Summaries 16
2.3.5.6 Deep Boring Data (below the fill/till interface) 24
2.3.5.7 Assessment of Debris Deposition 24
2.4 Actions to Date 25
2.4.1 Previous Removal Actions (affecting this PRS) 25
2.4.2 Core Team Actions 26
2.4.3 Current Actions 26
2.5 State and Local Authorities' Roles 26
2.5.1 Potential for Continued State and Local Response 27

3.0 THREAT TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT 27
3.1 Removal Site Evaluation 27

4.0 ENDANGERMENT DETERMINATION 28

5.0 EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN 28

6.0 REMOVAL DESIGN – ENGINEERING EVALUATION / COST ANALYSIS 29
6.1 EE/CA Objectives and Process 29
6.2 Identification of Removal Action Objectives 29
6.3 Statutory Limits on Removal Actions 30
6.4 Potential Removal Action Scope 31

Table of Contents

(continued)

6.5 Identification and Initial Screening of Removal Action Alternatives 31
6.5.1 General Response Actions 31
6.5.1.1 No Action 31
6.5.1.2 Institutional Control Actions 32
6.5.1.3 Containment Actions 32
6.5.1.4 Collection Actions 32
6.5.1.5 Treatment Actions 32
6.6 Identification and Screening of Technologies 33
6.6.1 Initial Screening of Remedial Technologies & Process Options 33
6.6.1.1 No Action 33
6.6.1.2 Institutional Control Actions 34
6.6.1.3 Containment Actions 34
6.6.1.4 Collection Actions 35
6.6.1.5 Treatment Actions 36
6.6.2 Summary 43
6.7 Analysis of Removal Action Alternatives 49
6.7.1 Evaluation Criteria 49
6.7.1.1 Overall Protectiveness of Human Health and Environment 50
6.7.1.2 Compliance with ARARs 50
6.7.1.3 Long-term Effectiveness and Permanence 51
6.7.1.4 Reduction in Toxicity, Mobility, or Volume through Treatment . 52
6.7.1.5 Short-term Effectiveness 52
6.7.1.6 Implementability 53
6.7.1.7 State/Support Agency Support 55
6.7.1.8 Community Acceptance 55
6.7.1.9 Cost 55
6.7.2 Alternative 1 - No Action 56
6.7.2.1 Overall Protectiveness of Human Health and Environment 57
6.7.2.2 Compliance with ARARs 57
6.7.2.3 Long-term Effectiveness and Permanence 57
6.7.2.4 Reduction in Toxicity, Mobility, or Volume through Treatment . 57
6.7.2.5 Short-term Effectiveness 58
6.7.2.6 Implementability 58
6.7.2.7 State/Support Agency Support 58
6.7.2.8 Community Acceptance 58
6.7.2.9 Cost 58
6.7.3 Alternative 2 – Full Excavation and Disposal without Segregation 59
6.7.3.1 Overall Protectiveness of Human Health and Environment 60
6.7.3.2 Compliance with ARARs 60
6.7.3.3 Long-term Effectiveness and Permanence 60
6.7.3.4 Reduction in Toxicity, Mobility, or Volume through Treatment . 60
6.7.3.5 Short-term Effectiveness 61
6.7.3.6 Implementability 61
6.7.3.7 State/Support Agency Support 62
6.7.3.8 Community Acceptance 62
6.7.3.9 Cost 62

(continued)

6.7.4 Alternative 3 - Full Excavation and Disposal with Segregation 63
6.7.4.1 Overall Protectiveness of Human Health and Environment 64
6.7.4.2 Compliance with ARARs 65
6.7.4.3 Long-term Effectiveness and Permanence 65
6.7.4.4 Reduction in Toxicity, Mobility, or Volume through Treatment . 65
6.7.4.5 Short-term Effectiveness 65
6.7.4.6 Implementability 66
6.7.4.7 State/Support Agency Support 67
6.7.4.8 Community Acceptance 67
6.7.4.9 Cost 67
6.7.5 Alternative 4 – Excavation/Removal of Contaminated Disposal Area ... 68
6.7.5.1 Overall Protectiveness of Human Health and Environment 70
6.7.5.2 Compliance with ARARs 70
6.7.5.3 Long-term Effectiveness and Permanence 70
6.7.5.4 Reduction in Toxicity, Mobility, or Volume through Treatment . 71
6.7.5.5 Short-term Effectiveness 71
6.7.5.6 Implementability 71
6.7.5.7 State/Support Agency Support 72
6.7.5.8 Community Acceptance 73
6.7.5.9 Cost 73
6.7.6 Alternative 5 - Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective 74
6.7.6.1 Overall Protectiveness of Human Health and Environment 75
6.7.6.2 Compliance with ARARs 76
6.7.6.3 Long-term Effectiveness and Permanence 76
6.7.6.4 Reduction in Toxicity, Mobility, or Volume through Treatment . 76
6.7.6.5 Short-term Effectiveness 77
6.7.6.6 Implementability 77
6.7.6.7 State/Support Agency Support 78
6.7.6.8 Community Acceptance 78
6.7.6.9 Cost 78
6.8 Comparative Analysis of Removal Action Alternatives 79
6.8.1 Basis for Comparison 79
6.8.1.1 Overall Protectiveness of Human Health and Environment 79
6.8.1.2 Compliance with ARARs 80
6.8.1.3 Long-term Effectiveness and Permanence 80
6.8.1.4 Reduction in Toxicity, Mobility, or Volume through Treatment . 81
6.8.1.5 Short-term Effectiveness 81
6.8.1.6 Implementability 82
6.8.1.7 State/Support Agency Support 83
6.8.1.8 Community Acceptance 84
6.8.1.9 Cost 85
6.9 Conclusion 85
6.10 Recommended Removal Action Alternative 88
6.10.1 Smart Sampling Analysis Results 89
6.10.2 Approach and Removal Action Description 89

Table of Contents

(continued)

7.0 PROPOSED ACTION AND ESTIMATED COST 91
7.1 Proposed Removal Action Identified by the EE/CA Process 91
7.2 Monitoring 94
7.3 Post-Removal Site Control 94
7.4 Cross-Media Relationships and Potential Adverse Impacts 94
7.5 Contribution to Future Remedial Actions 94
7.6 Project Schedule 94
7.7 Estimated Cost 95
8.0 OUTSTANDING POLICY ISSUES 95
9.0 ENFORCEMENT 95
10.0 RECOMMENDATION 96
11.0 REFERENCES 99

Tables

Table 1 PRS 66 Group Disposition Status 3
Table 2 Guideline and Screening Values for Soil/Sediment 14
Table 3 Clean Up Objectives for the Primary COCs 15
Table 4 PRS 66/80/40 Characterization Summary - Area I 20
Table 5 PRS 66/80/40 Characterization Summary - Area II 21
Table 6 PRS 66/80/40 Characterization Summary - Area III 22
Table 7 PRS 66/80/40 Characterization Summary - Area IV 23
Table 8 Remedial Technologies and Processes – Initial Screening 44
Table 9 Cost Summary – Alternative 2 – Full Excavation and Disposal Without Segregation 63
Table 10 Cost Summary – Alternative 3 – Full Excavation and Disposal With Segregation 68
Table 11 Cost Summary – Alternative 4 – Excavation and Removal of Contaminated Disposal Area 73
Table 12 Cost Summary – Alternative 4 – Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective 79
Table 13 Cost Summary – Alternative 4 – Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective 95

Table of Contents

(continued)

Figures

Figure 1 PRS 66/80/40 Historical Area 5

Figure 2 PRS 66/80/40 Contamination Areas 17

Figure 3 Schedule 97

Appendices

Appendix A Core Team Recommendations

Appendix B Radiological Data Illustrations and Chart Summaries (fill area)

Appendix C Radiological Data Illustrations and Chart Summaries (below fill/till)

Appendix D Chemical Data Summaries (fill area)

Appendix E PRS 66/80/40 ARARs

Appendix F PRS 66/80/40 Cost Estimate Detail

Appendix G PRS 66/80/40 Acceptable Debris Backfill Details

Acronyms

ALARA	As Low As Reasonably Achievable
AM	Action Memorandum
ARAR	Applicable or Relevant and Appropriate Requirements
BVA	Buried Valley Aquifer
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CO	cleanup objective
COC	contaminant of concern
D&D	decontamination and decommissioning
DOD	Department of Defense
DOE	U.S. Department of Energy
EE/CA	Engineering Evaluation / Cost Analysis
FFA	Federal Facilities Agreement
GRA	General Response Action
HASP	Health and Safety Plan
HI	Hazard Index
lcy	loose cubic yards
ITRD	Innovative Treatment and Remediation Demonstration
LLR	low-level radioactive
MDA	minimum detectable activity
MEMP	Mound Environmental Management Project
MMCIC	Miamisburg Mound Community Improvement Corporation
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NFA	No Further Assessment
NPL	National Priorities List
NTS	Nevada Test Site
OEPA	Ohio Environmental Protection Agency
OSC	On-Scene Coordinator
PCB	polychlorinated biphenyl
PRS	Potential Release Site
RA	Removal Action
RAGS	Risk Assessment Guidance for Superfund
RAO	Removal Action Objectives
RBGV	Risk-Based Guideline Value
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation / Feasibility Study
RSE	Removal Site Evaluation
SACM	Superfund Accelerated Cleanup Model
SAFER	Streamlined Approach for Environmental Restoration
SARA	Superfund Amendments and Reauthorization Act
SPHS	Single-Point Hot Spot
SVOC	semi-volatile organic compound
TBC	to be considered
TOC	total organic carbon
UCL	upper confidence level
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound
VSAP	Verification Sampling and Analysis Plan

1.0 PURPOSE OF THE ACTION MEMO EE/CA

There are three types of removal actions: (1) emergency, (2) time-critical, and (3) non-time-critical. **Emergency removals** must be initiated within hours or days in response to acute problems. These emergency situations may involve fires or explosions, imminent contamination of a water supply, or the release or imminent release of hazardous substances. **Time-critical removals** respond to releases requiring onsite action within six months. Examples include removal of drums or small volumes of contaminated soil and stabilization of lagoons. **Non-time-critical (NTC) removals** respond to releases where a planning period of at least six months is available before onsite activities must begin and the need is less immediate. The categorization of a removal into one of these three types is based largely on the urgency of the situation.

NTC removals generally attempt to control the source of contamination and are generally followed by a remedial action to complete site response. However, NTC removals could be used to remediate a site completely, as is the case for PRS 66/80/40. NTC removal actions include four major components: (1) site evaluation, (2) Engineering Evaluation/Cost Analysis (EE/CA), (3) removal action, and (4) closeout.

All removals require a **removal site evaluation** (RSE) [40 CFR 300.410(b)]. The RSE includes a removal preliminary assessment and if warranted a removal site inspection (SI). In the removal preliminary assessment, the DOE uses readily available information to identify the source and nature of the release, evaluate the magnitude of the threat, assess the threat to public health, and determine if more information is needed to characterize the release. Potential Release Site Package PRS 66, Potential Release Site Package PRS 80, and Potential Release Site Package PRS 40 fulfilled the documentation of the RSE for PRS 66/80/40.

Once the RSE is complete, the DOE documents the findings [40 CFR 300.410(f)]. DOE uses an **Action Memorandum** to document the findings for an NTC removal. The Action Memorandum documents that the site meets the NCP criteria for initiating an NTC removal and provides detailed information on the site. This process involves development of the Engineering Evaluation and Cost Analysis (EE/CA), conducting community relation activities, and documentation of the removal action decision in the Action Memorandum.

The EE/CA is comparable to the RI/FS in a remedial action, but it is less comprehensive. The NCP requires that the DOE prepare an EE/CA for all NTC removals (40 CFR 300.415(b)(4)(i)). The EE/CA identifies the objectives of the removal action and analyzes the removal action alternatives in terms of cost, effectiveness, and implementability. The EE/CA includes the following six major components: (1) executive summary, (2) site characterization, (3) identification of removal action objectives, (4) identification and analysis of removal action alternatives, (5) comparative analysis of removal action alternatives, and (6) removal action recommendation.

Although not required by law or regulation, the DOE prepares the Action Memorandum to serve as the official documentation of the removal action decision. The Action Memorandum is comparable to the Record of Decision (ROD) in a remedial response, in that it substantiates the need for a removal action, identifies the proposed action, and explains the rationale for the removal action. However, the Action Memorandum is less elaborate than a ROD. The DOE can use the Action Memorandum to help meet administrative record file and public participation requirements for NTC removals. As such, the PRS 66/80/40 Action Memorandum has been completed to; 1) document the evaluation of site conditions and the Engineering Evaluation and Cost Analysis (EE/CA) process, 2) propose the action described therein, and 3) gather public input.

2.0 SITE CONDITIONS AND BACKGROUND

The Mound Plant is located on the southern border of the city of Miamisburg in Montgomery County, Ohio. Miamisburg is approximately 10 miles south-southwest of Dayton and 45 miles north of Cincinnati. Mound's primary function was the manufacturing of non-nuclear explosive components for nuclear weapons assembled at other DOE sites. Other work performed at the site included the handling and development of tritium containing materials and processes, recovery and purification of tritium from other DOE sites, various programs that handled thorium-232, development and fabrication of radioisotopic heat sources fueled with plutonium-238 for the National Space Program and the Department of Defense (DOD), and the commercial separation and purification of non-radioactive noble gas isotopes. In 1993, DOE made the decision to eliminate Mound's Defense Program, and make the site available for future commercial use.

This removal action is proposed for Potential Release Site (PRS) 66 (also known as "The Ravine Fill or Area 7"), PRS 80 (adjacent to PRS 66), and PRS 40 (located within the PRS 66 limits) as one removal activity. These PRSs are located as shown in Figure 1. DOE, OEPA and USEPA also agreed to close out PRSs 38 and 39 (associated with Building 51 operations) in conjunction with the PRS 66 Removal Action.

2.1 National Priorities List Status

USEPA placed The Mound Plant on the National Priorities List (NPL) on November 21, 1989 (Federal Register, November 21, 1989).

2.2 PRS Site Characteristics

The PRS 66 Group is located within the upper portion of a large drainage swale/ravine that flows between the two hills that make up the footprint of the Mound facility. Historically this area was known as Area 7. The original PRS 66 Group consisted of PRSs 40, 66, 79, 80, 86, 235, 309, and 338. The current Mound 2000 status for each is presented in Table 1 and illustrated on Figure 1 on Page 5.

Table 1: PRS 66 Group Disposition Status

PRS	Title	Binning Status	Date Binned	Comments
40	Fuel Tanks and Pumping Station	Response Action	August 19, 1996	RA to be performed as part of the PRS 66 mobilization and RA activities, but as a separate project.
66	Area 7 Thorium and Plutonium Wastes	Response Action	February 28, 2000	Binned as a Removal Action
79	Warehouse 15 (former building)	NFA	August 19, 1996	None
80	Warehouse 15A (former building)	Response Action	September 26, 2001	RA to be performed as part of the PRS 66 mobilization and RA activities, but as a separate project.
86	Building 29 Septic Tank (Tank 224) Actinium Area	NFA	August 19, 1996	RA accomplished in 1998.
235	Area of Possible Elevated Thorium Activity	NFA	August 19, 1996	None
309	Potential area of elevated activity Location S0307	NFA	August 19, 1996	None
338	Building 29 Septic Tank	NFA	August 19, 1996	None

Although all were part of the original PRS 66 Group, PRSs 79, 235, 309, and 338 are not included in the proposed RA for PRS 66/80/40 since they were binned No Further Assessment (NFA) by DOE, OEPA and USEPA. A RA for PRS 86 was performed and completed in 1998. PRSs 38 and 39 (associated with Building 51 operations) were previously removed, but the soil verification sampling for these two PRSs will be performed during the PRS 66 final verification sampling.

PRS 66 refers to a disposal site located under the parking lot southeast of Buildings 29 and 98 (DOE 1992a) and south of Building 51, as depicted in Figure 1. The area (PRS 66) was originally identified as Area 7 (DOE 1994a). Currently, most of the area is an asphalt parking lot constructed in 1984. PRS 66 occupies approximately 96,250 square feet. The area south of Building 51 will be included under PRS 397/398. PRS 66 was once a steep ravine, used for the disposal of construction soils and debris, including 10,000 to 15,000 empty drums that once contained thorium-232 (1955-1966), a polonium-210 (Po^{210}) contaminated washing machine (date unknown), and a thorium-232 (Th^{232}) contaminated flat bed truck (mid-1960s). Other materials contaminated with Po^{210}, such as exhaust system ducts from T-Building (mid-1960s), may have been disposed of in the area (DOE 1993c).

PRS 66 was used primarily for the disposal of radioactively contaminated material. During the same time period that this area was in operation, other areas at other locations were operated for the disposal of hazardous chemicals, uncontaminated debris, and general refuse. Those areas have been designated by other PRS numbers (principally 8-12 and 277) and are being investigated separately from PRS 66. "During the early 1970s, it was rumored that some of the trash from the historic landfill (PRS 10) was excavated and removed to the ravine. This rumor has been difficult to substantiate; but if true, it would suggest the possibility that some hazardous chemicals could have been relocated from the historic landfill to Area 7" (DOE 1993c).

Two historical buildings were located within Area 7. Warehouse 15A was used for the storage and shipment of radioactive wastes. Warehouse 15 was used for the storage of approximately 1,650 tons of thorium-containing sludge received in anticipation of the completion of the planned thorium-232 Refining Program. These shipments were stored in carbon steel drums containing Monazite sludge, thorium, oxalate, and sulfate sludge

Historical Sample Location

ISS	DATE	REVISION	BY	CHKR	ENG	LPDEC	APVD	V
	06/06/02	ISSUE FOR REPORT	SSF					

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																					

SHEET	1	2	3	4	5	6
ISSUE						

PART CLASSIFICATION

Figure 1: Historical PRS 66/80/40 Area with 1965 Aerial Photo

DRAWING CLASSIFICATION	SIZE	DRAWING NUMBER	JOB NUMBER
UNCLASSIFIED		historical2.dgn	

DWG TYPE	STE	PRNG	ER-GIS	CAGEC	SCALE	GRAPH	SHEET 1 OF 1
STATUS	MD-REL-11/11/99			ORIGIN	MSTATION 5.0		

residues. These sludges are, by their nature, highly corrosive to steel. This corrosivity, combined with damage from shipping, caused drum leakage and area soil contamination, resulting in an ongoing drum maintenance/redrumming operation from the mid-1950s until the mid-1960s.

Initially, these operations were performed inside Warehouse 15. The process was later moved outside due to elevated radon levels. The outdoor redrumming operations are reported to have possibly resulted in the release of airborne particulates (dust due to the eventual dehydration of the sludges). These particulates would have been deposited just to the east of the former redrumming operations area. The resulting soil contamination area was assigned as PRS 235, which obtained an NFA status in August 1996 (DOE 1998).

Eventually, the superstructure of Warehouses 15 and 15A were sold for salvage (scrap). It is assumed that some of the building material and later (1970s) the footings and floor slabs were pushed off into the ravine (DOE 1993b).

Reports suggest approximately 200 cubic feet of radiologically contaminated soil and gravel (discovered during renovation of SW Building) were placed within the vicinity of an abandoned septic tank (PRS 86) in the upper end of the ravine. The soil and gravel were contaminated as a result of the leakage of radium/actinium process wastes from a sump located on the west side of room SW-1A (DOE 1998). A removal action for PRS 86 was implemented in the mid-1990s, resulting in the excavation and disposal of approximately 2,800 cubic yards of contaminated soil and debris.

2.2.1 Addition of PRS 80

Upon the completion of the characterization of PRS 80, a small area of contamination was determined to exist adjacent to one of the PRS 66 areas of contamination. Since the contaminants associated with PRS 80 are also Contaminants of Concern (COCs) for PRS 66, DOE, OEPA and USEPA made the decision to incorporate a removal for PRS 80 within the scope of the RA for PRS 66. Additional characterization information was obtained for its PRS 80 removal design during the timeframe that Phase III sampling was ongoing for PRS 66.

2.2.2 Addition of PRS 40

Plutonium contamination was discovered during a previous excavation effort at the lower end of PRS 66, near the current aboveground fuel storage facility. The excavation was backfilled, and the contamination was left in place and later designated as PRS 40. Since this area is adjacent to the lower area of contamination associated with PRS 66, it was incorporated into the PRS 66 Removal Action.

2.2.3 PRS 66/80/40 Site Geology and Hydrogeology

The hydrogeologic regime at the Mound facility consists of two different geologic environments: flow through bedrock and flow within unconsolidated glacial deposits and alluvium, with the latter associated with the Buried Valley Aquifer (BVA) in the Great Miami River Valley. Since PRS 66 lies directly over an upgradient tributary leading to the BVA, PRS 66 relates primarily to that regime. The BVA occupies a deep bedrock channel that roughly follows the course of the Great Miami River. This bedrock channel is up to 142 feet deep near its center. Outwash extends from the edge of the buried valley along tributaries, such as the Mound Plant valley, the upper portion of which is the filled ravine associated with PRS 66.

In the fall of 1999, BWXTO initiated the first of four drilling and sampling phases of the PRS 66 Sampling and Analysis Plan. Included in the drilling phase was an exploratory borehole program designed to provide more information regarding hydrogeologic characteristics of the PRS 66 area. The exploratory phase consisted of 19 boreholes set along four east/west transects spanning the PRS 66 area. Utilizing rotosonic drilling technology, the boreholes were advanced until bedrock was encountered, with analytical samples taken at regular intervals. Details on the analytical sampling protocol are included in the PRS 66 Sampling and Analysis Plan (DOE 1999). Each borehole was drilled using either 4 or 6-inch rotosonic drill bits. Continuous core samples, in 10-foot lengths, were obtained, allowing a detailed description of the lithology. In addition to written geologic logs, each core was digitally imaged at 1-foot intervals.

Using both the written geologic logs and the core images, a hydrostratigraphic model of the PRS 66 area was developed. Geologic cross-sections indicate the PRS 66 area is underlain by a relatively steep, narrow gorge. The gorge is cut into inter-bedded Ordovician shales and limestones and filled with glacially derived sediments. The fill

area associated with this RA consists of approximately 15-35 feet of fill material overlaying natural glacial deposits. The contact between the fill material and the underlying glacial sediments represents the topographic surface prior to construction of the Mound Plant. The glacial sediments are composed of both glacial till units and glaciofluvial sand and gravel outwash deposits. Glacial tills are primarily massive silt/clay deposits having a low permeability. The outwash deposits, on the other hand, have a very high permeability, and can therefore transmit water readily.

The southern end of the PRS 66 area contains a relatively thick section of outwash sand and gravel deposits overlain by a thick sequence of glacial till. These outwash deposits are saturated and therefore could be considered an aquifer. The remaining area of PRS 66 appears to be characterized by glacial tills extending downward to bedrock. These tills do contain inter-bedded sand and gravel zones that may represent ablation tills. These zones are often wet or saturated thus representing zones of preferential water movement.

Additionally, the fill/till interface represents a marked permeability transition from the overlying permeable fill material to the relatively impermeable underlying till. This permeability transition allows water to collect along the boundary, thus forming a perched water system.

Based on the hydrostratigraphic model, a groundwater monitoring network consisting of 11 wells was installed in 2000. Five of the wells were installed to monitor the perched water system (associated with the above mentioned fill/till interface), while six wells were installed to monitor the hydrologic activity associated with the underlying glacial sediments.

The wells have been sampled quarterly (4 quarters to date) for a wide variety of radiological and chemical parameters and the results to date suggest that PRS 66 has had minimal, or no impact on the underlying groundwater system.

2.3 Current and Historical Analytical Data

The PRS 66 ravine has been investigated on several occasions throughout the past. Figure 1 on Page 5 indicates the sampling locations from these previous investigations in relation to PRS 66. In addition, the collection of an extensive set of investigative

borings, on a 15-foot triangular grid, was initiated in the fall of 1999 as part of a thorough site characterization effort. Sufficient data has been collected from the characterization sampling and analysis effort to identify two main areas of contamination. The completed characterization efforts are documented in the Phase I, Phase II/III, and the soon-to-be-released Phase IV Further Assessment Data Reports. The characterization is further discussed in Section 2.3.2.

2.3.1 Previous Investigations

Remediation of a small section of the original Area 7 disposal site, PRS 86, began in August of 1995. PRS 86 is located in the north end of the parking lot (PRS 66). It was created when contaminated soil, gravel, and concrete from the SW Building was placed in this area. The radiological contaminants included actinium-227 (Ac^{227}), radium-226 (Ra^{226}), and thorium-228 (Th^{228}). Maximum levels removed for Th^{228} and Ac^{227} were 258 pCi/g and 599 pCi/g, respectively. Verification sampling of the removal action was completed in August of 1997 (DOE 1998).

Additional soil sampling, conducted during the 1994 Operable Unit 5 (OU5) Area 7 investigation, detected plutonium-238 (Pu^{238}) and thorium-232 (Th^{232}) concentrations of less than 25 pCi/g and 5 pCi/g, respectively. Analyses for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), total organic carbon (TOC), explosives, and inorganics were performed as part of the OU5 Area 7 Investigation in 1994 (DOE 1995a). The compounds were either not detected or detections were below the (soil risk-based) guideline criteria (DOE 1997).

Sampling for VOCs in soil was performed as part of the Site Soil Gas Survey in 1992. VOCs detected were Freon®-11, Freon®-113, 1,2-cis-dichloroethene, 1,1,1-trichloroethane, tetrachloroethene, and toluene. All VOC soil gas concentration levels were below the contamination limits defined by the Soil Screening Level calculations (DOE 1993b). It should be noted that soil gas surveys may integrate or average the concentration of contaminants from a large volume of soil, and that interpretation of the results should be limited for exploratory subsurface investigations. The log of one well located within PRS 66 (well #395) described a petroleum odor between 55 and 62 feet below ground surface.

During the Radiological Site Survey conducted in 1983, soil samples were collected from the surface and core boring to 18 feet depths. Plutonium^{238} (Pu^{238}) concentrations ranged from 0.01 to 7.4 pCi/g. Thorium^{232} (Th^{232}) levels ranged from less than 2.0 to 20.54 pCi/g. Radionuclide concentrations from radium^{226} (Ra^{226}), cobalt-60 (Co^{60}), cesium-137 (Cs^{137}), and tritium were below the Mound Plant guideline criteria (DOE 1997) for contamination (DOE 1993a).

Ground water sampling was conducted during the 1994 Operable Unit 5 (OU5) Area 7 investigation. Radionuclides detected, and the maximum concentrations of each, were Th^{228} (1.24 pCi/L), Th^{232} (0.32 pCi/L), and tritium (2373.7 pCi/g) (DOE 1995a). Ground water sampling was also conducted as part of the OU9 Hydrogeologic Investigation in the fall of 1994. Samples were collected at the wells that are down gradient of PRS 66; well #395 is the only well within the boundary of PRS 66, and it has generally been dry. Analyses were performed for radionuclides, organics, and inorganics (DOE 1995b).

In 1990, a magnetic survey of the parking lot was conducted in an attempt to locate buried ferrous (metallic) materials beneath the parking lot. The results of the survey indicated that large ferrous objects are buried underneath the north-central portion of the parking lot. These buried items were interpreted to be the buried flat bed truck, empty thorium drums, and other ferrous debris (DOE 1990a).

2.3.2 Current PRS 66/80/40 Characterization Effort

In the fall of 1999, a characterization study of PRS 66 was initiated using rotosonic drilling. The scope of the sampling and analysis included both onsite gamma spectroscopy and offsite analytical analysis. A complete description of the sampling and analysis approach is presented in the PRS 66 Sampling and Analysis Plan. Characterization was performed in four phases.

The first phase consisted of the installation of 77 boreholes selected from a potential of 423 grid internodes. These particular locations were considered to be representative profile of the PRS and yielded a preliminary assessment of the PRS 66 area. The results for Phase I showed a large area of contaminated soil was located within a discrete zone in the north central portion of PRS 66. Minimal amounts of data were secured, however in the southern section of the PRS boundary.

The second phase of the characterization consisted of the installation and development of nine monitoring wells and the installation of eleven additional boreholes. Six of these boreholes were implemented to assist in the development of the PRS 66 waste profile within the previously sampled contamination area. The remaining five samples were implemented outside of the PRS 66 boundary to determine the extent of contamination.

The third phase of the characterization was completed in the fall of 2001 and completed the characterization of all accessible areas within PRS 66 at that time. In addition, the sampling scope associated with PRS 80 was addressed under the PRS 66 Sampling and Analysis Plan during the third phase of PRS 66 sampling. This allowed the two PRSs to be characterized at the same time and be incorporated into one removal. The third phase consisted of the installation of 247 boreholes. The results for Phases III further expanded the discrete zone of contamination in the upper central portion of PRS 66 footprint to the north and west (PRS 80) from that observed during Phases I and II sampling. Additionally, Phase III revealed a second large discrete zone of contamination in the lower portion of the PRS footprint south of Building 51.

A fourth phase was completed in July 2002 after the demolition of Building 51, which completed the scope of the PRS 66 SAP in its entirety for all accessible locations. The fourth phase consisted of the installation of 63 boreholes in areas previously inaccessible under and around Building 51. This phase also secured additional sample beyond the southern edge of the originally defined PRS 66 boundary to ascertain the extent of the contamination to the south. The results for Phases IV further expanded the discrete zone of contamination in the southern portion of the PRS to the north from that observed during Phases III sampling. The results of the fourth phase have been shared with OEPA and USEPA and incorporated within the PRS 66 EE/CA analysis.

2.3.3 Further Assessment Data Reports

The radiological and chemical data results from the four phases of characterization, which are summarized within the Further Assessment Data Reports, are the basis for this Action Memo EE/CA and the PRS 66/80/40 grouping. A summary of the results and the detailed boring logs for Phase I characterization are presented in the Further Assessment Data Report, PRS 66 Soil Boring (DOE 2001). A summary of the results and the detailed boring logs for Phases II and III characterization are presented in the

Further Assessment Data Report, PRS 66 Phase II and Phase III (DOE 2002). The Further Assessment Data Report, PRS 66 Phase IV will not be available until approximately December 2002. Phase IV data, however has been provided to OEPA and USEPA in support of their review of the Action Memo EE/CA and it will be made available for public review in advance of the report. These reports contain data results for the sampled boreholes in five-foot intervals.

2.3.4 DOE Mound Risk Based Guideline Values

DOE Mound Risk-Based Guideline Values (RBGVs) were established by DOE-Mound for estimating exposures and evaluating the protectiveness of various concentration of contaminants in different media (DOE 1997). The RBGVs were developed in accordance with USEPA Risk Assessment Guidance for Superfund (RAGS) for a future site employee and a site construction worker in an industrial use scenario. These values are used to interpret the data sets for each specific PRS. The calculated RBGVs for the radiological isotopes commonly found in Mound soils are presented in Table 2, found on Page 14.

2.3.5 PRS 66/80/40 Radiological and Chemical Assessment

Using the Phase I, II, III, and IV characterization data, a detailed evaluation of the nature and extent of radiological and chemical contamination present was conducted.

2.3.5.1 Primary Contaminants of Concern

Based on the characterization results, historical process knowledge, and discussion with USEPA and OEPA, the main COCs were determined to consist of actinium-227, cesium-137, radium-226, thorium-232, and plutonium-238. Cleanup Objectives were developed specifically for the PRS 66 group for each of these five COCs based upon the results of the characterization and discussions with DOE, OEPA and USEPA.

2.3.5.2 Cleanup Objectives

The cleanup objectives for the PRS 66 group are reflective of the 10^{-5} RBGV plus background, with the exception of plutonium-238. In the case of plutonium-238, an agreed-to cleanup objective of 55 pCi/g was established versus the calculated 10^{-5} RBGV of 61.1 pCi/g.

Table 2: Guideline and Screening Values(pCi/g) for Soil/Sediment

RADIONUCLIDE	BKGD.	Guideline [1] Value 10^{-6}	Screening Level [6]
Actinium^{227+D}	0.11 [2]	0.45	0.56
Americium^{241}	ND	6.3	6.3
Cesium^{137+D}	0.42	0.34	0.76
Cobalt^{60}	NC	.07	.07
Lead^{210+D}	1.2 [2]	0.62	1.8
Plutonium^{238}	0.13	6.1	55 [3]
Protactinium^{231+D}	.11 [2]	0.39	4 [4]
Radium^{226+D}	2.0	0.09	2.1
Thorium^{230+D}	1.9	0.09	[5]
Thorium^{232+D}	1.4	0.07	1.47
Uranium^{234}	1.1	10.5	[6]
Uranium^{235}	0.11	1.6	1.7
Uranium^{238}	1.2	11.6	12.8
Uranium^{238+D}	1.2	0.1	1.3

NOTES:

[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, March 1997, Final but were performed using April 2001 HEAST slope factors.

[2] These radionuclides have comparatively short half-lives and are deduced to be in secular equilibrium with the parent nuclide. Thus the background value measured for the parent is considered to be the appropriate value for these as well. The validity of using this method for background determination for other radionuclides will be assessed on a case by case basis.

[3] The 55pCi/g value was retained because of its familiarity to the public.

[4] These values represent 1E-5 risk value

[5] In areas where Th-230 is not a contaminant of potential concern, Mound will use our normal sample analysis process through gamma spectroscopy and will assure that the result and MDA are less than 10 pCi/g.
If the detected value for Th-230 is greater than MDA, Mound will reanalyze the sample.
If Th-230 is a Contaminant of Potential Concern the detection limits of the analysis will be at or below the listed guideline value of 0.09 pCi/g above background.

[6] The Screening Level is reflective of onsite Gamma Spec Laboratory capabilities and will be used to determine if additional characterization or removal may be necessary. Soil Screening is not an appropriate technique for U-234. However, detection of U-235 or U-238 is anticipated in conjunction with U-234 contamination. Positive detection of either U-235 or U-238 (above guideline values) will trigger alpha spectroscopic analysis of the sample.

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

U-238 may be assessed for secular equilibrium and appropriate GV used.

NC = Not Calculated ND = Not detected

This table is an update of the March 2001 Draft version. On September 25 2001, Guideline Values were recalculated using HEAST slope factors dated April 2001.

A summary of the cleanup objectives for the PRS 66 primary radiological COCs is presented in Table 3.

Table 3: Cleanup Objectives for the Primary COCs (pCi/g)			
COC	**Background**	**10^{-5} RBGV**	**Cleanup Objective**
Actinium-227	0.11	4.5	4.61
Cesium-137	0.42	3.4	3.82
Radium-226	2.00	0.9	2.90
Thorium-232	1.40	0.7	2.10
Plutonium-238	0.13	61.0	55.00

A Single-Point Hot Spot (SPHS) Criteria was developed for the assessment of spatially isolated contamination detections for alternative analysis. The SPHS value for each COC is defined as three times the 10^{-5} RBGV plus background utilizing the HEAST slope factors dated April 2001.

2.3.5.3 Radiological Data Preparation

The complete data set consists of four validated and verified final data sets issued by Weston in September 2000 (Phase I), May 2002 (Phase II/III), and September 2002 (Phase IV). This complete data set contains analytical results for all soil samples and well borings associated with the PRS 66 characterization. Soil data from well borings were limited to only those results that were located no deeper than the next 5-foot interval below the observed fill/till interface.

DOE, OEPA and USEPA adopted a hierarchical scheme for selecting a radiological analytical result when multiple samples or multiple analyses for any single analyte exist for a single location. The hierarchical scheme was agreed-upon to ensure consistency in selecting the single sample. That agreed-upon scheme is as follows (in order of the most preferred to least): offsite alpha spectroscopy, onsite alpha spectroscopy, offsite gamma spectroscopy, and onsite gamma spectroscopy.

All duplicate analyses were screened against the above hierarchical scheme and only the most appropriate value was used for the evaluation and presentation of the characterization data. This method ensures only the most precise data are selected. This hierarchical scheme also is consistent with RRE processes currently used at the

Mound facility. As with the RRE process, non-detect (U-qualified) radiological results are represented as one-half the minimum detectable activity (MDA) value. However, non-detect (U-qualified) results with a MDA that is greater than the screening level (10^{-6} RBGV plus background) are considered invalid for characterization and subsequent removal consideration purposes. Detected analyses with MDAs greater than the 10^{-6} screening level are used and considered valid.

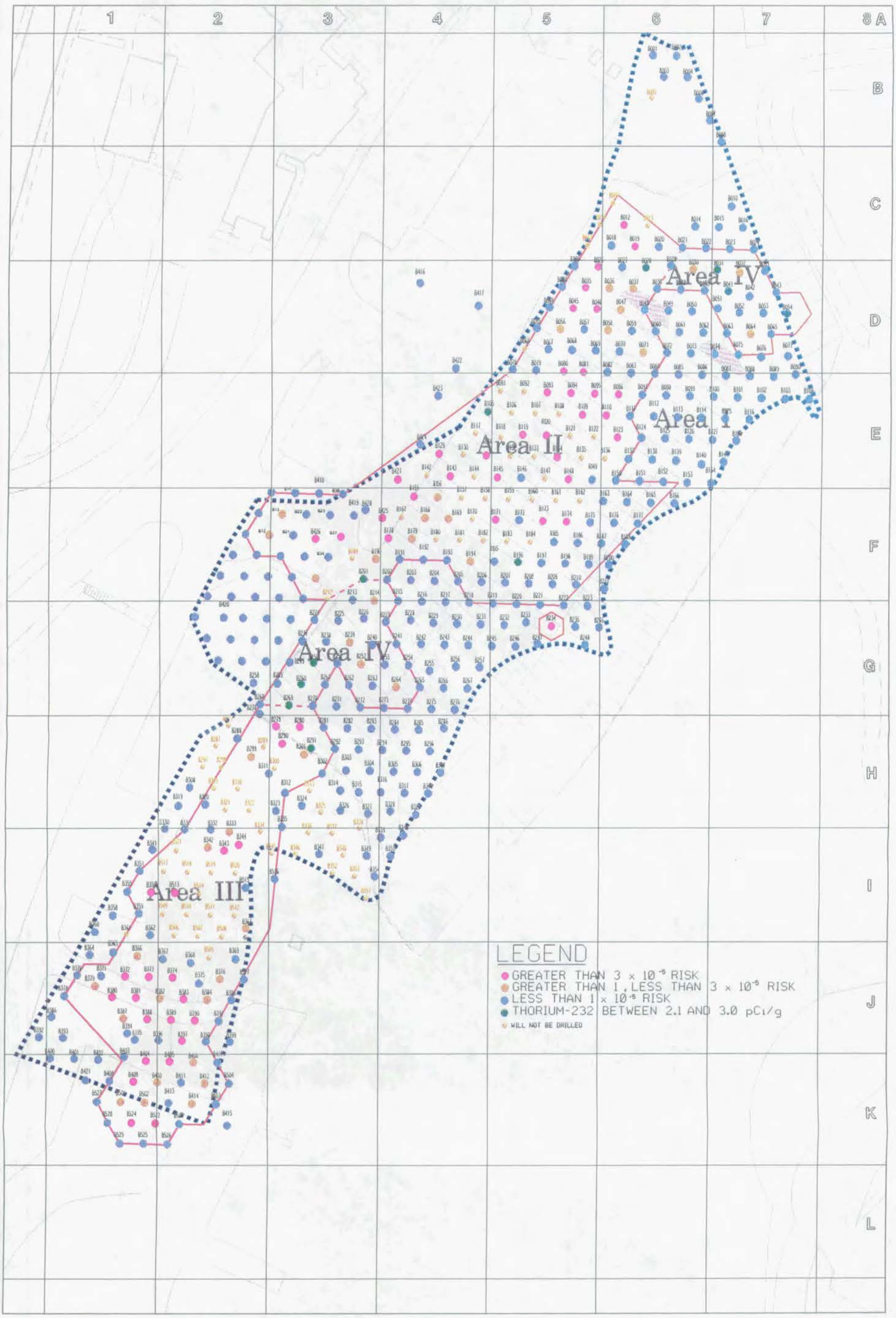
2.3.5.4 Chemical Data Preparation

Similar in concept to the radiological data preparation, a detailed evaluation for chemical results was undertaken. Specific analyte suites included VOCs, SVOCs, pesticides/PCBs, metals, and anions. More detail can be found in the PRS 66 and PRS 80 Sampling and Analysis Plans. Each analyte was evaluated against the more stringent of the 10^{-5} RBGV or a Hazard Index (HI) =1 risk value. The overall chemical results did not suggest chemical contamination at PRS 66, since only a few isolated chemical detections were identified.

2.3.5.5 PRS 66/80/40 Working Area Summaries

Using the above COs and SPHS criteria, the fill area was analyzed three dimensionally. When using a combination of historical topographical and contaminant zone boundary maps, four distinct contamination areas (labeled Areas I through IV) became apparent. A graphical illustration of the individual radiological contaminant locations for each 5-foot depth interval within the fill area (which is the basis of the above-mentioned three-dimensional analysis) is presented in Appendix B, Figures B1 through B8. An illustration of the four areas this process yielded is presented in Figure 2 on Page 17. A summary of the chemical detections greater than their respective risk values and/or hazard indexes is included in the area summaries and in Appendix D.

Area I was assigned to those locations where sampling results indicated no single radiological or chemical results above the cleanup objective level. As an independent verification of the residual risk that would be left in this area, a Smart Sampling statistical analysis was performed on a risk basis by DOE's Innovative Treatment and Remediation Development (ITRD) group, based at the Sandia National Lab in Albuquerque NM. The report on this modeling effort will be available before the Removal Plan is finalized. Smart Sampling is discussed further within Section 6.10.2.



Legend

- B416 Boring Location
- Tentative Excavation Boundary
- Area Boundary

0 20 40 60 80 100
Scale in Feet

MOUND
Environmental Restoration Geographic Information System

ISS	DATE	REVISION	BY	CHKR	ENG	M
	10/17/02		SSP			

SHEET 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
ISSUE
SHEET 1 2 3 4 5 6
ISSUE
PART CLASSIFICATION

Figure 2
PRS 66/80/40 Action Memo
Contiguous Areas

DRAWING CLASSIFICATION: UNCLASSIFIED
SIZE: D
DRAWING NUMBER: fig2areas101702.dgn
JOB NUMBER
DWG TYPE | PRMG | CAGEC | SCALE | SHEET 1 OF 4
STATUS: MD-REL-05/16/02
ORIGIN: MSTATION / J

Area II was designated as that area within the northern-most section of the PRS footprint requiring removal due to contiguous contamination

Area III was designated as that area within the southern-most section of the PRS footprint stretching from the southwest edge of the parking lot to the south of the former Building 51 location requiring removal due to contiguous contamination.

Area IV consists of two distinct low-risk areas in the PRS 66 footprint, one located in the north section of the footprint and one located in the central section of the footprint. These areas were designated as areas containing sporadic locations of contamination above the original Th-232 cleanup objective of 3.0 pCi/g. but which was of low enough risk that it could be excluded from removal consideration utilizing a "Hot Spot Criteria" agreed upon between DOE, OEPA, and USEPA. Under this criteria, soil removal would be required for any sample location where the results of any three contiguous sample locations are above the cleanup objective ($1x10^{-5}$ RBGV + background), or any single location where one or more of the isotopic results exceed 3 times the cleanup objective ($3x10^{-5}$ RBGV + background). When the cleanup objective of Th-232 was recently lowered to 2.1 pCi/g for PRS 66/80/40, contaminated locations within these areas became contiguous enough to warrant removal consideration.

A small inaccessible portion of Area I and Area III will be sampled during the removal of Area III due to utility interference. Based upon older topographical information and data trends of adjacent locations' sampling results within these areas, the inaccessible area within Area I is presumed to be non-contaminated, while the inaccessible area in Area III is presumed to be contaminated. Contamination discovered above the cleanup objective in this inaccessible areas during the removal would be shipped as waste.

A summary of the contamination identified in Areas I, II, III, and IV is presented in the following narratives and summary charts. The summary includes all analytes that were detected at a level greater than their respective $1X10^{-5}$ risk cleanup objective or greater than a Hazard Index (HI) of 1 in cases where there is a non-carcinogenic risk. This information is presented for each area independently in Tables 4 through 7. The tables list by COC the number of samples locations analyzed for that COC, the number of detections greater than the Cleanup Objective and whether removal was required.

Area I. As shown in Table 4, no samples contained radiological contaminants at levels greater than or equal to their respective cleanup objective. One non-COC (thorium-230) was detected in Boring 234 at the 0 to 5-foot interval at 35.8 pCi/g, which is significantly greater than the thorium-230 cleanup objective. Since this presents an unacceptable risk level, it will require a small independent remediation. A Smart Sampling statistical analysis of the data will confirm that no other locations with Area I pose an unacceptable radiological risk.

No chemical constituents were detected above their respective 10^{-5} RBGV or HI=1, whichever was the most stringent. An evaluation has been completed for the potential of VOC contaminants to leach from soil to groundwater, which revealed this not to be a concern. Results from the thirteen monitoring wells located at strategic locations within the PRS 66/80/40 area further supports that the observed VOCs are not leaching into the groundwater.

Table 4: PRS 66/80/40 Characterization Summary – Area I

Category		# Sample Locations	# Detections > CO or HI=1	Removal Required
Primary Radiological*	Actinium-227	645	0	No
	Cesium-137	645	0	No
	Plutonium-238	645	0	No
	Radium- 226	645	0	No
	Thorium-232	645	0	No
Chemical**	VOCs	111	0	No
	SVOCs	174	0	No
	Metals	195	0	No
	PCB/Pest	84	0	No
Geo-Physical	Terrain Conductivity Survey (EM31)	No magnetic anomalies.		
	Earth Resistivity Survey (ER)	No strong indicators.		
Other / Comments HI: Hazard Index CO: cleanup objective		Only minor indicators of debris within boring logs. * A detailed summary of the radiological results is presented in Appendix B. ** A summary of the chemical analyses is presented in Appendix D. *** Will be removed and shipped as waste in slopeback		

Area II. Area II consists of the northern-most area of contiguous contamination (behind Buildings 98 and 29). Overall sampling within Area II indicates that this area has contamination present within PRS 66 and the adjacent PRS 80. A summary of the characterization results for this area is presented in Table 5. Thorium-232 and plutonium-238 are the primary drivers for this main remedial zone. Other radioisotopes with detections greater than their cleanup objective include actinium-227, cesium-137, radium-226, uranium-235, uranium-233/234, uranium-238, thorium 228, and thorium-230, however they will be addressed in removing the thorium-232/plutonium-238 areas.

A few chemical constituents were detected above the most stringent of 10^{-5} RBGV or HI=1 values. Results from the thirteen monitoring wells located at strategic locations within the PRS 66/80/40 area indicate that the observed chemical contaminants are not leaching into the groundwater. Any potential future problem associated with chemical contaminants leaching from soil to groundwater, will be eliminated as a matter of course with the removal of all contaminated soils within Area II.

Table 5: PRS 66/80/40 Characterization Summary – Area II

Category		# Sample Locations	# Detections > CO or HI=1	Removal Required
Primary Radiological*	Actinium-227	699	5	Yes
	Cesium-137	699	5	Yes
	Plutonium-238	699	13	Yes
	Radium- 226	689	10	Yes
	Thorium-232	699	83	Yes
Chemical**	VOCs	132	1	Yes
	SVOCs	164	1	Yes ***
	Metals	217	3	Yes ***
	PCB/Pest	116	2	Yes ***
Geo-Physical	Terrain Conductivity Survey (EM31)	Strong magnetic anomaly in center portion of area.		
	Earth Resistivity Survey (ER)	Strong differentials of resistivity consistent with moisture and other conductors (ferrous metals etc).		
Other / Comments HI: Hazard Index CO: cleanup objective		Only minor indicators of debris within boring logs. * A detailed summary of the radiological results is presented in Appendix B. ** A summary of the chemical analyses is presented in Appendix D. *** Will be remediated as a matter of course with the radiological zones.		

Area III. Area III is the second area of contiguous contamination requiring remediation. This is an area on the southern portion of PRS 66, stretching from the southwest edge of the parking lot to the south of the former Building 51 location. Characterization efforts identified several locations with contaminants at or above their respective cleanup objectives. A summary of the characterization results for this area is presented in Table 6. Thorium-232 and plutonium-238 are the primary drivers for this remedial zone. Other radioisotopes with detections greater than their cleanup objective include actinium-227, cesium-137, radium-226, uranium-233/234, uranium-238, and plutonium-239, however they will be addressed in removing the thorium-232 and plutonium-238 areas.

A few chemical constituents were detected above the most stringent of 10^{-5} RBGV or HI=1 values. Results from the thirteen monitoring indicate that the observed chemical contaminants are not leaching into the groundwater. Any potential future problem associated with chemical contaminants leaching from soil to groundwater, will be eliminated with the removal of all contaminated soils within Area III.

Table 6: PRS 66/80/40 Characterization Summary – Area III

Category		# Sample Locations	# Detections > CO or HI=1	Removal Required
Primary Radiological*	Actinium-227	526	2	Yes
	Cesium-137	526	1	Yes
	Plutonium-238	526	23	Yes
	Radium- 226	525	7	Yes
	Thorium-232	526	29	Yes
Chemical**	VOCs	45	0	No
	SVOCs	143	2	Yes ***
	Metals	166	1	Yes ***
	PCB/Pest	29	0	Yes ***
Geo-Physical	Terrain Conductivity Survey (EM31)	No indicators of magnetic anomalies.		
	Earth Resistivity Survey (ER)	No indicators of major debris items.		
Other / Comments HI: Hazard Index CO: cleanup objective		Only minor indicators of debris within boring logs. * A detailed summary of the radiological results is presented in Appendix B. ** A summary of the chemical analyses is presented in Appendix D. *** Will be remediated as a matter of course with the radiological zones.		

Area IV. Area IV consists of two distinct areas in the PRS 66 footprint, one located in the north section of the footprint, northeast of Area II and one located in the central section of the footprint, south of Area II. Characterization efforts identified one location with Ac-227 and Th-232 contamination and five locations with only Th-232 contamination at or above the original 3.0 pCi/g cleanup objective for Th-232. With the recent lowering of the Th-232 cleanup objective to 2.1 pCi/g, six additional Th-232 contamination locations were noted.

No chemical constituents were detected above their respective 10^{-5} RBGV or HI=1, whichever was the most stringent. An evaluation has been completed for the potential of VOC contaminants to leach from soil to groundwater, which revealed this not to be a concern. Results from the thirteen monitoring wells located at strategic locations within the PRS 66/80/40 area further supports that the observed VOCs are not leaching into the groundwater.

A summary of the radiological and chemical data results is presented in Table 7.

Table 7: PRS 66/80/40 Characterization Summary – Area IV

Category		# Sample Locations	# Detections > CO or HI=1	Removal Required
Primary Radiological•	Actinium-227	314	1	Yes***
	Cesium-137	315	0	No
	Plutonium-238	315	0	No
	Radium- 226	315	0	No
	Thorium-232	315	12	Yes***
Chemical**	VOCs	48	0	No
	SVOCs	91	0	No
	Metals	100	0	No
	PCB/Pest	21	0	No
Geo-Physical	Terrain Conductivity Survey (EM31)	No magnetic anomalies.		
	Earth Resistivity Survey (ER)	No strong indicators.		
Other / Comments HI: Hazard Index CO: cleanup objective		Only minor indicators of debris within boring logs. • A detailed summary of the radiological results is presented in Appendix B. ** A summary of the chemical analyses is presented in Appendix D. *** With "Hot Spot Criteria" not applied and Lower Th-232 CO		

2.3.5.6 Deep Boring Data (below the fill/till interface)

Data results from 75 deeper geological exploratory boring locations were collected from below the fill/till interface with the radiological and chemical data results not indicating any locations exceeding the cleanup objectives for this PRS group. A summary of these results is presented in Appendix C.

2.3.5.7 Assessment of Debris Deposition

A magnetic survey for PRS 66 was performed in September of 1990. This was part of a site-wide survey of PRSs reported to have the potential for ferrous waste deposition. The survey results identified a magnetic anomaly located southeast of Building 98 and having the approximate dimensions of 35x80 feet for an area of approximately 2,800 square feet. This anomaly is believed to be the location of the reported empty thorium drums, an old flatbed truck, old ventilation equipment, and other ferrous debris as reported in historical documentation (DOE 1990).

A second geophysical survey was undertaken in March 2002 to further delineate the magnetic anomaly, including its depth and various other properties of the fill area not possible until the advent of current geophysical technologies. This geophysical survey employed the use of both Terrain Conductivity and Earth Resistivity technologies. The 2002 magnetic survey results were consistent with the 1990 survey, however the 2002 survey produced a greater degree of resolution and spatial location. It concluded the anomaly is approximately 50 feet by 115 feet in size, but it was approximately 50 feet north of the area previously shown on the PRS 66 footprint. No other major anomalies were identified during the second geophysical survey.

The Earth Resistivity survey was undertaken to yield information about non-ferrous media, slip planes, and unusual subsurface features. This survey did not identify any additional debris fields beyond the previously known area, but did define the known location more accurately. This survey estimated that the anomaly was 15 feet to 20 feet in thickness with a starting depth of approximately 10 feet. The estimated geometric volume of the anomalous area is approximately 2,700 banked cubic yards.

The PRS 66 characterization boring logs included descriptions and indicators that suggest the vast majority of the debris in the PRS 66 area is associated with Areas II

and III (the two main radionuclide contamination areas). Debris found in the borehole cores in Area I were characterized for removable contamination by radiological personnel securing swipes and analyzing their results through on-site screening laboratories. The field screening results were below 20 dpm, which is the free release level for debris. Debris descriptors used were concrete, metal, metal shavings (assumed integral to the soil matrix and not as a result of boring through a metal object), broken glass, ceramics, nails, wire, wood, as well as oily and petroleum odors. While most of the debris was located in Area II, a significant pocket was also noted in the southern section of Area III.

2.4 Actions to Date

The Mound Plant initiated a CERCLA program in 1989, now guided by an agreement among the DOE, Ohio EPA (OEPA), and USEPA. A Federal Facilities Agreement (FFA) under CERCLA Section 120 was executed between DOE and USEPA Region V on October 12, 1990. It was revised on July 15, 1993 (EPA Administrative Docket No. OH 890-008984) to include OEPA as a signatory. The purposes of this agreement are to:

- ensure that the environmental impacts associated with past and present activities at the site are thoroughly investigated and appropriate remedial actions taken as necessary to protect the public health, welfare, and the environment;
- establish a procedural framework and schedule for developing, implementing, maintaining, and monitoring appropriate response actions at the site in accordance with CERCLA, Superfund Amendments and Reauthorization Act (SARA), the NCP, Superfund guidance and policy, and Resource Conservation and Recovery Act (RCRA) guidance and policy;
- facilitate cooperation, exchange of information, and participation of the parties in such actions.

2.4.1 Previous Removal Actions (affecting this PRS)

A small section in the upper northeast corner of the PRS 66 footprint was designated as a separate Potential Release Site within the boundaries of PRS 66. Due to historical information indicating a different event and COCs, this was assigned PRS 86 and was

remediated in 1997 under a separate Removal Action. PRS 86 consisted of actinium-227 contaminated soil, gravel, and concrete (reported to have originated from the construction additions to SW Building) buried within (or in the vicinity of) an old septic tank in this area.

2.4.2 Core Team Actions

The Core Team (consisting of representatives of DOE/Miamisburg Environmental Management Project (MEMP), USEPA, and OEPA) has reviewed the information and extensive data for PRSs 66, 80, and 40 and issued their recommendations as previously shown in Table 1 on Page 3. On July 12, 2000, the Core Team recommended a Removal Action for PRS 66, 80 and 40 (signed recommendation pages included as Appendix A). This recommendation was available for public review and comment from September 15, 2000 to October 15, 2000.

As agreed upon with the Core Team during the January 16, 2002 FFA Meeting, PRSs 38 and 39 (associated with Building 51 operations) will be closed out in conjunction with the PRS 66 Removal Action.

The Core Team concluded that DOE as the lead responsible should proceed with a removal action in accordance with Section 104(b) of CERCLA through the mechanism of non-time-critical removal actions. Section 40 CFR Part 300.415 of the NCP requires that an EE/CA be performed if time permits. As such, the EE/CA process was implemented and is presented in Section 6 of this document.

2.4.3 Current Actions

Currently, there are no removal or containment actions underway at PRSs 66, 80, or 40. Site preparations have been initiated to support the Removal Plan. Buildings 29, 51, and 98 have already been removed through separate building demolition work plans.

2.5 State and Local Authorities' Roles

In 1989, as a result of Mound Plant's placement onto the NPL, DOE and USEPA entered into a FFA that specified the manner in which the CERCLA program was to be implemented at Mound. In 1993, the FFA was amended to include OEPA as a signatory. DOE remains the lead agency.

2.5.1 Potential for Continued State and Local Response

OEPA will continue its oversight role until all of the terms of the FFA have been completed.

3.0 THREAT TO PUBLIC HEALTH AND WELFARE OR THE ENVIRONMENT

Upon review of all of the information available with respect to the PRS 66 Group, the known risks associated with the main contamination areas (Areas II and III) do not present an immediate threat to the public health and welfare, or the environment. However, due to the potential future threat to either, DOE has determined that a non-time-critical removal action, as specified in 40 CFR 300.415 of the NCP, is an appropriate response given the characterization data and the historical site knowledge.

3.1 Removal Site Evaluation

The Removal Site Evaluation (RSE) requirements, as outlined under the NCP regulations in 40 CFR 300.410 and 40 CFR 300.415, were addressed in the EE/CA process and are presented in this document. The EE/CA process provides for a balanced evaluation of the potential removal alternatives applicable for this PRS group. 40 CFR 300.415 identifies the following factors, which are to be considered in determining the appropriateness of a removal action.

1) Actual or potential exposure to nearby human populations, animals, or the food chain from hazardous substances, pollutants, or contaminants.

2) Actual or potential contamination of drinking water supplies or sensitive ecosystems.

3) Hazardous substances, pollutants, or contaminants in drums, barrels, tanks, or other bulk storage containers, that may pose a threat of release.

4) High levels of hazardous substances, pollutants, or contaminants in soil largely at or near the surface that may migrate.

5) Weather conditions that may cause hazardous substances, pollutants, or contamination to migrate or be released.

6) Threats of fire or explosion.

7) The availability of other (non-Superfund) appropriate federal or state response mechanisms to respond to the release.

8) Other situations or factors that may pose a threat to the public health, welfare, or the environment.

- Contaminated debris and/or soil were deposited in the fill area as documented by the historical information and the characterization effort, and the fill area was not designed as a permanent landfill.
- The change in Mound's mission, as a result of the DOE decision to eliminate the Defense Programs at Mound Plant, has led to a change in anticipated future land use and ownership.

Of the eight items listed above, it is clear that the investigations into the Area 7 filled ravine have identified factors and/or risks that either apply directly or have the potential to cause a situation that would apply, (specifically, items 1, 2, 4, 5, and 8). As such, the appropriateness of a removal action is supported. Under CERCLA, as amended by SARA, DOE is responsible for cleanup activities at the Mound site.

4.0 ENDANGERMENT DETERMINATION

There is a potential or threat of release of contaminants from this PRS group that could pose an endangerment to public health or welfare or to the environment. To eliminate the possibility of endangerment, as the site transfers from DOE ownership and control, DOE has determined that removal of the contaminants is appropriate.

5.0 EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

Within the contaminant zones, very little change would be expected if the site were to remain undisturbed. However, the potential likelihood of creating a disturbance with the probable future use scenario (commercial/industrial) is a primary concern and one of the justifications for conducting the removal. Although there are very few soluble contaminants present, there is also the potential for contaminants to migrate via groundwater.

6.0 REMOVAL DESIGN – ENGINEERING EVALUATION / COST ANALYSIS

This section of the document provides a detailed description of the evaluation of the potential RA alternatives for the PRSs. It follows the "Guidance on Conducting Non-Time Critical Removal Actions Under CERCLA" under EPA540-R-93-057. Under this guidance, available remedial technologies are initially evaluated and screened out, after which the potential remedial alternatives are evaluated against nine CERCLA criteria.

6.1 EE/CA Objectives and Process

The EE/CA process is defined by USEPA guidance for removal actions relating to sites subject to CERCLA (EPA 1993). The objectives of the EE/CA process are to: 1) identify and evaluate potential removal action alternatives; 2) evaluate the potential impacts of any applicable removal actions on public health and the environment, and; 3) identify a removal action alternative appropriate for PRS 66, based on the results of this EE/CA process as defined by agency guidance.

As a part of the EE/CA process, DOE requested that the ITRD group initiate an independent investigation into PRS 66 in May 2000. This team consisted of representatives with knowledge of the most current treatment technologies available. The ITRD group reviewed the existing characterization data and revisited the available technologies and alternatives. The ITRD group was also tasked with evaluating additional or alternative characterization methods as well as data interpretation methods, which may be applicable. Several end point and interpretation criteria were presented in their final report issued in October 2001 (ITRD 2001). Recommendations of their investigation were pursued, with their results being included within the EE/CA.

6.2 Identification of Removal Action Objectives

Per USEPA guidance, the Removal Action Objectives (RAOs) identify the objectives associated with the remediation of the COCs. The RAOs serve as the basis for identifying and evaluating the appropriate removal technologies available at this time. All RAOs are aimed at maintaining human health and the environment through medium-specific or action-specific goals. They specify the COCs, the exposure routes and receptors, and include a preliminary removal cleanup goal. These goals are usually an acceptable contaminant level or range of levels for each exposure route.

Based on historical and recent characterization results, the primary COCs within PRS 66 are actinium-227, cesium-137, radium-226, thorium-232, and plutonium-238. All of these primary COCs were determined to be present within the soil and debris deposited as fill material in the aforementioned ravine. While the characterization data supports that actinium-227, cesium-137 and radium-226 exist in a number of locations above their respective cleanup objectives, the most prevalent COCs within the PRS 66 group are plutonium-238 and thorium-232. Other radioisotopes with detections greater than their cleanup objective include uranium-235, uranium-233/234, uranium-238, thorium 228, thorium-230 and plutonium-239, however they will be addressed in removing the primary COC areas.

The removal action cleanup goals must be consistent with the "excess cancer target risk level" of 10^{-4} to 10^{-6} established in CERCLA and the NCP and must meet all ARARs to the extent practicable. Preliminary ARARs that support the development of removal cleanup goals are discussed within the detailed analysis of the alternatives.

The RAOs for the PRS 66 group for the purpose of the EE/CA evaluation are as follows:

- *Remediate (remove) contaminated soil and debris as appropriate to comply with site-specific cleanup goals.*
- *Minimize potential environmental and health hazards to the public and to onsite personnel with respect to the contamination present within the filled ravine.*
- *Minimize future long-term stewardship requirements for the site.*

6.3 Statutory Limits on Removal Actions

Through Executive Order 12580 and Section 104 of CERCLA, DOE has the authority to conduct studies and tests to assess the threat posed by present or potential contamination for conditions arising on DOE sites. DOE also has the authority to undertake planning, engineering, and other studies to determine appropriate response actions such that the risk to public health and the environment can be limited. This authority was reaffirmed in the FFA between USEPA, OEPA, and DOE. In addition, the project is not subject to the 12 month, $2 million statutory limits of CERCLA since the funding to perform this work does not come from the SARA program trust fund.

6.4 Potential Removal Action Scope

The scope of any removal action alternative considered is to remediate the ravine fill area or portions thereof to comply with site specific cleanup goals for contaminated soil and debris through a means determined by the results of this EE/CA. The physical dimensions (volume and concentration) of the contaminated media are detailed below.

6.5 Identification of Potential Removal Action Alternatives

The first step in the process of identifying potential alternative removal actions is that of technology screening. Relevant and proven technologies, as well as developing technologies must be screened based upon their appropriateness and their ability to achieve the RAOs presented in Section 6.2. This process limits the number of alternatives to be analyzed or evaluated in detail with the EE/CA. The selected removal action alternative must constitute a solution that is protective of the public health and the environment and that is readily or reasonably initiated. Due to the nature of radioactive contamination and the COCs within PRS 66, there are only a few remedial technologies that may be technically feasible, implementable, or cost effective at PRS 66. The technologies considered in selecting removal action alternatives must also be consistent with those given in final USEPA guidance (EPA 1993) regarding removal actions.

6.5.1 General Response Actions

General Response Actions (GRAs) are typically grouped into five general categories: "No Action", "Institutional Controls", "Containment", "Collection", and "Treatment" alternatives. In terms of remedial technologies potentially applicable to PRS 66, only the latter four may be potentially appropriate. The GRA "No Action" is included for comparative purposes only. The GRAs selected for PRS 66 were based on the media of concern and they were designed to satisfy the RAOs. The GRAs involve activities that directly impact the source of contaminated materials to minimize the potential hazard to human health and the environment. Each GRA may include several technology options.

6.5.1.1 No Action

In this response, no action would be taken to implement any remedial technology to reduce the hazard to potential human or ecological receptors. As mentioned above, "No Action" is the basis of comparison for the other GRAs.

6.5.1.2 Institutional Control Actions

Institutional controls, such as fencing, site security, and deed restrictions, could potentially protect human health and the environment when implemented as a sole remedy by restricting access to contaminated media. In addition, this action may be implemented with other remedial actions (e.g., containment, physical and chemical treatment technologies). Environmental monitoring is included as part of institutional control actions. Although monitoring does not prevent or minimize exposures, it does provide information for the assessment of the migration of residual contaminants.

6.5.1.3 Containment Actions

Containment actions, by definition, are designed to prevent or minimize any migration of residual contamination and eliminate the ability of humans to come into contact with the COCs. In-situ containment for soil generally consists of various isolation measures such as caps and migration/infiltration walls. The considered approach for PRS 66 involved the use of a cap. Capping involves covering an area with a low permeability material and possibly incorporates the use of slurry walls to ensure that the COCs are sealed in-place. This prevents migration and minimizes the risk of exposure from intrusion activities.

6.5.1.4 Collection Actions

There are several variations of collection actions that were evaluated for PRS 66. Overall, collection of contaminated soil and debris for subsequent disposition in a controlled environment can generally be accomplished with conventional earthwork equipment. This process reduces the potential for human exposure in the long term, at the expense of potential increased short-term worker exposure. In addition, variations of in-situ and ex-situ segregation or measurement techniques may aid in reducing the volume of waste to be generated. In some cases segregation is also incorporated within the collection portion of an ex-situ treatment process.

6.5.1.5 Treatment Actions

The treatment actions evaluated for PRS 66 included both physical and chemical processes. These processes may be applied to contaminated soil either ex-situ (after being physically removed from its original location), in-situ (in place), or in a combination

of both. Treatment of the soil would serve to either reduce the concentration or immobilize the contaminants in the soil, thereby lowering the long-term risk associated with its eventual disposal.

6.6 Identification and Screening of Technologies

The GRAs identified in Section 6.5 included several potential technology options. This section describes the initial screening of potential technologies for each GRA to meet the RAOs defined in Section 6.2. The process and rationale used to identify potential alternative removal actions during the technology screening process, along with the specific screening summary of the GRAs, remedial technologies, and process options for the COCs is presented in Table 8, found on Page 44.

6.6.1 Initial Screening of Remedial Technologies and Process Options

Remedial technologies and process options were selected on the basis of their applicability to the contaminated environmental media and geologic and hydrogeologic characteristics of the PRS site. As described earlier, the contaminated media is soil and debris. Technologies considered to be: too difficult to implement at the site; that would not be implementable (using commercially available technologies) in a reasonable amount of time; that are not applicable to the contaminants of concern; or that were determined to be unreliable; were eliminated from further consideration.

Process options for soil were evaluated for each response action identified earlier. The rationale for either retaining or eliminating certain options is summarized in Table 8, found on Page 44, and explained in more detail in the following paragraphs.

6.6.1.1 No Action

The "No Action" response alternative involves no application of technologies or process options. No efforts to modify the existing site conditions would be undertaken, however, the Long-term Stewardship Guidelines currently under development by DOE would be applicable. This GRA is not appropriate for PRS 66, however it will be further analyzed as a base case for other technologies to be compared against.

6.6.1.2 Institutional Controls Technologies

The remedial technologies identified for "Institutional Control" for PRS 66 are access restrictions and environmental monitoring. Access restrictions include denial of entry to the area or restriction of access to residual contaminated media (e.g., surface and subsurface contaminated soil). Process options are site security/isolation and deed restrictions. Site security/isolation involves the use of fences, berms, signs, and/or surveillance of the surrounding site to help prevent unauthorized access. Deed restrictions can be applied to the properties in the area of contamination to require permits for any intrusive activity, which may disturb the soil. Together these restrictions lower the potential for direct human contact and, to a lesser extent, the inhalation of contaminated airborne particulate. It is, therefore, potentially applicable.

It would be necessary to place restrictions on current and future activities on the property and to modify the deed to the property to reflect these restrictions. The actions of environmental monitoring and analysis of contaminated air, soil, surface water, and groundwater are retained as applicable. Evaluation of the environmental monitoring program is typically conducted every one to five years on sites containing residual contamination to determine the need for remediation and/or continued monitoring (40 CFR 300, Subpart E.)

6.6.1.3 Containment Technologies

The primary objective of containment technologies is to reduce or eliminate the mobility of the contamination. The process options screened for containment included clay, asphalt, concrete, geosynthetic, multi-layered, and native soil caps with and without the incorporation of slurry walls to control lateral migration.

Capping techniques can be applied over contaminated soil to prevent the escape of contaminated particles into the atmosphere, to prevent the infiltration of surface water leading to the contamination of groundwater aquifer, and to prevent direct human contact. Clay caps over the contaminated areas are potentially applicable but have a potential for cracking from the heaving of the ground in the freeze/thaw cycle. Proper maintenance of the clay cap would mitigate this concern. Synthetic liners or multi-layered caps (e.g., synthetic liner overlying a clay cap) over the areas of contamination are not as susceptible to cracking and therefore, are potentially applicable. Asphalt and

concrete covers for multi-layered caps are also susceptible to cracking if not properly maintained. Native soil might be used in areas of relatively low radioactivity to provide an exposure barrier against direct human contact and, in conjunction with surface controls, could reduce contaminant migration by wind and water erosion. Native soil was eliminated in favor of clay or other soil due to lower permeability characteristics of clay.

The protectiveness of any containment action would dictate whether the site should be restricted for access or developed for possible beneficial use. If site access were limited, a multi-layered cap consisting of a synthetic liner overlying a clay base would be an appropriate containment action. If the site was to be developed for industrial (beneficial) use, an appropriate response action would be the installation of a multi-layered cap consisting of clay, synthetic liner, fill, and then asphalt. The beneficial use scenario would likely result in more regular maintenance than the limited use scenario.

6.6.1.4 Collection Technologies

For soil and debris, collection processes have historically been limited to what is termed "Conventional Excavation and Disposal", where the contaminated media is excavated and shipped untreated to a licensed disposal facility for long term "storage" or "disposal". Disposal is defined, for the purposes of this evaluation, as permanent offsite disposal. Offsite disposal options available for this removal action consist of the Federal Nevada Test Site (NTS) and a permitted commercial facility (Envirocare) in Utah. Both sites are able to receive, handle, and secure radioactive-contaminated soil and debris.

Although there are onsite disposal concepts that could potentially be applicable and are technically feasible, (similar to DOE's conceptual design of an aboveground land encapsulation facility (BNI 1989)), the concept is not appropriate for Mound. This is due to their incompatibility with the current mission of cleanup and transfer of land to the Miamisburg Mound Community Improvement Corporation (MMCIC).

A variation of the conventional excavation and disposal option includes the incorporation of a segregation process in situations where both contaminated and non-contaminated media are intermingled. Often a significant savings, due to waste minimization, may be realized if the two types of media could be segregated during the

excavation. When this is possible, this is known as Precision Excavation and it incorporates a type of soil segregation process that is not considered a "treatment". Precision Excavation techniques are possible when:

- in-situ characterization data is adequate to three-dimensionally map the contaminant zones, and;
- a means exists to accurately locate the resulting zones throughout the excavation process, and;
- the resulting zones are close enough in proximity and depth to preclude separate conventional excavations, and;
- the contamination zones are known to be in large discrete locations that they can be segregated through the execution of the excavation process.

The technologies screened for collection of contaminants included various types of excavation and disposal scenarios. Conventional Excavation and Precision Excavation both involve the removal of untreated contaminated soil by a number of standard mechanical excavation means (track hoes, track loaders, articulated loaders, dozers, and other earthwork equipment). Conventional and Precision Excavation collection and disposal technologies are potentially applicable and are further evaluated in Section 6.7.

6.6.1.5 Treatment Technologies

In general, the treatment actions that are potentially applicable are as follows:

- Solids separation processes employing physical separation techniques to segregate waste materials based on size, type, or levels of contamination. Particle size segregation and *Segmented Gate*™ technologies are examples of solids separation technologies.
- Size reduction processes involving the mechanical grinding, shredding, or dismantling of waste materials to obtain a physical reduction in size.
- In-situ grouting by solidifying the soil matrix through the injection of grouting material. Ex-situ grouting (or cementation), which involves the use of various cement and silicate mixtures to act as physical solidifying agents.

- In-situ vitrification, involving placement of a system of electrodes within the soil to electrically heat the soil and form a molten block of the contaminated media. This block then solidifies upon cooling to form a stabilized mass.
- Ex-situ vitrification (in-furnace, batch, or constant feed), involving the immobilization of inorganic constituents by melting the waste into a glass-like matrix through a high-temperature process.
- In-situ soil flushing, involving the flushing of the contaminants from the soil by using water injection and removal by pumping through extraction wells.
- Ex-situ soil flushing, involving the washing of the waste material with a water solution to separate the COCs based on the particle size.
- Chemical extraction processes involving the use of dilute environmentally benign chemicals to selectively remove heavy metals and radionuclides from contaminated soil. With ex-situ chemical extraction, the chemicals are added to the soil in multi-stage operations tailored to the cleanup levels desired to obtain separation of the contaminants into a smaller volume waste stream and "cleaned" soil in the larger volume stream. In-situ applications of these techniques provide for the addition of chemicals directly to the contaminated soil and removal through extraction wells.
- Chemical stabilization and fixation techniques involving the use of chemicals to form an organic polymer within the waste materials. This binds the contaminants of concern within the contaminated waste stream and reduces potential mobility.
- Additional chemical processes, including chemical oxidation, reduction, neutralization, chelation, and solvent flushing.
- Encapsulation/solidification processes including surface micro-encapsulation and thermoplastic solidification. Surface micro encapsulation is the physical enclosing of wastes in an organic binder of resin. Thermoplastic solidification is the sealing of contaminants in an asphalt bitumen, paraffin, or polyethylene matrix. Conventional solidification techniques involving the use of Portland cement mixtures are also used.

The primary objectives of treatment technologies for radionuclide contaminants are volume reduction, contaminant concentration reduction, and immobilization. Depending on their chemical properties, some radionuclides (including thorium and plutonium) tend to adhere to fine-grained particles because of a higher surface area to volume ratio. If coarse and fine-grained materials can be separated, treatment may be beneficial to lower the transportation and disposal cost through volume reduction. The benefits associated with reducing the volume of contaminated soil also depend on the options available to dispose of the less-contaminated material (e.g., coarse-grained material).

Immobilization processes bind the radionuclides in a matrix to prevent their availability for migration through the media of concern.

Process options screened for treatment included both in-situ and ex-situ physical and chemical options. Surface micro-encapsulation and thermoplastic solidification were eliminated from further consideration due to difficulty in implementation and the inherent stability of the plutonium-soil bond. Vendors for these technologies are not readily available and treatability studies would be required to select an appropriate binder.

6.6.1.5.1 Solids Separation and Size Reduction

Solids separation and size reduction techniques can be used to separate solids by mechanical screening, gravity separation, flotation, magnetic separation, etc. This technology option has been used to extract radionuclides from ores. Generally, this option is used as a pretreatment for a primary treatment process. The success of solids separation techniques varies with the soil/radionuclide particle size distributions. Treatability studies must be conducted to determine if there is a relationship between radionuclide concentrations and particle-size distribution on a site by site basis.

Six technologies/principles have been tested and evaluated for plutonium-238. These were Automated Mechanical Flotation, Tall Column Flotation, Air Sparging Hydrocyclone, Centrifugal Gravity Centrifugal Jig, and the Septor System. None of the testing runs on Mound soil were successful in meeting the treatment objectives (defined as concentrating at least 80% of the COCs in 20% or less of the original volume). In addition, further research found the processes were not cost effective. Therefore, these technologies are not appropriate for PRS 66 and will not be considered further.

The "Segmented Gate™" (RSRCH 2000a) technology has shown promise, and has been implemented for certain radionuclide contaminated soil removal actions at several sites throughout the United States. This technology uses real time detection ability to sense levels of radioactivity. The detector then signals for the operation of a segregation gate on the conveyor system to isolate contaminated soil from clean soil. This technology, however, is limited to segregating wastes with high enough radioactive concentration so as to be efficient. The Segmented Gate™ technology did not possess the ability to segregate plutonium-238 in tests conducted on Mound soil in 1997, due to the fact that plutonium-238 has a very low energy gamma emission. This is a concern, since one of the PRS 66 COCs is plutonium-238. With all of the uncertainty associated with the Segmented Gate™ technology, it is not appropriate to consider it further for PRS 66.

The ITRD group investigation included a study by Earthline technologies into physical separation on sample soil from PRS 66 cores. The results indicated that the soil consisted of 16-20% oversize, 29-32% silt and sand, and 45-48% fines (clays), and further concluded that the contaminants (thorium-232 and plutonium-238) did exhibit a preference for the fines as expected. The contamination was also distributed throughout the full soil matrix. As such, physical separation of the soil by size fractions alone would not yield a suitable reduction in waste volumes to be considered applicable.

6.6.1.5.2 Soil Washing or Flushing

In-situ soil washing or flushing involves the injection of a wash solution or water into the contaminated soil and the removal of the solution, along with the contamination by pumping for ex-situ treatment or disposal. In-situ soil washing was eliminated from consideration for PRS 66 because this technology is not effective for the contaminants of concern and may be difficult to implement given the nature of the fill strata (non-uniform permeabilities and hydraulic gradients etc.) associated with PRS 66.

Ex-situ soil washing/flushing separates and concentrates COCs by mechanically and/or chemically scrubbing soil to remove the contaminants. The technique removes the contaminants by dissolving them in a solution or by separating contamination through particle-size distribution.

Soil washing/flushing can be used alone or in combination with other treatment options. This method has the potential to reduce the volume of contaminated soil if the soil contains a large quantity of coarse-grained particles. Various chemicals may also be added in small amounts to adjust pH and to improve the efficiency of the process. This concept has been implemented for uranium contamination, which has an affinity for the smaller particles in a soil matrix. A demonstration of one type of this technology was performed on Mound soils using the AWC TRUclean™ process. The results indicated a limited effectiveness, resulting in a minimal reduction in waste volume. Therefore, it was determined to be non-cost effective.

Solvent extraction techniques employ dilute solvents, which have a selective affinity for certain contaminants. These solvents have proven to be environmentally benign, rendering a great percentage of soil clean and/or suitable for unrestricted return to the environment. The timing for this removal action, however, may preclude its use due to the need to perform further treatability studies at Mound and verify the successful implementation of removal actions using these technologies at Superfund sites, which are not federal facilities (such as Mound). A previous treatability study at Mound using the Selentec chelation process was attempted in 1998. The study included both constant feed and batch processes. The results, however, were inconclusive. Therefore, this technology will also not be considered further.

A related process option is the Ashtabula soil washing/chemical treatment technology currently in use at Reactive Metals, Inc. (RMI). On preliminary review of the performance of the Ashtabula Soil Washing Pilot test system, some treated batches were found to be still above the treatment standard. The Cost and Performance Report from this project dated July 1998 listed some of the reasons given for failed batches included: assumed hot spots of unknown activities, mixtures of hot materials, and improper feed rate. An estimate of a 95% reduction was given by the report. This estimate was on soil with a fairly high percentage of coarse-grained particles, and would therefore not be directly comparable to any volume reduction expectation for PRS 66. Also, the chemical processes that work with uranium may not be directly comparable to that of thorium- 232 and plutonium-238. Due to the number of uncertainties associated with the RMI technology and its applicability, it will not be considered further for PRS 66.

The ITRD group investigation did involve two laboratory studies for soil washing/extraction. One was performed by Earthline Technologies, the other by the Pacific Northwest National Laboratory. Earthline reported a removal efficiency of 47% for plutonium-238 and 45% for thorium-232 citing removals >70% could be achieved with further optimization efforts. It would appear that achieving extraction to a level that would meet the cleanup objectives is unlikely and would require extensive research.

6.6.1.5.3 Vitrification Processes

Ex-situ vitrification involves the immobilization of inorganic constituents by dissolving and/or suspending the contaminated material into a glass-like matrix. Vitrification is a high temperature process (11,000 – 14,000 degrees Centigrade); therefore, any organics present will be volatilized, although afterburners may be required on the exhaust stream to convert any partially burned organics to carbon dioxide. The process, in general, involves the blending of various glass-making constituents and the waste (appropriately sized reduced if necessary) into a high-temperature furnace. At the appropriate (design) temperature, the contaminated materials are dissolved and/or suspended within the molten glass. Specific routing and cooling designs can produce a solid glass-like mass in beads (like a marble) or in monolith form. Both of these forms contain the dissolved or suspended contaminants.

After vitrification, the contaminants are unavailable for reaction due to the chemical bonding and entrapment within the glass matrix. Both alpha and beta radiation emitters would be sealed in the glass matrix formed during the vitrification process (EPA 1991). However, the vitrified material would still require disposal at an offsite facility, and since the volume would increase due to the addition of the glass forming constituents, waste disposal costs would increase. Also, the immobilization benefit offered by the glass matrix is redundant when considering the containment provided by an offsite disposal cell. The high costs of implementation, excavation, operation, and disposal lead to a very low benefit/cost ratio. As such, ex-situ vitrification will not be considered further.

In-situ vitrification involves the placement of a system of electrodes within the soil to heat the soil and form a molten block of the contaminated media. Upon cooling, this forms a stabilized mass. The soil may require a pretreatment drying step prior to vitrification depending on furnace design. This may be required to reduce the moisture

content based on the amount of free moisture expected in the contaminated soil. Since the COCs would remain in place, this technology is inconsistent with the RAO of minimizing Long-term Stewardship, and therefore, will not be considered further.

6.6.1.5.4 Solidification Techniques/Processes

In-situ and ex-situ solidification techniques, known as stabilization or fixation, can be applied to solid, liquid, or sludge wastes. Although solidification techniques can be effective in reducing the mobility of contaminants and does reduce the potential hazards to human health and the environment, it often is accompanied by an increase (with ex-situ) in waste volumes and additional process waste streams. Solidification combines a formulated reagent with the waste to create a solidified matrix.

Stabilization technologies can be categorized by the primary stabilizing agent used, i.e., thermoplastic-based or organic polymer-based, or various Portland cement-type mixtures. Stabilization has been used effectively to stabilize soil contaminated with inorganic wastes.

Ex-situ solidification techniques (especially cement type) will significantly increase the volume of waste for disposal. The resulting solids resist leaching, thereby minimizing the potential for migration of contaminants, however, this treatment would be redundant given the relative immobility of the nuclides present, and the containment afforded by offsite disposal. Considering the added cost of the treatment and disposal for the additional waste volume, ex-situ solidification treatment(s) will not be considered further.

In-situ grouting/solidification involves injecting cement grout at high pressures directly into the contaminated soil, forming a mechanical bond. Cement grouts are best suited for coarse-grained materials. As with the ex-situ solidification process, in-situ grouting /solidification does not remove the contaminated materials. It is also redundant due to the relative immobility of the nuclides present, and is inconsistent with the site's future uses. As such, in-situ grouting/solidification processes will not be further considered.

6.6.1.5.5 Chemical Stabilization/Fixation Processes

Chemical stabilization/fixation process options evaluated include a variety of processes such as chemical leaching, chemical oxidation, reduction, neutralization, precipitation,

chelation, soil aeration, solvent flushing, etc. In general, these processes involve adding chemicals to the waste media to treat the contaminants chemically. As such, there is a high potential for generating larger volumes of hazardous constituents and byproducts in the resulting waste stream. Recently, however, advances have been made in the use of environmentally benign extraction solvents with selective affinity for radionuclides and/or heavy metals. Although the potential exists for these techniques to significantly reduce the volume of waste to be contended with, most processes still require further development before full-scale field implementation.

6.6.1.5.6 Other Treatments

Other treatment technologies include Paramagnetic Separation, and Phytoremediation. Paramagnetic Separation involves the exposure of slurried soil to a high gradient magnetic field to separate metals. Phytoremediation utilizes the ability of certain plants to take up specific COCs. The plants are then burned and the COC is then concentrated in the ash.

Both of these technologies have been researched at previous times for Mound plutonium-contaminated soil. Paramagnetic Separation was tested with Mound soil at both TMA/Eberline and the Los Alamos National Lab in 1995. The results were not promising, and no further action was initiated. Phytoremediation investigations have shown that the process does have the ability to reduce the concentration of certain contaminants to a concentration less than 100 ppm. The process does not, however, have the ability to reduce the concentrations of plutonium to the site's CO of 55 pCi/g, which is the approximate equivalent of 3.135 ppb. As such, the process was not pursued any further as an option.

6.6.2 Summary

A summary of the GRA and the various screened removal action technologies are presented in Table 8 starting on Page 44. Based on consideration of the various benefits and liabilities from the range of possible technologies and the approaches presented in the technology screening phase of the evaluation, several alternatives were formulated, which warranted further consideration.

Table 8: Remedial Technologies and Processes – Initial Screening				
General Response Action	**Remedial Technology**	**Technology Process Option(s)**	**Description of Processes Involved**	**Screening Result/Comments**
No Action	Environmental Monitoring only	NA	NA	This was retained for comparative analysis only. The response conflicts with current site mission.
Institutional Controls	Access Restrictions	Site Security / Isolation	Construction of fencing w/ signs, berms surrounding the PRS site. Use of site security personnel for authorized access.	Potentially applicable, although it conflicts with current site mission and future uses.
	Monitoring	Periodic sampling and analysis.	Environmental Monitoring	Potentially applicable, although it conflicts with current site mission and future uses.
Containment	Capping	Native Soil	Clean native soil cap constructed over contaminated area(s)	Not applicable, since it provides ineffective containment due to shrink-swell potential and maintenance requirements; provides limited prevention of human contact if improperly maintained; conflicts with current site mission and potential future uses.
		Clay	Compacted clay cap placed over contaminated area(s)	Not applicable, since it provides ineffective containment due to shrink-swell potential and maintenance requirements; provides limited prevention of human contact if improperly maintained; conflicts with current site mission and potential future uses.
		Asphalt	Layer(s) of asphalt and appropriate sub-base constructed over the contaminated area(s)	Not applicable due to a high potential of future cracking and a limited life expectancy if not properly maintained.
		Concrete	Engineered concrete cap constructed over contaminated area(s)	Not applicable. If maintained, may provide an improved barrier to human contact than those mentioned previously, but is in conflict with the current site mission.

Table 8: Remedial Technologies and Processes – Initial Screening (continued)				
General Response Action	**Remedial Technology**	**Technology Process Option(s)**	**Description of Processes Involved**	**Screening Result/Comments**
Containment (continued)	Capping (continued)	Synthetic	Synthetic liner installed over the contaminated area(s)	Not Applicable. It is effective only with the proper maintenance and possesses a limited long-term life expectancy on exposed liner surfaces.
		Multi-layered	Classic multi layer combination of geo and synthetic layers.	Applicable. This approach, however, is in conflict with the current site mission.
Collection	Conventional Excavation / Onsite Disposal	Complete Excavation (128,706 loose cubic yards)	Excavation and Onsite disposal of entire PRS soils and debris	Not applicable. On-site disposal is NOT consistent with the current site mission, stakeholder inputs, and anticipated future land use(s). In addition, it is inappropriate and contradictory to waste minimization directives due to the large amount of media where the contaminants are not above the CO (10-5). Approximately 65% of the PRS would be disposed of as waste.
		Partial Excavation (40,608 loose cubic yards)	Excavation and Onsite disposal of soils and debris within defined areas of the PRS exhibiting contamination levels greater than the site's CO.	Not applicable. On-site disposal is NOT consistent with the current site mission, stakeholder inputs, and anticipated future land use(s).
	Conventional Excavation / Offsite Disposal	Complete Excavation (128,706 loose cubic yards)	Excavation and Offsite disposal of entire PRS soils and debris	Applicable but inappropriate and contradictory to waste min. directives on a significant (~65%) of the media is not above RBGV (10^{-5}) or ALARA levels. Very high transportation and disposal costs for media characterized as clean.
		Partial Excavation (40,608 loose cubic yards)	Excavation and Offsite disposal of soils and debris within discrete/defined areas of the PRS exhibiting contamination levels greater than the site's RBGVs.	Applicable. But still inappropriate and contradictory to waste minimization directives since clean overburden and other clean areas such as slopebacks will all be shipped as waste.

Table 8: Remedial Technologies and Processes – Initial Screening (continued)				
General Response Action	**Remedial Technology**	**Technology Process Option(s)**	**Description of Processes Involved**	**Screening Result/Comments**
Collection (continued)	Precision Excavation Segregation / Offsite Disposal.	Complete or Partial Excavation (128,706 or 40,608 loose cubic yards)	Segregation of clean and contaminated soils via in-situ characterization (lab analyses) or real time screening with disposal of the contaminated soils and debris on the entire PRS.	Potentially Applicable. Technology for field screening at detectable limits low enough for Plutonium-238 does not exist. Discrete sampling both in-situ, and during excavation could provide the data, but is very costly. The characterization data for the majority of the PRS does not indicate a need of a complete excavation.
Treatment	In-Situ Physical	Matrix Grouting	Soil matrix solidified in-place via high-pressure grout injection.	Not applicable. Inconsistent with the current site mission, stakeholder inputs, and anticipated future land use(s). Subject to freeze/thaw produced cracking and high grout permeation coefficients.
		Soil Flushing	High pressure water injection to "wash" the contaminants from the soil matrix. "Wash" water is removed via pumping.	Not applicable. Chemistry required for the Contaminants of Concern is unproven. Uncertainty of effectiveness due to non-uniform permeabilities and hydraulic gradients etc. associated with this PRS is also a concern.
	Ex-Situ Physical	Surface Micro-encapsulation	Organic binder or resin micro-encapsulation of waste.	Not applicable. Eliminated due to high cost and increases in waste volumes, which will still require radiological disposal.
		Thermo-Plastic Solidification	Waste sealed in asphalt bitumen, paraffin, or polyethylene matrix.	Not applicable. Eliminated due to high costs and increases in waste volumes still requiring radiological disposal.
		Soil Washing / Flushing	Waste soils are washed using water or chemical solution to remove and concentrate contaminants.	Potentially applicable, however difficult to implement on fine grained soils. Unproven chemistry for our cleanup objectives. Other problems in the addition of a wastewater waste stream.

Table 8: Remedial Technologies and Processes – Initial Screening (continued)				
General Response Action	**Remedial Technology**	**Technology Process Option(s)**	**Description of Processes Involved**	**Screening Result/Comments**
Treatment (continued)	Ex-Situ Physical (continued)	Particle Solids Separation	Mechanical separation of contaminated material thereby concentrating contaminants possessing an assoc. with specific particle size. Sometimes incorporated as a preliminary step for soil washing.	Not applicable due to media type, whereby the COCs are not sufficiently uniformly attached to any one particle size or group which could achieve the cleanup objectives associated with this PRS. Costs are also very high.
		Segmented Gate® or other segregating gate system	Real Time Rad Surveying to identify no or low-level activity soil from higher level soil on conveying system. Sensors trigger gate to separate levels.	Potentially applicable. Limited to primarily gamma emitters. Ineffective with very low energy gamma emitters such as Plutonium-238.
	In-situ Chemical	Solidification	Excavated soil solidified with various cement or silicate based solidifying agents.	Not applicable due to significant costs and waste volume increases.
		Chemical Stabilization / Chemical Fixation	Stabilization/Fixation of hazardous substances via continuous flow incorporation/ injection of chemical additions into the waste/soil matrix thereby forming an organic polymer with the COCs.	Not applicable. Limited applicability to contaminants of concern leading to effectiveness issues. Inconsistent with the current site mission.
		Chem. Oxidation, Reduction, Neutralization, Precipitation, Chelation, & solvent flushing	All processes involve injecting/ addition of chemical(s) to react with the COCs and mitigate.	Not applicable. Limited applicability to contaminants of concern leading to effectiveness issues. Inconsistent with the current site mission.

Table 8: Remedial Technologies and Processes – Initial Screening (continued)				
General Response Action	**Remedial Technology**	**Technology Process Option(s)**	**Description of Processes Involved**	**Screening Result/Comments**
Treatment (Continued)	Ex-situ Chemical	Chemical oxidation, reduction, neutralization, leaching, chelation, aeration, flushing and separation.	The addition of specific chemicals, strong acids or bases, which will extract various metals from a solid (soil) matrix.	Potentially applicable. However, significant research may be necessary to select for the COCs. Additional waste streams are generated which may require disposition or additional treatment prior to disposition.
		Segmented Gate® or other segregating gate system	Real Time Rad Surveying to identify no or low-level activity soils from higher level soils on conveying system. Sensors trigger gate to separate the levels.	Potentially applicable. Limited to primarily gamma emitters. Ineffective with very low energy gamma emitters such as Plutonium-238.

6.7 Analysis of Removal Action Alternatives

The potential alternatives subject to further analysis subsequent to the technology screening included the following:

- No Action
- Institutional Controls
- Containment
- Full Excavation and Disposal Without Segregation
- Full Excavation and Disposal With Segregation
- Excavation and Removal of Contaminated Disposal Area
- Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective

Of these identified alternatives, "Institutional Controls" and "Containment", which are acceptable remedial approaches under CERCLA were screened from further detailed analysis due to their inability to fully comply with the PRS 66 RAO of "*Remediate (remove) contaminated soil and debris as appropriate to comply with site-specific cleanup goals*". In this section of the EE/CA, each remaining potential alternative will be further analyzed and systematically evaluated.

The following section will present the criteria, which will be utilized in the evaluation process. Subsequent sections will evaluate each of the remaining five alternatives listed above against the identified criteria. After the individual alternative evaluations, the five alternatives will undergo a comparative analysis leading up to a recommended removal action alternative.

6.7.1 Evaluation Criteria

The alternatives passing the initial technology screening process as having the most applicability to the PRS 66 group were then evaluated according to the nine criteria of National Oil and Hazardous Substances Pollution Contingency Plan (NCP) [40 CFR 300.430(e)(2)]. These nine criteria are described below.

6.7.1.1 Overall Protection of Human Health and the Environment

This criterion assesses whether each alternative provides adequate protection of human health and the environment. Evaluation of the overall protectiveness of an alternative focuses on whether a specific alternative achieves adequate protection, and describes how site risks are eliminated, reduced, or controlled through treatment, engineering, or institutional controls. The assessment of overall protection draws on assessments of other evaluation criteria, especially long-term effectiveness and permanence, short-term effectiveness, and compliance with ARARs. This evaluation should also identify any unacceptable short-term impacts

6.7.1.2 Compliance with ARARs

Section 121(d) of CERCLA requires that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs," unless such ARARs are waived under CERCLA Section 121(d)(4).

"Applicable Requirements" are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address hazardous substances, the remedial action to be implemented at the site, the location of the site, or other circumstances present at the site.

"Relevant and Appropriate Requirements" are those substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law. These requirements while not applicable to the hazardous materials found at the site, the remedial action itself, the site location, or other circumstances at the site, nevertheless address problems or situations sufficiently similar to those encountered at the site that their use is well suited to the site.

Compliance with ARARs addresses whether a remedy will meet all the applicable or relevant and appropriate requirements of other Federal and State environmental statutes or provides the basis for invoking a waiver.

ARARs are of several types: chemical-specific, location-specific, and action-specific. Chemical-specific ARARs are usually health- or risk-based numerical values or

methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable amount or concentration of a chemical that may be found in, or discharged to, the ambient environment. Location-specific ARARs are restrictions placed on the concentration of hazardous substances or the conduct of activities solely because they are located in specific locations, e.g., flood plains, wetlands, historic places, etc. Action-specific ARARs are usually technology- or activity-based requirements or limitations on actions taken with respect to hazardous wastes. These requirements are triggered by the particular remedial activities that are selected to accomplish a remedy.

Non-promulgated regulations or "guidances" (e.g. DOE Orders, etc.) that do not qualify as true ARARs, may still be appropriately considered in the event the ARARs are not health protective. These are often referred to as "*to be considered*" (TBC) criteria. TBCs are not required by the NCP; rather, TBCs are meant to compliment the use of ARARs. Because ARARs do not exist for every chemical or circumstance, TBCs may be very useful in determining what is protective of a site or how to carry out certain actions or requirements. Local laws are generally not promulgated state requirements and, although they are not ARARs, they may be TBCs. However, if the local requirement is developed under explicit state authority or if compliance is a requirement of a promulgated state statute, the local requirement may be an ARAR.

6.7.1.3 Long-term Effectiveness and Permanence

The evaluation of alternatives under this criterion addresses the results of a remedial action in terms of the risk remaining at the site after response objectives have been met. The primary focus of this evaluation is the extent and effectiveness of controls that may be required to manage the risk posed by treatment residuals or untreated wastes. The following components of the criterion should be addressed for each alternative:

- Magnitude of Residual Risk - This factor assesses the residual risk remaining from untreated waste or treatment residuals at the conclusion of remedial activities (e.g., after source/soil containment and/or treatment are complete). The potential for this risk may be measured by risk numbers, if appropriate, or by the volume or concentrations of contaminants remaining.

- Adequacy and Reliability of Controls - This factor assesses the adequacy and suitability of controls, if any, that are used to manage untreated wastes that remain at the site. It may include an assessment of containment systems and institutional controls to determine if they are sufficient to maintain exposures to human and environmental receptors within protective levels. This factor also addresses the long-term reliability of management controls for providing continued protection from residuals. It includes the assessment of the future need to replace technical components of the alternative, such as a cap, a slurry wall, or a treatment system in the event of failure, and the potential exposure pathway and the risks posed if the remedial action requires replacement.

6.7.1.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

This evaluation criterion addresses the statutory preference for selecting remedial actions that use treatment technologies that permanently and significantly reduce toxicity, mobility, or volume of the hazardous substances as their principal element. This preference is satisfied when treatment is used to reduce the principal threats at a site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility, or reduction of total volume of contaminated media. This evaluation would focus on the following specific factors for a particular remedial alternative:

- The treatment processes employed and the materials they will treat
- The amount of hazardous materials to be destroyed or treated
- The degree of reduction expected in toxicity, mobility, or volume
- The degree to which the treatment will be irreversible
- The type and quantity of residuals that will remain after treatment
- Whether the alternative will satisfy the statutory preference for treatment

6.7.1.5 Short-term Effectiveness

This evaluation criterion addresses the effects of the alternative during the construction and implementation phase until the removal objectives have been met. Under this criterion, alternatives should be evaluated with regard to their effects on human health

and the environment during implementation of the remedial action. The following factors should be addressed as appropriate for each alternative:

- Protection of the Community During Remedial Actions - This aspect of short-term effectiveness addresses any risk that results from implementation of the proposed remedial action, such as dust from excavation, transportation of hazardous materials, or air-quality impacts from a stripping tower that may affect human health.
- Protection of Workers During Remedial Actions - This factor assesses threats that may be posed to workers and the effectiveness and reliability of protective measures that would be taken. Issues such as radioactive emissions and corresponding doses may be quantified for comparison.
- Environmental Impacts - This factor addresses the potential adverse environmental effects that may result from the construction and implementation of an alternative, and evaluates the reliability of the available mitigation measures in preventing or reducing the potential impacts.
- Time Until Remedial Response Objectives Are Achieved - This factor includes an estimate of the time required to achieve protection for the entire site or for individual elements associated with specific site areas or threats.

6.7.1.6 Implementability

The implementability criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation. This criterion involves analysis of the following factors:

6.7.1.6.1 Technical Feasibility

Multiple technical factors will be evaluated for each alternative under this evaluation criterion. These factors include:

- Construction and Operation - Relates to the technical difficulties and unknowns associated with a technology. This factor was initially identified for specific technologies during development and screening of alternatives and is addressed again in the detailed analysis for the alternative as a whole.

- Reliability of Technology - Focuses on the likelihood that technical problems associated with implementation will lead to schedule delays.
- Ease of Undertaking Additional Remedial Action - Includes a discussion of what, if any, future remedial actions may be undertaken and how difficult it would be to implement such actions. Robust technologies (the ability to address a variety of conditions) and technologies that do not severely limit future actions are preferred over other technologies.
- Monitoring Considerations - Addresses the ability to monitor the effectiveness of the remedy and includes an evaluation of the risks of exposure if monitoring is insufficient to detect a system failure. This factor also considers the availability of parameters to determine the occurrence of a reasonable deviation.

6.7.1.6.2 Administrative Feasibility

The administrative feasibility factor evaluates those activities needed to coordinate with other offices, agencies, and the stakeholders. Each alternative will be evaluated in regard to the need for off-site permits (e.g., obtaining permits for offsite activities or rights-of-way for construction), adherence to applicable non-environmental laws, and concerns of other regulatory agencies will be evaluated under this criterion.

6.7.1.6.3 Availability of Services and Materials

Multiple factors pertaining to the availability of services and materials will be evaluated for each alternative under this evaluation criterion. These factors include:

- Availability of adequate offsite treatment, storage capacity, and disposal services. This factor is especially relevant for sites containing mixed (hazardous and radioactive) waste or transuranic (TRU) waste.
- Availability of necessary equipment and specialists and provisions to provide any necessary additional resources.
- Availability of services and materials plus the potential for obtaining competitive bids, which may be particularly important for innovative technologies.
- Availability of prospective technologies

6.7.1.7 State/Support Agency Acceptance

The comments and feedback from the Ohio Environmental Protection Agency (OEPA) and any its support agencies (i.e., the Ohio Department of Health), as well as those received from the U. S. Environmental Protection Agency (USEPA) will be evaluated within this criterion. Any administrative and technical concerns expressed will be considered in determining the recommended alternative of the Action Memo EE/CA.

6.7.1.8 Community Acceptance

As with the State/Support Agency acceptance, community acceptance of an alternative will be considered when evaluating each alternative and considered in determining the recommended alternative. For several years, DOE, OEPA, and USEPA have conducted PRS 66 Working Group Meetings for the purpose of soliciting input and feedback into the project, including discussions about the alternatives being evaluated in the following sections.

Additionally, through such forums as the Mound Reuse Committee (MRC), Mound Action Committee (MAC), weekly meeting with the MMCIC, and quarterly community updates, the community has been kept appraised on the PRS 66 Removal Action and the proposed alternatives being evaluated. Preliminary community feedback will be incorporated with each alternative's evaluation, however the community acceptance will be finalized and evaluated after the receipt of comments from the public review of the Action Memo EE/CA.

6.7.1.9 Cost

The final factor considered in the alternative evaluation process is the projected total cost of each alternative. Site characterization information is utilized to refine cost estimates for each alternative. Typically, these study estimates are expected to provide an accuracy of plus 50 to minus 30 percent based on the existing information. A present worth analysis is used to evaluate expenditures that occur over different time periods by discounting all future costs to a common base year. This allows the cost of each alternative to be compared on the basis of a single figure representing the amount of money that, if invested in the base year and disbursed as needed, would be sufficient to cover all costs associated with the remedial action over its planned life.

Regulatory guidance allows the use of Order of Magnitude estimation for the purposes of assessing the relative expense of a given alternative as compared to any other option in an EE/CA. At this stage, it is not expected that detailed costs such as those, which come from a completed engineering design, would be available in all cases. The costs relating to the alternatives later described are based with the most accurate information available. The following are the cost factors that will be addressed for all alternatives:

- Capital Costs - Capital costs consist of direct (construction) and indirect (non-construction and overhead) costs. Direct costs include expenditures for the equipment, labor, and materials necessary to implement remedial actions. Indirect costs include expenditures for engineering, financial, and other services that are not part of actual installation activities, but are required to complete the installation of remedial alternatives.
- Annual Operations and Maintenance (O&M) Costs - Annual O&M costs are post-construction costs necessary to provide continued effectiveness of a remedial action. The following O&M cost components should be considered:
    - Labor costs, inclusive of ongoing monitoring and analytical services
    - Maintenance, services, materials, and energy costs
    - Costs to treat or dispose of residuals, such as sludges from treatment processes or spent activated
    - Costs associated with the administration of remedial O&M not included under other categories
    - Cost for maintaining equipment or structures that need repair
    - Costs of periodic site reviews. Costs for site reviews that are conducted at least every 5 years if wastes above health-based levels remain at the site

6.7.2 Alternative 1 - No Action

"No Action" consists of performing no removal action and only the maintenance of monitoring programs, current land use, and public access conditions at the site. The "No Action" alternative is included only as a basis for evaluation of other alternatives, since it does not adequately address the PRS 66/80/40 RAOs.

6.7.2.1 Overall Protection of Human Health and the Environment

Although the current human health and environmental risks of the PRS 66 group may be acceptable for the community, workers, or the environment, it is not effective under future land-use scenarios in protecting human health and the environment. Although evaluations of the current risk to the public and environment (performed on the basis of present land use) indicate the threat from PRS 66 contaminants is small, the "No Action" scenario does not address the RAOs as presented in Section 6.2.

6.7.2.2 Compliance with ARARs

The "No Action" alternative implementation would not be in compliance with the PRS 66 ARARs. Most notably, this alternative would not meet chemical-specific and location-specific ARARs, since it does not meet the health- or risk-based RAO goals for the project. In particular, unacceptable concentration levels of radioactive contaminants would be left in place under this alternative. Since this alternative does not remove any soils, action-specific ARARs are non-applicable to this alternative.

6.7.2.3 Long-term Effectiveness and Permanence

Since no contaminated soil is removed under this alternative, the long-term risk remains the same at best for this alternative in terms of magnitude of risk. Exposure to contaminants and the size of the affected area could possibly increase over time as a result of disturbances by humans and natural processes and the subsequent movement of contaminants by erosion and surface water transport. Since this alternative does not implement any controls to preclude future soil disturbances, it is not reliable from a control perspective.

6.7.2.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

The "No Action" alternative does not reduce the toxicity, mobility, or volume of contaminants through any treatment technologies. Subsequently, the potential exposure pathways of direct contact, ingestion and inhalation of contaminated soil remain unchanged. As such, this alternative does not adequately address the statutory preference for treatment.

6.7.2.5 Short-term Effectiveness

Since the "No Action" alternative does not involve any construction or implementation activities, it poses no short-term risks to the community and workers and it poses no additional adverse environmental impacts. Since this alternative does not adequately address the PRS 66 Group RAO, no estimate of time required to achieve protection is appropriate.

6.7.2.6 Implementability

The technical feasibility of the "No Action" alternative is very high, in that it is not technically difficult to implement, it does not rely upon technology, and no monitoring considerations of the area is implemented under this alternative. Similarly, its administrative feasibility is good, since it requires no additional coordination with other offices, agencies and stakeholders to implement. The alternative does not depend on the availability of funding, treatment and disposal services, construction materials or labor to implement.

6.7.2.7 State/Support Agency Acceptance

Feedback received from the OEPA and USEPA does not support the "No Action" alternative, since it does not meet the PRS 66 Group RAOs.

6.7.2.8 Community Acceptance

Feedback received from the PRS 66 Working Group, MAC, MRC, and the MMCIC does not support the "No Action" alternative, since it does not meet the PRS 66 Group RAOs. In particular, community concern has also been expressed that this alternative would hinder the future site reuse and it would pose potential risk to future site workers excavating within the PRS 66 footprint in support of on-site utility and facility development activities.

6.7.2.9 Cost

No additional capital costs are required to implement the "No Action" alternative. The operation and maintenance (O&M) costs include the costs associated with the current monitoring program. The O&M costs to maintain current groundwater monitoring are approximately $40,000 per year.

6.7.3 Alternative 2 - Full Excavation and Disposal Without Segregation

Under this alternative, approximately 128,706 lcy of material would be excavated and designated as waste without regard to its actual level of radioactive activity and contaminants present. The excavated soil and debris would be removed with conventional earth-moving equipment by utilizing standard excavation practices. Ongoing radiological screening would be performed for health and safety (H&S) monitoring and waste acceptance criteria. Soil and debris would be hauled to the site's railroad load-out facility and shipped offsite.

Prior to implementation of this alternative, a significant level of preliminary planning would need to be accomplished. Once completed, the initial layout would minimally consist of the following areas: defined radiological control/contamination zones; a radiological control personnel work area/change-out/offices trailer; an onsite radiological analysis lab; construction personnel work area/change-out/offices trailer; decontamination facilities including full equipment wash capability; and a vehicle wheel-wash system with a water management system. In addition, both a small equipment lay-down area and a contingent mixed/hazardous waste lay-down/holding area (including emergency absorbents) would also need to be incorporated. Utilities located within the PRS footprint would be rerouted prior to commencing with excavation.

Runon and runoff controls would need to be designed and installed to prevent the infiltration of uncontrolled site water as well as the prevention of any uncontrolled site runoff. Water generated during excavation would be managed in accordance with regulatory and site requirements. Since the duration is expected to be long term, these controls would need to be either semi-permanent or permanent in their design and construction depending on their specific location and use.

When excavation is complete via the exposure of the fill/till interface, verification samples would be collected at the bottom of the excavated footprint. Upon the return of acceptable verification results, the excavation would be backfilled with clean onsite materials or purchased backfill from offsite. The backfill would be placed in lifts of sufficient thickness to facilitate compaction to a predetermined value commensurate with the anticipated future land use. A drainage channel for the upper portion of the valley would be incorporated.

6.7.3.1 Overall Protection of Human Health and the Environment

Once implemented, this alternative offers excellent long-term overall protection to the public and the environment since it removes all levels of residual contamination within the PRS by removing and disposing all soil off-site. It also offers low short-term human health and environmental risk to the public. The human health and environmental risks to the public would be controlled through dust suppression methods to minimize fugitive dust and any potential airborne contamination releases. Perimeter environmental and safety and health monitoring will be conducted throughout the project.

6.7.3.2 Compliance with ARARs

This alternative implementation would be in compliance with the PRS 66 ARARs. Most notably, this alternative would meet all chemical-specific, location-specific, action-specific ARARs. This alternative does meet the health- or risk-based RAO goals for the project, while handling waste in acceptable manners. Where appropriate, technologies are incorporated to ensure that discharges to the ambient environment, if any, will be minimized. The implementation would also be in full compliance with all TBCs.

6.7.3.3 Long-term Effectiveness and Permanence

The long-term effectiveness is excellent in that all debris and soil are removed, regardless of contamination level. Subsequently, the magnitude of residual risk is essentially eliminated other than background levels of natural contamination in the nearby community. No additional future actions would be required at the conclusion of this alternative's implementation. No remaining controls would be required upon the completion of this alternative since no untreated waste would remain at the site.

6.7.3.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

Total excavation and disposal does eliminate all contaminated soil and as such, reduces mobility of the contaminants (relative to the macro environment) by securing them in a disposal facility free of mobilization agents, such as water, air, and future activities. The toxicity of the waste itself would not be reduced; however, it would be placed in a controlled permanent isolated location offsite where the exposure to human and environmental receptors would be significantly reduced. While meeting the RAOs, excessive waste volumes are generated since no treatment technologies would be

applied to minimize the waste volumes or to segregate the contaminated soil from uncontaminated soil.

6.7.3.5 Short-term Effectiveness

This alternative has low short-term human health and environmental risk to the public, but a higher level of short-term human health risk to the workers due to exposure via inhalation, dermal contact, and incidental ingestion. The short-term human health and environmental risks to the public would be controlled through dust suppression methods to minimize fugitive dust, while perimeter environmental and safety and health monitoring will be conducted throughout the project. Water run-on and run-off controls would be implemented to minimize the potential for increase off-site releases of suspended solids as the result of the excavation. The short-term public health and environmental risks associated with this alternative versus that of a lesser excavation alternative is slightly higher simply due the increased implementation time (two years).

The short-term worker risks are directly proportionate to the amount of exposure time workers have to potential industrial and radiological risks. The short-term worker risks will be controlled through worker training, personal protective clothing, personnel monitoring, and frequent equipment decontamination. Efforts will be made to control and minimize the spreading of contamination from the excavation site throughout the project's duration. Safety and Health and Radiological oversight personnel will assist in assuring that the project risks are minimized for this alternative. Again, the short-term health worker risks associated with this alternative versus that of a lesser excavation alternative are higher due the increased time of implementation.

6.7.3.6 Implementability

This alternative is readily implementable from a technical feasibility standpoint since the approach is not technically difficult to implement. It would utilize known reliable technologies and the monitoring techniques that would be utilized have proven to be effective in past removals. Measures to protect or reroute underground utilities directly affected or removed by the excavation can be technically implemented, but they would pose additional schedule requirements to implement. The main technical challenge would be maintaining excavation efficiency based upon the depth of the excavation and the amount of dispositioned debris requiring downsizing to facilitate its transportation.

The alternative's administrative feasibility is good, since it requires minimal ongoing coordination with other offices, agencies and stakeholders to implement. A high degree of coordination would be involved, however with maintaining timely pick-up of full railcars and delivery of empty railcars to ensure that the project excavation would proceed without delay.

Excavation equipment and construction equipment are commercially available, as are borrow materials for backfill and soil cover. Given the amount of available radiological and chemical characterization data, no waste acceptance or capacity restriction issues associated with the anticipated offsite disposal facilities exist.

6.7.3.7 State/Support Agency Acceptance

Feedback received from the OEPA and USEPA acknowledges the alternative as an acceptable alternative, which does meet the PRS 66 Group RAOs. When compared to other alternatives, however, the alternative does require a substantially longer time to complete, thus posing additional short-term risks, while not achieving a result much more effective from a residual risk perspective than other alternatives.

6.7.3.8 Community Acceptance

Feedback received from the PRS 66 Working Group, MAC, MRC, and the MMCIC does acknowledge the alternative as an acceptable alternative, which does meet the PRS 66 Group RAOs. In particular, the alternative would clearly address the community concern of exposing future site workers to potential risk during future on-site utility and facility development activities, since it would remove all potentially contaminated soil from the PRS footprint.

6.7.3.9 Cost

The estimated total cost for this alternative, including labor, equipment and materials for excavation, transportation and disposal fees, as well as site restoration costs and indirect costs is $52.8 million. A cost summary for this alternative is presented in Table 9. An additional cost detail breakout for this alternative can be found in Appendix F.

Table 9: Cost Summary Alternative 2 - Full Excavation and Disposal Without Segregation	
Historical Planning and Characterization	$2,436,060
Planning and Engineering	$295,442
Characterization	$1,944,200
Site Prep	$1,474,375
Excavation	$3,630,231
Verification	$2,221,992
Backfill/Site Restoration	$2,993,222
Waste Management & Disposal	$37,789,667
Total	**$52,785,189**

6.7.4 Alternative 3 - Full Excavation and Disposal With Segregation

Under this alternative, a full excavation and segregation of the PRS would occur with only the shipment of contaminated materials as waste based on the characterization data, field instrument monitoring, and sampling. The volume of contaminated soil in PRS 66/80/40 was estimated by analysis of the historical information and characterization data collected to date. DOE risk-based and negotiated cleanup objectives were used to calculate waste volume projections. Areas of contamination greater than the project's cleanup objectives were identified and quantified both laterally and vertically. Using this technique, the volume of contaminated soil and debris above the cleanup objective is estimated to be approximately 40,608 lcy, although the project would excavate and handle approximately 128,706 lcy in total. The scope of this RA and the costing for the purposes of this EE/CA are based on the above volumes only.

Prior to implementation of this alternative, a slightly higher level of preliminary planning would need to be accomplished than that level of Alternative 2 - Full Excavation and Disposal Without Segregation. The initial layout would minimally consist of the following areas: defined radiological control/contamination zones; a radiological control and construction personnel work area/change-out/offices trailer; an onsite radiological analysis lab; decontamination facilities including full equipment wash capability; and a vehicle wheel-wash system with a water management system. In addition, both a small equipment lay-down area and a contingent mixed/hazardous waste lay-down/holding

area (including emergency absorbents) would also need to be incorporated. Runon and runoff controls would need to be designed and installed to prevent the infiltration of uncontrolled site water as well as the prevention of any uncontrolled site runoff. Utilities located within the PRS footprint would be rerouted prior to commencing with excavation.

The excavated soil and debris would be removed with conventional earth-moving equipment by utilizing standard excavation practices. Based upon prior characterization results and continuous field survey monitoring, contaminated soil and debris would be removed and hauled to the Waste Management railroad load-out facility and shipped offsite. All clean soil and debris would be staged for eventual engineered backfill in the excavation area or hauled to another site location if necessary for staging. Ongoing radiological screening would be performed for H&S monitoring.

Excavation would proceed in phases for the entire PRS 66 Group footprint down to the fill/till interface, where verification samples would be collected at the bottom on the excavation footprint. Water generated during excavation would be managed in accordance with regulatory and site requirements. Since the duration is expected to be long term, these controls would need to be either semi-permanent or permanent in their design and construction depending on their specific location and use. Upon the return of acceptable verification results, the excavation would be backfilled with excavated soil and debris determined to be below the cleanup objective based upon prior characterization, other clean onsite material or purchased backfill from offsite. The backfill would be placed in lifts of sufficient thickness to facilitate compaction to a predetermined value commensurate with the anticipated future land use. An appropriate drainage channel for the upper portion of the valley would be incorporated.

6.7.4.1 Overall Protection of Human Health and the Environment

Once implemented, this alternative offers very good long-term overall protection to the public and the environment since it removes and disposes all contamination soils and debris above the cleanup objective within the PRS 66 Group. It also offers low short-term human health and environmental risk to the public. The human health and environmental risks to the public would be controlled through dust suppression methods to minimize fugitive dust and any potential airborne contamination releases. Perimeter environmental and safety and health monitoring would be conducted during the project.

6.7.4.2 Compliance with ARARs

This alternative implementation would be in compliance with the PRS 66 ARARs. Most notably, this alternative would meet all chemical-specific, location-specific, action-specific ARARs. This alternative does meet the health- or risk-based RAO goals for the project, while handling the waste in acceptable manners. Where appropriate, technologies are incorporated to ensure that discharges to the ambient environment, if any, would be minimized. The implementation would also be compliant with all PRS 66 TBCs.

6.7.4.3 Long-term Effectiveness and Permanence

The long-term effectiveness is very good in that all debris and soil above the cleanup objective are removed. Subsequently, the magnitude of residual risk is significantly reduced from that currently posed by the PRS. No additional future actions are anticipated at the conclusion of this alternative's implementation unless future residual risk factors are decreased from those currently determined to be acceptable. No remaining controls would be required upon the completion of this alternative since no unacceptable waste would remain at the site.

6.7.4.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

This alternative does provide for total excavation of the PRS and the disposal of soils and debris above the cleanup objective. A small residual level of contamination would remain in the backfilled soil. The contaminated soil that is removed significantly reduces the overall mobility of the contaminants (relative to the macro environment) by securing them in a disposal facility free of mobilization agents, such as water, air, and future activities. The toxicity of the disposed waste would not be reduced; however, it would be placed in a controlled permanent isolated location offsite where the exposure to human and environmental receptors would be significantly reduced. While meeting the RAOs, significant waste volumes are generated since no treatment technologies would be applied to minimize the waste volumes.

6.7.4.5 Short-term Effectiveness

This alternative has minimal short-term human health and environmental risk to the public. The short-term human health and environmental risks to the public would be

controlled through dust suppression methods to minimize fugitive dust, while perimeter environmental and safety and health monitoring will be conducted throughout the project. Water run-on and run-off controls would be implemented to minimize the potential for increase off-site releases of suspended solids during excavation.

The short-term worker risks are directly proportionate to the amount of exposure time workers have to potential industrial and radiological risks. The short-term worker risks will be controlled through worker training, personal protective clothing, personnel monitoring, and frequent equipment decontamination. Efforts will be made to control and minimize the spreading of contamination from the excavation site throughout the project's duration. Safety and Health and Radiological oversight personnel will assist in assuring that the project risks are minimized for this alternative. The short-term worker risks associated with this alternative versus that of a lesser excavation alternative are slightly higher due the increased implementation time causing increased exposure time.

6.7.4.6 Implementability

The implementability of this alternative is good from a technical feasibility standpoint since the approach is not technically difficult to implement. It would utilize known reliable technologies and the monitoring techniques that would be utilized have proven to be effective in past removals. Measures to protect or reroute underground utilities directly affected or removed by the excavation can be technically implemented. The main technical challenge will be attempting to segregate plutonium-238 soil above the cleanup objective in the overburden and slopeback areas utilizing field instrumentation. As such, soil located adjacent to known plutonium-238 contaminated soil would be sent for laboratory analysis, thus adding the additional technical challenge of retaining the sample soil until results are secured. The other technical challenge would be that of maintaining excavation efficiency based upon the varying depth of the excavation.

The alternative's administrative feasibility is fairly good, since it requires minimal ongoing coordination with other offices, agencies and stakeholders to implement. A moderate degree of coordination would be envisioned with OEPA on monitoring the slopeback soil contamination status and field determination of acceptable backfill debris. Excavation equipment and construction equipment are commercially available, as are borrow materials for backfill and soil cover. Given the amount of available radiological

and chemical data as the result of the characterization process, no waste acceptance or capacity restriction issues associated with the anticipated offsite disposal facilities exist.

6.7.4.7 State/Support Agency Acceptance

Feedback received from the OEPA and USEPA acknowledges the alternative as an acceptable alternative, which does meet the PRS 66 Group RAOs. When compared to other alternatives, however the alternative does require a substantially longer time to complete, thus posing additional short-term risks, while not achieving a result much more effective from a residual risk perspective than other alternatives. Additionally, the implementation of this alternative does rely upon a high degree of field instrumentation monitoring and field decision concerning acceptable soil and debris backfill. As such, this will be a point of focus for the OEPA and USEPA during their PRS 66 Removal Plan review and approval.

6.7.4.8 Community Acceptance

Feedback received from the PRS 66 Working Group, MAC, MRC, and the MMCIC does acknowledge this alternative as their preferred alternative in that it meets the PRS 66 Group RAOs, while excavating and exposing the complete excavation footprint of the PRS 66 Group. In particular, the alternative would address all soils within the PRS and it would provide the community a higher level of assurance that no contaminated areas not seen during the project's characterization remain at the project's conclusion. Subsequently, it would address the community concern of exposing future site workers to potential risk during on-site utility and facility development activities.

6.7.4.9 Cost

The estimated total cost for this alternative, including labor, equipment and materials for excavation, transportation and disposal fees, as well as site restoration and indirect costs is roughly $27.4 million. Of this, approximately $13.0 million is directly related to waste management and disposal, while the balance is for site preparation, necessary upgrades for the project, excavation, segregation, and material handling. A summary of the costs for this alternative is presented in Table 10. An additional cost detail breakout for this alternative can be found in Appendix F.

Table 10: Cost Summary Alternative 3 - Full Excavation and Disposal With Segregation	
Historical Planning and Characterization	$2,436,060
Planning and Engineering	$295,442
Characterization	$1,944,200
Site Prep	$1,474,375
Excavation	$4,683,057
Verification	$2,182,769
Backfill/Site Restoration	$1,377,578
Waste Management & Disposal	$13,008,654
Total	**$27,402,135**

6.7.5 Alternative 4 - Excavation and Removal of Contaminated Disposal Area

Under this alternative, the soil and debris would be removed only where contiguous characterization data indicates that it exceeds the cleanup objectives (inclusive of Th-232 above 3.0 pCi/g) and where non-contiguous locations are greater than the SPHS Criteria. The volume of contaminated soil in PRS 66/80/40 was estimated by analysis of the historical information and characterization data. DOE risk-based and negotiated cleanup objectives were used to calculate waste volume projections. Areas of contamination greater than the cleanup objectives were identified and quantified both laterally and vertically. Using this technique, the volume of contaminated soil and debris above the cleanup objective is estimated to be approximately 37,661 lcy while handling in total 61,439 lcy.

Prior to implementation of this alternative, a significantly higher level of preliminary planning would need to be accomplished than that required in a full PRS footprint excavation due to detailed engineering and instructions required to identify the precision excavation areas. The initial layout would minimally consist of the following areas: defined radiological control/contamination zones; a radiological control and construction personnel work area/change-out/offices trailer; an onsite radiological analysis lab; decontamination facilities including full equipment wash capability; and a vehicle wheel-wash system with water management system. In addition, both a small

equipment/accessories lay-down area and a contingent mixed/hazardous waste lay-down area (including emergency absorbents) would be incorporated.

Runon and runoff controls would need to be designed and installed to prevent the infiltration of uncontrolled site water as well as the prevention of any uncontrolled site runoff. Water generated during excavation would be controlled, tested, and disposed of in accordance with regulatory and site requirements. Since the duration is expected to be a relatively long term, these controls would need to be either semi-permanent or permanent in their design and construction depending on their specific location and use.

Upon surveying and marking the location of the affected area (per characterization data results), the excavated soil and debris would be removed by conventional earth-moving equipment using precision excavation practices. Ongoing radiological screening would be performed using field instrumentation to identify the slopeback and overburden soil that is below the agreed-upon cleanup objectives, which would be stockpiled in the vicinity of the excavation for later use as backfill material. When field instrumentation indications suggest levels above background, samples will be secured and analyzed for verification that the soil is indeed below the cleanup objective. In areas where the characterization shows plutonium-238 or other weak gamma emitter isotopes, samples will be secured and analyzed for verification that the soil is below the cleanup objective.

Contaminated soil and smaller debris items uncovered within the contamination zone or within the overburden or slopeback areas would be hauled to the soil staging and load out facility. Larger contaminated debris items would be downsized and either containerized at the excavation site or hauled to the load out facility. The footprint of the contaminated excavation will extend into slopeback areas until all contaminated soils and debris are removed.

Once the excavation is thought to be complete via visual and field analysis, verification samples would be collected from the removal zones. Upon the return of acceptable verification results, the excavation would be backfilled with previously excavated "clean" soil as well as other clean onsite borrow or purchased offsite material. The backfill would be placed in lifts of sufficient thickness to facilitate compaction to a predetermined value commensurate with the anticipated future land use. An appropriate drainage

channel for the upper portion of the valley would be incorporated. After all backfilling is completed, the PRS 66 site would be seeded and restored back to the pre-removal topography of the area.

6.7.5.1 Overall Protection of Human Health and the Environment

Once implemented, this alternative offers very good long-term overall protection to the public and the environment since it removes and disposes the vast majority of the contaminated soil and debris above the cleanup objective within the PRS 66 Group as identified during the project characterization efforts. It also offers low short-term human health and environmental risk to the public. The human health and environmental risks to the public would be controlled through dust suppression methods to minimize fugitive dust and any potential airborne contamination releases. Perimeter environmental and safety and health monitoring will be conducted throughout the project.

6.7.5.2 Compliance with ARARs

This alternative implementation would be in compliance with the PRS 66 ARARs. This alternative would meet all chemical-specific, location-specific, action-specific ARARs. This alternative does meet the health- or risk-based RAO goals for the project, while handling the waste in acceptable manners. Where appropriate, technologies are incorporated to ensure that discharges to the ambient environment, if any, would be minimized. The implementation would also be in full compliance with all TBCs.

6.7.5.3 Long-term Effectiveness and Permanence

The long-term effectiveness is good in that the vast majority of the contaminated soil and debris above the cleanup objective as identified during the project characterization efforts within the PRS footprint are removed. Some small spots of the contamination soil and debris above the cleanup objective would not be removed since they are located outside of the excavation zone and they do not exceed the "Hot Spot" criteria negotiated between OEPA, USEPA, and DOE. No additional future actions are anticipated at the conclusion of this alternative's implementation unless future residual risk factors are decreased from those currently determined to be acceptable. No remaining controls would be required upon the completion of this alternative since no unacceptable waste would remain at the site.

6.7.5.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

This alternative does provide for the excavation of a large part of the PRS footprint and the disposal of soils and debris above the cleanup objective. A small residual level of contamination would remain in the backfilled soil and any soil remaining in the unexcavated area of the PRS. The contaminated soil that is removed significantly reduces the overall mobility of the contaminants (relative to the macro environment) by securing them in a disposal facility free of mobilization agents, such as water, air, and future activities. The toxicity of the disposed waste would not be reduced; however, it would be placed in a controlled permanent isolated location offsite where the exposure to human and environmental receptors would be significantly reduced.

6.7.5.5 Short-term Effectiveness

This alternative has minimal short-term human health and environmental risk to the public. The short-term human health and environmental risks to the public would be controlled through dust suppression methods to minimize fugitive dust, while perimeter environmental and safety and health monitoring will be conducted throughout the project. Water run-on and run-off controls would be implemented to minimize the potential for increase off-site releases of suspended solids during excavation.

The short-term worker risks are directly proportionate to the amount of exposure time workers have to potential industrial and radiological risks. The short-term worker risks will be controlled through worker training, personal protective clothing, personnel monitoring, and frequent equipment decontamination. Efforts will be made to control and minimize the spreading of contamination from the excavation site throughout the project's duration. Safety and Health and Radiological oversight personnel will assist in assuring that the project risks are minimized for this alternative.

6.7.5.6 Implementability

The implementability of this alternative is good from a technical feasibility standpoint since the approach is not technically difficult to implement. It would utilize known reliable technologies and the monitoring techniques that would be utilized have proven to be effective in past removals. Measures to protect or reroute underground utilities directly affected or removed by the excavation can be technically implemented.

The main technical challenge will be attempting to segregate plutonium-238 soil above the cleanup objective in the overburden and slopeback areas utilizing field instrumentation. As such, soil located adjacent to known plutonium-238 contaminated soil would be sent for laboratory analysis, thus adding the additional technical challenge of interim staging of the sampled soil until results are secured. The other technical challenge would be that maintaining excavation efficiency based upon the depth of the excavation and the amount of dispositioned debris, which would require downsizing to facilitate its transportation.

The alternative's administrative feasibility is fairly good, since it requires minimal ongoing coordination with other offices, agencies and stakeholders to implement. A moderate degree of coordination would be envisioned with OEPA on monitoring the slopeback soil contamination status and field determination of acceptable backfill debris. Excavation equipment and construction equipment are commercially available, as are borrow materials for backfill and soil cover. Given the amount of available radiological and chemical data as the result of the detailed characterization process, no waste acceptance or capacity restriction issues associated with the anticipated offsite disposal facilities exist.

6.7.5.7 State/Support Agency Acceptance

Feedback received from the OEPA and USEPA acknowledges the alternative as an acceptable alternative, which does meet the PRS 66 Group RAOs. The implementation of this alternative does rely upon field instrumentation monitoring and field decision concerning acceptable soil and debris backfill. As such, this will be a point of focus for the OEPA and USEPA during their PRS 66 Removal Plan review and approval.

With the recent decision to lower the Th-232 cleanup objective to 2.1 pCi/g, some concern has been expressed over whether the application of the "Hot Spot Criteria" to discount the contamination within the two areas designated by Area IV is appropriate. As such, this alternative has less OEPA and USEPA support than Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective", which removes Area IV. As such, OEPA has stipulated that the results of the Smart Sampling analysis must be received prior to their final judgement on excluding Area IV from excavation.

6.7.5.8 Community Acceptance

Feedback received from the PRS 66 Working Group, MAC, MRC, and the MMCIC have expressed some concern with this alternative, although it does meet the PRS 66 Group RAOs. In particular, the alternative would leave some contaminated locations, which are above the cleanup objective, but which do not require removal based upon the "Hot Spot" criteria. Some concern has also been expressed about this alternative not excavating and exposing the entire PRS footprint, as an assurance that all buried contaminated soils and debris would be removed. As such, it would not address the community concern of exposing future site workers to potential risk during on-site utility and facility development activities.

6.7.5.9 Cost

The estimated total cost for this alternative, including labor, equipment and materials for excavation, transportation and disposal fees, site restoration costs, escalation and fees is approximately $22.7 million. Of this total cost, approximately $12.0 million is directly related to waste management and disposal, while the balance is for site preparation, necessary upgrades for the project, excavation, segregation, and material handling. A summary of these costs is presented in Table 11. An additional cost detail breakout for this alternative can be found in Appendix F.

Table 11: Cost Summary
Alternative 4 - Excavation and Removal of Contaminated Disposal Area

Historical Planning and Characterization	$2,436,060
Planning and Engineering	$271,570
Characterization	$1,944,200
Site Prep	$1,279,711
Excavation	$2,660,538
Verification	$1,224,762
Backfill/Site Restoration	$884,202
Waste Management & Disposal	$11,982,589
Total	**$22,683,632**

6.7.6 Alternative 5 – Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective

Under this alternative, all contaminated soil and debris that exceed the Mound site or negotiated cleanup objectives would be removed within the PRS footprint, with no "Hot Spot" criteria being utilized. The volume of contaminated soil in PRS 66/80/40 was estimated by analysis of the historical information and characterization data. DOE risk-based and negotiated cleanup objectives were used to calculate waste volume projections. Areas of contamination greater than the cleanup objectives were identified and quantified both laterally and vertically. Using this technique, the volume of contaminated soil and debris above the cleanup objective is estimated to be approximately 40,608 lcy while handling in total 69,580 lcy. The scope of this RA and the costing for the purposes of this EE/CA are based on the above volumes only.

Prior to implementation of this alternative, significant preliminary planning would be needed for detailed engineering and instructions to identify the areas requiring precision excavation areas. The initial layout would minimally consist of the following areas: defined radiological control/contamination zones; a radiological and construction control personnel work area/change-out/offices trailer; an onsite radiological analysis lab; decontamination facilities including full equipment wash capability; and a vehicle wheel-wash system with water management system. In addition, both a small equipment/accessories lay-down area and a contingent mixed/hazardous waste lay-down area (including emergency absorbents) would be incorporated.

Runon and runoff controls would need to be designed and installed to prevent the infiltration of uncontrolled site water as well as the prevention of any uncontrolled site runoff. Water generated during excavation would be controlled, tested, and disposed of in accordance with regulatory and site requirements. Since the duration is expected to be relatively long, these controls would need to be either semi-permanent or permanent in their design and construction depending on their specific location and use.

Upon surveying and marking the location of the affected area (per characterization data results), the excavated soil and debris would be removed by conventional earth-moving equipment using precision excavation practices. Ongoing radiological screening would be performed to identify the slopeback and overburden soil that is lower than the

agreed-upon cleanup objectives, which would be stockpiled in the vicinity of the excavation for later use as backfill material. When field instrumentation indications suggest levels above background, samples will be secured and analyzed for verification that the soil is indeed below the cleanup objective. In areas where the characterization shows plutonium-238 or other weak gamma emitter isotopes, samples will be secured and analyzed for verification that the soil is indeed below the cleanup objective.

Contaminated soil and debris items uncovered within the contamination zone or within the overburden or slopeback areas would be hauled to the soil staging and load out facility. Larger contaminated debris items would be downsized and either containerized at the excavation site or hauled to the load out facility. The footprint of the contaminated excavation would extend into slopeback areas until all contaminated soils and debris are removed. Once all known contamination is removed from the contaminated excavation area, any residual contamination remaining would be "chased" and removed in all lateral and vertical directions until the remaining surface areas are verified to be below the project cleanup objective levels.

Once the excavation is thought to be complete via visual and field analysis, verification samples would be collected from the base of the removed zones. Upon the return of acceptable verification results, the excavation would be backfilled with previously excavated "clean" soil as well as other clean onsite borrow or purchased offsite material. The backfill would be placed in lifts of sufficient thickness to facilitate compaction to a predetermined value commensurate with the anticipated future land use. An appropriate drainage channel for the upper portion of the valley would be incorporated. After all backfilling is completed, the PRS 66 site would be seeded and restored back to the pre-removal topography of the area.

6.7.6.1 Overall Protection of Human Health and the Environment

Once implemented, this alternative offers very good long-term overall protection to the public and the environment since it removes and disposes of all known contaminated soils and debris above the cleanup objective within the PRS 66 Group as identified during the project characterization efforts. It also offers low short-term human health and environmental risk to the public. The human health and environmental risks to the public would be controlled through dust suppression methods to minimize fugitive dust

and any potential airborne contamination releases. Perimeter environmental and safety and health monitoring will be conducted throughout the project.

6.7.6.2 Compliance with ARARs

This alternative implementation would be in compliance with the PRS 66 ARARs. Most notably, this alternative would meet all chemical-specific, location-specific, action-specific ARARs. This alternative does meet the health- or risk-based RAO goals for the project, while handling the waste in acceptable manners. Where appropriate, technologies are incorporated to ensure that discharges to the ambient environment, if any, would be minimized. The implementation would also be compliant with all TBCs.

6.7.6.3 Long-term Effectiveness and Permanence

The long-term effectiveness is good in that all known contaminated soil and debris above the cleanup objective as identified during the project characterization efforts within the PRS footprint are removed. No additional future actions are anticipated at the conclusion of this alternative's implementation unless future residual risk factors are decreased from those currently determined to be acceptable. No remaining controls would be required upon the completion of this alternative since no unacceptable waste would remain at the site.

6.7.6.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

This alternative does provide for the excavation of a large part of the PRS footprint and the disposal of soils and debris above the cleanup objective. A small residual level of contamination would remain in the backfilled soil, which is below the cleanup objective, and any soil remaining in the unexcavated area of the PRS. The contaminated soil that is removed significantly reduces the overall mobility of the contaminants (relative to the macro environment) by securing them in a disposal facility free of mobilization agents, such as water, air, and future activities. The toxicity of the disposed waste would not be reduced; however, it would be placed in a controlled permanent isolated location offsite where the exposure to human and environmental receptors would be significantly reduced.

6.7.6.5 Short-term Effectiveness

This alternative has minimal short-term human health and environmental risk to the public. The short-term human health and environmental risks to the public would be controlled through dust suppression methods to minimize fugitive dust, while perimeter environmental, safety and health monitoring would be conducted throughout the project. Water run-on and run-off controls would be implemented to minimize the potential for increase off-site releases of suspended solids as the result of the excavation.

The short-term worker risks are directly proportionate to the amount of exposure time workers have to potential industrial and radiological risks. The short-term worker risks will be controlled through worker training, personal protective clothing, personnel monitoring, and frequent equipment decontamination. Efforts would be made to control and minimize the spreading of contamination from the excavation site throughout the project's duration. Safety and Health and Radiological oversight personnel would assist in assuring that the project risks are minimized for this alternative during the project execution.

6.7.6.6 Implementability

The implementability of this alternative is good from a technical feasibility standpoint since the approach is not technically difficult to implement. It would utilize known reliable technologies and the monitoring techniques that would be utilized have proven to be effective in past removals. Measures to protect or reroute underground utilities directly affected or removed by the excavation can be technically implemented. The main technical challenge will be attempting to segregate plutonium-238 soil above the cleanup objective in the overburden and slopeback areas utilizing field instrumentation. As such, soil located adjacent to known plutonium-238 contaminated soil would be sent for laboratory analysis, thus adding the additional challenge of interim staging of the sampled soil until results are secured. The other technical challenge would be that maintaining excavation efficiency based upon the depth of the excavation.

The alternative's administrative feasibility is fairly good, since it requires minimal ongoing coordination with other offices, agencies and stakeholders to implement. A moderate degree of coordination would be envisioned with OEPA on monitoring the slopeback soil contamination status and field determination of acceptable backfill debris.

Excavation equipment and construction equipment are commercially available, as are borrow materials for backfill and soil cover. Given the characterization data, there exist no waste acceptance or capacity restriction issues associated with the anticipated offsite disposal facilities. The alternative does not depend on the availability of funding, treatment and disposal services, construction materials or labor to implement.

6.7.6.7 State/Support Agency Acceptance

Feedback received from the OEPA and USEPA acknowledges this alternative as not only an acceptable alternative, which does meet the PRS 66 Group RAOs, but their preferred alternative. The implementation of this alternative does rely upon a high degree of field instrumentation monitoring and field decision concerning acceptable soil and debris backfill. As such, this will be a point of focus for the OEPA and USEPA during their PRS 66 Removal Plan review and approval.

6.7.6.8 Community Acceptance

This alternative does address the prior concern that has been expressed about leaving some contaminated location, which are above the cleanup objective, but below the "Hot Spot" criteria. As such, it addresses the community concern of exposing future site workers to potential risk during future on-site utility and facility development activities. Initial feedback received from meetings between the City of Miamisburg officials and the OEPA/USEPA suggests that this alternative is much more acceptable in removing all soils above the cleanup objective within the PRS 66/80/40 footprint. Formal feedback from the stakeholders on this alternative will be secured during the 30-day public comment period for this Action Memo EE/CA.

6.7.5.9 Cost

The estimated total cost for this alternative, including labor, equipment and materials for excavation, transportation and disposal fees, site restoration costs, escalation and fees is approximately $24.2 million. Of this total cost, approximately $12.9 million is directly related to waste management and disposal, while the balance is for site preparation, necessary upgrades for the project, excavation, segregation, and material handling. A summary of these costs is presented in Table 12. An additional cost detail breakout for this alternative can be found in Appendix F.

Table 12: Cost Summary Alternative 5 - Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective	
Historical Planning and Characterization	$2,436,060
Planning and Engineering	$271,570
Characterization	$1,944,200
Site Prep	$1,279,711
Excavation	$3,002,928
Verification	$1,420,030
Backfill/Site Restoration	$961,088
Waste Management & Disposal	$12,908,135
Total	**$24,223,722**

6.8 Comparative Analysis of Removal Action Alternatives

This section of the EE/CA systematically evaluates each of the five alternatives qualitatively against the criteria previously discussed. The overall comparative evaluation process, discussed in detail below, when completed will indicate the most appropriate alternative for the PRS 66 Group when completed.

6.8.1 Basis for Comparison

The purpose of the comparative analysis is to identify the advantages and disadvantages of the alternatives when compared with each other based on the detailed analysis described in Section 6.7. The evaluation was performed based on the USEPA EE/CA guidance documents. Overall, this analysis generated a relative balancing of the positive and negative aspects of each alternative. Great care was taken to evaluate each component objectively and completely.

6.8.1.1 Overall Protection of Human Health and the Environment

The overall protection of human health and environmental of all five alternatives, other than Alternative 1 - "No Action", are acceptable. They all remove and dispose of comparable levels of contaminated soils and debris based upon the project characterization data and project cleanup objectives. Alternative 2 – "Full Excavation and Disposal Without Segregation" provides the best long-term overall protection since

it minimizes all health risks by totally removing all soils. Alternative 3 – "Full Excavation and Disposal With Segregation" is comparable to Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective". Both are marginally better than Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" in terms of providing long-term overall health and environmental protectiveness to the public. This is attributable to the amount of residual contamination within the remaining soils for Alternative 4. Although not pristine, this residual soil contamination is below the cleanup objective utilizing the "Hot Spot" criteria.

All four alternatives ensure comparable levels of short-term human health and environmental protection to the public through dust suppression methods to minimize potential fugitive dust and airborne contamination releases. Perimeter environmental, safety and health monitoring will be conducted by the four excavation projects.

6.8.1.2 Compliance with ARARs

All alternatives, except Alternative 1 - "No Action", would be implemented in compliance with the PRS 66 ARARs. The four excavation alternatives would meet all chemical-specific, location-specific, action-specific ARARs and they would be would also be compliant with all TBCs. While meeting the health- or risk-based RAO goals for the project, all four alternatives would handle the waste in acceptable manners. Where appropriate, technologies would be incorporated to ensure that discharges to the ambient environment, if any, would be minimized.

6.8.1.3 Long-term Effectiveness and Permanence

Alternative 1 - "No Action" has the least long-term effectiveness since it does not meet the cleanup objective associated with "remediating (removing) the contamination from the PRS". Alternative 2 – "Full Excavation and Disposal Without Segregation" is the most effective alternative since it minimizes all residual risk by totally removing all soils. Alternative 3 – "Full Excavation and Disposal With Segregation" is comparable to Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective". Both are marginally better Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" in terms of their long-term effectiveness. This is attributable to the amount residual contamination

within the remaining soils for Alternative 4. Although not pristine, this residual soil contamination is below the cleanup objective.

No additional future actions are anticipated at the conclusion of any of the four excavation alternatives' implementation. No remaining controls would be required upon the completion of any of these four alternatives since no unacceptable contamination would remain at the site.

6.8.1.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

Alternative 1 - "No Action" does nothing to reduce toxicity, mobility, or volume of the contaminants within PRS 66. Alternative 2 – "Full Excavation and Disposal Without Segregation" is the most effective in reducing mobility of the contaminated soil since it removes all of the contaminated soil from the site. Alternative 3 – "Full Excavation and Disposal With Segregation" is comparable to Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective". Both are marginally better Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" in terms of their reduction in mobility and remaining soil toxicity. This is attributable to the amount residual contamination within the remaining soils for each alternative. Although not pristine, this residual soil contamination is below the cleanup objective. The contaminated soil that is removed significantly reduces the overall mobility of the contaminants (relative to the macro environment) by securing them in a disposal facility free of mobilization agents, such as water, air, and future activities.

The toxicity of the disposed waste would not be reduced in any of the four excavation alternatives; however, it would be placed in a controlled permanent isolated location offsite where the exposure to human and environmental receptors would be significantly reduced. The residual risk for the soil remaining is comparable for Alternatives 3 through 5.

6.8.1.5 Short-term Effectiveness

Since no construction or implementation activities are performed under Alternative 1 – "No Action", this alternative poses no short-term risks to the community and workers and it poses no additional adverse environmental impacts. Alternative 2 – "Full

Excavation and Disposal Without Segregation" and Alternative 3 – "Full Excavation and Disposal With Segregation" pose comparable short-term risks to the workers and the environment, since they are similar in duration. Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" is comparable to Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" in terms of short-term worker exposure and environmental impact potential. Both are better than Alternatives 2 and 3, due to their shorter project duration limiting worker risk exposure. All four alternatives provide minimal risk to the public or environment if adequate controls are implemented during construction to minimize dust emissions and sediment runoff.

6.8.1.6 Implementability

The technical feasibility of the "No Action" alternative is very high, in that it is not technically difficult to implement, it does not rely upon technology, and no monitoring considerations of the area are implemented under this alternative. The four excavation alternatives are all readily implementable from a technical feasibility standpoint since their approach is not technically difficult to implement. They would all utilize known reliable technologies and the monitoring techniques that have proven to be effective in past removals.

Alternative 2 – "Full Excavation and Disposal Without Segregation" and Alternative 3 – "Full Excavation and Disposal With Segregation" pose comparable technical challenges based upon their overall depth of the excavation going down to fill-till. Alternative 3 – "Full Excavation and Disposal With Segregation" poses the greatest technical challenge associated with field detection of contamination for waste segregation with the added complexity of managing the large volume of clean soil. Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" and Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" have a similar technical challenge as Alternative 3 – "Full Excavation and Disposal With Segregation" associated with field screening the slopeback areas. The slopeback adjacent to plutonium contamination areas must rely on laboratory sampling rather than precision field surveying for determining the areas requiring removal.

Administrative feasibility is best for Alternative 1 – "No Action", since it requires no additional coordination with other offices, agencies and stakeholders to implement. A high degree of coordination would be involved with Alternative 2 – "Full Excavation and Disposal Without Segregation" with maintaining timely pick-up of full railcars and delivery of empty railcars to ensure that the project excavation would proceed without delay. Alternative 3 – "Full Excavation and Disposal With Segregation" would require the most coordination with OEPA in regard to confirming the soil contamination status and field determination of acceptable backfill debris. Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" and Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" require a moderate degree of coordination with OEPA on monitoring the slopeback soil contamination status and field determination of acceptable backfill debris.

Excavation equipment, construction equipment, services, supplies, materials and systems required for implementing the four excavation alternatives are commercially available. Technologies and methodologies required to implement these actions are readily available and frequently used. There exist no waste acceptance or capacity issues associated with any of the four excavation alternatives.

6.8.1.7 State/Support Agency Acceptance

Feedback received from the OEPA and USEPA does not support the "No Action" alternative, since it does not meet the PRS 66 Group RAOs. The remaining four excavation alternatives all meet the PRS 66 Group RAOs. Alternative 2 – "Full Excavation and Disposal Without Segregation" and Alternative 3 – "Full Excavation and Disposal With Segregation" require a substantially longer time to complete, thus posing additional short-term worker risks, while not achieving a result not much more effective from a residual risk perspective than other alternatives. The implementation of Alternative 3 – "Full Excavation and Disposal With Segregation", Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" and Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" relies upon a high degree of field instrumentation monitoring and field decision concerning acceptable soil and debris backfill.

6.8.1.8 Community Acceptance

The PRS 66 Working Group, MAC, MRC, and the MMCIC do not support the "No Action" alternative, since it does not meet the PRS 66 Group RAOs. In particular, community concern has also been expressed that this alternative would hinder the future site reuse and it would pose potential risk to future site workers excavating within the PRS 66 footprint in support of on-site utility and facility development activities.

The PRS 66 Working Group, MAC, MRC, and the MMCIC acknowledge Alternative 2 – "Full Excavation and Disposal Without Segregation" and Alternative 3 – "Full Excavation and Disposal With Segregation" as acceptable alternatives, which do meet the PRS 66 Group RAOs. In particular, both alternatives would clearly address all soils within the PRS and it would provide the community a higher level of assurance that contaminated areas not seen during the project's characterization do not remain at the project's conclusion. Subsequently, it would address the community concern of exposing future site workers to potential risk during on-site utility and facility development activities.

The PRS 66 Working Group, MAC, MRC, and the MMCIC have expressed some concern with Alternative 4 – "Excavation and Removal of Contaminated Disposal Area", even though it does meet the PRS 66 Group RAOs. In particular, the concern has been expressed that the alternative would leave some contaminated location, which are above the cleanup objective, but which do not require removal based upon the "Hot Spot" criteria. Some concern has also been expressed about this alternative not excavating and exposing the entire PRS footprint, as an assurance that all undetected (through characterization) small pockets of contaminated soils and buried debris would be removed. As such, it would not address the community concern of exposing future site workers to potential risk during on-site utility and facility development activities.

Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" addresses the prior concern that has been expressed about leaving some contaminated locations, which are above the cleanup objective, but below the "Hot Spot" criteria. As such, it addresses the community concern of exposing future site workers to potential risk during future on-site utility and facility development activities.

6.8.1.9 Cost

Much effort was invested in developing the initial conceptual cost estimate for each of the various alternatives presented in the Draft PRS 66 Action Memo EE/CA sent for regulatory review. Recently, however, more detailed cost estimate have been formulated to address stakeholder concerns over the accuracy of the conceptual cost estimates. An independent review, which was performed to validate the quality and accuracy of the cost estimates, found these new estimates to be reasonable, and complete from a cost, schedule and assumption perspective.

As expected, the cost for Alternative 1 – "No Actions" is low. The costs for the other alternatives increase dramatically as the excavation and waste disposal volumes and verification sampling footprint change. The most costly is Alternatives 2 – "Full Excavation and Disposal Without Segregation", which is attributable to the high cost of shipment and disposal of all of the PRS soil. The estimated cost of this alternative is approximately $52.8 million. Alternative 3 – "Full Excavation and Disposal With Segregation" was detailed estimated at approximately $27.4 million. Alternative 4 – "Excavation and Removal of Contaminated Disposal Area" was estimated at approximately $22.7 million. Alternative 5 – "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" was estimated at approximately $24.2 million.

During the various stages of the cost estimation process, some discussion had occurred as to the impact of performing each of the alternatives utilizing onsite personnel versus subcontractors. Although some of the calculated costs might vary slightly for each alternative, the *relative* cost of the alternatives would be the same when estimated on a consistent labor basis. As such, whether the work scopes were performed utilizing onsite personnel or subcontracted organizations, it would have no bearing on the qualitative cost comparison portion of this EE/CA.

6.9 Conclusion

Alternative 1 - "No Action" is an unacceptable since it clearly does not meet the RAOs.

Alternative 2 – "Full Excavation and Disposal Without Segregation" is clearly the most effective alternative from a long-term effectiveness, overall protection of human health

and environment, and reduction of mobility perspective, since it removes all PRS 66 soils from the site. It is comparable with other excavation alternatives from a compliance with ARARs, reduction in toxicity or volume through treatment, and implementability perspective. It is not as effective as the partial excavation alternatives from a short-term effectiveness perspective as it is longer in duration, thus exposing on-site workers to greater safety and health risks. It has high State/Support Agency and Community Acceptance as it fully meets the PRS 66 RAOs. However, it is extremely expensive and the full excavation of the PRS is not justified given the characterization of the PRS.

Alternative 3 – "Full Excavation and Disposal With Segregation" is slightly less effective that Alternative 2 – "Full Excavation and Disposal Without Segregation" from long-term effectiveness, overall protection of human health and environment, and reduction of mobility perspective. This is attributable to the amount of residual contamination within the backfill soils for Alternative 3. Although not pristine, this residual soil contamination is below the cleanup objective. It is comparable with the partial excavation alternatives from a long-term health and environmental, overall protection of human health and environment, and reduction of mobility perspective. It is comparable with other excavation alternatives from a compliance with ARARs, reduction in toxicity or volume through treatment, and implementability perspective. It is not as effective as the partial excavation alternatives from a short-term effectiveness perspective as it is longer in duration, thus exposing on-site workers to greater safety and health risks.

Alternative 3 – "Full Excavation and Disposal With Segregation" has high State/Support Agency and Community Acceptance as it fully meets the PRS 66 RAOs. Additionally, it provides the community a higher level of assurance that no contaminated areas not seen during the project's characterization remain at the project's conclusion, thereby addressing the community concern of exposing future site workers to potential risk during on-site utility and facility development activities. Although significantly less expensive than that Alternative 2 – "Full Excavation and Disposal Without Segregation", the additional cost above the partial excavation alternatives is not justified given the characterization of the PRS and the incremental level of risk reduction which is achieved by excavating the entire PRS footprint.

Alternative 4 - "Excavation and Removal of Contaminated Disposal Area" is slightly less effective that Alternative 2 – "Full Excavation and Disposal Without Segregation" from long-term effectiveness, overall protection of human health and environment, and reduction of mobility perspective. This is attributable to its leaving some lower risk soils behind due to a "hot spot criteria". Additionally, an amount of residual contamination within the soils is left behind in other unexcavated areas and within the backfill, which although not pristine, is below the cleanup objective. It is comparable with Alternative 3 – "Full Excavation and Disposal With Segregation" from a long-term effectiveness, overall protection of human health and environment, and reduction of mobility perspective. It is comparable with other excavation alternatives from a compliance with ARARs, reduction in toxicity or volume through treatment, and implementability perspective. It is the most effective alternative from a short-term effectiveness perspective as it is shortest in duration, thus exposing on-site workers to lower safety and health risks.

Alternative 4 - "Excavation and Removal of Contaminated Disposal Area" has a lower community acceptance than the full footprint excavation alternatives, but it does fully meet the PRS 66 RAOs. It does not provide the community as high a level of assurance that no contaminated areas remain at the project's conclusion. As such, the community is concerned about exposing future site workers to potential risk during on-site utility and facility development activities. This alternative has the lowest cost of any alternative meeting the PRS 66 RAOs.

Alternative 5 - "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" is slightly less effective that Alternative 2 – "Full Excavation and Disposal Without Segregation" from long-term effectiveness, overall protection of human health and environment, and reduction of mobility perspective. This is attributable to the amount of residual contamination within the soils left behind in unexcavated areas and within the backfill. Although not pristine, this residual soil contamination is below the cleanup objective. It is comparable with Alternative 3 – "Full Excavation and Disposal With Segregation" and Alternative 4 - "Excavation and Removal of Contaminated Disposal Area" from a long-term effectiveness, overall protection of human health and environment, and reduction of mobility perspective. It is comparable with other excavation alternatives from a

compliance with ARARs, reduction in toxicity or volume through treatment, and implementability perspective. It is comparable to Alternative 4 - "Excavation and Removal of Contaminated Disposal Area" from a short-term effectiveness perspective as it is short in duration, thus exposing on-site workers to lower safety and health risks.

OEPA and USEPA indicated that Alternative 5 - "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" represents their preferred alternative for PRS 66. Community Acceptance of this alternative will not be known until after public review of this new alternative. It does provide the community, however a higher level of assurance that no contaminated areas seen during the project's characterization would remain at the project's conclusion. The community's concern about exposing future site workers to potential risk during on-site utility and facility development activities should be lessened. This alternative has the second lowest cost of any alternative meeting the PRS 66 RAOs.

6.10 Recommended Removal Action Alternative

Alternative 5 - "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" is the recommended alternative. This alternative meets the RAOs, has very good long-term effectiveness, provides for overall protection of human health and environment, and achieves a reduction of contamination mobility by removing all contaminants with a risk greater than $1X10^{-5}$ based upon the characterization data. Its implementation would not be technically difficult, as it would utilize known reliable technologies. The monitoring techniques that would be utilized have proven to be effective in past removals. Its implementation would also be fully compliant with ARARs. Due to its shorter duration, it would have the lowest risk to workers during implementation.

Alternative 5 - "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" has OEPA and USEPA support, since all locations within the full PRS footprint that are greater than $1X10^{-5}$ risk based upon characterization results would be removed. Additionally, this alternative ensures that additional contaminated soil does not exist through field screening and sampling during excavation. Although Community Acceptance of this alternative will not be known until after public review of this new alternative, this alternative addresses the

community concerns expressed in their review of Alternative 4 - "Excavation and Removal of Contaminated Disposal Area". Although not the least-cost alternative, this alternative is the most cost-effective option that addresses the Community's concerns.

6.10.1 Smart Sampling Analysis Results

As a check to evaluate whether applying the cleanup objectives in concert with the recommended alternative would leave behind pockets of contamination that pose an unacceptable risk (greater then $1X10^{-5}$ risk), Sandia National Laboratory was contracted to apply Smart Sampling[R] modeling to the PRS 66 data. The report on this modeling effort will be available before the Removal Plan is finalized. Results will be discussed with the PRS 66 Working Group, MAC, and the MRC when available. Should any modifications to the approach based upon these results be required, it will be reflected within the Removal Plan.

The conclusion of this modeling effort is that the process described in the recommended alternative would result in the removal of all known and predicted (modeled) pockets of contamination above the cleanup objectives. The modeling did suggest elevated contamination in two areas where the data either did not see contamination or there was no data. However, in both cases, the predicted probability of these areas exceeding 10^{-5} risk is low (less than 30%) and the process described in the recommended alternative would find and remove the contaminated soil if it really does exist (i.e., they are contiguous to areas already planned for excavation).

6.10.2 Approach and Removal Action Description

Alternative 5 - "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" uses the results of the extensive characterization data to delineate and define the extent of the excavation area. By analyzing the results that exceed the PRS 66 cleanup objective three-dimensionally, a continuous contamination area is evident within the PRS 66 footprint, which runs north to south and parallels the PRS 66 1946 original topography. This contamination area is supported by the characterization data as summarized in the appropriate section of this text as well as a more detailed summary presented in Appendix B.

Slopebacks, which would be incorporated to insure soil stability and worker safety, would extend beyond the contaminated excavation area footprint into the non-contaminated areas. Overburden and slopeback soil, which is not contaminated based upon characterization results, would be screened during removal utilizing field instrument and sampling, as necessary, prior to stockpiling for backfill. All soils and debris in the characterized non-contaminated overburden and slopeback areas would be removed and shipped as waste, should field instrumentation and/or sampling reveal contamination above the project cleanup objectives. Once all known contamination is removed from the contaminated excavation area, any residual contamination remaining would be "chased" and removed in all lateral and vertical directions until the remaining surface areas are verified to be below the project cleanup objective

Any debris found within the contaminated areas would be considered contaminated and it would be treated as waste, while any non-contaminated debris discovered in the non-contaminated overburden and slopeback areas would be handled per agreement of the OEPA/USEPA permissible backfill guidelines (see Appendix G). These guidelines allows for debris to be handled as construction and demolition debris ("clean hard fill") and managed per guidance found under OEPA:#OAC 3745-400-05. Examples of "clean hard fill" include concrete, brick, mortar, and asphalt. Additionally, man-made incidental objects will be permitted within backfill soils, such as bottle caps, nails, wood splinters, broken glass, nuts, bolts, staples, etc. These objects will be scanned along with the associated soils. If a pocket (larger than an excavator bucket) of such incidental objects are found within the excavation, these items would be removed and treated as waste. If a pocket of metal shavings is observed, the metal shavings and the associated soils will be specifically scanned.

All debris, which are suggestive of possible contamination would not be permissible for backfill and would be removed as waste. Examples of non-permissible backfill debris include any potential waste containers, laboratory supplies, drainage piping, large metallic items, objects potentially containing hazardous materials, and objects with inaccessible surfaces. Rags, plastic bottles, clothing, shoe covers, batteries, hand tools, and electrical devices will be removed from the soils when observed and treated as waste. Appendix G contains the complete listing of permissible and non-permissible backfill debris.

The excavation would proceed in stages of 5-foot excavation intervals, based upon the characterization results and extrapolated into the field using precision surveying techniques and real time ongoing monitoring throughout the excavation process. Contaminated material would be hauled to the site's railroad load-out facility for offsite disposal. Upon reaching the characterization defined extent and obtaining acceptable radiological cleanup results through field screening methods and on-site sampling analysis, as required, verification samples would be secured and analyzed per an approved PRS 66 Verification Sampling and Analysis Plan (VSAP).

7.0 ACTION MEMORANDUM PROPOSED ACTION AND ESTIMATED COST

Based upon the conclusions and recommendations of the EE/CA, Alternative 5 - "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective" is proposed as the remedial action for PRS 66/80/40. As such, the following sections will address the engineering, cost and schedule details associated with its proposed implementation.

7.1 Proposed Removal Action Identified by the EE/CA Process

The EE/CA process identified the most appropriate removal action alternative as being Alternative 5 - "Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective".

The proposed action will be detailed as appropriate in the applicable Work Packages and documents. In general, the following steps will be undertaken for this removal action, although this listing is not intended to be comprehensive

Project Engineering and Planning. This step includes, but is not limited to: identifying the method(s) and engineering for removal, handling and containerization of contaminated medias; identifying the appropriate disposal site(s); identifying real or near-real time monitoring techniques for health and safety; performing various cost/benefit analyses for larger site preparation options; procuring DOE fieldwork authorization; preparing the necessary work instructions for work execution in the form of a Removal Plan; preparing an Health and Safety Plan (HASP) covering the work scope; and providing any training for personnel as appropriate.

Public Notification. A notice of the availability of this Action Memorandum EE/CA for 30-day public review will be published in a local newspaper.

Prerequisite Mound Site Project Prep Activities. Due to the anticipated waste volume requiring shipment by railcar of this project, as well as other Mound site projects operating simultaneously, several general site upgrades were deemed necessary. These include an expansion and upgrade of the site's load-out and rail spur facilities and provisions for entrance into the plant from the south, allowing for the current roadway leading to the soil staging area to be dedicated to hauling soil. Additionally, sanitary and storm sewer reroutes were required to allow for the excavation to proceed. Limited shoring provisions were installed to preserve the sanitary and storm sewer manholes located within the northeast corner (Area IV) of the contaminated excavation footprint.

Removal Plan Review. The Removal Plan will be submitted to DOE, OEPA, and USEPA for their review, comments, and approval prior to proceeding with the excavation. Site Preparation activities will proceed in advance of the Removal Plan review.

PRS Site Preparation. This step includes: reviewing the anticipated approach, activities, safety issues and concerns; securing the appropriate permits; establishing control of access and egress to the construction site; locating and clearly marking any remaining underground utilities; establishing staging areas for excavation and project equipment; establishing erosion and water management controls; establishing provisions for containment for contaminated material and water management; and establishing site-specific Health Physics and radiological controls. Site Preparation activities will proceed in advance of the Removal Plan review.

Precision Excavation. Precision excavation is a relatively new approach in excavation techniques at Mound. When an area has been characterized in-situ and/or precision real-time cost-effective field monitoring for the contaminants of concern exists, the technique of precision excavation may be employed. Such is the case with PRS 66/80/40, using data acquired via the characterization process combined with field monitoring data and precision spatial controls. All excavated soil with contaminant

concentrations greater than the cleanup objective (Table 2) will be disposed of at a licensed low-level waste disposal facility.

Overburden and slopeback soil, which is not contaminated based upon characterization results, would be screened during removal utilizing field instrument and sampling, as necessary, prior to stockpiling for later backfill. Any soils and debris within the characterized non-contaminated overburden and slopeback areas would be removed and shipped as waste, should field instrumentation and/or sampling reveal contamination above the project cleanup objectives. Non-contaminated debris discovered in the non-contaminated overburden and slopeback areas would be handled per agreement of the OEPA/USEPA permissible backfill guidelines (see Appendix G).

Verification. Upon reaching the depth and lateral extent of removal for an area, verification of achievement of cleanup objects will be determined by sampling and analysis of soil at the base of the excavation to determine the residual contaminant concentration. In the case of these PRSs, statistically based verification sampling will be employed. The specific design, final COC list and final verification approach will be presented in the VSAP. Verification Data Reports will be generated for each unique work package phase and provided to OEPA and USEPA for their review/concurrence.

Continued Public Involvement. Throughout all phases of Site Preparations, Precision Excavation, and Verification, continued dialogue would occur with the PRS 66 Working Group, MAC, and MRC on the ongoing status of progress. Results of verification sampling for each work package phase will be summarized and communicated to the PRS 66 Working Group, MAC, and MRC as they become available.

Site Restoration. The site will be backfilled and compacted to contours and elevations consistent with the future use planned for this area per MMCIC's reuse plan or as otherwise later agreed-upon. All equipment, materials, waste containers, and site boundary markers will be removed. The area will be seeded with grass to ensure insure environmental compliance.

Documentation of Completion. The Removal Action will be summarized and its completion documented in an On-Scene Coordinator (OSC) Report at the end of the removal project.

7.2 Monitoring

Health and Safety Monitoring would be performed throughout the removal action according to standard Mound procedures and would be fully compliant with all ARARs requirements.

7.3 Post-Removal Site Control

Initial post-removal site control will be maintained by DOE, consistent with the site's on-going restoration mission. The area will eventually be turned over to the Miamisburg Mound Community Improvement Corporation (MMCIC). Any institutional or site controls, as well as any necessary deed restrictions needed at the time of the site transfer, will be included in the Record of Decision.

7.4 Cross-Media Relationships and Potential Adverse Impacts

There is a slight potential for unintended release of contaminated material into the atmosphere and surface waters, as a result of airborne disposition from the disturbed surfaces. Careful monitoring, administrative and engineering controls (i.e., dust suppression and water management) will be implemented during the removal action.

7.5 Contribution to Future Remedial Actions

All documentation, photographs, drawings, and other information collected during the fieldwork will be provided in the OSC Report to facilitate further assessments and removal actions in or near the site of this Removal Action. The location and dimensions of the excavation footprint and the final verification results will be documented. The final verification sampling data and information obtained as a result of this removal will also be used in determining the availability of the Mound site for final disposition and will be subject to review in the subsequent residual risk evaluation(s). It is expected though, that no additional remedial activities will be required for this PRS.

7.6 Project Schedule

The currently scheduled removal action stages are as follows: 1) completion of a 12-month removal action design/planning process and 2) the performance of any required site upgrades and the removal action starting in early fiscal year 2003. The performance of this removal action is expected to take approximately two years including various site

preparation activities, necessary site upgrades, the removal action fieldwork, verification, and restoration as necessary, as well as, the final documentation (OSC Report). As required by Action Memorandum guidance, a high-level baseline schedule is shown in Figure 3 on Page 97.

7.7 Estimated Cost

The estimated costs to perform this removal action are shown in below.

Table 13: Cost Summary Alternative 5 - Excavation and Removal of Contaminated Disposal Area and Contaminated Soil Greater Than the Cleanup Objective	
Historical Planning and Characterization	$2,436,060
Planning and Engineering	$271,570
Characterization	$1,944,200
Site Prep	$1,279,711
Excavation	$3,002,928
Verification	$1,420,030
Backfill/Site Restoration	$961,088
Waste Management & Disposal	$12,908,135
Total	**$24,223,722**

8.0 OUTSTANDING POLICY ISSUES

No outstanding policy issues exist that would affect the performance of this removal action.

9.0 ENFORCEMENT

The Core Team has agreed on the need to perform the removal. The work described in this document does not create a waiver of any rights under the FFA, nor is it intended to create a waiver of any rights under the FFA. The DOE is the sole party responsible for implementing this cleanup. Therefore, DOE is undertaking the role of lead agency, per CERCLA and the NCP, for the performance of this removal action. The funding for this removal action will be through DOE budget authorization and no Superfund monies will be required.

10.0 RECOMMENDATION

This decision document presents the selected removal action identified through the EE/CA process for this PRS (PRS 66). This document was also developed in accordance with CERCLA as amended by SARA, and is consistent with the NCP. This decision is based on the administrative record for PRS 66. Conditions at PRS 66 meet the NCP Section 300.415 (b)(2) criteria for a removal and we recommend the initiation of the removal action identified.

Approved:

10-28-02

Robert S. Rothman, CERCLA Program Manager, DOE/MCP — Date

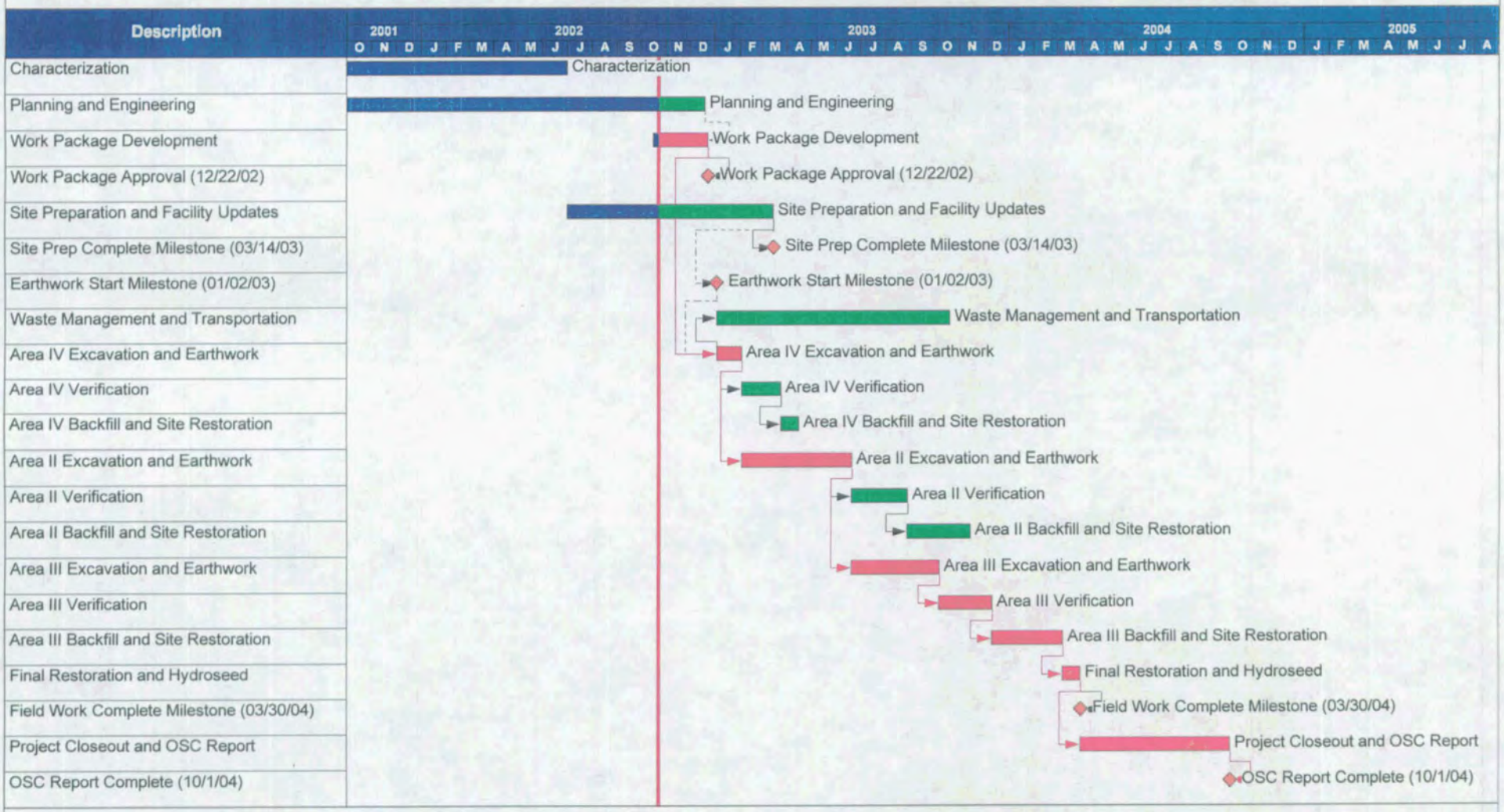
10/28/02

Timothy J. Fischer, Remedial Project Manager, USEPA — Date

10/28/02

Brian K. Nickel, Project Manager, OEPA — Date

Figure 3



Start date	01OCT01
Finish date	01OCT04
Data date	23OCT02
Run date	23OCT02
Page number	1A

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PRS 66/80/40 Removal Action Project Schedule

- Early bar
- Progress bar
- Critical bar
- Summary bar
- Start milestone point
- Finish milestone point

11.0 REFERENCES

BNI 1989 "Conceptual Design Report for a Permanent Disposal Site for FUSRAP Wastes, "Bechtel National, Inc., April 1989.

DOE 1990 Letter Report: Preliminary Results of Reconnaissance Magnetic Survey - Mound Plant - Areas 2,6,7, and C , DOE, Albuquerque Operations Office, Albuquerque, NM, November 1990

DOE 1992a Operable Unit 9, Site Scoping report, Volume 6 - Photo History Report , EG&G Mound, Miamisburg, OH, February 1992.

DOE 1993a "Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey Final ", Roy F Weston, Inc. Albuquerque, New Mexico, June 1993.

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DOE 1998 "OSC Report PRS 86, Actinium Removal, BWXTO, Miamisburg, OH, April 1998.

DOE 1999 "Sampling and Analysis Plan - PRS 66", Draft Final, Rev 1, BWXTO, Miamisburg, OH, November 1999.

EPA 1988 "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA [INTERIM FINAL]." Document No. EPA/540/G-89/004, OSWER Directive 9355.3-01. U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C., October 1988.

EPA 1991 "Treatment Technologies" Second Edition, U.S. Environmental Protection Agency, Office Of Solid Waste, Government Institutes, Inc., August 1991.

EPA 1993 "Guidance On Conducting Non-Time-Critical Removal Actions Under CERCLA", EPA 540R-93-057, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, August 1993.

ITRD 2001 Mound PRS66 Technical Evaluation Report, Final, October 2001

RSRCH 2000a Segmented Gate technologies research - letter report, R F WESTON, Inc. March 2000.

RSRCH 2000b Soil Washing technologies research - letter report, R F Weston, Inc. April 2000.

WSTN 1997 Conceptual Design Analysis, Cap Design over Former Landfill in Area & (PRS 66), Roy F. Weston, Inc., February 1997

APPENDIX A

Core Team Recommendations

MOUND PLANT RECOMMENDATION

PRS 66

Background:

Potential Release Site (PRS) 66 encompasses a historical ravine that was leveled with fill and paved over with asphalt. From the mid-1950s to mid-1960s, an estimated 10,000 to 15,000 emptied thorium drums from repackaging operations were crushed and buried along the western part of the original ravine. In either 1959 or 1960, three truckloads of soil and debris contaminated with radium-226, actinium-227, and thorium-228 was excavated from the SW Building and disposed of in an old septic tank on the northeastern edge of PRS 66. The area near the septic tank (PRS 86) was excavated during a CERCLA removal action and subsequently designated No Further Action (NFA) by the Core Team in 1998. Records show the practice of disposing waste items into the ravine continued through the mid-1960s. During construction excavation in 1986, plutonium contaminated soil was discovered in the far southwest corner of the historic ravine, known as PRS 40.

Recommendation:

Potential Release Site 40, 66, 79, 80, 86, 235, 309, and 338 are found within PRS 66. This area has been periodically filled in with materials contaminated with thorium-232, polonium-210 and some actinium-227. On August 20, 1996, the Core Team recommended Further Assessment (FA) for PRS 66. Subsequently, the cost of further investigation versus removing the potentially contaminated soils were evaluated. On July 10, 1997, this evaluation resulted in the decision to continue with the original FA recommendation. As a result of this further assessment, elevated plutonium-238, cesium-137 and americium-241 contamination was found.

By December 1999, the Mound Gamma Spectrometry Lab had analyzed approximately 162 investigative soil samples taken during the 1999 PRS 66 Core Sampling Characterization. The maximum plutonium-238 concentration measured was 5,868 pCi/g, as compared to the 10^{-5} Risk Based Guideline Value of 55 pCi/g. The maximum thorium-232 concentration measured was 397 pCi/g compared to a 10^{-5} Risk Based Guideline Value of 1.1 pCi/g. The Core Team, therefore, now recommends that a <u>REMOVAL ACTION</u> be accomplished for PRS 66.

Concurrence:

DOE/MEMP: Art Kleinrath — Feb 17 2000
Art Kleinrath, Remedial Project Manager (date)

USEPA: Timothy J. Fischer — 2/22/2000
Timothy J. Fischer, Remedial Project Manager (date)

OEPA: Brian Nickel — Feb 17, 2000
Brian Nickel, Project Manager (date)

MOUND PLANT
PRS 80
Warehouse 15A

RECOMMENDATION:

Potential Release Site (PRS) 80 was identified due to process history pertaining to operations in Warehouse 15A—primarily the loading of radioactive waste for offsite shipment. Radioactive trash, plutonium sludge from SM Building, polonium sludge from WD Building, and waste from other plant operations were stored until loaded into vans for shipment offsite. The structure was sold for salvage, but the floor of the warehouse was bulldozed into the adjacent ravine known as Area 7 (PRS 66). During subsequent construction of buildings in the vicinity of PRS 80, the Health Physics program invoked "Stop Work" actions due to contamination, although no data could be found.

On August 19, 1996, the Core Team recommended Further Assessment (FA) for PRS 80. Soil Sampling and Analysis was completed in December 1999.

Thorium-232 was found within PRS 80 at values (3.30 pCi/g) exceeding Guideline Criteria. PRS 66 was declared a Removal Action in February 2000.

Therefore the Core Team recommends a RESPONSE ACTION for PRS 80.

CONCURRENCE:

DOE/MEMP: Robert S. Rothman, Remedial Project Manager — 6/12/02 (date)

USEPA: Timothy J. Fischer, Remedial Project Manager — 6/13/02 (date)

OEPA: Brian K. Nickel, Project Manager — 6/14/02 (date)

MOUND PLANT
PRS 40
SOIL CONTAMINATION - BUILDING 66 PARKING LOT

RECOMMENDATION:

Potential Release Site (PRS) 40 was identified as a local area of plutonium-238 contamination found during a construction project.

Plutonium-238 has been found at concentrations of up to 7 nanocuries per gram (7,000 picocuries per gram) at a depth of 4 to 6 feet. The concentrations of plutonium-238 in the soil are above both the Mound ALARA Guideline Criteria of 25 picocuries per gram and the 10^{-4} Risk Based Guideline Value of 550 picocuries per gram. All other contaminants were detected or calculated to be at acceptable soil concentrations or below guideline criteria.

Plutonium-238 exists in the PRS 40 soils at levels presenting unacceptable risk to future construction workers. Therefore, a RESPONSE ACTION is recommended.

CONCURRENCE:

DOE/MB: Arthur W. Kleinrath 3/18/97
Arthur W. Kleinrath, Remedial Project Manager (date)

USEPA: Timothy J. Fischer 3/18/97
Timothy J. Fischer, Remedial Project Manager (date)

OEPA: Brian K. Nickel 3/18/97
Brian K. Nickel, Project Manager (date)

SUMMARY OF COMMENTS AND RESPONSES:

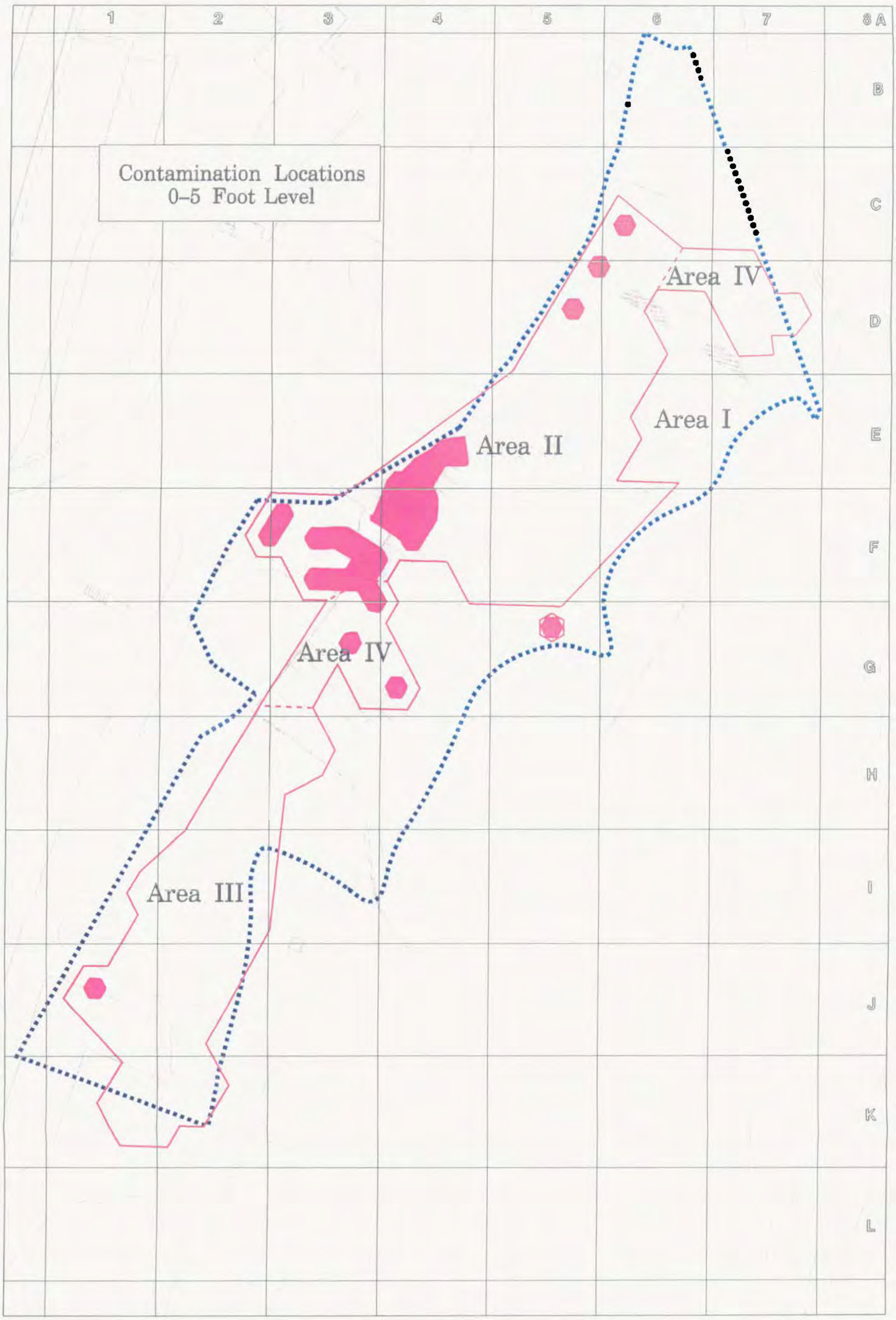
Comment period from 5/8/97 to 6/16/97

☒ No comments were received during the comment period.

☐ Comment responses can be found on page _____ of this package.

APPENDIX B

Radiological Data Illustrations and Chart Summaries
Fill Area



Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale in Feet

ISS	DATE	REVISION	BY	CHKR	ENG	M
	10/17/02		SSP			

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
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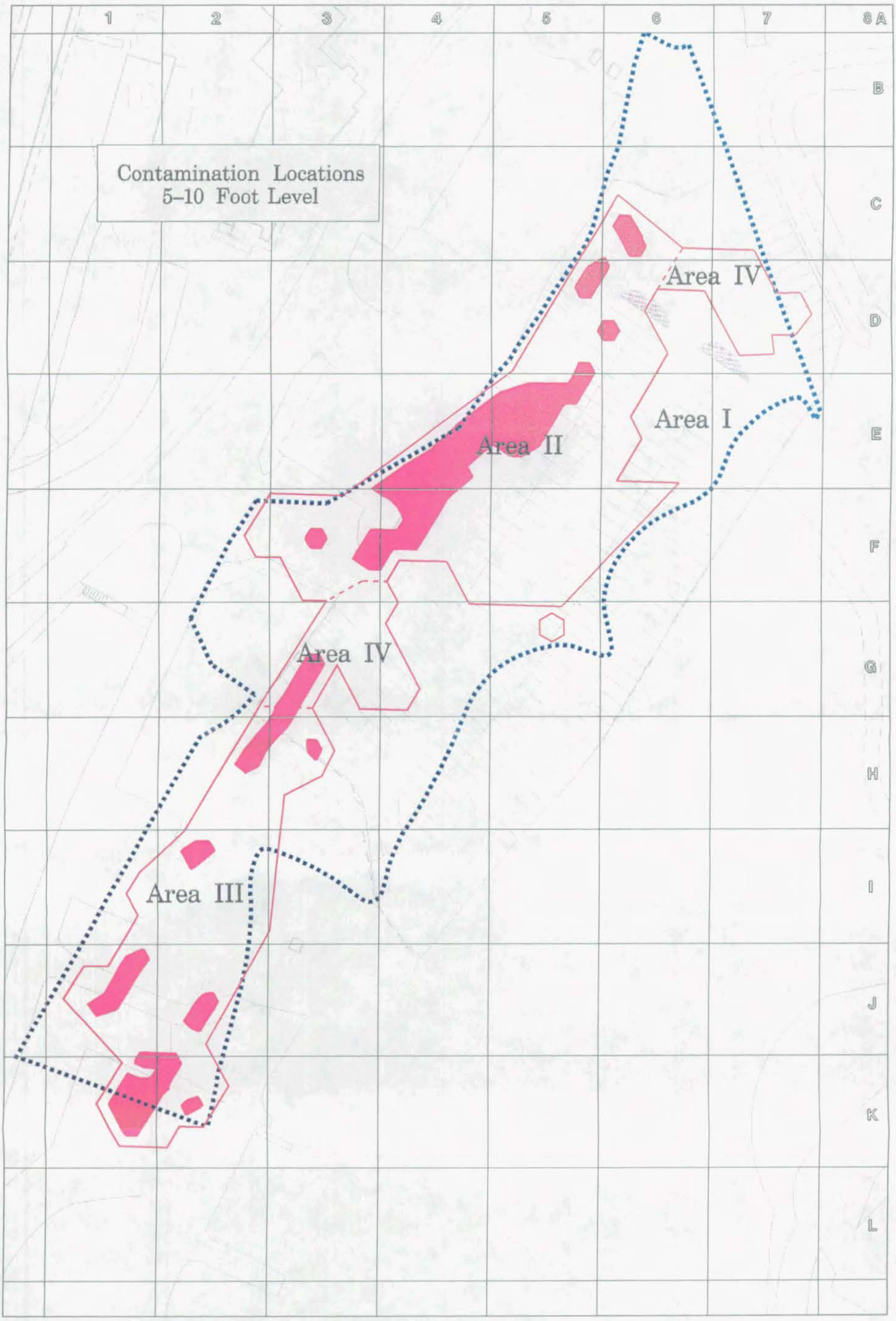
PRIMG	
CADEC	
SCALE	
SHEET 1 OF #	
STATUS	MD-REL-05/16/02
ORIGIN	MSTATION / J

Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(0–5 Feet)



Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale In Feet

ISS	DATE	REVISION	BY	CHKR	ENG	M
	10/17/02		SSP			

MOUND
Environmental Restoration Geographic Information System

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ISSUE
SHEET 1 2 3 4 5 6
ISSUE
PART CLASSIFICATION

Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(5–10 Feet)

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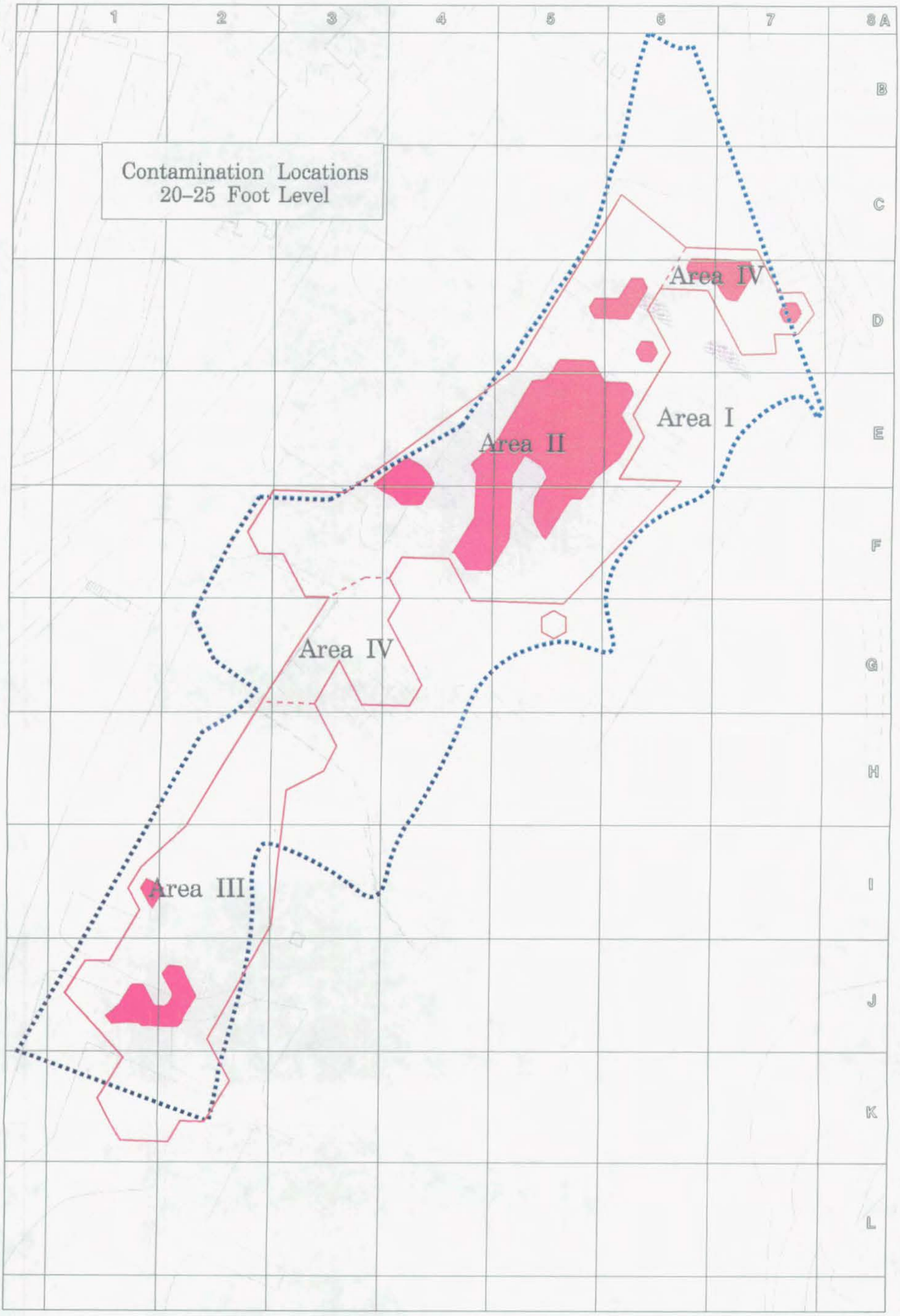

Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale In Feet

MOUND
Environmental Restoration Geographic Information System

ISS	DATE	REVISION	BY	CHKR	ENG	M
	10/17/02		SSP			

SHEET 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
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PART CLASSIFICATION

Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(20–25 Feet)

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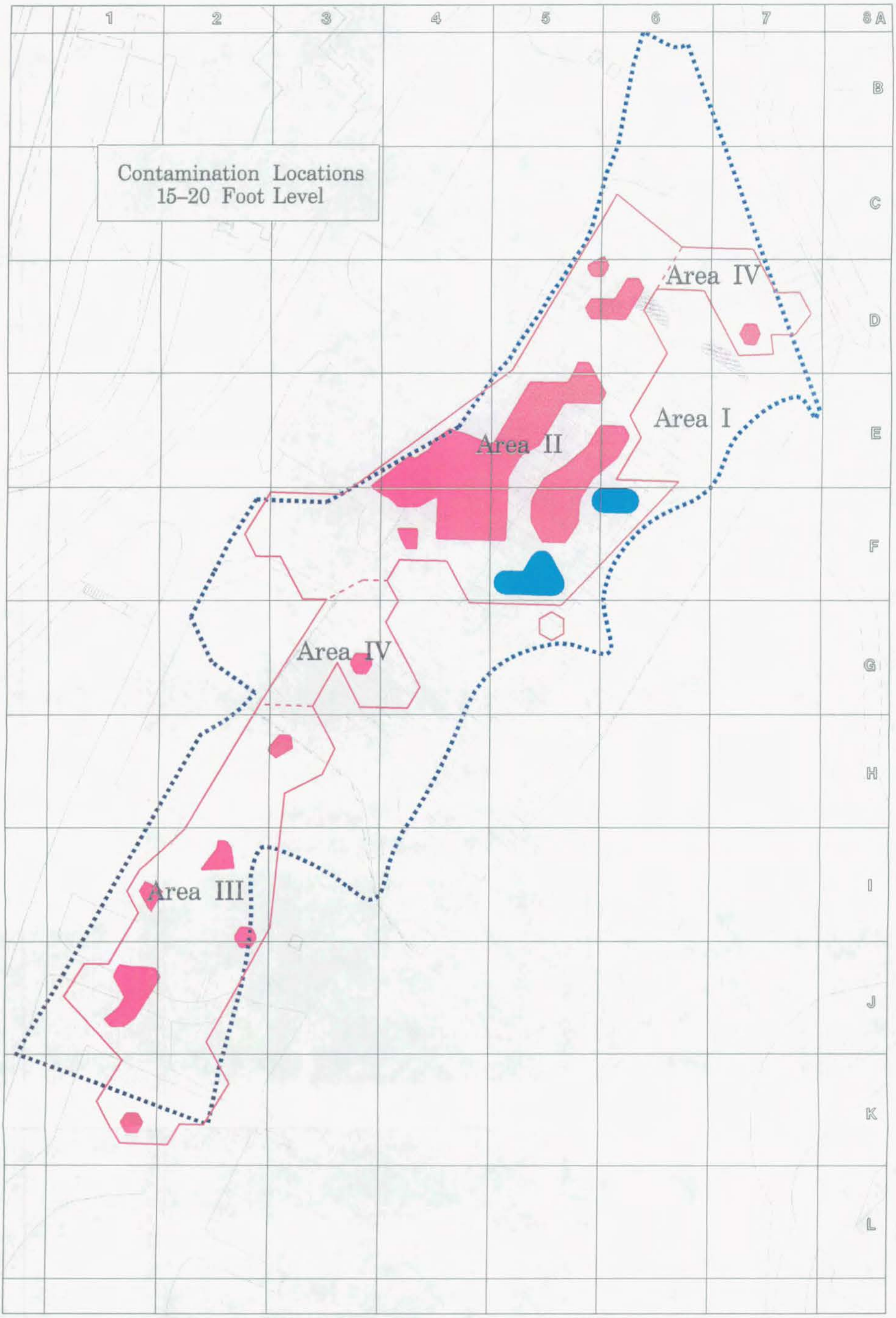

Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale in Feet

MOUND
Environmental Restoration Geographic Information System

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PART CLASSIFICATION

Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(15–20 Feet)

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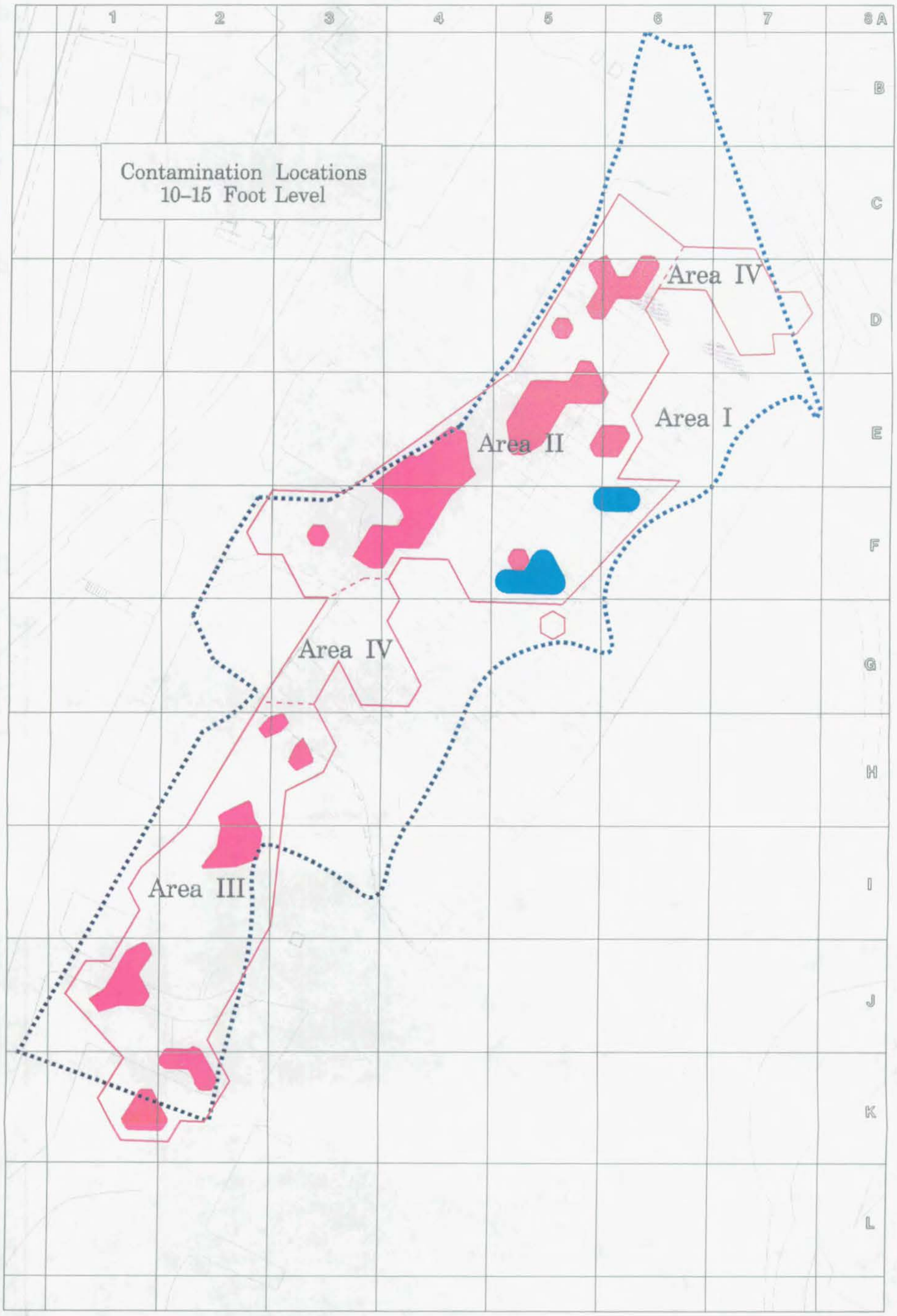

Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale in Feet

MOUND
Environmental Restoration Geographic Information System

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PART CLASSIFICATION

Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(10–15 Feet)

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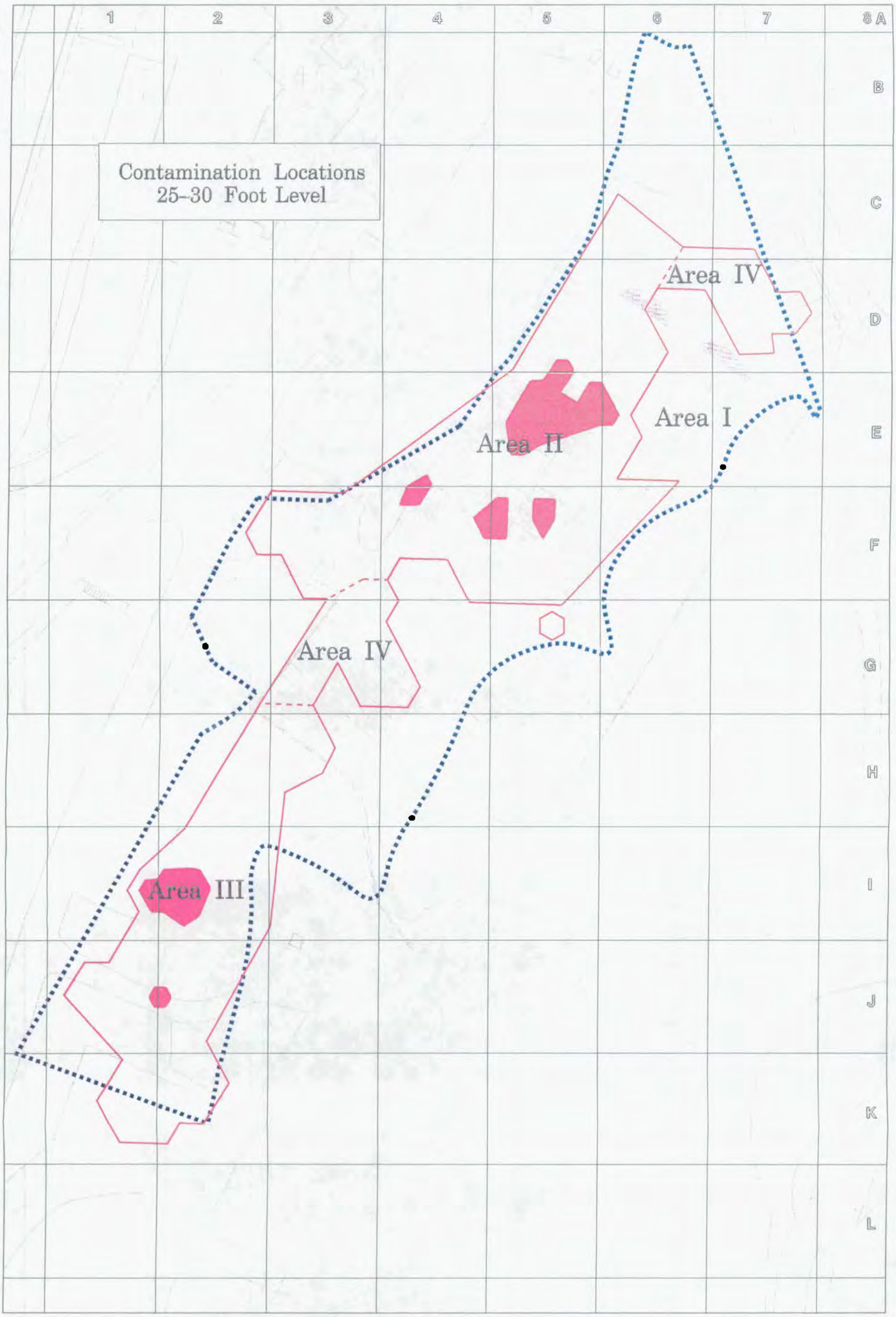

Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale in Feet

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MOUND
Environmental Restoration Geographic Information System

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PART CLASSIFICATION

Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(25–30 Feet)

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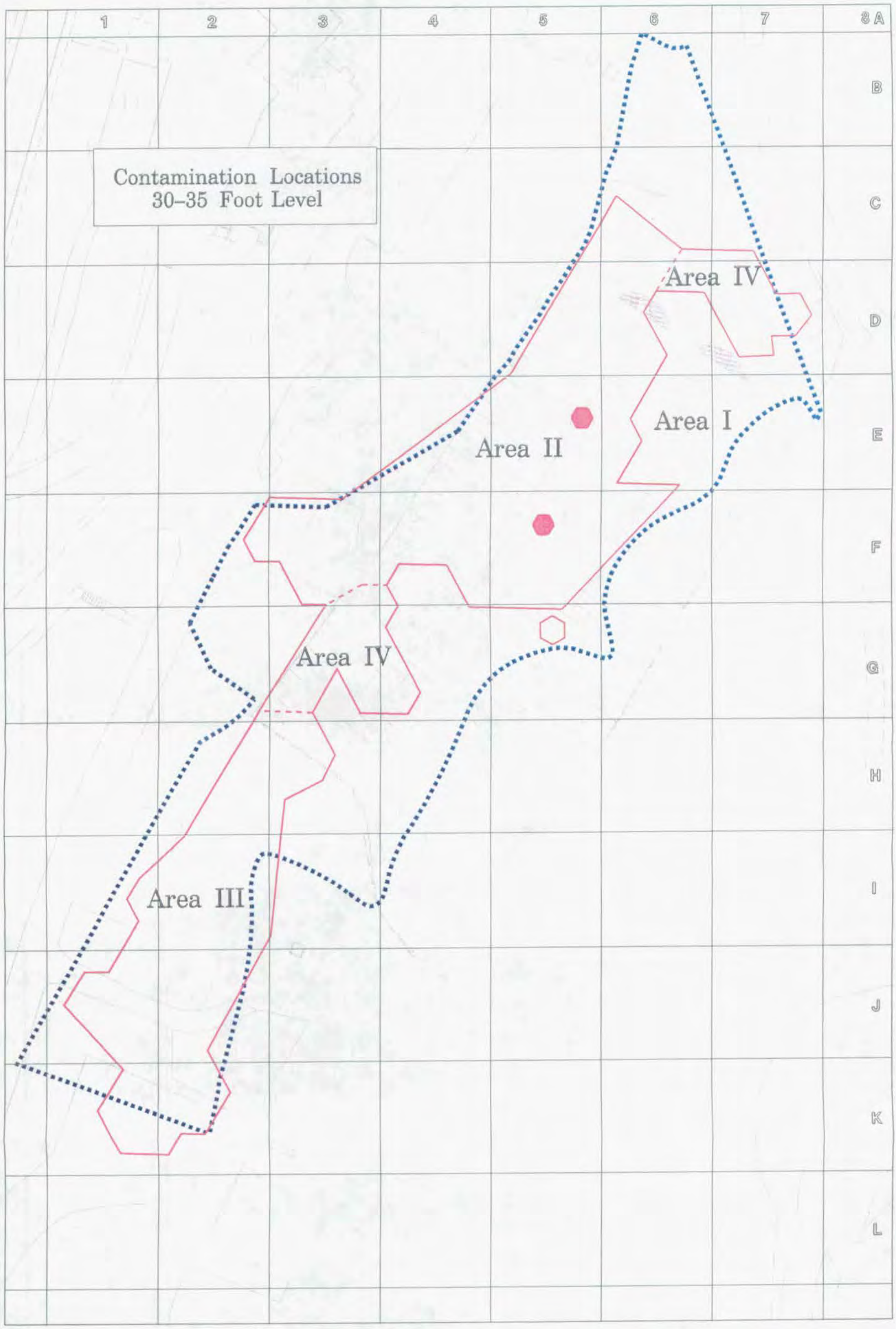
STATUS MD-REL-05/16/02		ORIGIN	MSTATION / J	



Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale in Feet

ISS	DATE	REVISION	BY	CHKR	ENG	M
	10/17/02		SSP			

MOUND
Environmental Restoration Geographic Information System

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Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(30–35 Feet)

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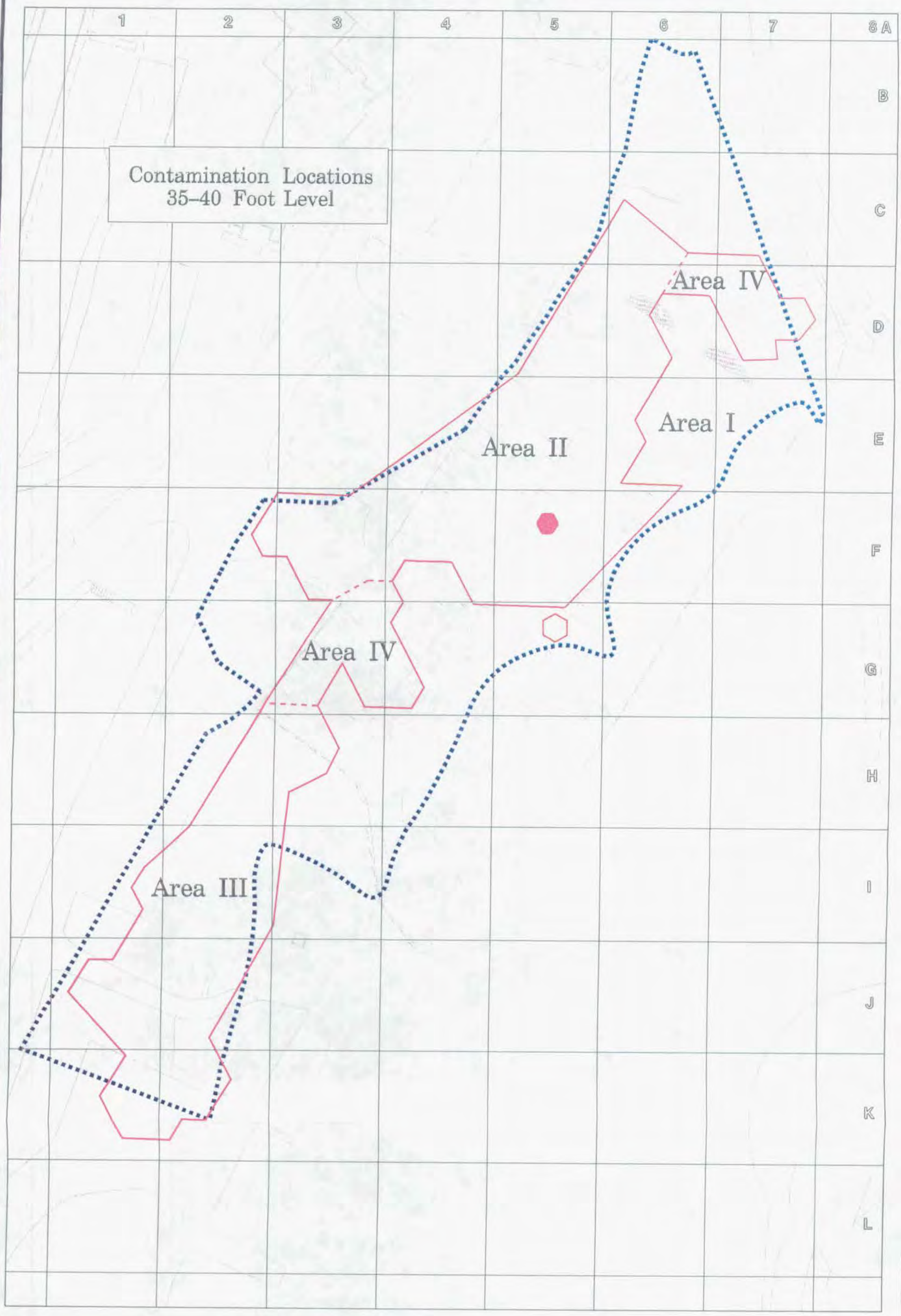

Legend

- Tentative Excavation Boundary
- Area Boundary
- RAD Contaminated Area
- VOC Contaminated Area

0 20 40 60 80 100
Scale in Feet

MOUND
Environmental Restoration Geographic Information System

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	10/17/02		SSP			

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SHEET 1 2 3 4 5 6
ISSUE
PART CLASSIFICATION

Figure B1: PRS 66/80/40
EE/CA Contaminated Areas
(35–40 Feet)

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PRS 66/80/40 Characterization Summary
AREA I

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-238	Uranium-238	Pu-238 and U-238 Daughters Analyzed							
				Uranium-234	Thorium-230	Radium-226	Lead-214	Bismuth-214	Lead-210	Bismuth-210	Bismuth-210M
0	Total Samples	147	11	11	145	147	6	0	147	1	43
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	7.1790	0.3012	0.3335	2.6948	1.1296	0.9407	N/A	0.5890	0.0436	0.0429
	StdDev of Results	5.5167	0.0898	0.0680	4.2402	0.4990	0.1266	N/A	0.3764	N/A	0.0107
	95% Confidence Value	0.8918	0.0531	0.0402	0.6902	0.0807	0.1013	N/A	0.0608	N/A	0.0032
	Upper Bound (95% CI)	8.0708	0.3542	0.3738	3.3849	1.2103	1.0419	N/A	0.6499	N/A	0.0461
	Number of Detections > or = 10-5 CO	0	0	0	1	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	50.44	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	50.44	-	-	-	-	-	-
5	Total Samples	143	11	11	140	143	8	1	143	1	43
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	6.8272	0.2415	0.3016	2.3514	1.0800	0.9008	1.1300	0.5594	0.0545	0.0458
	StdDev of Results	5.3677	0.0701	0.0478	1.5457	0.3853	0.1029	N/A	0.3302	N/A	0.0081
	95% Confidence Value	0.8798	0.0414	0.0282	0.2580	0.0631	0.0713	N/A	0.0541	N/A	0.0024
	Upper Bound (95% CI)	7.7069	0.2829	0.3299	2.6074	1.1432	0.9721	N/A	0.6135	N/A	0.0483
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
10	Total Samples	125	11	11	120	125	6	1	125	1	39
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	7.2848	0.2170	0.2950	2.2865	1.1046	1.0103	0.9570	0.5963	0.0454	0.0475
	StdDev of Results	6.3503	0.0788	0.0436	1.5031	0.4283	0.1329	N/A	0.4179	N/A	0.0077
	95% Confidence Value	1.1132	0.0466	0.0258	0.2689	0.0751	0.1063	N/A	0.0733	N/A	0.0024
	Upper Bound (95% CI)	8.3980	0.2636	0.3208	2.5554	1.1797	1.1167	N/A	0.6695	N/A	0.0500
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
15	Total Samples	85	11	11	83	85	6	0	85	0	26
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	6.4680	0.2451	0.2996	2.4138	1.0833	0.9247	N/A	0.5657	N/A	0.0462
	StdDev of Results	5.0854	0.0887	0.0655	1.7792	0.4298	0.1901	N/A	0.4192	N/A	0.0082
	95% Confidence Value	1.0811	0.0524	0.0387	0.3828	0.0914	0.1521	N/A	0.0891	N/A	0.0032
	Upper Bound (95% CI)	7.5490	0.2975	0.3383	2.7966	1.1747	1.0768	N/A	0.6548	N/A	0.0494
	Number of Detections > or = 10-5 CO	0	0	0	1	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	13.15	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	13.15	-	-	-	-	-	-
20	Total Samples	56	11	11	53	56	5	1	56	0	19
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	6.2367	0.2670	0.2881	2.2889	1.2149	1.1088	1.4000	0.6129	N/A	0.0481
	StdDev of Results	5.0771	0.0851	0.0561	1.5566	0.4090	0.3341	N/A	0.3629	N/A	0.0086
	95% Confidence Value	1.3297	0.0503	0.0331	0.4191	0.1071	0.2928	N/A	0.0951	N/A	0.0039
	Upper Bound (95% CI)	7.5665	0.3173	0.3212	2.7079	1.3221	1.4016	N/A	0.7079	N/A	0.0519
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
25	Total Samples	27	6	6	24	27	3	1	27	0	10
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	6.5060	0.3088	0.3280	2.2864	1.3533	1.3033	1.0100	0.7910	N/A	0.0543
	StdDev of Results	5.4988	0.1153	0.0626	1.5876	0.4895	0.3109	N/A	0.4063	N/A	0.0088
	95% Confidence Value	2.4540	0.2471	0.2624	0.9147	0.5105	1.4748	N/A	0.2984	N/A	0.0337
	Upper Bound (95% CI)	8.9601	0.5559	0.5904	3.2011	1.8638	2.7782	N/A	1.0894	N/A	0.0880
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
30	Total Samples	13	5	5	12	13	2	1	13	0	6
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	6.3142	0.2850	0.3148	1.9300	1.1670	1.0165	0.9440	0.5328	N/A	0.0472
	StdDev of Results	6.9102	0.1196	0.0890	1.5349	0.4156	0.1181	N/A	0.2654	N/A	0.0057
	95% Confidence Value	3.7564	0.1048	0.0780	0.8684	0.2259	0.1637	N/A	0.1443	N/A	0.0046
	Upper Bound (95% CI)	10.0705	0.3898	0.3928	2.7985	1.3929	1.1802	N/A	0.6770	N/A	0.0517
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
35	Total Samples	5	3	3	5	5	2	0	5	0	3
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	3.8091	0.4117	0.4733	1.7106	0.9911	0.9985	N/A	0.6815	N/A	0.0481
	StdDev of Results	5.9596	0.2260	0.1557	1.8695	0.3620	0.1577	N/A	0.4923	N/A	0.0055
	95% Confidence Value	5.2237	0.2558	0.1762	1.6387	0.3173	0.2185	N/A	0.4315	N/A	0.0062
	Upper Bound (95% CI)	9.0328	0.6674	0.6495	3.3493	1.3084	1.2170	N/A	1.1130	N/A	0.0543
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
40	Total Samples	5	3	3	5	5	2	0	5	0	3
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
	Average of All Samples	3.0834	0.3290	0.3707	1.4988	1.0762	0.9895	N/A	0.7569	N/A	0.0414
	StdDev of Results	4.4469	0.1267	0.1255	1.4514	0.3628	0.0997	N/A	0.4576	N/A	0.0020
	95% Confidence Value	3.8978	0.1433	0.1421	1.2722	0.3180	0.1382	N/A	0.4011	N/A	0.0023
	Upper Bound (95% CI)	6.9812	0.4723	0.5127	2.7710	1.3942	1.1277	N/A	1.1580	N/A	0.0437
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-

Summary	Plutonium-238	Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-214	Bismuth 214	Lead-210	Bismuth-210	Bismuth-210M
Total Total Samples	606	72	72	587	606	40	5	606	3	192
Total Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4	2.9	2.9
Total Average of All Samples	6.8209	0.2707	0.3163	2.4021	1.1233	0.9981	1.0882	0.5924	0.0478	0.0463
Total StdDev of Results	5.5896	0.1020	0.0750	2.5149	0.4392	0.2014	0.1891	0.3821	0.0058	0.0089
95% Confidence Value	0.4450	0.0236	0.0173	0.2034	0.0350	0.0624	0.1658	0.0304	0.0066	0.0013
Upper Bound (95% CI)	7.2659	0.2942	0.3336	2.6056	1.1583	1.0605	1.2540	0.6228	0.0544	0.0475
Total Number of Detections > or = 10-5 CO	0	0	0	2	0	0	0	0	0	0
Total Maximum of Detections > or = 10-5 CO	-	-	-	50.44	-	-	-	-	-	-
Total Minimum of Detections > or = 10-5 CO	-	-	-	13.15	-	-	-	-	-	-

PRS 66/80/40 Characterization Summary

AREA I

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-239/240	Pu-239 Daughters		Thorium-232	Th-232 Daughters					
			Uranium-235	Actinium-227		Radium-228	Actinium-228	Thorium-228	Radium-224	Lead-212	Thallium-208
0	Total Samples	44	11	147	147	44	2	45	6	6	3
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0087	0.0181	0.2433	0.5814	0.9964	1.1185	0.6894	0.9243	0.8773	0.2807
	StdDev of Results	0.0067	0.0129	0.3224	0.2366	0.3194	0.2425	0.2742	0.1406	0.1386	0.0340
	95% Confidence Value	0.0020	0.0076	0.0521	0.0382	0.0944	0.3361	0.0801	0.1125	0.1109	0.0385
	Upper Bound (95% CI)	0.0107	0.0257	0.2954	0.6196	1.0908	1.4546	0.7695	1.0368	0.9882	0.3192
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
5	Total Samples	44	11	143	143	44	1	47	8	8	7
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0095	0.0172	0.2969	0.6186	1.2000	1.2500	0.7270	1.2784	1.2100	0.3626
	StdDev of Results	0.0093	0.0140	0.4376	0.2230	0.4122	N/A	0.2532	0.3410	0.3226	0.1175
	95% Confidence Value	0.0028	0.0083	0.0717	0.0366	0.1218	N/A	0.0724	0.2363	0.2236	0.0871
	Upper Bound (95% CI)	0.0122	0.0255	0.3686	0.6551	1.3217	N/A	0.7994	1.5147	1.4336	0.4496
	Number of Detections > or = 10-5 CO	0	0	0	0	2	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	2.74	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	2.21	-	-	-	-	-
10	Total Samples	40	11	125	125	40	0	41	6	6	6
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0087	0.0132	0.2913	0.6414	1.0608	N/A	0.7623	1.2580	1.1948	0.3993
	StdDev of Results	0.0075	0.0026	0.4029	0.2189	0.3369	N/A	0.2510	0.3370	0.3213	0.1133
	95% Confidence Value	0.0023	0.0016	0.0708	0.0384	0.1044	N/A	0.0768	0.2696	0.2570	0.0906
	Upper Bound (95% CI)	0.0110	0.0147	0.3619	0.6798	1.1652	N/A	0.8392	1.5276	1.4519	0.4900
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
15	Total Samples	26	11	85	85	26	0	26	6	6	3
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0141	0.0177	0.2511	0.6207	1.0624	N/A	0.7420	1.2182	1.1548	0.3117
	StdDev of Results	0.0168	0.0223	0.3939	0.1879	0.3588	N/A	0.2736	0.3460	0.3294	0.0994
	95% Confidence Value	0.0064	0.0132	0.0837	0.0399	0.1379	N/A	0.1052	0.2768	0.2636	0.1125
	Upper Bound (95% CI)	0.0205	0.0308	0.3348	0.6607	1.2003	N/A	0.8471	1.4950	1.4184	0.4242
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
20	Total Samples	19	11	56	56	19	1	19	5	5	4
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0077	0.0141	0.2199	0.6151	1.1145	1.8300	0.7763	1.3370	1.2654	0.3835
	StdDev of Results	0.0063	0.0039	0.2451	0.2254	0.3514	N/A	0.2106	0.4226	0.4069	0.0810
	95% Confidence Value	0.0028	0.0023	0.0642	0.0590	0.1580	N/A	0.0947	0.3704	0.3566	0.0794
	Upper Bound (95% CI)	0.0105	0.0165	0.2841	0.6742	1.2726	N/A	0.8710	1.7074	1.6220	0.4629
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
25	Total Samples	10	6	27	27	10	1	10	3	3	2
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0056	0.0162	0.3750	0.6247	1.1694	1.5500	0.7491	1.6050	1.5280	0.4620
	StdDev of Results	0.0019	0.0059	0.5281	0.2620	0.4549	N/A	0.2399	0.5545	0.5323	0.1400
	95% Confidence Value	0.0034	0.0129	0.1414	0.2356	0.7248	N/A	0.4643	1.8162	1.7291	0.6403
	Upper Bound (95% CI)	0.0090	0.0291	0.5164	0.8604	1.8942	N/A	1.2134	3.4212	3.2571	1.1023
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
30	Total Samples	6	5	13	13	6	1	6	2	2	1
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0105	0.0204	0.1913	0.5613	0.9183	1.2100	0.7188	1.0540	1.0040	0.4200
	StdDev of Results	0.0068	0.0203	0.0682	0.1744	0.3110	N/A	0.2362	0.5459	0.5176	N/A
	95% Confidence Value	0.0054	0.0178	0.0371	0.0948	0.2488	N/A	0.1890	0.7565	0.7173	N/A
	Upper Bound (95% CI)	0.0159	0.0382	0.2284	0.6561	1.1672	N/A	0.9078	1.8105	1.7213	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
35	Total Samples	3	3	5	5	3	0	3	1	2	1
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0164	0.0096	0.3875	0.3992	0.7720	N/A	0.5637	1.1600	0.8900	0.5010
	StdDev of Results	0.0065	0.0041	0.3981	0.1198	0.3392	N/A	0.2203	N/A	0.2970	N/A
	95% Confidence Value	0.0074	0.0046	0.3490	0.1050	0.3838	N/A	0.2493	N/A	0.4116	N/A
	Upper Bound (95% CI)	0.0238	0.0142	0.7364	0.5042	1.1558	N/A	0.8129	N/A	1.3016	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
40	Total Samples	3	3	5	5	3	0	3	2	2	1
	Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0094	0.0134	0.1743	0.4339	0.9503	N/A	0.7007	-1.1460	1.0875	0.3680
	StdDev of Results	0.0041	0.0032	0.0571	0.1379	0.3203	N/A	0.3136	0.4299	0.3995	N/A
	95% Confidence Value	0.0046	0.0036	0.0501	0.1209	0.3624	N/A	0.3549	0.5958	0.5537	N/A
	Upper Bound (95% CI)	0.0140	0.0170	0.2243	0.5547	1.3128	N/A	1.0556	1.7418	1.6412	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-

Summary	Plutonium-239/240	Uranium-235	Actinium-227	Thorium-232	Radium-228	Actinium-228	Thorium-228	Radium-224	Lead-212	Thallium-208
Total Total Samples	195	72	606	606	195	6	200	39	40	28
Total Cleanup Objective	55	16.11	4.61	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Total Average of All Samples	0.0095	0.0160	0.2701	0.6100	1.0782	1.3462	0.7304	1.2228	1.1479	0.3735
Total StdDev of Results	0.0093	0.0125	0.3807	0.2223	0.3654	0.3053	0.2535	0.3640	0.3507	0.1028
95% Confidence Value	0.0013	0.0029	0.0303	0.0177	0.0513	0.2443	0.0351	0.1142	0.1087	0.0381
Upper Bound (95% CI)	0.0108	0.0189	0.3005	0.6277	1.1294	1.5904	0.7656	1.3370	1.2566	0.4116
Total Number of Detections > or = 10-5 CO	0	0	0	0	2	0	0	0	0	0
Total Maximum of Detections > or = 10-5 CO	-	-	-	-	2.74	-	-	-	-	-
Total Minimum of Detections > or = 10-5 CO	-	-	-	-	2.21	-	-	-	-	-

PRS 66/80/40 Characterization Summary

AREA I

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Americium-241	Cesium-137	Bismuth-207	Cobalt-60	Potassium-40	Tritium	Grand Total
0	Total Samples	147	147	44	147	44	11	1653
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.0686	0.0332	0.0284	0.0272	19.3100	0.2695	
	StdDev of Results	0.0758	0.0280	0.0068	0.0170	5.4142	0.2413	
	95% Confidence Value	0.0122	0.0045	0.0020	0.0028	1.5998	0.1426	
	Upper Bound (95% CI)	0.0808	0.0377	0.0304	0.0300	20.9098	0.4121	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
5	Total Samples	143	143	44	143	44	11	1628
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.0762	0.0414	0.0308	0.0281	23.1550	0.5306	
	StdDev of Results	0.0909	0.0576	0.0059	0.0141	5.8106	0.5377	
	95% Confidence Value	0.0149	0.0094	0.0017	0.0023	1.7169	0.3178	
	Upper Bound (95% CI)	0.0911	0.0509	0.0326	0.0304	24.8719	0.8484	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
10	Total Samples	125	125	40	125	40	11	1430
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.1126	0.0427	0.0313	0.0287	24.9680	0.6015	
	StdDev of Results	0.3235	0.0589	0.0058	0.0149	6.5997	0.6953	
	95% Confidence Value	0.0567	0.0103	0.0018	0.0026	2.0452	0.4109	
	Upper Bound (95% CI)	0.1693	0.0530	0.0331	0.0313	27.0132	1.0124	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
15	Total Samples	85	85	26	85	26	11	984
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.0731	0.0406	0.0319	0.0270	23.6558	0.4537	
	StdDev of Results	0.0874	0.0423	0.0066	0.0138	7.3013	0.5109	
	95% Confidence Value	0.0186	0.0090	0.0025	0.0029	2.8065	0.3019	
	Upper Bound (95% CI)	0.0917	0.0496	0.0344	0.0299	26.4622	0.7556	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
20	Total Samples	56	56	19	56	19	11	680
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.0765	0.0301	0.0326	0.0264	24.2863	0.5546	
	StdDev of Results	0.0860	0.0184	0.0055	0.0141	8.3201	0.4954	
	95% Confidence Value	0.0225	0.0048	0.0025	0.0037	3.7411	0.2928	
	Upper Bound (95% CI)	0.0991	0.0349	0.0350	0.0301	28.0274	0.8474	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
25	Total Samples	27	27	10	27	10	6	337
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.1157	0.0374	0.0369	0.0331	25.0200	0.4970	
	StdDev of Results	0.1302	0.0273	0.0078	0.0177	9.8058	0.3040	
	95% Confidence Value	0.0436	0.0141	0.0229	0.0125	15.5072	0.3977	
	Upper Bound (95% CI)	0.1594	0.0516	0.0598	0.0456	40.5272	0.8947	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
30	Total Samples	13	13	6	13	6	5	181
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.0642	0.0265	0.0329	0.0305	22.6833	0.3130	
	StdDev of Results	0.0359	0.0132	0.0052	0.0156	7.2096	0.1536	
	95% Confidence Value	0.0195	0.0072	0.0042	0.0085	5.7687	0.1346	
	Upper Bound (95% CI)	0.0837	0.0337	0.0371	0.0390	28.4521	0.4476	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
35	Total Samples	5	5	3	5	3	3	81
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.0745	0.0289	0.0298	0.0364	20.5333	0.5263	
	StdDev of Results	0.0568	0.0084	0.0049	0.0087	9.7900	0.2521	
	95% Confidence Value	0.0498	0.0074	0.0055	0.0076	11.0782	0.2852	
	Upper Bound (95% CI)	0.1243	0.0363	0.0353	0.0440	31.6115	0.8116	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
40	Total Samples	5	5	3	5	3	3	82
	Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
	Average of All Samples	0.0899	0.0280	0.0283	0.0346	21.5000	0.3293	
	StdDev of Results	0.0690	0.0075	0.0054	0.0115	8.0075	0.1891	
	95% Confidence Value	0.0605	0.0066	0.0062	0.0101	9.0612	0.2139	
	Upper Bound (95% CI)	0.1503	0.0346	0.0344	0.0447	30.5612	0.5433	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	

Summary	Americium-241	Cesium-137	Bismuth-207	Cobalt-60	Potassium-40	Tritium	Grand Total
Total Total Samples	606	606	195	606	195	72	7056
Total Cleanup Objective	63	3.82	1.75	0.9	1000	235001.6	
Total Average of All Samples	0.0830	0.0378	0.0310	0.0281	22.8516	0.4670	
Total StdDev of Results	0.1662	0.0449	0.0064	0.0151	6.9218	0.4608	
95% Confidence Value	0.0132	0.0036	0.0009	0.0012	0.9715	0.1064	
Upper Bound (95% CI)	0.0963	0.0414	0.0319	0.0293	23.8232	0.5734	
Total Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
Total Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
Total Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	

PRS 66/80/40 Characterization Summary
AREA II

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-238	Uranium-238	Pu-238 and U-238 Daughters Analyzed								Plutonium-239/240
				Thorium-234	Uranium-233/234	Uranium-234	Thorium-230	Radium-226	Lead-214	Lead-210	Bismuth-210M	
0	Total Samples	121	13	1	1	12	110	120	2	121	36	36
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	7.6883	12.9169	3.9950	132.0000	0.3054	7.1909	1.1850	0.7535	0.5581	0.0455	0.0076
	StdDev of Results	6.0720	45.6953	N/A	N/A	0.0495	46.5389	0.5831	0.3231	0.3052	0.0112	0.0060
	95% Confidence Value	1.0819	24.8398	N/A	N/A	0.0280	8.6970	0.1008	0.4479	0.0544	0.0037	0.0020
	Upper Bound (95% CI)	8.7702	37.7567	N/A	N/A	0.3334	15.8878	1.2857	1.2014	0.6125	0.0491	0.0096
	Number of Detections > or = 10-5 CO	0	1	1	0	0	3	1	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	165	3.995	-	-	490	4.54	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	165	3.995	-	-	11	4.54	-	-	-	-
5	Total Samples	121	15	3	3	12	111	122	2	124	36	36
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	7.3396	8.0163	14.1557	28.3320	0.3083	3.4925	1.1650	0.9180	0.5947	0.0469	0.0082
	StdDev of Results	6.0890	17.7905	12.4706	35.6519	0.0675	6.6011	0.7107	0.1081	0.4407	0.0092	0.0055
	95% Confidence Value	1.0849	9.0030	14.1115	40.3431	0.0382	1.2280	0.1261	0.1470	0.0776	0.0030	0.0018
	Upper Bound (95% CI)	8.4245	15.0193	28.2672	68.6751	0.3464	4.7205	1.2912	1.0650	0.6722	0.0500	0.0100
	Number of Detections > or = 10-5 CO	0	2	3	0	0	4	2	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	68.37	28.47	-	-	58.52	5.97	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	17.22	5.642	-	-	12.11	3.61	-	-	-	-
10	Total Samples	116	12	3	1	11	105	116	1	120	36	36
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	7.6206	0.6182	20.3713	1.2980	0.3284	2.6482	1.1782	0.9000	0.5907	0.0496	0.0080
	StdDev of Results	6.2786	0.9388	28.6522	N/A	0.0735	2.7986	0.6132	N/A	0.3958	0.0111	0.0060
	95% Confidence Value	1.1426	0.5312	32.4224	N/A	0.0434	0.5353	0.1116	N/A	0.0708	0.0038	0.0020
	Upper Bound (95% CI)	8.7632	1.1493	52.7937	N/A	0.3718	3.1835	1.2898	N/A	0.6615	0.0532	0.0100
	Number of Detections > or = 10-5 CO	0	1	3	0	0	1	2	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	3.39	53.45	-	-	27.26	5.05	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	3.39	3.284	-	-	27.26	4.19	-	-	-	-
15	Total Samples	114	14	2	3	12	104	113	2	115	35	35
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	116.9271	2.5249	4.8945	0.5920	0.8030	2.8816	1.1534	0.8185	0.5836	0.0512	0.9087
	StdDev of Results	1069.0237	5.4344	3.0483	0.4546	0.7103	5.2276	0.4901	0.1478	0.4047	0.0083	5.2193
	95% Confidence Value	196.2377	2.8467	4.2247	0.5144	0.4019	1.0047	0.0904	0.2048	0.0740	0.0027	1.7291
	Upper Bound (95% CI)	313.1648	5.3715	9.1192	1.1064	1.0049	3.8862	1.2437	1.0233	0.6576	0.0540	2.6378
	Number of Detections > or = 10-5 CO	4	2	2	0	0	1	1	0	0	0	0
	Maximum of Detections > or = 10-5 CO	11400	18.98	7.05	-	-	53.62	3.2	-	-	-	-
	Minimum of Detections > or = 10-5 CO	60.4	10.4	2.739	-	-	53.62	3.2	-	-	-	-
20	Total Samples	90	7	0	1	6	79	90	1	92	25	25
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	144.3175	2.0817	N/A	11.1600	0.3920	2.8453	1.2537	0.7410	0.6242	0.0571	1.0252
	StdDev of Results	1263.9056	4.2724	N/A	N/A	0.1505	2.7490	0.6674	N/A	0.3626	0.0183	4.9332
	95% Confidence Value	261.1204	3.1649	N/A	N/A	0.1204	0.6062	0.1379	N/A	0.0741	0.0072	1.9338
	Upper Bound (95% CI)	405.4379	5.2467	N/A	N/A	0.5124	3.4515	1.3916	N/A	0.6983	0.0643	2.9590
	Number of Detections > or = 10-5 CO	3	1	0	0	0	1	3	0	0	0	0
	Maximum of Detections > or = 10-5 CO	12000	11.75	-	-	-	21.72	5.45	-	-	-	-
	Minimum of Detections > or = 10-5 CO	63	11.75	-	-	-	21.72	3.05	-	-	-	-
25	Total Samples	58	8	1	0	8	50	58	2	59	17	17
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	12.9049	0.7814	8.1400	N/A	0.7035	2.4776	1.3161	0.9345	0.7141	0.0552	0.0444
	StdDev of Results	33.6205	1.2211	N/A	N/A	1.1203	1.8976	0.4933	0.1492	0.4002	0.0191	0.1252
	95% Confidence Value	8.6524	0.8462	N/A	N/A	0.7763	0.5260	0.1269	0.2068	0.1021	0.0091	0.0595
	Upper Bound (95% CI)	21.5574	1.6275	N/A	N/A	1.4798	3.0036	1.4430	1.1413	0.8162	0.0643	0.1039
	Number of Detections > or = 10-5 CO	2	1	1	0	0	1	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	256	3.74	8.14	-	-	11.8	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	57.6	3.74	8.14	-	-	11.8	-	-	-	-	-
30	Total Samples	24	7	0	0	7	20	24	1	24	7	7
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	6.7490	0.4413	N/A	N/A	0.4571	2.4017	1.3233	1.1900	0.6489	0.0602	0.0078
	StdDev of Results	5.2914	0.4356	N/A	N/A	0.4955	1.4066	0.5521	N/A	0.4227	0.0194	0.0060
	95% Confidence Value	2.1170	0.3227	N/A	N/A	0.3671	0.6165	0.2209	N/A	0.1691	0.0144	0.0059
	Upper Bound (95% CI)	8.8660	0.7640	N/A	N/A	0.8242	3.0181	1.5442	N/A	0.8180	0.0746	0.0137
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-	-
35	Total Samples	8	6	0	0	6	8	8	1	8	6	6
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	10.2245	0.3217	N/A	N/A	0.3547	2.1037	1.0570	1.2100	0.8658	0.0442	0.0260
	StdDev of Results	20.4681	0.0861	N/A	N/A	0.0606	3.2295	0.3305	N/A	0.4874	0.0039	0.0469
	95% Confidence Value	14.1834	0.0669	N/A	N/A	0.0485	2.2379	0.2290	N/A	0.3378	0.0031	0.0375
	Upper Bound (95% CI)	24.4079	0.3905	N/A	N/A	0.4032	4.3416	1.2860	N/A	1.2035	0.0473	0.0635
	Number of Detections > or = 10-5 CO	1	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	59.3	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	59.3	-	-	-	-	-	-	-	-	-	-
40	Total Samples	6	6	0	0	6	6	6	1	6	6	6
	Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
	Average of All Samples	0.2194	0.3350	N/A	N/A	0.2962	0.4740	0.8990	1.0900	0.8443	0.0426	0.0083
	StdDev of Results	0.5196	0.1004	N/A	N/A	0.0658	0.1362	0.1430	N/A	0.3121	0.0077	0.0020
	95% Confidence Value	0.4158	0.0803	N/A	N/A	0.0527	0.1090	0.1144	N/A	0.2497	0.0061	0.0016
	Upper Bound (95% CI)	0.6352	0.4153	N/A	N/A	0.3488	0.5830	1.0134	N/A	1.0940	0.0487	0.0099
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-	-

Summary	Plutonium-238	Uranium-238	Thorium-234	Uranium-233/234	Uranium-234	Thorium-230	Radium-226	Lead-214	Lead-210	Bismuth-210M	Plutonium-239/240
Total Total Samples	658	88	10	9	80	593	657	13	669	204	204
Cleanup Objective	55	2.2	2.2	N/A	106.1	10	2.9	2.9	7.4	2.9	55
Total Average of All Samples	45.6143	3.7362	12.5505	25.8922	0.4162	3.6640	1.1965	0.9215	0.6075	0.0501	0.2907
Total StdDev of Results	645.1892	19.0637	16.2047	45.4988	0.4729	20.4327	0.5959	0.1946	0.3906	0.0131	2.7619
95% Confidence Value	49.2971	3.9830	10.0436	29.7253	0.1036	1.6445	0.0456	0.1058	0.0296	0.0018	0.3790
Upper Bound (95% CI)	94.9114	7.7192	22.5941	55.4175	0.5198	5.3086	1.2421	1.0273	0.6371	0.0519	0.6697
Total Number of Detections > or = 10-5 CO	10	8	10	0	0	11	9	0	0	0	0
Total Maximu	12000	165	53.45	-	-	490	5.97	-	-	-	-
Total Minimu	57.6	3.39	2.739	-	-	11	3.05	-	-	-	-

PRS 66/80/40 Characterization Summary

AREA II

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-239	Pu-239 Daughters		Thorium-232	Th-232 Daughters Analyzed					
			Uranium-235	Actinium-227		Radium-228	Actinium-228	Thorium-228	Radium-224	Lead-212	Thallium-208
0	Total Samples	0	13	122	122	36	0	37	2	2	2
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	N/A	4.1211	2.6143	17.8117	1.3223	N/A	52.0125	0.8525	0.8155	0.2805
	StdDev of Results	N/A	14.8055	24.7861	179.6088	0.8760	N/A	309.3782	0.4207	0.4165	0.1862
	95% Confidence Value	N/A	8.0487	4.3982	31.8710	0.2862	N/A	99.6859	0.5831	0.5772	0.2303
	Upper Bound (95% CI)	N/A	[illegible]	7.0125	49.6826	[illegible]	N/A	151.6983	[illegible]	[illegible]	[illegible]
	Number of Detections > or = 10-5 CO	0	1	2	16	5	0	6	0	0	0
	Maximum of Detections > or = 10-5 CO	-	53.4	274	1985	4.16	-	1883	-	-	-
	Minimum of Detections > or = 10-5 CO	-	53.4	8.78	2.25	2.1	-	2.27	-	-	-
5	Total Samples	4	15	126	126	36	0	39	2	2	1
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0981	0.2883	0.4201	6.8523	1.4993	N/A	17.0990	1.3600	1.2900	0.4780
	StdDev of Results	0.1064	0.8199	0.8748	39.0843	1.5071	N/A	89.5594	0.2121	0.1838	N/A
	95% Confidence Value	0.1043	0.4149	0.1534	6.8516	0.4923	N/A	21.8309	0.2940	0.2548	N/A
	Upper Bound (95% CI)	[illegible]	[illegible]	[illegible]	13.5040	[illegible]	N/A	38.9299	[illegible]	[illegible]	N/A
	Number of Detections > or = 10-5 CO	0	0	1	13	4	0	5	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	8.29	315.75	8.25	-	333.65	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	8.29	2.253	2.6	-	2.54	-	-	-
10	Total Samples	1	12	120	120	36	0	37	1	1	1
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.0025	0.0275	0.3725	2.6058	2.0619	N/A	1.9104	1.1000	1.0800	0.3810
	StdDev of Results	N/A	0.0249	0.5650	7.1060	2.7177	N/A	3.2424	N/A	N/A	N/A
	95% Confidence Value	N/A	0.0141	0.1011	1.2714	0.8878	N/A	1.0447	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	[illegible]	[illegible]	3.8772	[illegible]	N/A	2.9552	N/A	N/A	N/A
	Number of Detections > or = 10-5 CO	0	0	0	18	6	0	5	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	48.74	14.5	-	14.712	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	2.11	2.37	-	2.4	-	-	-
15	Total Samples	3	14	115	114	35	1	36	2	2	1
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	2.6192	0.2355	0.4276	1.8720	1.5411	0.8290	1.2524	1.1505	1.0960	0.4220
	StdDev of Results	2.2729	0.6435	0.7260	6.1901	1.0353	N/A	1.1632	0.2821	0.2885	N/A
	95% Confidence Value	2.5720	0.3371	0.1327	1.1363	0.3430	N/A	0.3800	0.3910	0.3998	N/A
	Upper Bound (95% CI)	[illegible]	[illegible]	[illegible]	3.0083	[illegible]	N/A	[illegible]	[illegible]	[illegible]	N/A
	Number of Detections > or = 10-5 CO	0	0	0	12	4	0	4	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	61.1	5.66	-	5.9	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	2.65	3.01	-	3.08	-	-	-
20	Total Samples	1	7	92	91	26	0	27	1	1	1
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	0.1650	0.0881	0.4196	4.8587	3.3928	N/A	9.5317	1.3500	1.3000	0.4470
	StdDev of Results	N/A	0.1689	0.6863	19.3340	6.6556	N/A	30.8866	N/A	N/A	N/A
	95% Confidence Value	N/A	0.1251	0.1402	3.9724	2.6089	N/A	11.6503	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	[illegible]	[illegible]	8.8290	6.0017	N/A	21.1819	N/A	N/A	N/A
	Number of Detections > or = 10-5 CO	0	0	1	15	7	0	7	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	4.86	171.81	34.5	-	159.63	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	4.86	2.94	2.27	-	3.69	-	-	-
25	Total Samples	0	5	59	59	17	1	17	2	2	2
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	N/A	0.0457	0.5423	1.8536	2.7511	1.1500	2.4898	1.1245	1.0775	0.3315
	StdDev of Results	N/A	0.0584	1.7278	4.4662	5.6619	N/A	6.6322	0.5735	0.5692	0.1209
	95% Confidence Value	N/A	0.0405	0.4408	1.1396	2.8915	N/A	3.1527	0.7948	0.7889	0.1678
	Upper Bound (95% CI)	N/A	[illegible]	[illegible]	2.9932	5.4425	N/A	5.6425	[illegible]	[illegible]	[illegible]
	Number of Detections > or = 10-5 CO	0	0	1	7	3	0	1	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	13	25.89	24.8	-	28.2	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	13	2.72	2.63	-	28.2	-	-	-
30	Total Samples	0	7	24	24	7	0	7	1	1	0
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	N/A	0.0173	0.2455	1.0670	2.8734	N/A	2.7313	1.1700	1.1000	N/A
	StdDev of Results	N/A	0.0073	0.2958	1.9114	4.5827	N/A	5.1939	N/A	N/A	N/A
	95% Confidence Value	N/A	0.0054	0.1183	0.7847	3.3800	N/A	3.8476	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	[illegible]	[illegible]	[illegible]	6.2534	N/A	6.5789	N/A	N/A	N/A
	Number of Detections > or = 10-5 CO	0	0	0	1	1	0	1	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	9.96	13.2	-	14.5	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	9.96	13.2	-	14.5	-	-	-
35	Total Samples	0	6	8	8	6	0	6	1	1	1
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	N/A	0.0146	0.2050	0.5472	0.9285	N/A	0.6352	0.7940	0.7450	0.2670
	StdDev of Results	N/A	0.0056	0.0412	0.1959	0.2108	N/A	0.2054	N/A	N/A	N/A
	95% Confidence Value	N/A	0.0045	0.0286	0.1358	0.1887	N/A	0.1643	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	[illegible]	[illegible]	[illegible]	[illegible]	N/A	[illegible]	N/A	N/A	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
40	Total Samples	0	6	8	6	6	0	6	1	1	0
	Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
	Average of All Samples	N/A	0.0226	0.5784	0.4242	0.7103	N/A	0.5583	0.6560	0.6540	N/A
	StdDev of Results	N/A	0.0094	0.9219	0.2772	0.4891	N/A	0.3648	N/A	N/A	N/A
	95% Confidence Value	N/A	0.0075	0.7377	0.2218	0.3753	N/A	0.2919	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	[illegible]	[illegible]	[illegible]	[illegible]	N/A	[illegible]	N/A	N/A	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-

Summary	Plutonium-239	Uranium-235	Actinium-227	Thorium-232	Radium-228	Actinium-228	Thorium-228	Radium-224	Lead-212	Thallium-208
Total Total Samples	9	58	671	669	204	2	212	13	13	9
Cleanup Objective	55	16.11	4.51	2.1	2.1	2.1	2.1	2.1	2.1	2.1
Total Average of All Samples	0.9353	0.7142	0.8151	6.1502	1.9180	0.9895	14.3069	1.0835	1.0321	0.3554
Total StdDev of Results	1.7007	5.6971	10.5969	78.9200	3.3036	0.2270	132.8963	0.3182	0.3104	0.1082
95% Confidence Value	1.1111	1.1903	0.8018	5.9803	0.4533	0.3148	17.8893	0.1730	0.1687	0.0694
Upper Bound (95% CI)	[illegible]	[illegible]	[illegible]	12.1305	2.3714	[illegible]	32.1961	[illegible]	[illegible]	[illegible]
Total Number of Detections > or = 10-5 CO	0	1	5	82	30	0	29	0	0	0
Total Maximum	-	53.4	274	1985	34.5	-	1883	-	-	-
Total Minimum	-	53.4	4.86	2.11	2.1	-	2.27	-	-	-

PRS 66/80/40 Characterization Summary

AREA II

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Americium-241	Bismuth-207	Cesium-137	Cobalt-60	Potassium-40	Tritium	Manganese-54	Grand Total
0	Total Samples	122	36	122	121	36	12	0	1358
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.0906	0.0301	0.0719	0.0282	19.1497	0.6004	N/A	
	StdDev of Results	0.1469	0.0075	0.1692	0.0139	7.7462	0.9337	N/A	
	95% Confidence Value	0.0261	0.0025	0.0300	0.0025	2.5304	0.5283	N/A	
	Upper Bound (95% CI)	0.1167	0.0326	0.1019	0.0307	21.6801	1.1287	N/A	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
5	Total Samples	125	36	125	125	36	12	0	1393
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.0872	0.0318	0.3752	0.0312	21.8586	0.7497	N/A	
	StdDev of Results	0.1094	0.0081	3.0578	0.0255	5.2517	0.5954	N/A	
	95% Confidence Value	0.0192	0.0020	0.5360	0.0045	1.7155	0.3389	N/A	
	Upper Bound (95% CI)	0.1064	0.0336	0.9113	0.0357	23.5741	1.0886	N/A	
	Number of Detections > or = 10-5 CO	0	0	1	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	34.12	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	34.12	-	-	-	-	
10	Total Samples	120	36	120	120	36	11	1	1330
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.0905	0.0326	0.2225	0.0299	21.5272	1.3610	0.1620	
	StdDev of Results	0.1092	0.0072	0.9053	0.0184	5.0560	1.2581	N/A	
	95% Confidence Value	0.0195	0.0023	0.1620	0.0029	1.6516	0.7435	N/A	
	Upper Bound (95% CI)	0.1101	0.0349	0.3845	0.0328	23.1788	2.1045	N/A	
	Number of Detections > or = 10-5 CO	0	0	2	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	8.09	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	4.44	-	-	-	-	
15	Total Samples	115	35	115	115	35	12	0	1299
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.3598	0.0337	0.1361	0.0298	22.9200	6.1716	N/A	
	StdDev of Results	2.2608	0.0060	0.8973	0.0152	5.1859	18.6925	N/A	
	95% Confidence Value	0.4132	0.0020	0.1274	0.0028	1.7181	10.5761	N/A	
	Upper Bound (95% CI)	0.7730	0.0357	0.2635	0.0326	24.6381	16.7477	N/A	
	Number of Detections > or = 10-5 CO	0	0	1	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	7.21	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	7.21	-	-	-	-	
20	Total Samples	92	25	92	92	25	6	0	994
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.3543	0.0377	0.1362	0.0315	23.6320	4.6707	N/A	
	StdDev of Results	2.4526	0.0135	0.6982	0.0220	6.4943	9.9747	N/A	
	95% Confidence Value	0.5012	0.0053	0.1427	0.0045	2.5457	7.9812	N/A	
	Upper Bound (95% CI)	0.8555	0.0430	0.2789	0.0360	26.1777	12.6519	N/A	
	Number of Detections > or = 10-5 CO	0	0	1	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	6.67	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	6.67	-	-	-	-	
25	Total Samples	59	17	59	59	17	8	0	664
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.0965	0.0370	0.0331	0.0290	22.1565	3.1074	N/A	
	StdDev of Results	0.1319	0.0126	0.0229	0.0160	6.6592	6.5067	N/A	
	95% Confidence Value	0.0337	0.0060	0.0058	0.0041	3.1655	4.5088	N/A	
	Upper Bound (95% CI)	0.1301	0.0430	0.0390	0.0330	25.3220	7.6162	N/A	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
30	Total Samples	24	7	24	24	7	7	0	285
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.0878	0.0382	0.0331	0.0323	22.0000	0.7414	N/A	
	StdDev of Results	0.1085	0.0134	0.0198	0.0150	5.4970	0.5691	N/A	
	95% Confidence Value	0.0434	0.0099	0.0079	0.0060	4.0721	0.4216	N/A	
	Upper Bound (95% CI)	0.1312	0.0481	0.0411	0.0383	26.0721	1.1630	N/A	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
35	Total Samples	8	6	8	8	6	6	0	136
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.0787	0.0272	0.0310	0.0346	17.6167	1.6508	N/A	
	StdDev of Results	0.0440	0.0021	0.0062	0.0089	5.2549	3.0428	N/A	
	95% Confidence Value	0.0305	0.0017	0.0043	0.0062	4.2047	2.4347	N/A	
	Upper Bound (95% CI)	0.1092	0.0289	0.0353	0.0407	21.8214	4.0855	N/A	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
40	Total Samples	6	6	6	6	6	6	0	117
	Cleanup Objective	63	1.75	3.82	0.9	1000	235001.6	N/A	
	Average of All Samples	0.1094	0.0295	0.0327	0.0390	18.5933	0.2893	N/A	
	StdDev of Results	0.0444	0.0059	0.0074	0.0089	11.6800	0.2209	N/A	
	95% Confidence Value	0.0355	0.0047	0.0059	0.0071	9.3458	0.1768	N/A	
	Upper Bound (95% CI)	0.1449	0.0342	0.0386	0.0461	27.9391	0.4661	N/A	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	
Summary		**Americium-241**	**Bismuth-207**	**Cesium-137**	**Cobalt-60**	**Potassium-40**	**Tritium**	**Manganese-54**	**Grand Total**
Total Total Samples		671	204	671	670	204	80	1	7576
Cleanup Objective		63	1.75	3.82	0.9	1000	235001.6	N/A	
Total Average of All Samples		0.1727	0.0332	0.1695	0.0302	21.5304	2.1868	0.1620	
Total StdDev of Results		1.3084	0.0089	1.4295	0.0185	6.3306	7.9952	N/A	
95% Confidence Value		0.0990	0.0012	0.1082	0.0014	0.8687	1.7520	N/A	
Upper Bound (95% CI)		0.2717	0.0344	0.2777	0.0316	22.3991	3.9388	N/A	
Total Number of Detections > or = 10-5 CO		0	0	5	0	0	0	0	
Total Maximu		-	-	34.12	-	-	-	-	
Total Minimu		-	-	4.44	-	-	-	-	

PRS 66/80/40 Characterization Summary
AREA III

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-238	Uranium-238	Pu-238 and U-238 Daughters Analyzed							Plutonium-239/240
				Uranium-233/234	Uranium 234	Thorium-230	Radium 226	Lead-210	Bismuth-210	Bismuth-210M	
0	Total Samples	92	5	1	4	92	92	92	2	19	21
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	13.7894	1.5696	3.1200	0.3934	2.6443	1.0583	0.5879	0.0433	0.0388	0.1461
	StdDev of Results	41.4427	2.7854	N/A	0.3650	1.3531	0.5922	0.3793	0.0069	0.0092	0.5696
	95% Confidence Value	8.4684	2.4415	N/A	0.3577	0.2765	0.1210	0.0775	0.0096	0.0041	0.2564
	Upper Bound (95% CI)	[illegible]	4.0111	N/A	[illegible]	2.9208	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Number of Detections > or = 10-5 CO	1	1	0	0	0	1	0	0	0	0
	Maximum of Detections > or = 10-5 CO	399.29	6.52	-	-	-	4.05	-	-	-	-
	Minimum of Detections > or = 10-5 CO	399.29	6.52	-	-	-	4.05	-	-	-	-
5	Total Samples	93	1	0	1	87	93	93	2	18	20
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	28.7003	0.4890	N/A	0.4860	2.7023	1.2236	0.5271	0.0482	0.0552	0.3677
	StdDev of Results	73.1335	N/A	N/A	N/A	1.3999	0.8430	0.3093	0.0082	0.0430	0.9130
	95% Confidence Value	14.8638	N/A	N/A	N/A	0.2942	0.1713	0.0629	0.0114	0.0198	0.4001
	Upper Bound (95% CI)	[illegible]	N/A	N/A	N/A	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Number of Detections > or = 10-5 CO	10	0	0	0	0	2	0	0	0	0
	Maximum of Detections > or = 10-5 CO	581	-	-	-	-	7.37	-	-	-	-
	Minimum of Detections > or = 10-5 CO	84.49	-	-	-	-	3.3	-	-	-	-
10	Total Samples	93	2	0	2	91	95	95	2	20	23
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	47.7287	0.5255	N/A	0.3990	2.5296	1.1494	0.4583	0.0483	0.0486	1.4594
	StdDev of Results	255.7021	0.1082	N/A	0.2208	1.2917	0.5822	0.2519	0.0088	0.0134	4.1477
	95% Confidence Value	51.9885	0.1499	N/A	0.3058	0.2654	0.1171	0.0508	0.0122	0.0059	1.8951
	Upper Bound (95% CI)	99.6972	0.6754	N/A	0.7148	2.7949	1.2665	0.5092	0.0605	0.0545	7.1145
	Number of Detections > or = 10-5 CO	9	0	0	0	0	2	0	0	0	0
	Maximum of Detections > or = 10-5 CO	2433	-	-	-	-	3.73	-	-	-	-
	Minimum of Detections > or = 10-5 CO	56.23		-	-	-	3.44	-	-	-	-
15	Total Samples	91	3	0	3	88	91	92	2	19	22
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	11.3505	16.3157	N/A	16.1097	2.5644	1.0350	0.5069	0.0481	0.0434	0.0730
	StdDev of Results	18.4546	27.3371	N/A	27.0288	1.3602	0.4500	0.3330	0.0105	0.0073	0.1625
	95% Confidence Value	3.3808	30.9342	N/A	30.5854	0.2842	0.0925	0.0680	0.0146	0.0033	0.0679
	Upper Bound (95% CI)	14.7313	47.2499	N/A	46.6951	2.9486	1.1275	0.5749	0.0626	0.0466	0.1409
	Number of Detections > or = 10-5 CO	3	1	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	102.5	47.881	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	70.1	47.881	-	-	-	-	-	-	-	-
20	Total Samples	74	2	0	2	71	74	75	2	18	20
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	8.9286	0.2955	N/A	0.2470	2.6957	1.1434	0.5404	0.0421	0.0572	0.0184
	StdDev of Results	8.0488	0.2510	N/A	0.1216	1.9082	0.5303	0.3133	0.0088	0.0488	0.0244
	95% Confidence Value	1.8338	0.3479	N/A	0.1688	0.4434	0.1208	0.0709	0.0119	0.0228	0.0107
	Upper Bound (95% CI)	11.7624	0.6434	N/A	0.4158	3.1391	1.2642	0.6113	0.0540	0.0796	0.0291
	Number of Detections > or = 10-5 CO	0	0	0	0	1	2	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	11.7	3.13	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	11.7	3.1	-	-	-	-
25	Total Samples	40	2	0	2	37	40	40	1	9	10
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	6.7147	0.3270	N/A	0.3200	2.3525	1.1487	0.5807	0.0575	0.0419	0.0078
	StdDev of Results	4.9632	0.1853	N/A	0.0198	1.2094	0.4637	0.3613	N/A	0.0047	0.0044
	95% Confidence Value	1.4451	0.2568	N/A	0.0274	0.3897	0.1437	0.1120	N/A	0.0031	0.0027
	Upper Bound (95% CI)	8.1598	0.5838	N/A	0.3474	2.7422	1.2924	0.6928	N/A	0.0450	0.0103
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
30	Total Samples	15	2	0	2	14	15	15	0	5	5
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	6.3159	0.3895	N/A	0.3530	2.2849	1.2811	0.7124	N/A	0.0429	0.0113
	StdDev of Results	4.3641	0.1138	N/A	0.0289	1.4979	0.5012	0.4462	N/A	0.0086	0.0088
	95% Confidence Value	2.2085	0.1578	N/A	0.0372	0.7847	0.2537	0.2258	N/A	0.0058	0.0077
	Upper Bound (95% CI)	8.5244	0.5473	N/A	0.3902	3.0696	1.5347	0.9383	N/A	0.0487	0.0190
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
35	Total Samples	9	2	0	2	5	6	6	0	3	3
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	6.5239	0.4285	N/A	0.3240	0.9930	1.2138	0.5454	N/A	0.0358	0.0067
	StdDev of Results	7.1871	0.1181	N/A	0.0893	0.8284	0.5589	0.3224	N/A	0.0059	0.0041
	95% Confidence Value	5.7508	0.1637	N/A	0.0980	0.5508	0.4472	0.2580	N/A	0.0067	0.0046
	Upper Bound (95% CI)	12.2747	0.5922	N/A	0.4220	1.4438	1.6610	0.8034	N/A	0.0425	0.0113
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
40	Total Samples	2	2	0	2	2	2	2	0	2	2
	Cleanup Objective	55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
	Average of All Samples	0.3075	0.3900	N/A	0.3680	0.8510	0.8590	0.8050	N/A	0.0329	0.0071
	StdDev of Results	0.1987	0.1287	N/A	0.0240	0.1556	0.0509	0.3485	N/A	0.0049	0.0086
	95% Confidence Value	0.2754	0.1784	N/A	0.0333	0.2156	0.0706	0.4802	N/A	0.0068	0.0091
	Upper Bound (95% CI)	0.5829	0.5684	N/A	0.4013	0.9666	0.9296	1.2852	N/A	0.0397	0.0163
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
Summary		**Plutonium-238**	**Uranium-238**	**Uranium-233/234**	**Uranium 234**	**Thorium-230**	**Radium 226**	**Lead-210**	**Bismuth-210**	**Bismuth-210M**	**Plutonium-239/240**
Total Total Samples		506	21	1	20	487	508	510	11	113	126
Cleanup Objective		55	2.2	N/A	106.1	10	2.9	7.4	2.9	2.9	55
Total Average of All Samples		20.6981	2.9522	3.1200	2.7195	2.5678	1.1278	0.5345	0.0470	0.0467	0.3661
Total StdDev of Results		116.0708	10.3824	N/A	10.4992	1.4428	0.6031	0.3297	0.0076	0.0274	1.8797
95% Confidence Value		10.1134	4.4405	N/A	4.6014	0.1281	0.0524	0.0288	0.0045	0.0050	0.3266
Upper Bound (95% CI)		30.6114	7.3827	N/A	7.3209	2.6958	1.1802	0.5631	0.0515	0.0518	2.6927
Total Number of Detections > or = 10-5 CO		23	2	0	0	1	7	0	0	0	0
Total Maximu		2433	47.881	-	-	11.7	7.37	-	-	-	-
Total Minimu		56.23	6.52	-	-	11.7	3.1	-	-	-	-

PRS 66/80/40 Characterization Summary
AREA III

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-239	Pu-239 Daughters Analyzed		Thorium-232	Th-232 Daughters Analyzed		Americium-241	Bismuth-207	Cesium-137	Cobalt-60
			Uranium-235	Actinium-227		Radium-228	Thorium-228				
0	Total Samples	1	5	93	93	21	22	93	21	93	92
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	4.6100	0.1889	0.2189	0.9317	0.8686	1.4265	0.1224	0.0251	0.2745	0.0268
	StdDev of Results	N/A	0.3755	0.2545	3.3087	0.4815	4.0589	0.4032	0.0061	2.2775	0.0188
	95% Confidence Value	N/A	0.3291	0.0517	0.6725	0.2059	1.6961	0.0819	0.0026	0.4629	0.0038
	Upper Bound (95% CI)	N/A	0.5180	0.2686	1.6042	1.0745	3.1226	0.2044	0.0277	0.7374	0.0307
	Number of Detections > or = 10-5 CO	0	0	0	2	0	1	0	0	1	0
	Maximum of Detections > or = 10-5 CO	-	-	-	28.52	-	19.52	-	-	22	-
	Minimum of Detections > or = 10-5 CO	-	-	-	15.8	-	19.52	-	-	22	-
5	Total Samples	0	1	93	93	20	20	93	20	93	93
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.0124	0.3346	1.0119	7.1859	3.0260	0.2044	0.0368	0.0507	0.0248
	StdDev of Results	N/A	N/A	1.0350	2.6521	25.2285	8.1260	0.8401	0.0289	0.0634	0.0196
	95% Confidence Value	N/A	N/A	0.2104	0.5390	11.0567	3.5613	0.1301	0.0127	0.0129	0.0040
	Upper Bound (95% CI)	N/A	N/A	0.5449	1.5509	18.2426	6.5872	0.3345	0.0494	0.0636	0.0288
	Number of Detections > or = 10-5 CO	0	0	1	8	3	4	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	9.79	23.2	114	36.1	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	9.79	2.45	3.22	2.4	-	-	-	-
10	Total Samples	0	2	95	95	22	22	95	22	95	95
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.0231	0.2780	1.1268	1.6960	1.3411	0.3325	0.0312	0.0469	0.0250
	StdDev of Results	N/A	0.0190	0.4381	2.3800	1.9733	1.9501	1.1531	0.0092	0.0381	0.0150
	95% Confidence Value	N/A	0.0264	0.0881	0.4786	0.8246	0.8149	0.2319	0.0038	0.0077	0.0030
	Upper Bound (95% CI)	N/A	0.0494	0.3661	1.6054	2.5206	2.1560	0.5644	0.0350	0.0545	0.0281
	Number of Detections > or = 10-5 CO	0	0	0	6	4	3	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	17.4	8.3	7.99	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	2.28	3.01	2.91	-	-	-	-
15	Total Samples	0	3	92	92	21	22	92	21	92	92
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.8754	0.2665	0.9304	1.3024	0.9277	0.0813	0.0300	0.0399	0.0252
	StdDev of Results	N/A	1.3892	0.4328	1.6857	1.5877	1.5814	0.0940	0.0049	0.0354	0.0141
	95% Confidence Value	N/A	1.5720	0.0884	0.3445	0.6790	0.6525	0.0192	0.0021	0.0072	0.0029
	Upper Bound (95% CI)	N/A	2.4474	0.3549	1.2749	1.9815	1.5801	0.1005	0.0321	0.0472	0.0280
	Number of Detections > or = 10-5 CO	0	0	0	5	1	1	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	11.76	8.15	7.88	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	2.24	8.15	7.88	-	-	-	-
20	Total Samples	0	2	76	75	20	20	75	20	75	75
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.0106	1.8563	2.4647	6.4483	5.1193	0.0940	0.0375	0.0371	0.0290
	StdDev of Results	N/A	0.0025	12.4479	8.7259	20.0969	16.7842	0.2348	0.0307	0.0327	0.0218
	95% Confidence Value	N/A	0.0034	2.8172	1.9748	8.8077	7.3559	0.0531	0.0134	0.0074	0.0049
	Upper Bound (95% CI)	N/A	0.0140	4.4735	4.4396	15.2560	12.4751	0.1472	0.0509	0.0446	0.0339
	Number of Detections > or = 10-5 CO	0	0	1	7	2	2	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	108	67.1	90.2	75	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	108	2.6	18.6	15.6	-	-	-	-
25	Total Samples	0	2	40	40	10	10	40	10	40	40
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.0179	0.2275	1.0151	1.0127	0.7234	0.0626	0.0282	0.0292	0.0257
	StdDev of Results	N/A	0.0050	0.3526	2.0184	0.3515	0.3483	0.0724	0.0046	0.0245	0.0150
	95% Confidence Value	N/A	0.0070	0.1093	0.6255	0.2178	0.2146	0.0224	0.0029	0.0076	0.0047
	Upper Bound (95% CI)	N/A	0.0248	0.3368	1.6406	1.2305	0.9380	0.0850	0.0311	0.0368	0.0303
	Number of Detections > or = 10-5 CO	0	0	0	3	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	12	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	2.837	-	-	-	-	-	-
30	Total Samples	0	2	16	15	5	5	15	5	15	15
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.0139	0.2192	0.8732	1.2310	0.7690	0.0543	0.0289	0.0416	0.0295
	StdDev of Results	N/A	0.0003	0.1821	0.1696	0.4960	0.3079	0.0299	0.0052	0.0445	0.0142
	95% Confidence Value	N/A	0.0004	0.0922	0.0858	0.4348	0.2699	0.0151	0.0045	0.0225	0.0072
	Upper Bound (95% CI)	N/A	0.0144	0.3113	0.7590	1.6858	1.0389	0.0694	0.0334	0.0641	0.0367
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
35	Total Samples	0	2	6	6	3	4	6	3	6	6
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.0293	0.1594	0.5353	0.5993	0.6045	0.0717	0.0249	0.0236	0.0259
	StdDev of Results	N/A	0.0061	0.0609	0.2052	0.2016	0.2312	0.0392	0.0073	0.0102	0.0104
	95% Confidence Value	N/A	0.0084	0.0487	0.1642	0.2281	0.2266	0.0314	0.0083	0.0081	0.0083
	Upper Bound (95% CI)	N/A	0.0377	0.2081	0.6995	0.8274	0.8311	0.1030	0.0332	0.0318	0.0342
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
40	Total Samples	0	2	2	2	2	2	2	2	2	2
	Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	0.0210	0.1608	0.5270	0.5153	0.6150	0.0743	0.0218	0.0266	0.0312
	StdDev of Results	N/A	0.0017	0.0343	0.1838	0.5455	0.3465	0.0202	0.0043	0.0120	0.0094
	95% Confidence Value	N/A	0.0024	0.0475	0.2548	0.7561	0.4802	0.0279	0.0059	0.0167	0.0130
	Upper Bound (95% CI)	N/A	0.0234	0.2083	0.7818	1.2713	1.0952	0.1022	0.0278	0.0432	0.0442
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	-	-

Summary	Plutonium-239	Uranium-235	Actinium-227	Thorium-232	Radium-228	Thorium-228	Americium-241	Bismuth-207	Cesium-137	Cobalt-60
Total Total Samples	1	21	511	511	124	127	511	124	511	510
Cleanup Objective	55	16.11	4.81	2.1	2.1	2.1	63	1.75	3.82	0.9
Total Average of All Samples	4.6100	0.1818	0.4699	1.2000	3.0218	2.0388	0.1574	0.0312	0.0844	0.0261
Total StdDev of Results	N/A	0.5574	4.7970	4.0549	12.9955	7.6526	0.6061	0.0180	0.9722	0.0174
95% Confidence Value	N/A	0.2384	0.4159	0.3516	2.2873	1.3309	0.0526	0.0032	0.0843	0.0015
Upper Bound (95% CI)	N/A	0.4200	0.8858	1.5516	5.3091	3.3697	0.2099	0.0344	0.1687	0.0276
Total Number of Detections > or = 10-5 CO	0	0	2	29	10	11	0	0	1	0
Total Maximu	-	-	108	67.1	114	75	-	-	22	-
Total Minimu	-	-	9.79	2.24	3.01	2.4	-	-	22	-

PRS 66/80/40 Characterization Summary
AREA III

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Cerium-141	Cerium-144	Cerium-144/Praseodymium	Manganese-54	Potassium-40	Tritium	Grand Total
0	Total Samples	0	0	0	0	21	3	978
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	N/A	N/A	N/A	14.8200	0.4663	
	StdDev of Results	N/A	N/A	N/A	N/A	7.0513	0.5559	
	95% Confidence Value	N/A	N/A	N/A	N/A	3.0156	0.6291	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	17.8358	1.0954	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
5	Total Samples	0	0	0	2	20	1	957
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	N/A	N/A	1.0435	18.2880	0.3490	
	StdDev of Results	N/A	N/A	N/A	1.3527	5.1072	N/A	
	95% Confidence Value	N/A	N/A	N/A	1.8747	2.2383	N/A	
	Upper Bound (95% CI)	N/A	N/A	N/A	2.9182	20.5263	N/A	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
10	Total Samples	0	0	0	1	22	2	991
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	N/A	N/A	0.1850	18.1423	1.3990	
	StdDev of Results	N/A	N/A	N/A	N/A	5.8017	1.7128	
	95% Confidence Value	N/A	N/A	N/A	N/A	2.4243	2.3735	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	20.5666	3.7725	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
15	Total Samples	0	0	0	0	21	2	961
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	N/A	N/A	N/A	19.8476	1.1550	
	StdDev of Results	N/A	N/A	N/A	N/A	4.7897	0.4596	
	95% Confidence Value	N/A	N/A	N/A	N/A	2.0486	0.6370	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	21.8962	1.7920	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
20	Total Samples	0	1	1	0	20	2	799
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	0.5120	1.0200	N/A	20.7200	0.9340	
	StdDev of Results	N/A	N/A	N/A	N/A	4.9585	1.1399	
	95% Confidence Value	N/A	N/A	N/A	N/A	2.1731	1.5797	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	22.8931	2.5137	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
25	Total Samples	1	0	0	0	10	2	426
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	1.6100	N/A	N/A	N/A	18.3500	1.0745	
	StdDev of Results	N/A	N/A	N/A	N/A	5.2636	0.6583	
	95% Confidence Value	N/A	N/A	N/A	N/A	3.2623	0.9124	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	21.6123	1.9869	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
30	Total Samples	0	0	0	0	5	2	172
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	N/A	N/A	N/A	20.3800	0.9495	
	StdDev of Results	N/A	N/A	N/A	N/A	6.5702	0.9341	
	95% Confidence Value	N/A	N/A	N/A	N/A	5.7589	1.2946	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	26.1389	2.2441	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
35	Total Samples	0	0	0	0	3	2	80
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	N/A	N/A	N/A	14.0933	0.5190	
	StdDev of Results	N/A	N/A	N/A	N/A	4.2645	0.3097	
	95% Confidence Value	N/A	N/A	N/A	N/A	4.8257	0.4292	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	18.9190	0.9482	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	
40	Total Samples	0	0	0	0	2	2	38
	Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
	Average of All Samples	N/A	N/A	N/A	N/A	11.6150	0.5755	
	StdDev of Results	N/A	N/A	N/A	N/A	5.7771	0.4985	
	95% Confidence Value	N/A	N/A	N/A	N/A	8.0064	0.6909	
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	19.6214	1.2664	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	

Summary	Cerium-141	Cerium-144	Cerium-144/Praseodymium	Manganese-54	Potassium-40	Tritium	Grand Total
Total Total Samples	1	1	1	3	124	18	5402
Cleanup Objective	N/A	N/A	N/A	N/A	1000	235001.6	
Total Average of All Samples	1.6100	0.5120	1.0200	0.7573	18.2114	0.8312	
Total StdDev of Results	N/A	N/A	N/A	1.0773	5.8435	0.7150	
95% Confidence Value	N/A	N/A	N/A	1.2191	1.0285	0.3303	
Upper Bound (95% CI)	N/A	N/A	N/A	1.9764	19.2400	1.1615	
Total Number of Detections > or = 10-5 CO	0	0	0	0	0	0	
Total Maximu	-	-	-	-	-	-	
Total Minimu	-	-	-	-	-	-	

PRS 66/80/40 Characterization Summary
AREA IV

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium 238	Uranium-238	Pu-238 and U-238 Daughters					
				Uranium-234	Thorium-230	Radium-226	Lead-214	Bismuth-214	Lead-210
0	Total Samples	49	5	5	44	49	1	0	49
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	8.4329	0.2552	0.3564	2.4989	1.1524	0.9340	N/A	0.5335
	StdDev of Results	6.4119	0.0774	0.1012	1.4075	0.4493	N/A	N/A	0.3686
	95% Confidence Value	1.7953	0.0678	0.0887	0.4159	0.1258	N/A	N/A	0.1032
	Upper Bound (95% CI)	10.2282	0.3230	0.4451	2.9147	1.2782	N/A	N/A	0.6367
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
5	Total Samples	49	5	5	47	49	1	0	49
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	7.4137	0.2922	0.2992	2.4577	1.1086	1.1600	N/A	0.5303
	StdDev of Results	5.0805	0.0507	0.0574	1.3268	0.4866	N/A	N/A	0.3151
	95% Confidence Value	1.4225	0.0444	0.0503	0.3793	0.1363	N/A	N/A	0.0882
	Upper Bound (95% CI)	8.8362	0.3366	0.3495	2.8370	1.2449	N/A	N/A	0.6185
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
10	Total Samples	47	4	4	45	47	1	0	47
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	7.5166	0.2210	0.2978	2.4325	1.0767	1.1700	N/A	0.5596
	StdDev of Results	5.3782	0.1475	0.0528	1.3005	0.4069	N/A	N/A	0.2635
	95% Confidence Value	1.5376	0.1445	0.0518	0.3800	0.1163	N/A	N/A	0.0753
	Upper Bound (95% CI)	9.0541	0.3655	0.3495	2.8124	1.1930	N/A	N/A	0.6349
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
15	Total Samples	48	5	5	46	48	1	1	48
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	7.4905	0.2586	0.2666	2.2122	1.1369	1.0500	1.0700	0.4912
	StdDev of Results	5.9814	0.0215	0.0335	1.1320	0.4496	N/A	N/A	0.2365
	95% Confidence Value	1.6921	0.0189	0.0294	0.3271	0.1272	N/A	N/A	0.0669
	Upper Bound (95% CI)	9.1826	0.2775	0.2960	2.5393	1.2641	N/A	N/A	0.5581
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
20	Total Samples	44	5	5	42	44	1	0	44
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	7.4317	0.3718	0.3712	2.4448	1.2362	0.9340	N/A	0.4991
	StdDev of Results	5.8980	0.2057	0.1367	1.3808	0.4554	N/A	N/A	0.2799
	95% Confidence Value	1.7427	0.1803	0.1198	0.4176	0.1346	N/A	N/A	0.0827
	Upper Bound (95% CI)	9.1744	0.5521	0.4910	2.8624	1.3708	N/A	N/A	0.5818
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
25	Total Samples	30	4	4	27	30	0	0	30
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	6.6027	0.2998	0.3283	1.9054	1.0809	N/A	N/A	0.5195
	StdDev of Results	6.2825	0.1175	0.0447	1.3545	0.3379	N/A	N/A	0.3666
	95% Confidence Value	2.2481	0.1152	0.0438	0.5109	0.1209	N/A	N/A	0.1312
	Upper Bound (95% CI)	8.8508	0.4149	0.3720	2.4163	1.2018	N/A	N/A	0.6507
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
30	Total Samples	19	2	2	17	19	0	0	19
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	5.6809	0.2290	0.3170	1.5757	1.1458	N/A	N/A	0.5996
	StdDev of Results	6.3214	0.0438	0.0792	1.3160	0.3130	N/A	N/A	0.3199
	95% Confidence Value	2.8424	0.0608	0.1098	0.6256	0.1407	N/A	N/A	0.1438
	Upper Bound (95% CI)	8.5233	0.2898	0.4268	2.2013	1.2865	N/A	N/A	0.7434
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
35	Total Samples	4	2	2	3	4	0	0	4
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	5.5015	0.2170	0.2565	1.4410	1.1893	N/A	N/A	0.5396
	StdDev of Results	6.5493	0.1386	0.0813	1.3257	0.2319	N/A	N/A	0.2127
	95% Confidence Value	6.4182	0.1921	0.1127	1.5002	0.2272	N/A	N/A	0.2085
	Upper Bound (95% CI)	11.9197	0.4091	0.3692	2.9412	1.4165	N/A	N/A	0.7481
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
40	Total Samples	2	2	2	2	2	0	0	2
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0097	0.3115	0.2830	0.5410	0.8525	N/A	N/A	1.1800
	StdDev of Results	0.0093	0.0587	0.0141	0.0721	0.0035	N/A	N/A	0.0000
	95% Confidence Value	0.0129	0.0813	0.0196	0.1000	0.0049	N/A	N/A	0.0000
	Upper Bound (95% CI)	0.0226	0.3928	0.3026	0.6410	0.8574	N/A	N/A	1.1800
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-

Summary	Plutonium 238	Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-214	Bismuth-214	Lead-210
Total Total Samples	292	34	34	273	292	5	1	292
leanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
Total Average of All Samples	7.3436	0.2790	0.3142	2.2821	1.1336	1.0496	1.0700	0.5324
Total StdDev of Results	5.8516	0.1122	0.0796	1.3308	0.4278	0.1156	N/A	0.3071
95% Confidence Value	0.6712	0.0377	0.0267	0.1579	0.0491	0.1013	N/A	0.0352
Upper Bound (95% CI)	8.0148	0.3167	0.3410	2.4399	1.1827	1.1509	N/A	0.5676
Total Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
Total Maxi	-	-	-	-	-	-	-	-
Total Minim	-	-	-	-	-	-	-	-

PRS 66/80/40 Characterization Summary
AREA IV

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Bismuth-210M	Plutonium 239/240	Pu-239 Daughters: Uranium-235	Pu-239 Daughters: Actinium-227	Thorium-232	Th-232 Daughters: Radium-228	Th-232 Daughters: Thorium-228	Th-232 Daughters: Radium-224
0	Total Samples	13	13	5	49	49	13	13	1
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0466	0.0072	0.0192	0.3210	1.0298	1.5055	1.2396	0.7280
	StdDev of Results	0.0067	0.0039	0.0133	0.6898	0.8900	0.8702	0.9721	N/A
	95% Confidence Value	0.0036	0.0021	0.0116	0.1931	0.2492	0.4730	0.5284	N/A
	Upper Bound (95% CI)	0.0503	0.0093	0.0308	0.5141	1.2790	1.9786	1.7681	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	3	1	1	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	4.74	3.93	4.01	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	3.53	3.93	4.01	-
5	Total Samples	13	13	5	49	49	13	13	1
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0454	0.0080	0.0224	0.2568	0.6726	1.0551	0.8592	0.8600
	StdDev of Results	0.0081	0.0046	0.0174	0.3637	0.3895	0.5306	0.5483	N/A
	95% Confidence Value	0.0044	0.0025	0.0152	0.1018	0.1091	0.2884	0.2981	N/A
	Upper Bound (95% CI)	0.0497	0.0105	0.0376	0.3587	0.7817	1.3435	1.1573	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	2	1	1	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	2.62	2.6	2.57	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	2.12	2.6	2.57	-
10	Total Samples	12	12	4	47	47	12	12	1
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0471	0.0075	0.0140	0.2229	0.5881	1.0629	0.7241	0.8990
	StdDev of Results	0.0085	0.0077	0.0023	0.2716	0.1799	0.1967	0.1293	N/A
	95% Confidence Value	0.0048	0.0043	0.0022	0.0776	0.0514	0.1113	0.0731	N/A
	Upper Bound (95% CI)	0.0519	0.0118	0.0162	0.3005	0.6396	1.1742	0.7972	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
15	Total Samples	12	12	5	48	48	12	13	1
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0453	0.0073	0.0123	0.2317	0.8157	1.0696	0.7453	1.1400
	StdDev of Results	0.0064	0.0069	0.0021	0.3010	0.8760	0.2763	0.2082	N/A
	95% Confidence Value	0.0036	0.0039	0.0018	0.0852	0.2478	0.1563	0.1132	N/A
	Upper Bound (95% CI)	0.0490	0.0112	0.0142	0.3169	1.0636	1.2259	0.8585	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	2	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	5.5	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	4.09	-	-	-
20	Total Samples	13	13	5	44	44	13	13	1
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0464	0.0097	0.0196	0.4417	0.9583	1.4006	1.2468	0.5070
	StdDev of Results	0.0101	0.0063	0.0103	0.9998	0.7309	1.0441	1.0730	N/A
	95% Confidence Value	0.0055	0.0034	0.0091	0.2954	0.2160	0.5676	0.5833	N/A
	Upper Bound (95% CI)	0.0519	0.0131	0.0286	0.7371	1.1743	1.9682	1.8301	N/A
	Number of Detections > or = 10-5 CO	0	0	0	1	5	2	2	0
	Maximum of Detections > or = 10-5 CO	-	-	-	6.04	3.36	3.86	3.59	-
	Minimum of Detections > or = 10-5 CO	-	-	-	6.04	2.19	3.32	3.44	-
25	Total Samples	11	11	4	30	30	11	12	0
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0457	0.0079	0.0107	0.2951	0.6487	1.2849	0.9360	N/A
	StdDev of Results	0.0068	0.0081	0.0015	0.3817	0.2703	0.3909	0.4263	N/A
	95% Confidence Value	0.0040	0.0048	0.0015	0.1366	0.0967	0.2310	0.2412	N/A
	Upper Bound (95% CI)	0.0497	0.0127	0.0122	0.4317	0.7454	1.5159	1.1772	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
30	Total Samples	9	9	2	19	19	9	10	0
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0485	0.0080	0.0174	0.4556	0.6756	1.0507	0.7531	N/A
	StdDev of Results	0.0138	0.0056	0.0023	0.6931	0.2048	0.4690	0.2108	N/A
	95% Confidence Value	0.0090	0.0037	0.0031	0.3117	0.0921	0.3064	0.1306	N/A
	Upper Bound (95% CI)	0.0575	0.0117	0.0205	0.7673	0.7677	1.3571	0.8837	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
35	Total Samples	2	2	2	4	4	2	2	0
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0513	0.0073	0.0120	0.3586	0.8193	1.3750	0.9210	N/A
	StdDev of Results	0.0024	0.0012	0.0026	0.3378	0.2034	0.3889	0.3804	N/A
	95% Confidence Value	0.0033	0.0017	0.0036	0.3310	0.1993	0.5390	0.5272	N/A
	Upper Bound (95% CI)	0.0546	0.0090	0.0156	0.6896	0.8185	1.9140	1.4482	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
40	Total Samples	2	2	2	2	2	2	2	0
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0445	0.0078	0.0151	0.5103	0.4065	0.4950	0.5210	N/A
	StdDev of Results	0.0044	0.0020	0.0044	0.4154	0.0205	0.0580	0.1471	N/A
	95% Confidence Value	0.0061	0.0027	0.0061	0.5757	0.0284	0.0804	0.2038	N/A
	Upper Bound (95% CI)	0.0506	0.0105	0.0212	1.0860	0.4349	0.5754	0.7248	N/A
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-

Summary	Bismuth-210M	Plutonium 239/240	Uranium-235	Actinium-227	Thorium-232	Radium-228	Thorium-228	Radium-224
Total Total Samples	87	87	34	292	292	87	90	5
leanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
Total Average of All Samples	0.0464	0.0079	0.0163	0.3059	0.7807	1.2002	0.9280	0.8268
Total StdDev of Results	0.0083	0.0060	0.0095	0.5721	0.6334	0.6290	0.6382	0.2326
95% Confidence Value	0.0017	0.0013	0.0032	0.0656	0.0727	0.1322	0.1319	0.2039
Upper Bound (95% CI)	0.0482	0.0092	0.0195	0.3715	0.8534	1.3324	1.0598	1.0307
Total Number of Detections > or = 10-5 CO	0	0	0	1	12	4	4	0
Total Maxi	-	-	-	6.04	5.5	3.93	4.01	-
Total Minim	-	-	-	-	2.12	2.6	2.57	-

PRS 66/80/40 Characterization Summary
AREA IV

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Th-232 Daughters		Americium-241	Bismuth-207	Cesium-137	Cobalt-60	Potassium-40	Tritium	Grand Total
		Lead-212	Thallium-208							
0	Total Samples	1	0	49	13	49	49	13	5	537
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	0.6890	N/A	0.0721	0.0309	0.0336	0.0267	20.5977	0.3926	
	StdDev of Results	N/A	N/A	0.0724	0.0054	0.0191	0.0135	5.7940	0.2014	
	95% Confidence Value	N/A	N/A	0.0203	0.0029	0.0053	0.0038	3.1496	0.1766	
	Upper Bound (95% CI)	N/A	N/A	0.0924	0.0338	0.0389	0.0305	23.7473	0.5692	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
5	Total Samples	1	0	49	13	49	49	13	5	540
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	0.8140	N/A	0.0825	0.0291	0.0562	0.0265	18.6377	0.7244	
	StdDev of Results	N/A	N/A	0.1118	0.0060	0.0809	0.0142	5.7775	0.5543	
	95% Confidence Value	N/A	N/A	0.0313	0.0033	0.0226	0.0040	3.1406	0.4859	
	Upper Bound (95% CI)	N/A	N/A	0.1138	0.0324	0.0789	0.0305	21.7783	1.2103	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
10	Total Samples	1	0	47	12	47	47	12	4	512
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	0.8510	N/A	0.0651	0.0298	0.0565	0.0255	22.1583	1.8778	
	StdDev of Results	N/A	N/A	0.0750	0.0051	0.1312	0.0159	6.9795	1.3729	
	95% Confidence Value	N/A	N/A	0.0214	0.0029	0.0375	0.0046	3.9490	1.3454	
	Upper Bound (95% CI)	N/A	N/A	0.0866	0.0327	0.0940	0.0301	26.1073	3.2232	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
15	Total Samples	1	1	48	12	48	48	12	5	528
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	1.0700	0.3040	0.0552	0.0292	0.0640	0.0231	19.2258	1.0708	
	StdDev of Results	N/A	N/A	0.0568	0.0042	0.1404	0.0120	4.1097	0.9860	
	95% Confidence Value	N/A	N/A	0.0161	0.0024	0.0397	0.0034	2.3252	0.8642	
	Upper Bound (95% CI)	N/A	N/A	0.0713	0.0315	0.1038	0.0265	21.5511	1.9350	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
20	Total Samples	1	0	44	13	44	44	13	5	495
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	0.4790	N/A	0.0748	0.0297	0.0604	0.0247	18.5538	0.4302	
	StdDev of Results	N/A	N/A	0.0890	0.0065	0.0788	0.0127	6.3211	0.3043	
	95% Confidence Value	N/A	N/A	0.0263	0.0035	0.0233	0.0037	3.4361	0.2668	
	Upper Bound (95% CI)	N/A	N/A	0.1011	0.0332	0.0837	0.0284	21.9900	0.6969	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
25	Total Samples	0	0	30	11	30	30	11	4	350
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	N/A	N/A	0.0916	0.0324	0.1090	0.0303	21.7364	0.4643	
	StdDev of Results	N/A	N/A	0.0912	0.0042	0.2846	0.0148	7.0831	0.4717	
	95% Confidence Value	N/A	N/A	0.0326	0.0025	0.1019	0.0053	4.1858	0.4622	
	Upper Bound (95% CI)	N/A	N/A	0.1242	0.0348	0.2108	0.0356	25.9221	0.9265	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
30	Total Samples	0	0	19	9	19	19	9	2	232
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	N/A	N/A	0.1345	0.0323	0.0315	0.0313	20.8544	0.6145	
	StdDev of Results	N/A	N/A	0.1738	0.0097	0.0167	0.0168	7.7783	0.6583	
	95% Confidence Value	N/A	N/A	0.0782	0.0064	0.0075	0.0075	5.0804	0.9124	
	Upper Bound (95% CI)	N/A	N/A	0.2126	0.0386	0.0390	0.0389	25.7348	1.5269	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
35	Total Samples	0	0	4	2	4	4	2	2	55
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	N/A	N/A	0.1612	0.0371	0.0309	0.0335	22.6500	0.9115	
	StdDev of Results	N/A	N/A	0.1850	0.0047	0.0162	0.0181	5.4447	0.3656	
	95% Confidence Value	N/A	N/A	0.1813	0.0065	0.0158	0.0177	7.5459	0.5066	
	Upper Bound (95% CI)	N/A	N/A	0.3425	0.0436	0.0467	0.0513	30.1959	1.4181	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
40	Total Samples	0	0	2	2	2	2	2	2	38
	Cleanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
	Average of All Samples	N/A	N/A	0.0988	0.0272	0.0356	0.0385	13.8000	0.2275	
	StdDev of Results	N/A	N/A	0.0598	0.0014	0.0049	0.0056	0.5657	0.1223	
	95% Confidence Value	N/A	N/A	0.0828	0.0020	0.0068	0.0078	0.7840	0.1695	
	Upper Bound (95% CI)	N/A	N/A	0.1816	0.0291	0.0424	0.0463	14.5840	0.3970	
	Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
	Maximum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	
	Minimum of Detections > or = 10-5 CO	-	-	-	-	-	-	-	-	

Summary	Lead-212	Thallium-208	Americium-241	Bismuth-207	Cesium-137	Cobalt-60	Potassium-40	Tritium	Grand Total
Total Total Samples	5	1	292	87	292	292	87	34	3287
leanup Objective	2.1	2.1	63	1.75	3.82	0.9	1000	235001.6	
Total Average of All Samples	0.7806	0.3040	0.0778	0.0304	0.0577	0.0264	20.0662	0.7637	
Total StdDev of Results	0.2175	N/A	0.0950	0.0059	0.1284	0.0142	6.1630	0.7836	
95% Confidence Value	0.1906	N/A	0.0109	0.0012	0.0147	0.0016	1.2950	0.2634	
Upper Bound (95% CI)	0.9712	N/A	0.0887	0.0317	0.0724	0.0281	21.3612	1.0271	
Total Number of Detections > or = 10-5 CO	0	0	0	0	0	0	0	0	
Total Maxi	-	-	-	-	-	-	-	-	
Total Minim	-	-	-	-	-	-	-	-	

APPENDIX C

Radiological Data Chart Summaries
Below Fill Till

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-238	Uranium-238	Pu-238 and U-238 Daughters					
				Uranium-234	Thorium-230	Radium-226	Lead-214	Bismuth-214	Lead-210
45	Num of Samples	10	9	9	10	10	3	0	10
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	1.2797	0.4234	0.3803	0.9477	0.9835	1.0227	N/A	0.9104
	Std Dev of Results	3.3189	0.0876	0.0605	1.1201	0.1543	0.1789	N/A	0.3363
	95% Confidence Value	2.0570	0.0573	0.0395	0.6942	0.0956	0.2025	N/A	0.2085
	Upper Bound (95% CI)	3.3367	0.4807	0.4199	1.6419	1.0791	1.2252	N/A	1.1188
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	10.52	0.548	0.491	4.128	1.21	1.18	-	1.38
50	Num of Samples	10	8	8	10	10	2	0	10
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	2.8361	0.4014	0.3869	1.3925	0.8828	0.8785	N/A	0.9090
	Std Dev of Results	5.7352	0.0447	0.0421	1.6408	0.2676	0.1294	N/A	0.4957
	95% Confidence Value	3.5546	0.0310	0.0292	1.0170	0.1659	0.1793	N/A	0.3072
	Upper Bound (95% CI)	6.3907	0.4323	0.4161	2.4094	1.0486	1.0578	N/A	1.2163
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	15.63	0.462	0.437	4.7165	1.538	0.97	-	1.67
55	Num of Samples	7	5	5	7	7	1	0	7
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	1.2780	0.4254	0.3906	1.0290	0.9610	1.0100	N/A	0.8132
	Std Dev of Results	2.1395	0.0700	0.1061	0.7741	0.1552	N/A	N/A	0.5051
	95% Confidence Value	1.5849	0.0613	0.0930	0.5735	0.1149	N/A	N/A	0.3742
	Upper Bound (95% CI)	2.8629	0.4867	0.4836	1.6025	1.0759	N/A	N/A	1.1874
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	4.4465	0.538	0.51	2.2395	1.11	1.01	-	1.56
60	Num of Samples	7	6	6	7	7	1	0	7
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	1.6142	0.3963	0.3848	1.0393	0.8428	0.8080	N/A	0.8716
	Std Dev of Results	4.2335	0.0803	0.1009	1.3370	0.1800	N/A	N/A	0.3506
	95% Confidence Value	3.1362	0.0642	0.0807	0.9904	0.1333	N/A	N/A	0.2597
	Upper Bound (95% CI)	4.7504	0.4606	0.4655	2.0297	0.9762	N/A	N/A	1.1313
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	11.215	0.496	0.573	4.055	1.04	0.808	-	1.32
65	Num of Samples	8	6	6	7	8	1	1	8
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	3.4701	0.3280	0.3450	1.1159	0.8590	0.7730	0.6180	0.8656
	Std Dev of Results	6.3979	0.1417	0.1234	1.6672	0.1860	N/A	N/A	0.3412
	95% Confidence Value	4.4335	0.1134	0.0988	1.2351	0.1289	N/A	N/A	0.2364
	Upper Bound (95% CI)	7.9036	0.4414	0.4438	2.3510	0.9879	N/A	N/A	1.1020
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	14.31	0.581	0.539	4.8925	1.165	0.773	0.618	1.32
70	Num of Samples	9	7	7	9	9	2	0	9
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	1.0477	0.3180	0.3620	0.9773	0.9563	0.8515	N/A	0.7523
	Std Dev of Results	2.0717	0.1021	0.0926	0.9145	0.4748	0.1860	N/A	0.2230
	95% Confidence Value	1.3535	0.0757	0.0686	0.5975	0.3102	0.2577	N/A	0.1457
	Upper Bound (95% CI)	2.4012	0.3937	0.4306	1.5748	1.2665	1.1092	N/A	0.8980
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	5.175	0.446	0.502	2.719	2.047	0.983	-	1.07
75	Num of Samples	8	6	6	8	8	1	0	8
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	2.4623	0.3690	0.3532	1.2228	0.9179	0.7730	N/A	0.5589
	Std Dev of Results	4.5475	0.0374	0.0568	1.2361	0.2695	N/A	N/A	0.2034
	95% Confidence Value	3.1512	0.0300	0.0454	0.8566	0.1868	N/A	N/A	0.1409
	Upper Bound (95% CI)	5.6135	0.3990	0.3986	2.0793	1.1046	N/A	N/A	0.6998
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	9.87	0.424	0.466	3.359	1.413	0.773	-	0.899
80	Num of Samples	7	6	6	7	7	2	0	7
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	1.5722	0.4098	0.3653	1.0620	0.7689	0.8680	N/A	0.6438
	Std Dev of Results	4.1397	0.0879	0.0284	1.1920	0.1987	0.3705	N/A	0.2439
	95% Confidence Value	3.0666	0.0703	0.0227	0.8830	0.1472	0.5135	N/A	0.1807
	Upper Bound (95% CI)	4.6388	0.4801	0.3881	1.9450	0.9160	1.3815	N/A	0.8245
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	10.96	0.534	0.412	3.75	1.067	1.13	-	1.05
85	Num of Samples	7	6	6	7	7	2	0	7
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.6562	0.4207	0.4632	0.7207	0.8793	1.0350	N/A	0.9323
	Std Dev of Results	1.7034	0.0391	0.0888	0.5543	0.1619	0.0212	N/A	0.4735
	95% Confidence Value	1.2618	0.0313	0.0710	0.4106	0.1199	0.0294	N/A	0.3508
	Upper Bound (95% CI)	1.9180	0.4519	0.5342	1.1314	0.9992	1.0644	N/A	1.2831
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	4.519	0.457	0.57	1.953	1.179	1.05	-	1.6
90	Num of Samples	5	5	5	5	5	2	1	5
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Bismuth-210M	Plutonium-239/240	Pu-239 Daughters		Thorium-232	Th-232 Daughters		
				Uranium-235	Actinium-227		Radium-228	Actinium 228	Thorium-228
45	Num of Samples	9	9	9	10	10	9	0	9
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0428	0.0085	0.0136	0.2770	0.4037	0.5556	N/A	0.4852
	Std Dev of Results	0.0051	0.0060	0.0039	0.1648	0.0544	0.1702	N/A	0.0433
	95% Confidence Value	0.0033	0.0039	0.0025	0.1022	0.0337	0.1112	N/A	0.0283
	Upper Bound (95% CI)	0.0461	0.0124	0.0161	0.3792	0.4374	0.6667	N/A	0.5135
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0498	0.0226	0.0206	0.704	0.514	0.759	-	0.567
50	Num of Samples	8	8	8	10	10	8	0	8
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0379	0.0117	0.0173	0.3139	0.3625	0.4829	N/A	0.4891
	Std Dev of Results	0.0066	0.0112	0.0058	0.2811	0.0983	0.1836	N/A	0.1258
	95% Confidence Value	0.0046	0.0078	0.0040	0.1742	0.0609	0.1272	N/A	0.0872
	Upper Bound (95% CI)	0.0425	0.0194	0.0213	0.4882	0.4234	0.6102	N/A	0.5763
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04645	0.03645	0.0279	1.07	0.523	0.743	-	0.638
55	Num of Samples	5	5	5	7	7	5	0	5
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0439	0.0069	0.0178	0.1793	0.3990	0.7664	N/A	0.6362
	Std Dev of Results	0.0050	0.0045	0.0085	0.0659	0.0944	0.2566	N/A	0.1677
	95% Confidence Value	0.0044	0.0040	0.0074	0.0488	0.0699	0.2249	N/A	0.1470
	Upper Bound (95% CI)	0.0482	0.0109	0.0253	0.2281	0.4690	0.9913	N/A	0.7832
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04745	0.01265	0.0305	0.2435	0.506	1.13	-	0.746
60	Num of Samples	6	6	6	7	7	6	0	6
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0413	0.0080	0.0143	0.2039	0.4773	0.8028	N/A	0.5938
	Std Dev of Results	0.0067	0.0065	0.0048	0.0439	0.1434	0.4910	N/A	0.2743
	95% Confidence Value	0.0054	0.0052	0.0038	0.0325	0.1062	0.3929	N/A	0.2194
	Upper Bound (95% CI)	0.0466	0.0132	0.0181	0.2364	0.5835	1.1957	N/A	0.8133
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0486	0.0202	0.0197	0.268	0.731	1.69	-	0.972
65	Num of Samples	6	6	6	8	8	6	0	6
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0457	0.0075	0.0156	0.3271	0.4935	0.7997	N/A	0.7050
	Std Dev of Results	0.0039	0.0031	0.0082	0.3332	0.1038	0.3085	N/A	0.1965
	95% Confidence Value	0.0031	0.0025	0.0066	0.2309	0.0719	0.2468	N/A	0.1572
	Upper Bound (95% CI)	0.0488	0.0100	0.0221	0.5580	0.5654	1.0465	N/A	0.8622
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0525	0.013	0.0318	1.15	0.688	1.18	-	0.987
70	Num of Samples	7	7	7	9	9	7	1	7
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0417	0.0081	0.0184	0.4751	0.4359	0.5646	0.6790	0.5669
	Std Dev of Results	0.0020	0.0064	0.0125	0.4157	0.0928	0.2718	N/A	0.1172
	95% Confidence Value	0.0015	0.0048	0.0092	0.2716	0.0606	0.2013	#VALUE!	0.0868
	Upper Bound (95% CI)	0.0432	0.0129	0.0276	0.7467	0.4965	0.7659	#VALUE!	0.6537
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0437	0.02025	0.0457	1.14	0.59	1.05	0.679	0.763
75	Num of Samples	6	6	6	8	8	6	0	6
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0397	0.0047	0.0143	0.2479	0.3740	0.5463	N/A	0.5475
	Std Dev of Results	0.0108	0.0018	0.0065	0.1060	0.1472	0.3084	N/A	0.2186
	95% Confidence Value	0.0087	0.0015	0.0052	0.0735	0.1020	0.2468	N/A	0.1749
	Upper Bound (95% CI)	0.0483	0.0061	0.0195	0.3214	0.4759	0.7930	N/A	0.7224
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0605	0.00725	0.0263	0.422	0.656	1.07	-	0.902
80	Num of Samples	6	6	6	7	7	6	0	6
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0345	0.0090	0.0115	0.1631	0.3729	0.4494	N/A	0.5275
	Std Dev of Results	0.0048	0.0069	0.0013	0.0288	0.0987	0.2066	N/A	0.1056
	95% Confidence Value	0.0038	0.0055	0.0011	0.0213	0.0731	0.1653	N/A	0.0845
	Upper Bound (95% CI)	0.0383	0.0145	0.0126	0.1844	0.4460	0.6147	N/A	0.6120
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.03985	0.0206	0.0129	0.207	0.489	0.742	-	0.674
85	Num of Samples	6	6	6	7	7	6	0	6
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0397	0.0115	0.0159	0.1869	0.3517	0.7252	N/A	0.4877
	Std Dev of Results	0.0094	0.0085	0.0059	0.0627	0.1322	0.3434	N/A	0.1563
	95% Confidence Value	0.0075	0.0068	0.0048	0.0465	0.0979	0.2748	N/A	0.1251
	Upper Bound (95% CI)	0.0472	0.0183	0.0206	0.2334	0.4496	0.9999	N/A	0.6127
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0525	0.0234	0.0272	0.257	0.464	1.26	-	0.61
90	Num of Samples	5	5	5	5	5	5	0	5
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Th-232 Daughters			Americium-241	Bismuth-207	Cesium-137	Cobalt-60
		Radium-224	Lead-212	Thallium-208				
45	Num of Samples	3	3	1	10	9	10	10
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.6760	0.6383	0.1680	0.1126	0.0271	0.0307	0.0348
	Std Dev of Results	0.1330	0.1227	N/A	0.1076	0.0028	0.0068	0.0070
	95% Confidence Value	0.1505	0.1389	N/A	0.0667	0.0018	0.0042	0.0043
	Upper Bound (95% CI)	0.8265	0.7772	N/A	0.1792	0.0289	0.0349	0.0391
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.815	0.765	0.168	0.3825	0.03115	0.03745	0.04515
50	Num of Samples	2	2	0	10	8	10	10
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.6515	0.6180	N/A	0.0872	0.0255	0.0306	0.0328
	Std Dev of Results	0.3231	0.3083	N/A	0.0447	0.0044	0.0066	0.0090
	95% Confidence Value	0.4479	0.4273	N/A	0.0277	0.0031	0.0041	0.0056
	Upper Bound (95% CI)	1.0994	1.0453	N/A	0.1149	0.0285	0.0347	0.0384
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.88	0.836	-	0.168	0.03215	0.0397	0.0472
55	Num of Samples	1	1	1	7	5	7	7
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.8450	0.8030	0.2570	0.0903	0.0275	0.0287	0.0287
	Std Dev of Results	N/A	N/A	N/A	0.0855	0.0052	0.0097	0.0096
	95% Confidence Value	N/A	N/A	N/A	0.0634	0.0045	0.0072	0.0071
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1537	0.0320	0.0358	0.0358
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.845	0.803	0.257	0.27	0.0316	0.037	0.0384
60	Num of Samples	1	1	0	7	6	7	7
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.5540	0.5240	N/A	0.0793	0.0264	0.0314	0.0332
	Std Dev of Results	N/A	N/A	N/A	0.0410	0.0040	0.0078	0.0070
	95% Confidence Value	N/A	N/A	N/A	0.0304	0.0032	0.0058	0.0052
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1097	0.0297	0.0371	0.0384
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.554	0.524	-	0.1395	0.03345	0.0464	0.04195
65	Num of Samples	1	1	1	8	6	8	8
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.5830	0.5530	0.2680	0.1073	0.0281	0.0331	0.0352
	Std Dev of Results	N/A	N/A	N/A	0.0826	0.0026	0.0048	0.0049
	95% Confidence Value	N/A	N/A	N/A	0.0572	0.0021	0.0033	0.0034
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1645	0.0302	0.0364	0.0386
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.583	0.553	0.268	0.3005	0.0313	0.03755	0.04205
70	Num of Samples	2	2	1	9	7	9	9
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.6500	0.6150	0.2580	0.1293	0.0276	0.0300	0.0340
	Std Dev of Results	0.0523	0.0509	N/A	0.0910	0.0019	0.0074	0.0029
	95% Confidence Value	0.0725	0.0706	N/A	0.0594	0.0014	0.0048	0.0019
	Upper Bound (95% CI)	0.7225	0.6856	N/A	0.1887	0.0290	0.0348	0.0359
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.687	0.651	0.258	0.338	0.03065	0.0383	0.03765
75	Num of Samples	1	1	1	8	6	8	8
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.3300	0.3130	0.1250	0.1294	0.0251	0.0266	0.0308
	Std Dev of Results	N/A	N/A	N/A	0.0857	0.0075	0.0093	0.0088
	95% Confidence Value	N/A	N/A	N/A	0.0594	0.0060	0.0065	0.0061
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1888	0.0311	0.0331	0.0369
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.33	0.313	0.125	0.2585	0.03875	0.04445	0.0472
80	Num of Samples	2	2	1	7	6	7	7
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.5545	0.5245	0.2400	0.0833	0.0234	0.0280	0.0304
	Std Dev of Results	0.2058	0.1945	N/A	0.0236	0.0040	0.0045	0.0046
	95% Confidence Value	0.2852	0.2695	N/A	0.0175	0.0032	0.0033	0.0034
	Upper Bound (95% CI)	0.8397	0.7940	N/A	0.1008	0.0265	0.0313	0.0338
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.7	0.662	0.24	0.12	0.0279	0.03365	0.03665
85	Num of Samples	2	2	0	7	6	7	7
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.7715	0.7305	N/A	0.0803	0.0256	0.0290	0.0312
	Std Dev of Results	0.0332	0.0304	N/A	0.0417	0.0049	0.0083	0.0103
	95% Confidence Value	0.0461	0.0421	N/A	0.0309	0.0039	0.0062	0.0077
	Upper Bound (95% CI)	0.8176	0.7726	N/A	0.1112	0.0295	0.0352	0.0389
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.795	0.752	-	0.156	0.0312	0.037	0.04515
90	Num of Samples	2	2	1	5	5	5	5
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Potassium-40	Tritium	Grand Total
45	Num of Samples	9	9	190
	Cleanup Objective	1000	235001.6	
	Average of All Samples	14.4000	0.2855	
	Std Dev of Results	1.6985	0.1675	
	95% Confidence Value	1.1097	0.1094	
	Upper Bound (95% CI)	15.5097	0.3950	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	16.4	0.512	
50	Num of Samples	8	8	176
	Cleanup Objective	1000	235001.6	
	Average of All Samples	13.0475	0.4009	
	Std Dev of Results	3.7389	0.3124	
	95% Confidence Value	2.5909	0.2165	
	Upper Bound (95% CI)	15.6384	0.6174	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	18.3	0.914	
55	Num of Samples	5	5	117
	Cleanup Objective	1000	235001.6	
	Average of All Samples	16.3600	0.2740	
	Std Dev of Results	4.3935	0.2345	
	95% Confidence Value	3.8510	0.2056	
	Upper Bound (95% CI)	20.2110	0.4796	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	21.6	0.531	
60	Num of Samples	6	6	126
	Cleanup Objective	1000	235001.6	
	Average of All Samples	18.3967	0.2698	
	Std Dev of Results	8.9626	0.1964	
	95% Confidence Value	7.1715	0.1571	
	Upper Bound (95% CI)	25.5681	0.4269	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	34	0.57	
65	Num of Samples	6	6	136
	Cleanup Objective	1000	235001.6	
	Average of All Samples	19.7500	0.3264	
	Std Dev of Results	7.0679	0.1714	
	95% Confidence Value	5.6554	0.1371	
	Upper Bound (95% CI)	25.4054	0.4635	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	31.1	0.497	
70	Num of Samples	7	7	159
	Cleanup Objective	1000	235001.6	
	Average of All Samples	17.9286	0.2760	
	Std Dev of Results	6.0188	0.1693	
	95% Confidence Value	4.4587	0.1254	
	Upper Bound (95% CI)	22.3873	0.4014	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	27.8	0.615	
75	Num of Samples	6	6	136
	Cleanup Objective	1000	235001.6	
	Average of All Samples	13.1083	0.3697	
	Std Dev of Results	8.9583	0.1633	
	95% Confidence Value	7.1680	0.1306	
	Upper Bound (95% CI)	20.2763	0.5003	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	30.5	0.647	
80	Num of Samples	6	6	130
	Cleanup Objective	1000	235001.6	
	Average of All Samples	11.5350	0.3370	
	Std Dev of Results	3.5396	0.1610	
	95% Confidence Value	2.8322	0.1288	
	Upper Bound (95% CI)	14.3672	0.4658	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	16.2	0.528	
85	Num of Samples	6	6	129
	Cleanup Objective	1000	235001.6	
	Average of All Samples	15.7017	0.3876	
	Std Dev of Results	5.6026	0.1759	
	95% Confidence Value	4.4829	0.1407	
	Upper Bound (95% CI)	20.1846	0.5283	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	22.9	0.622	
90	Num of Samples	5	5	103
	Cleanup Objective	1000	235001.6	

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Plutonium-238	Uranium-238	Pu-238 and U-238 Daughters					
				Uranium-234	Thorium-230	Radium-226	Lead-214	Bismuth-214	Lead-210
	Average of All Samples	0.0075	0.4130	0.5118	0.4938	0.8840	0.9610	0.8590	1.0432
	Std Dev of Results	0.0064	0.1509	0.2302	0.0860	0.0676	0.0042	N/A	0.4982
	95% Confidence Value	0.0056	0.1323	0.2017	0.0754	0.0592	0.0059	N/A	0.4367
	Upper Bound (95% CI)	0.0131	0.5453	0.7135	0.5692	0.9432	0.9669	N/A	1.4799
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0185	0.649	0.803	0.589	0.998	0.964	0.859	1.86
95	Num of Samples	4	4	4	4	4	1	0	4
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0063	0.3088	0.3783	0.5325	0.6910	0.6250	N/A	0.5880
	Std Dev of Results	0.0017	0.2022	0.2021	0.1164	0.2369	N/A	N/A	0.1786
	95% Confidence Value	0.0017	0.1981	0.1980	0.1141	0.2321	N/A	N/A	0.1750
	Upper Bound (95% CI)	0.0080	0.5069	0.5763	0.6466	0.9231	N/A	N/A	0.7630
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.00845	0.599	0.637	0.625	1.04	0.625	-	0.78
99	Num of Samples	1	1	1	1	1	1	0	1
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0097	0.2150	0.3210	0.4480	0.7740	1.0900	N/A	0.6000
	Std Dev of Results	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	95% Confidence Value	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0097	0.215	0.321	0.448	0.774	1.09	-	0.6
100	Num of Samples	3	3	3	3	3	0	0	3
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0056	0.2944	0.3038	0.2898	0.4907	N/A	N/A	0.2967
	Std Dev of Results	0.0010	0.2626	0.2455	0.2729	0.2478	N/A	N/A	0.0513
	95% Confidence Value	0.0011	0.2972	0.2779	0.3088	0.2804	N/A	N/A	0.0580
	Upper Bound (95% CI)	0.0067	0.5916	0.5817	0.5986	0.7710	N/A	N/A	0.3547
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.00665	0.576	0.56	0.576	0.647	-	-	0.348
105	Num of Samples	3	3	3	3	3	0	0	3
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0173	0.5183	0.7820	0.4120	0.8753	N/A	N/A	0.7430
	Std Dev of Results	0.0217	0.0864	0.2189	0.0416	0.2508	N/A	N/A	0.3101
	95% Confidence Value	0.0246	0.0978	0.2477	0.0471	0.2838	N/A	N/A	0.3509
	Upper Bound (95% CI)	0.0419	0.6161	1.0297	0.4591	1.1592	N/A	N/A	1.0939
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0424	0.611	0.961	0.444	1.11	-	-	1.1
110	Num of Samples	2	2	2	2	2	0	0	2
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0044	0.4095	0.6145	0.3265	1.1250	N/A	N/A	1.4145
	Std Dev of Results	0.0026	0.1011	0.0021	0.0445	0.1485	N/A	N/A	0.8280
	95% Confidence Value	0.0036	0.1401	0.0029	0.0617	0.2058	N/A	N/A	1.1476
	Upper Bound (95% CI)	0.0080	0.5496	0.6174	0.3882	1.3308	N/A	N/A	2.5621
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.00628	0.481	0.616	0.358	1.23	-	-	2
115	Num of Samples	2	2	2	2	2	0	0	2
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0071	0.5220	0.5400	0.4270	0.6795	N/A	N/A	0.7640
	Std Dev of Results	0.0049	0.0552	0.1527	0.0438	0.1450	N/A	N/A	0.2107
	95% Confidence Value	0.0068	0.0764	0.2117	0.0608	0.2009	N/A	N/A	0.2920
	Upper Bound (95% CI)	0.0138	0.5984	0.7517	0.4878	0.8804	N/A	N/A	1.0560
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.0105	0.561	0.648	0.458	0.782	-	-	0.913
125	Num of Samples	2	2	2	2	2	0	0	2
	Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
	Average of All Samples	0.0191	0.2245	0.5130	0.4975	0.7940	N/A	N/A	0.9100
	Std Dev of Results	0.0202	0.1450	0.1824	0.1365	0.0679	N/A	N/A	0.4101
	95% Confidence Value	0.0280	0.2009	0.2528	0.1891	0.0941	N/A	N/A	0.5684
	Upper Bound (95% CI)	0.0471	0.4254	0.7658	0.6866	0.8881	N/A	N/A	1.4784
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.03335	0.327	0.642	0.594	0.842	-	-	1.2

ummary	Plutonium-238	Uranium-238	Uranium-234	Thorium-230	Radium-226	Lead-214	Bismuth-214	Lead-210
Num of Samples	95	81	81	94	95	19	2	95
Cleanup Objective	55	2.2	106.1	10	2.9	2.9	2.9	7.4
erage of All Samples	1.4115	0.3850	0.4131	0.9192	0.8726	0.9124	0.7385	0.8068
Std Dev of Results	3.6148	0.1149	0.1454	1.0556	0.2476	0.1686	0.1704	0.3865
Confidence Value	0.7269	0.0250	0.0317	0.2134	0.0498	0.0758	0.2362	0.0777
r Bound (95% CI)	2.1384	0.4100	0.4447	1.1326	0.9224	0.9882	0.9747	0.8846
f detections > or = 10-5 CO	0	0	0	0	0	0	0	0
x of Sample Results	15.63	0.649	0.961	4.8925	2.047	1.18	0.859	2

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Bismuth-210M	Plutonium-239/240	Pu-239 Daughters Uranium-235	Pu-239 Daughters Actinium-227	Thorium-232	Th-232 Daughters Radium-228	Th-232 Daughters Actinium 228	Th-232 Daughters Thorium-228
45	Average of All Samples	0.0377	0.0059	0.0229	0.1905	0.3974	0.5824	N/A	0.4466
	Std Dev of Results	0.0055	0.0035	0.0186	0.0197	0.1293	0.1234	N/A	0.1325
	95% Confidence Value	0.0048	0.0031	0.0163	0.0173	0.1133	0.1081	N/A	0.1162
	Upper Bound (95% CI)	0.0425	0.0090	0.0392	0.2078	0.5107	0.6905	N/A	0.5628
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04675	0.01045	0.0498	0.224	0.573	0.745	-	0.599
95	Num of Samples	4	4	4	4	4	4	0	4
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0357	0.0062	0.0179	0.1829	0.4545	0.6819	N/A	0.6150
	Std Dev of Results	0.0109	0.0036	0.0093	0.0619	0.2138	0.4927	N/A	0.2029
	95% Confidence Value	0.0107	0.0035	0.0091	0.0607	0.2095	0.4828	N/A	0.1988
	Upper Bound (95% CI)	0.0464	0.0097	0.0270	0.2435	0.6640	1.1647	N/A	0.8138
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04925	0.01	0.0318	0.2665	0.762	1.32	-	0.831
99	Num of Samples	1	1	1	1	1	1	0	1
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0422	0.0097	0.0125	0.2295	0.5430	0.5860	N/A	0.6350
	Std Dev of Results	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	95% Confidence Value	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04215	0.0097	0.0125	0.2295	0.543	0.586	-	0.635
100	Num of Samples	3	3	3	3	3	3	0	3
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0375	0.0082	0.0121	0.4267	0.2090	0.4407	N/A	0.2734
	Std Dev of Results	0.0085	0.0024	0.0010	0.2740	0.1525	0.3454	N/A	0.1939
	95% Confidence Value	0.0097	0.0027	0.0011	0.3100	0.1725	0.3909	N/A	0.2194
	Upper Bound (95% CI)	0.0471	0.0109	0.0132	0.7367	0.3815	0.8315	N/A	0.4928
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04415	0.01095	0.01295	0.677	0.297	0.83	-	0.459
105	Num of Samples	3	3	3	3	3	3	0	3
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0445	0.0044	0.0176	0.2450	0.3773	0.9107	N/A	0.5717
	Std Dev of Results	0.0148	0.0019	0.0107	0.0975	0.1599	0.6168	N/A	0.3479
	95% Confidence Value	0.0168	0.0021	0.0121	0.1103	0.1809	0.6980	N/A	0.3937
	Upper Bound (95% CI)	0.0612	0.0065	0.0297	0.3553	0.5582	1.6087	N/A	0.9654
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.054	0.00585	0.02945	0.304	0.498	1.38	-	0.779
110	Num of Samples	2	2	2	2	2	2	0	2
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0496	0.0052	0.0127	0.6575	0.5740	1.0285	N/A	0.6900
	Std Dev of Results	0.0034	0.0003	0.0019	0.5692	0.0424	0.5819	N/A	0.0438
	95% Confidence Value	0.0048	0.0004	0.0026	0.7889	0.0588	0.8065	N/A	0.0608
	Upper Bound (95% CI)	0.0543	0.0056	0.0153	1.4464	0.6328	1.8350	N/A	0.7508
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.052	0.0054	0.014	1.06	0.604	1.44	-	0.721
115	Num of Samples	2	2	2	2	2	2	0	2
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0368	0.0070	0.0150	0.1735	0.4115	0.5515	N/A	0.4950
	Std Dev of Results	0.0129	0.0048	0.0005	0.0721	0.2708	0.2086	N/A	0.2135
	95% Confidence Value	0.0179	0.0067	0.0007	0.1000	0.3753	0.2891	N/A	0.2960
	Upper Bound (95% CI)	0.0547	0.0137	0.0158	0.2735	0.7868	0.8406	N/A	0.7910
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04595	0.01045	0.0154	0.2245	0.603	0.699	-	0.646
125	Num of Samples	2	2	2	2	2	2	0	2
	Cleanup Objective	2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
	Average of All Samples	0.0444	0.0102	0.0178	0.5960	0.4760	0.9035	N/A	0.7510
	Std Dev of Results	0.0048	0.0081	0.0105	0.5218	0.0552	0.0205	N/A	0.1386
	95% Confidence Value	0.0066	0.0113	0.0146	0.7232	0.0764	0.0284	N/A	0.1921
	Upper Bound (95% CI)	0.0510	0.0215	0.0323	1.3192	0.5524	0.9319	N/A	0.9431
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0	0
	Max of Sample Results	0.04775	0.01595	0.0252	0.965	0.515	0.918	-	0.849
ummary		Bismuth-210M	Plutonium-239/240	Uranium-235	Actinium-227	Thorium-232	Radium-228	Actinium 228	Thorium-228
Num of Samples		81	81	81	95	95	81	1	81
Cleanup Objective		2.9	55	16.11	4.61	2.1	2.1	2.1	2.1
erage of All Samples		0.0406	0.0080	0.0159	0.2811	0.4080	0.6399	0.6790	0.5473
Std Dev of Results		0.0074	0.0061	0.0079	0.2385	0.1265	0.3189	N/A	0.1805
Confidence Value		0.0016	0.0013	0.0017	0.0480	0.0254	0.0694	#VALUE!	0.0393
r Bound (95% CI)		0.0422	0.0094	0.0176	0.3290	0.4334	0.7094	#VALUE!	0.5866
f detections > or = 10-5 CO		0	0	0	0	0	0	0	0
x of Sample Results		0.0605	0.03645	0.0498	1.15	0.762	1.69	0.679	0.987

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Th-232 Daughters			Americium-241	Bismuth-207	Cesium-137	Cobalt-60
		Radium-224	Lead-212	Thallium-208				
45	Average of Samples	0.6055	0.5755	0.2670	0.1070	0.0259	0.0298	0.0365
	Std Dev of Results	0.1039	0.1025	N/A	0.0498	0.0041	0.0067	0.0062
	95% Confidence Value	0.1441	0.1421	N/A	0.0436	0.0036	0.0059	0.0054
	Upper Bound (95% CI)	0.7496	0.7176	N/A	0.1506	0.0294	0.0358	0.0420
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.679	0.648	0.267	0.1705	0.0312	0.03865	0.04475
95	Num of Samples	1	1	0	4	4	4	4
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.5000	0.4730	N/A	0.0738	0.0244	0.0281	0.0325
	Std Dev of Results	N/A	N/A	N/A	0.0314	0.0075	0.0107	0.0110
	95% Confidence Value	N/A	N/A	N/A	0.0307	0.0073	0.0104	0.0107
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1045	0.0317	0.0385	0.0432
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.5	0.473	-	0.12	0.03475	0.04195	0.04835
99	Num of Samples	1	1	1	1	1	1	1
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	0.6260	0.5920	0.2910	0.0620	0.0244	0.0314	0.0344
	Std Dev of Results	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	95% Confidence Value	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Upper Bound (95% CI)	N/A	N/A	N/A	N/A	N/A	N/A	N/A
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	0.626	0.592	0.291	0.062	0.02435	0.0314	0.0344
100	Num of Samples	0	0	0	3	3	3	3
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	N/A	N/A	0.1708	0.0244	0.0280	0.0325
	Std Dev of Results	N/A	N/A	N/A	0.1328	0.0051	0.0042	0.0074
	95% Confidence Value	N/A	N/A	N/A	0.1502	0.0057	0.0047	0.0084
	Upper Bound (95% CI)	N/A	N/A	N/A	0.3211	0.0301	0.0327	0.0408
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	-	-	-	0.323	0.02875	0.03275	0.03695
105	Num of Samples	0	0	0	3	3	3	3
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	N/A	N/A	0.1654	0.0303	0.0364	0.0374
	Std Dev of Results	N/A	N/A	N/A	0.1955	0.0108	0.0138	0.0169
	95% Confidence Value	N/A	N/A	N/A	0.2212	0.0122	0.0157	0.0192
	Upper Bound (95% CI)	N/A	N/A	N/A	0.3866	0.0425	0.0521	0.0566
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	-	-	-	0.39	0.03785	0.04575	0.04755
110	Num of Samples	0	0	0	2	2	2	2
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	N/A	N/A	0.1458	0.0325	0.0408	0.0453
	Std Dev of Results	N/A	N/A	N/A	0.0322	0.0003	0.0030	0.0014
	95% Confidence Value	N/A	N/A	N/A	0.0446	0.0004	0.0041	0.0020
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1903	0.0330	0.0449	0.0473
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	-	-	-	0.1685	0.03275	0.0429	0.0463
115	Num of Samples	0	0	0	2	2	2	2
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	N/A	N/A	0.0828	0.0216	0.0289	0.0291
	Std Dev of Results	N/A	N/A	N/A	0.0230	0.0104	0.0097	0.0105
	95% Confidence Value	N/A	N/A	N/A	0.0318	0.0145	0.0134	0.0146
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1146	0.0360	0.0423	0.0437
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	-	-	-	0.099	0.02895	0.0357	0.0365
125	Num of Samples	0	0	0	2	2	2	2
	Cleanup Objective	2.1	2.1	2.1	63	1.75	3.82	0.9
	Average of All Samples	N/A	N/A	N/A	0.1208	0.0306	0.0366	0.0440
	Std Dev of Results	N/A	N/A	N/A	0.0272	0.0031	0.0029	0.0013
	95% Confidence Value	N/A	N/A	N/A	0.0377	0.0043	0.0040	0.0018
	Upper Bound (95% CI)	N/A	N/A	N/A	0.1585	0.0349	0.0405	0.0458
	Number of detections > or = 10-5 CO	0	0	0	0	0	0	0
	Max of Sample Results	-	-	-	0.14	0.0328	0.0386	0.0449
ummary		Radium-224	Lead-212	Thallium-208	Americium-241	Bismuth-207	Cesium-137	Cobalt-60
Num of Samples		19	19	8	95	81	95	95
Cleanup Objective		2.1	2.1	2.1	63	1.75	3.82	0.9
erage of All Samples		0.6280	0.5947	0.2343	0.1051	0.0263	0.0303	0.0333
Std Dev of Results		0.1525	0.1446	0.0572	0.0761	0.0049	0.0075	0.0079
Confidence Value		0.0686	0.0650	0.0396	0.0153	0.0011	0.0015	0.0016
r Bound (95% CI)		0.6966	0.6596	0.2739	0.1204	0.0274	0.0318	0.0349
f detections > or = 10-5 CO		0	0	0	0	0	0	0
x of Sample Results		0.88	0.836	0.291	0.39	0.03875	0.0464	0.04835

PRS 66/80/40 Characterization Summary
Below Fill Till (All Areas)

Starting Depth Interval	(COCs are in yellow, all analytes are organized into their primary decay chain where applicable)	Potassium-40	Tritium	Grand Total
45	Average of All Samples	14.1200	0.3298	
	Std Dev of Results	2.7170	0.1709	
	95% Confidence Value	2.3815	0.1498	
	Upper Bound (95% CI)	16.5015	0.4796	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	18.2	0.598	
95	Num of Samples	4	4	79
	Cleanup Objective	1000	235001.6	
	Average of All Samples	17.6950	0.2740	
	Std Dev of Results	10.8159	0.1463	
	95% Confidence Value	10.5994	0.1434	
	Upper Bound (95% CI)	28.2944	0.4174	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	31	0.375	
99	Num of Samples	1	1	23
	Cleanup Objective	1000	235001.6	
	Average of All Samples	18.4000	0.0320	
	Std Dev of Results	N/A	N/A	
	95% Confidence Value	N/A	N/A	
	Upper Bound (95% CI)	N/A	N/A	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	18.4	0.032	
100	Num of Samples	3	3	57
	Cleanup Objective	1000	235001.6	
	Average of All Samples	11.6033	0.5483	
	Std Dev of Results	5.7189	0.2680	
	95% Confidence Value	6.4714	0.3033	
	Upper Bound (95% CI)	18.0747	0.8516	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	18.1	0.76	
105	Num of Samples	3	3	57
	Cleanup Objective	1000	235001.6	
	Average of All Samples	19.5367	0.2467	
	Std Dev of Results	11.9381	0.1678	
	95% Confidence Value	13.5090	0.1899	
	Upper Bound (95% CI)	33.0456	0.4366	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	28.6	0.401	
110	Num of Samples	2	2	38
	Cleanup Objective	1000	235001.6	
	Average of All Samples	29.7000	0.5235	
	Std Dev of Results	9.1924	0.5197	
	95% Confidence Value	12.7397	0.7203	
	Upper Bound (95% CI)	42.4397	1.2438	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	36.2	0.891	
115	Num of Samples	2	2	38
	Cleanup Objective	1000	235001.6	
	Average of All Samples	12.3500	0.1450	
	Std Dev of Results	7.8489	0.0467	
	95% Confidence Value	10.8778	0.0647	
	Upper Bound (95% CI)	23.2278	0.2097	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	17.9	0.178	
125	Num of Samples	2	2	38
	Cleanup Objective	1000	235001.6	
	Average of All Samples	25.2000	0.5210	
	Std Dev of Results	2.9698	0.3295	
	95% Confidence Value	4.1159	0.4567	
	Upper Bound (95% CI)	29.3159	0.9777	
	Number of detections > or = 10-5 CO	0	0	
	Max of Sample Results	27.3	0.754	

ummary	Potassium-40	Tritium	Grand Total
Num of Samples	81	81	1732
Cleanup Objective	1000	235001.6	
erage of All Samples	16.0485	0.3304	
Std Dev of Results	6.7858	0.2075	
Confidence Value	1.4778	0.0452	
r Bound (95% CI)	17.5263	0.3756	
f detections > or = 10-5 CO	0	0	
x of Sample Results	36.2	0.914	

APPENDIX D

Chemical Data Summaries – Fill Area

PRS 66/80/40
Characterization Summary
VOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
1,1,1-Trichloroethane	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
1,1,2,2-Tetrachloroethane	Number of Samples	141	101	45	48	335
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
1,1,2-Trichloroethane	Number of Samples	141	101	45	48	335
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
1,1-Dichloroethane	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	7800	7800	7800	7800	7800
	Num. of Lab Det. or Est Values	0	1	1	0	2
	Max Result (if detected) ug/kg	-	13	6	-	13
	Num. of Hits > CO	0	0	0	0	0
1,1-Dichloroethene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	50000	50000	50000	50000	50000
	Num. of Lab Det. or Est Values	0	0	1	0	1
	Max Result (if detected) ug/kg	-	-	3	-	3
	Num. of Hits > CO	0	0	0	0	0
1,2-Dichloroethane	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	110000	110000	110000	110000	110000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
1,2-Dichloroethene	Number of Samples	140	101	45	48	334
	10-5 RBGV or HI=1 CO	4300000	4300000	4300000	4300000	4300000
	Num. of Lab Det. or Est Values	0	4	5	0	9
	Max Result (if detected) ug/kg	-	17	840	-	840
	Num. of Hits > CO	0	0	0	0	0
1,2-Dichloropropane	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
1,3-trans-Dichloropropene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2-Butanone	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	9300000	9300000	9300000	9300000	9300000
	Num. of Lab Det. or Est Values	54	34	13	23	124
	Max Result (if detected) ug/kg	360	220	45	60	360
	Num. of Hits > CO	0	0	0	0	0
2-Hexanone	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
VOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
4-Methyl-2-pentanone	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	700000	700000	700000	700000	700000
	Num. of Lab Det. or Est Values	1	1	1	0	3
	Max Result (if detected) ug/kg	800	210	8	-	800
	Num. of Hits > CO	0	0	0	0	0
Acetone	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	21000000	21000000	21000000	21000000	21000000
	Num. of Lab Det. or Est Values	11	4	9	1	25
	Max Result (if detected) ug/kg	250	430	190	10	430
	Num. of Hits > CO	0	0	0	0	0
Benzene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	320000	320000	320000	320000	320000
	Num. of Lab Det. or Est Values	5	7	2	1	15
	Max Result (if detected) ug/kg	5800	470	10	3	5800
	Num. of Hits > CO	0	0	0	0	0
Bromodichloromethane	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	480000	480000	480000	480000	480000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Bromoform	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Carbon Disulfide	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	280000	280000	280000	280000	280000
	Num. of Lab Det. or Est Values	36	28	10	13	87
	Max Result (if detected) ug/kg	14	17	7	5	17
	Num. of Hits > CO	0	0	0	0	0
Carbon Tetrachloride	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	120000	120000	120000	120000	120000
	Num. of Lab Det. or Est Values	2	1	1	0	4
	Max Result (if detected) ug/kg	2	1.46	1	-	2
	Num. of Hits > CO	0	0	0	0	0
Chlorobenzene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	16	12	2	0	30
	Max Result (if detected) ug/kg	110000	58000	2	-	110000
	Num. of Hits > CO	0	0	0	0	0
Chloroform (Trichloromethane)	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	155000	155000	155000	155000	155000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Dibromochloromethane	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	355000	355000	355000	355000	355000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Dichloromethane (Methylene Chlor	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	3950000	3950000	3950000	3950000	3950000
	Num. of Lab Det. or Est Values	2	0	0	0	2
	Max Result (if detected) ug/kg	30	-	-	-	30

PRS 66/80/40
Characterization Summary
VOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
	Num. of Hits > CO	0	0	0	0	0
Ethylbenzene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	480	480	480	480	480
	Num. of Lab Det. or Est Values	10	9	5	0	24
	Max Result (if detected) ug/kg	22000	1000	39	-	22000
	Num. of Hits > CO	2	2	0	0	4
Styrene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	2	1	0	3
	Max Result (if detected) ug/kg	-	73	3	-	73
	Num. of Hits > CO	0	0	0	0	0
Tetrachloroethene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	2100000	2100000	2100000	2100000	2100000
	Num. of Lab Det. or Est Values	5	1	5	1	12
	Max Result (if detected) ug/kg	2.002	28	17	1	28
	Num. of Hits > CO	0	0	0	0	0
Toluene	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	250000	250000	250000	250000	250000
	Num. of Lab Det. or Est Values	36	26	11	5	78
	Max Result (if detected) ug/kg	13000	1400	770	3	13000
	Num. of Hits > CO	0	0	0	0	0
Trichloroethylene (TCE)	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	1250000	1250000	1250000	1250000	1250000
	Num. of Lab Det. or Est Values	5	5	6	5	21
	Max Result (if detected) ug/kg	2.526	9	23	4	23
	Num. of Hits > CO	0	0	0	0	0
Vinyl Chloride	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	2	3	0	5
	Max Result (if detected) ug/kg	-	5	500	-	500
	Num. of Hits > CO	0	0	0	0	0
Xylenes, Total	Number of Samples	142	101	45	48	336
	10-5 RBGV or HI=1 CO	430000000	430000000	430000000	430000000	430000000
	Num. of Lab Det. or Est Values	20	12	7	2	41
	Max Result (if detected) ug/kg	69000	4400	72	2	69000
	Num. of Hits > CO	0	0	0	0	0
1,3-cis-Dichloropropene	Number of Samples	9	7	11	0	27
	10-5 RBGV or HI=1 CO	na	na	na	0	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Bromomethane	Number of Samples	9	7	11	0	27
	10-5 RBGV or HI=1 CO	na	na	na	0	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Chloroethane	Number of Samples	9	7	11	0	27
	10-5 RBGV or HI=1 CO	160000	160000	160000	0	160000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Chloromethane	Number of Samples	9	7	11	0	27
	10-5 RBGV or HI=1 CO	na	na	na	0	na
	Num. of Lab Det. or Est Values	0	0	0	0	0

PRS 66/80/40
Characterization Summary
VOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Total Number of Samples		4150	2957	1349	1392	9848
Total Num. of Lab Det. or Est Values		203	149	83	51	486
Total Num. of Hits > CO		2	2	0	0	4

PRS 66/80/40
Characterization Summary
SVOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
1,2,4-Trichlorobenzene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
1,2-Dichlorobenzene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	2	0	0	0	2
	Max Result (if detected) ug/kg	29000	-	-	-	29000
	Num. of Hits > CO	0	0	0	0	0
1,3-Dichlorobenzene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	2	0	0	0	2
	Max Result (if detected) ug/kg	2800	-	-	-	2800
	Num. of Hits > CO	0	0	0	0	0
1,4-Dichlorobenzene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	2	1	0	0	3
	Max Result (if detected) ug/kg	5900	31	-	-	5900
	Num. of Hits > CO	0	0	0	0	0
1-chloro-4-phenoxybenzene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2,2'-oxybis(1-chloropropane)	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2,4,5-Trichlorophenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2,4,6-Trichlorophenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2,4-Dichlorophenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2,4-Dimethylphenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2,4-Dinitrophenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
SVOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
2,4-Dinitrotoluene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2,6-Dinitrotoluene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2-Chloronaphthalene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2-Chlorophenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	1	1
	Max Result (if detected) ug/kg	-	-	-	20	20
	Num. of Hits > CO	0	0	0	0	0
2-Methylnaphthalene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	13	17	23	7	60
	Max Result (if detected) ug/kg	96000	540	2000	95	96000
	Num. of Hits > CO	0	0	0	0	0
2-Methylphenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2-Nitroaniline	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
2-Nitrophenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
3,3'-Dichlorobenzidine	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
3-Nitroaniline	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
4,6-Dinitro-o-Cresol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
SVOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
4-Bromophenyl-phenyl Ether	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
4-Chloro-3-methylphenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	1	1
	Max Result (if detected) ug/kg	-	-	-	29	29
	Num. of Hits > CO	0	0	0	0	0
4-Chloroaniline	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
4-Methylphenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	1100000	1100000	1100000	1100000	1100000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
4-Nitroaniline	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
4-Nitrophenol	Number of Samples	193	138	143	89	563
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	1	1
	Max Result (if detected) ug/kg	-	-	-	43	43
	Num. of Hits > CO	0	0	0	0	0
Acenaphthene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	41	38	50	27	156
	Max Result (if detected) ug/kg	5000	1900	5200	940	5200
	Num. of Hits > CO	0	0	0	0	0
Acenaphthylene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	6	12	5	5	28
	Max Result (if detected) ug/kg	330	92	85	130	330
	Num. of Hits > CO	0	0	0	0	0
Anthracene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	64000000	64000000	64000000	64000000	64000000
	Num. of Lab Det. or Est Values	56	47	67	36	206
	Max Result (if detected) ug/kg	8100	3100	11000	3000	11000
	Num. of Hits > CO	0	0	0	0	0
Benzo(a)anthracene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	41000	41000	41000	41000	41000
	Num. of Lab Det. or Est Values	78	66	87	48	279
	Max Result (if detected) ug/kg	4500	5300	15000	2700	15000
	Num. of Hits > CO	0	0	0	0	0
Benzo(a)pyrene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	4100	4100	4100	4100	4100
	Num. of Lab Det. or Est Values	72	68	84	48	272
	Max Result (if detected) ug/kg	4000	4500	13000	2200	13000
	Num. of Hits > CO	0	1	2	0	3

PRS 66/80/40
Characterization Summary
SVOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Benzo(b)fluoranthene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	41000	41000	41000	41000	41000
	Num. of Lab Det. or Est Values	73	64	83	47	267
	Max Result (if detected) ug/kg	3400	4300	15000	1700	15000
	Num. of Hits > CO	0	0	0	0	0
Benzo(g,h,i)perylene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	66	61	76	42	245
	Max Result (if detected) ug/kg	3500	2500	7500	1100	7500
	Num. of Hits > CO	0	0	0	0	0
Benzo(k)fluoranthene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	41000	41000	41000	41000	41000
	Num. of Lab Det. or Est Values	69	61	82	47	259
	Max Result (if detected) ug/kg	2900	2800	4700	1800	4700
	Num. of Hits > CO	0	0	0	0	0
Bis(2-chloroethoxy)methane	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Bis(2-chloroethyl)ether	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Bis(2-ethylhexyl)phthalate	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	2150000	2150000	2150000	2150000	2150000
	Num. of Lab Det. or Est Values	49	44	27	24	144
	Max Result (if detected) ug/kg	310	5100	490	1100	5100
	Num. of Hits > CO	0	0	0	0	0
Butyl Benzyl Phthalate	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	43000000	43000000	43000000	43000000	43000000
	Num. of Lab Det. or Est Values	3	0	2	4	9
	Max Result (if detected) ug/kg	130	-	63	1000	1000
	Num. of Hits > CO	0	0	0	0	0
Carbazole	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	29	35	48	23	135
	Max Result (if detected) ug/kg	1100	1800	5400	1100	5400
	Num. of Hits > CO	0	0	0	0	0
Chrysene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	4100000	4100000	4100000	4100000	4100000
	Num. of Lab Det. or Est Values	83	71	90	49	293
	Max Result (if detected) ug/kg	5100	5800	16000	2500	16000
	Num. of Hits > CO	0	0	0	0	0
Dibenz(a,h)anthracene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	4100	4100	4100	4100	4100
	Num. of Lab Det. or Est Values	27	40	37	19	123
	Max Result (if detected) ug/kg	770	730	2100	360	2100
	Num. of Hits > CO	0	0	0	0	0
Dibenzofuran	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	22	29	32	14	97
	Max Result (if detected) ug/kg	3100	1200	4700	790	4700
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
SVOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Diethyl Phthalate	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	1	0	0	0	1
	Max Result (if detected) ug/kg	24	-	-	-	24
	Num. of Hits > CO	0	0	0	0	0
Dimethyl Phthalate	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Di-n-butyl Phthalate	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	21000000	21000000	21000000	21000000	21000000
	Num. of Lab Det. or Est Values	25	22	19	20	86
	Max Result (if detected) ug/kg	47	3100	870	240	3100
	Num. of Hits > CO	0	0	0	0	0
Di-n-octyl Phthalate	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	4300000	4300000	4300000	4300000	4300000
	Num. of Lab Det. or Est Values	12	3	0	1	16
	Max Result (if detected) ug/kg	92	58	-	25	92
	Num. of Hits > CO	0	0	0	0	0
Fluoranthene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	8500000	8500000	8500000	8500000	8500000
	Num. of Lab Det. or Est Values	94	75	96	57	322
	Max Result (if detected) ug/kg	13000	21000	43000	7900	43000
	Num. of Hits > CO	0	0	0	0	0
Fluorene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	33	35	48	22	138
	Max Result (if detected) ug/kg	8100	2000	5500	1300	8100
	Num. of Hits > CO	0	0	0	0	0
Hexachlorobenzene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Hexachlorobutadiene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Hexachlorocyclopentadiene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Hexachloroethane	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Indeno(1,2,3-cd)pyrene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	41000	41000	41000	41000	41000
	Num. of Lab Det. or Est Values	60	57	76	42	235
	Max Result (if detected) ug/kg	2300	2200	6500	1100	6500
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
SVOC Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Isophorone	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	31500000	31500000	31500000	31500000	31500000
	Num. of Lab Det. or Est Values	0	2	3	2	7
	Max Result (if detected) ug/kg	-	32	7900	380	7900
	Num. of Hits > CO	0	0	0	0	0
Naphthalene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	13	18	32	5	68
	Max Result (if detected) ug/kg	31000	170	4000	170	31000
	Num. of Hits > CO	0	0	0	0	0
Nitrobenzene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
N-Nitroso-di-n-propylamine	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
N-Nitrosodiphenylamine	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	6000000	6000000	6000000	6000000	6000000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Pentachlorophenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	250000	250000	250000	250000	250000
	Num. of Lab Det. or Est Values	0	0	0	1	1
	Max Result (if detected) ug/kg	-	-	-	26	26
	Num. of Hits > CO	0	0	0	0	0
Phenanthrene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	87	71	94	54	306
	Max Result (if detected) ug/kg	42000	20000	51000	9900	51000
	Num. of Hits > CO	0	0	0	0	0
Phenol	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	130000000	130000000	130000000	130000000	130000000
	Num. of Lab Det. or Est Values	4	2	9	3	18
	Max Result (if detected) ug/kg	22	30	160	62	160
	Num. of Hits > CO	0	0	0	0	0
Pyrene	Number of Samples	196	142	143	91	572
	10-5 RBGV or HI=1 CO	6400000	6400000	6400000	6400000	6400000
	Num. of Lab Det. or Est Values	100	75	96	58	329
	Max Result (if detected) ug/kg	23000	14000	35000	6600	35000
	Num. of Hits > CO	0	0	0	0	0
Total Number of Samples		12541	9084	9152	5822	36599
Total Num. of Lab Det. or Est Values		1122	1014	1266	708	4110
Total Num. of Hits > CO		0	1	2	0	3

PRS 66/80/40
Characterization Summary
Metals Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Aluminum	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	219	193	166	100	678
	Max Result (if detected) ug/kg	30300000	21200000	35200000	24600000	35200000
	Num. of Hits > CO	0	0	0	0	0
Antimony	Number of Samples	216	193	164	100	673
	10-5 RBGV or HI=1 CO	85000	85000	85000	85000	85000
	Num. of Lab Det. or Est Values	0	5	16	0	21
	Max Result (if detected) ug/kg	-	8000	78700	-	78700
	Num. of Hits > CO	0	0	0	0	0
Arsenic	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	64000	64000	64000	64000	64000
	Num. of Lab Det. or Est Values	216	193	164	98	671
	Max Result (if detected) ug/kg	14600	14700	14400	10200	14700
	Num. of Hits > CO	0	0	0	0	0
Barium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	15000000	15000000	15000000	15000000	15000000
	Num. of Lab Det. or Est Values	133	142	120	72	467
	Max Result (if detected) ug/kg	209000	1670000	1210000	115000	1670000
	Num. of Hits > CO	0	0	0	0	0
Beryllium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	7000	7000	7000	7000	7000
	Num. of Lab Det. or Est Values	205	186	151	97	639
	Max Result (if detected) ug/kg	1400	27500	226000	1100	226000
	Num. of Hits > CO	0	2	1	0	3
Cadmium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	210000	210000	210000	210000	210000
	Num. of Lab Det. or Est Values	1	8	21	0	30
	Max Result (if detected) ug/kg	1600	6800	20300	-	20300
	Num. of Hits > CO	0	0	0	0	0
Calcium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	213	190	164	100	667
	Max Result (if detected) ug/kg	231000000	235000000	227000000	255000000	255000000
	Num. of Hits > CO	0	0	0	0	0
Chromium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	1100000	1100000	1100000	1100000	1100000
	Num. of Lab Det. or Est Values	219	193	166	100	678
	Max Result (if detected) ug/kg	32600	52000	266000	50500	266000
	Num. of Hits > CO	0	0	0	0	0
Cobalt	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	54	35	10	16	115
	Max Result (if detected) ug/kg	28900	16600	16100	22800	28900
	Num. of Hits > CO	0	0	0	0	0
Copper	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	218	192	164	100	674
	Max Result (if detected) ug/kg	140000	1270000	22500000	79200	22500000
	Num. of Hits > CO	0	0	0	0	0
Iron	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	219	193	166	100	678
	Max Result (if detected) ug/kg	50300000	47900000	67500000	39700000	67500000
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
Metals Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Lead	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	219	193	166	100	678
	Max Result (if detected) ug/kg	136000	153000	2240000	96000	2240000
	Num. of Hits > CO	0	0	0	0	0
Lithium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	155	136	127	68	486
	Max Result (if detected) ug/kg	49400	52000	40400	45100	52000
	Num. of Hits > CO	0	0	0	0	0
Magnesium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	219	193	166	100	678
	Max Result (if detected) ug/kg	104000000	91700000	99500000	92900000	104000000
	Num. of Hits > CO	0	0	0	0	0
Manganese	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	27000000	27000000	27000000	27000000	27000000
	Num. of Lab Det. or Est Values	219	193	166	100	678
	Max Result (if detected) ug/kg	1690000	1790000	1790000	1140000	1790000
	Num. of Hits > CO	0	0	0	0	0
Mercury	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	64000	64000	64000	64000	64000
	Num. of Lab Det. or Est Values	55	69	93	37	254
	Max Result (if detected) ug/kg	1200	102000	24600	1600	102000
	Num. of Hits > CO	0	1	0	0	1
Nickel	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	4300000	4300000	4300000	4300000	4300000
	Num. of Lab Det. or Est Values	206	187	153	94	640
	Max Result (if detected) ug/kg	34100	52900	353000	56700	353000
	Num. of Hits > CO	0	0	0	0	0
Potassium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	204	192	143	98	637
	Max Result (if detected) ug/kg	6460000	7520000	5730000	5820000	7520000
	Num. of Hits > CO	0	0	0	0	0
Selenium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	2	0	1	0	3
	Max Result (if detected) ug/kg	1500	-	1600	-	1600
	Num. of Hits > CO	0	0	0	0	0
Silver	Number of Samples	217	192	165	100	674
	10-5 RBGV or HI=1 CO	1100000	1100000	1100000	1100000	1100000
	Num. of Lab Det. or Est Values	2	8	32	4	46
	Max Result (if detected) ug/kg	2600	42200	67000	9900	67000
	Num. of Hits > CO	0	0	0	0	0
Sodium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	6	1	4	6	17
	Max Result (if detected) ug/kg	1690000	1430000	1600000	1790000	1790000
	Num. of Hits > CO	0	0	0	0	0
Thallium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
Metals Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Vanadium	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	1500000	1500000	1500000	1500000	1500000
	Num. of Lab Det. or Est Values	219	193	166	100	678
	Max Result (if detected) ug/kg	55700	50000	43200	51700	55700
	Num. of Hits > CO	0	0	0	0	0
Zinc	Number of Samples	219	193	166	100	678
	10-5 RBGV or HI=1 CO	64000000	64000000	64000000	64000000	64000000
	Num. of Lab Det. or Est Values	219	193	165	100	677
	Max Result (if detected) ug/kg	3490000	1520000	8380000	89700	8380000
	Num. of Hits > CO	0	0	0	0	0
Total Number of Samples		5251	4631	3981	2400	16263
Total Num. of Lab Det. or Est Values		3422	3088	2690	1590	10790
Total Num. of Hits > CO		0	3	1	0	4

PRS 66/80/40
Characterization Summary
Pesticide/PCB Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
4,4'-DDD	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
4,4'-DDE	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	90000	90000	90000	90000	90000
	Num. of Lab Det. or Est Values	0	2	0	0	2
	Max Result (if detected) ug/kg	-	4.1	-	-	4.1
	Num. of Hits > CO	0	0	0	0	0
4,4'-DDT	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	90000	90000	90000	90000	90000
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Aldrin	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Alpha Chlordane	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	6	2	2	1	11
	Max Result (if detected) ug/kg	16	58	15	2.6	58
	Num. of Hits > CO	0	0	0	0	0
Alpha-BHC	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Aroclor-1016	Number of Samples	96	104	29	21	250
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Aroclor-1221	Number of Samples	96	104	29	21	250
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Aroclor-1232	Number of Samples	96	104	29	21	250
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Aroclor-1242	Number of Samples	96	104	29	21	250
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	3	0	0	3
	Max Result (if detected) ug/kg	-	6900	-	-	6900
	Num. of Hits > CO	0	0	0	0	0
Aroclor-1248	Number of Samples	96	104	29	21	250
	10-5 RBGV or HI=1 CO	3850	3850	3850	3850	3850
	Num. of Lab Det. or Est Values	1	15	2	0	18
	Max Result (if detected) ug/kg	51	13000	1700	-	13000
	Num. of Hits > CO	0	1	0	0	1
Aroclor-1254	Number of Samples	96	104	29	21	250
	10-5 RBGV or HI=1 CO	4300	4300	4300	4300	4300
	Num. of Lab Det. or Est Values	1	9	0	0	10
	Max Result (if detected) ug/kg	41	6000	-	-	6000
	Num. of Hits > CO	0	1	0	0	1

PRS 66/80/40
Characterization Summary
Pesticide/PCB Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Aroclor-1260	Number of Samples	96	104	29	21	250
	10-5 RBGV or HI=1 CO	3850	3850	3850	3850	3850
	Num. of Lab Det. or Est Values	1	0	0	1	2
	Max Result (if detected) ug/kg	96	-	-	40	96
	Num. of Hits > CO	0	0	0	0	0
Beta-BHC	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	16500	16500	16500	16500	16500
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Delta-BHC	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Dieldrin	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	1850	1850	1850	1850	1850
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Endosulfan I	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Endosulfan II	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Endosulfan Sulfate	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Endrin	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Endrin Aldehyde	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Endrin Ketone	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Gamma Chlordane	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	4	2	2	0	8
	Max Result (if detected) ug/kg	7.8	54	15	-	54
	Num. of Hits > CO	0	0	0	0	0
Gamma-BHC (Lindane)	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0

PRS 66/80/40
Characterization Summary
Pesticide/PCB Analyses

Analyte		Area I	Area II	Area III	Area IV	Grand Total
Heptachlor	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Heptachlor Epoxide	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Methoxychlor	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Toxaphene	Number of Samples	93	68	29	21	211
	10-5 RBGV or HI=1 CO	na	na	na	na	na
	Num. of Lab Det. or Est Values	0	0	0	0	0
	Max Result (if detected) ug/kg	-	-	-	-	-
	Num. of Hits > CO	0	0	0	0	0
Total Number of Samples		2625	2156	812	588	6181
Total Num. of Lab Det. or Est Values		13	33	6	2	54
Total Num. of Hits > CO		0	2	0	0	2

APPENDIX E

PRS 66/80/40 ARARs

PRS 66/80/40 REMOVAL ACTION

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Chemical-Specific ARARs

Chemical-specific ARARs are health- or risk-based numerical values or methods that establish concentrations or discharge limits for chemical contaminants known or suspected to be in the removal action area. The following chemical-specific ARARs have been identified for the PRS 66 Removal Action:

- 40 CFR 61 Subpart H - National Emission Standards for Emissions of Hazardous Air Pollutants and Radionuclides Other Than Radon from DOE Facilities
- 10 CFR 835 - Radiation Protection for Occupational Workers
- Ohio Administrative Code (O.A.C.) 3745-17-02 A, B, and C - Particulate Ambient Air Quality Standards
- O.A.C. 3745-17-05 - Regulation prohibiting degradation of air quality in areas where air quality exceeds requirements of OAC 3745-17-02
- O.A.C. 3745-17-08 (A)(1), (A)(2), (B), (D) - Emission Restrictions for Fugitive Dust

Location-Specific ARARs

Location-specific ARARs are restrictions placed on the concentrations of hazardous substances in the environment, or the conduct of activities solely because they occur in special locations. The following location-specific ARARs have been identified for the PRS 66 Removal Action:

- National Pollutant Discharge Elimination System (NPDES) Permit No. 1IO00005*HD - Permit for off-site water discharge

Action-Specific ARARs

Action-specific ARARs are usually technology- or activity-based requirements or limitations applied to specific actions. The following action-specific ARARs have been identified for the PRS 66 Removal Action:

- OAC 3745-15-01 thru 09 - Requirements Include Measurement of Emissions of Air Contaminants, Scheduled Maintenance, Reporting and Malfunction of Equipment
- OAC 3745-17-01 thru 11 - Measurement of Ambient Air Quality and Allowable Emission Standards
- OAC 3745-27-01 thru 10 - Requirements Include Authorized Solid Waste Disposal Methods, Operational Requirements for Solid Waste Disposal Facilities and Closure Requirements
- OAC 3745-54-13 - Waste Analysis Requirements Before Storage
- OAC 3745-55-14 - Disposal/ Decontamination of Equipment, Structures and Soils
- OAC 3745-50.44 C(4) - Additional Permit Information for Hazardous Waste Stored in Waste Piles
- OAC 3745-59 - Land Disposal Restrictions
- OAC 3745-59-50 - Time Limits for On-site Storage of Hazardous Wastes Restricted from Land Disposal
- ORC 6111 - Prohibits Pollution of Waters Within the State
- 29 CFR 1910 - Occupational Safety and Health Act (OSHA) General Industrial Standards for Worker Protection
- 29 CFR 1926 - OSHA Safety and Health Standards
- 29 CFR 1904 - OSHA Recordkeeping, Reporting, and Related Regulations

PRS 66/80/40 REMOVAL ACTION

APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS (Continued)

Action-Specific ARARs (Continued)

- 49 CFR 171, 172, 173 & 174 – Department of Transportation (DOT), Hazardous Materials Transportation and Hazardous Material Employee Training Requirements
- DOE Order 1540.1 (A) - Materials Transportation and Traffic Management

Requirements To Be Considered (TBCs)

In addition to the ARARs listed above, certain to be considered (TBC) requirements are applied when no ARAR exists or to ensure protectiveness. The following TBCs have been identified for the PRS 66 Removal Action:

- EPA guidance EPA/230/02-89/042 - Methods for Evaluating the Attainment of Cleanup Standards
- DOE Order 5400.1 - General Environmental Protection Program Requirements
- DOE Order 5400.5 - Radiation Protection of the Public and the Environment
- DOE Order 5480.4 - Environmental Protection Safety and Health Protection Standards
- DOE Order 5480.15 - DOE Laboratory Accreditation Program for Personnel Dosimetry
- DOE Order 5820.2A - Radioactive Waste Management Requirements

Other Standards and Requirements

Other standards or requirements related to the actual implementation of the PRS 66/80/40 Removal Action may be identified subsequently during the design phase and will be incorporated into the Work Plan and/or its revisions.

APPENDIX F

PRS 66/80/40 Cost Estimate Detail

DETAILED COSTS FOR EACH EXCAVATION ALTERNATIVE

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Historical				
Pre-October 1, 2001 Costs	$2,436,060	$2,436,060	$2,436,060	$2,436,060
Project Planning and Engineering				
Review Characterization Data	$0	$0	$0	$0
Develop EECA Work Plan Package(s)	$165,071	$165,071	$144,437	$144,437
Review and Incorporate Comments	$60,104	$60,104	$60,104	$60,104
Update PRS 66 Data Package	$20,002	$20,002	$20,002	$20,002
Verification Sampling Plan Development	$35,616	$35,616	$32,378	$32,378
Verification Sampling Plan Review/revise	$14,649	$14,649	$14,649	$14,649
Planning and Engineering Summary	**$295,442**	**$295,442**	**$271,570**	**$271,570**
Characterization				
Radiological/Chemical Characterization	$1,839,959	$1,839,959	$1,839,959	$1,839,959
Well Sampling	$104,241	$104,241	$104,241	$104,241
Characterization Summary	**$1,944,200**	**$1,944,200**	**$1,944,200**	**$1,944,200**
Site Preparation				
Assess Utilities	$0	$0	$0	$0
Isolate Utilities - Above Ground	$17,825	$17,825	$17,825	$17,825
Re-Route Underground Utilities	$505,855	$505,855	$311,191	$311,191
Re-Route Electrical Power	$41,473	$41,473	$41,473	$41,473
Haul Road Feasability Analysis	$0	$0	$0	$0
Haul Road Design and Specification	$0	$0	$0	$0
Construct Haul Road	$129,168	$129,168	$129,168	$129,168
Rail Spur Feasability Analyses	$0	$0	$0	$0
Rail Spur Upgrade	$505,908	$505,908	$505,908	$505,908
Site Preparations/Layout	$274,146	$274,146	$274,146	$274,146
Site Preparation Summary	**$1,474,375**	**$1,474,375**	**$1,279,711**	**$1,279,711**

DETAILED COSTS FOR EACH EXCAVATION ALTERNATIVE

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Excavation				
Shoring Systems	$263,166	$263,166	$187,122	$286,656
Dewatering Pumps	$17,063	$17,063	$17,063	$17,063
Water and Sediment Control Structures	$354,985	$354,985	$354,985	$354,985
Pre-Engineered Fabric Building(s)	$0	$0	$0	$0
Additional Equipment Purchases	$428,215	$416,006	$391,946	$395,438
Clean Soil / Asphalt Removal	$0	$1,859,512	$437,053	$530,578
Contaminated Soil Removal	$2,251,647	$752,746	$948,415	$1,031,312
Laboratory Support Costs	$315,155	$1,019,579	$323,954	$386,896
Excavation Summary	**$3,630,231**	**$4,683,057**	**$2,660,538**	**$3,002,928**
Verification and Project Closeout				
Verification - Contract Cost	$1,863,118	$1,855,122	$971,147	$1,124,855
Verification Data Validation	$86,085	$83,752	$44,371	$52,197
Verification Data Summary Report	$42,990	$42,794	$22,158	$25,702
Verification MEIMS Data Entry	$18,850	$18,764	$9,716	$11,270
Event Reporting/Closeout	$81,606	$70,538	$68,616	$79,384
PRS 66 OSC Report	$99,892	$86,343	$83,991	$97,171
OSC Review and Revisions	$29,451	$25,456	$24,763	$29,451
Verification and Closeout Summary	**$2,221,992**	**$2,182,769**	**$1,224,762**	**$1,420,030**
Backfill and Restoration				
Backfill from Clean Staging (on PRS)	$0	$220,802	$62,387	$77,131
Purchaced Backfill	$2,653,886	$817,439	$758,126	$816,221
Top Soil Placement and Hydroseed	$339,336	$339,336	$63,689	$67,736
Backfill and Restoration Summary	**$2,993,222**	**$1,377,578**	**$884,202**	**$961,088**

DETAILED COSTS FOR EACH EXCAVATION ALTERNATIVE

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Waste Management Costs				
LLR Waste Management and Disposal	$35,867,492	$11,086,468	$10,134,129	$11,005,822
Mixed Waste Treatment and Disposal	$1,896,847	$1,896,858	$1,823,844	$1,877,341
Haz Waste Treatment and Disposal	$25,328	$25,328	$24,616	$24,972
Waste Management Summary	**$37,789,667**	**$13,008,654**	**$11,982,589**	**$12,908,135**
Alternative Totals	**$52,785,189**	**$27,402,135**	**$22,683,632**	**$24,223,722**

Excavation/Backfill Cost Detail By Alternative

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Pre-Excavation Activities				
Shoring Systems	$263,166	$263,166	$187,122	$286,656
Dewatering Pumps	$17,063	$17,063	$17,063	$17,063
Water and Sediment Control Structures	$354,985	$354,985	$354,985	$354,985
Pre-Engineered Fabric Building(s)	$0	$0	$0	$0
Additional Equipment Purchases	$428,215	$416,006	$391,946	$395,438
Areas I & IV, and Perimeter Slopebacks				
Excavate, Scan and Load Clean Overburden and Slopeback Materials Including Asphalt and Subbase (upper elevation)	$0	$298,470	$0	$57,616
Excavate (direct load) and Haul Contaminated (upper elevations)	$0	$4,702	$0	$4,702
Excavate, Scan and Load Clean Overburden and slopebacks (lower elev)	$0	$391,978	$0	$23,351
Excavate/Haul (direct load) Lower Elevation Contaminated	$0	$11,713	$0	$11,713
Excavate /Haul (semi-direct load High % debris) Lower elevations - Contaminated	$0	$11,713	$0	$39,546
Excavate / Scan / Stage / Haul (lower elevation high percent debris)	$0	$648,963	$0	$0
Gamma Spec lab Costs (clean scan)	$0	$603,124	$0	$43,680
Alpha Spec Lab costs (10% of Gamma)	$0	$85,224	$0	$6,172
LLR Waste Management and Disposal	$0	$602,692	$0	$602,692
Backfill from Clean Staging (on PRS)	$0	$154,271	$0	$11,716
Purchaced Backfill	$0	$43,742	$0	$42,524

Excavation/Backfill Cost Detail By Alternative

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Area II				
Excavate, Scan and Load Clean Overburden and Slopeback Materials Including Asphalt and Subbase (upper elevation)	$0	$202,159	$192,683	$192,683
Excavate (direct load) and Haul Contaminated (upper elevations)	$0	$46,997	$46,344	$45,672
Excavate, Scan and Load Clean Overburden and Slopebacks (lower elev)	$0	$110,060	$57,599	$57,599
Excavate/Haul (direct load) Lower Elevation Contaminated	$0	$117,845	$114,524	$114,524
Excavate and Haul (semi direct load) lower elevations - high % debris - Contaminated		$249,375	$394,448	$392,420
Gamma Spec lab Costs (clean scan)	$0	$171,627	$162,871	$162,729
Alpha Spec Lab costs (10% of Gamma)	$0	$24,252	$23,014	$22,994
LLR Waste Management and Disposal	$0	$5,990,761	$5,932,137	$5,910,115
Mixed Waste Treatment and Disposal	$0	$1,083,919	$1,067,696	$1,064,402
Haz Waste Treatment and Disposal	$0	$12,664	$12,308	$12,308
Backfill from Clean Staging (on PRS)	$0	$39,740	$35,149	$36,168
Purchaced Backfill	$0	$442,156	$443,722	$442,156

Excavation/Backfill Cost Detail By Alternative

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
Area III				
Excavate, Scan and Load Clean Overburden and Slopeback Materials Including Asphalt and Subbase (upper elevation)	$0	$130,237	$136,956	$146,401
Excavate (direct load) and Haul Contaminated (upper elevations)	$0	$35,248	$32,911	$34,254
Excavate, Scan and Load Clean Overburden and Slopbebacks (lower elev)	$0	$77,645	$49,815	$52,928
Excavate/Haul (direct load) Lower Contaminated	$0	$88,384	$81,338	$85,893
Excavate / Haul (semidirect load- lower elevation high percent debris)- Contaminated	$0	$186,770	$278,851	$302,589
Gamma Spec lab Costs (clean scan)	$0	$118,594	$120,974	$132,586
Alpha Spec Lab costs (10% of Gamma)	$0	$16,758	$17,094	$18,735
LLR Waste Management and Disposal	$0	$4,493,015	$4,201,992	$4,493,015
Mixed Waste Treatment and Disposal	$0	$812,939	$756,148	$812,939
Haz Waste Treatment and Disposal	$0	$12,664	$12,308	$12,664
Backfill from Clean Staging (on PRS)	$0	$26,791	$27,238	$29,247
Purchaced Backfill	$0	$331,541	$314,404	$331,541
Site restoration - Top soil Placement and Hydroseed ~250x700 ft area	$0	$339,336	$63,689	$67,736

Excavation/Backfill Cost Detail By Alternative

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
North Portion				
Excavate, Direct Load, and Haul (5 ft lifts, upper elevations, min debris)	$188,063	$0	$0	$0
Excavate, Direct Load, and Haul (5 ft lifts, lower elevations, some debris)	$362,441	$0	$0	$0
Excavate, Direct Load, and Haul (5 ft lifts, lower elevations, high % debris)	$989,153	$0	$0	$0
Gamma Spec lab Costs (clean scan)	$189,770	$0	$0	$0
Alpha Spec Lab costs (10% of Gamma)	$26,815	$0	$0	$0
LLR Waste Management and Disposal	$24,591,435	$0	$0	$0
Mixed Waste Treatment and Disposal	$1,083,917	$0	$0	$0
Haz Waste Treatment and Disposal	$12,664	$0	$0	$0
Placement and Compaction of Purchased Backfill	$1,823,777	$0	$0	$0

Excavation/Backfill Cost Detail By Alternative

	Alternative 2	Alternative 3	Alternative 4	Alternative 5
South Portion				
Excavate, Direct Load, and Haul (5 ft lifts, upper elevations, min debris)	$89,156	$0	$0	$0
Excavate, Direct Load, and Haul (5 ft lifts, lower elevations, some debris)	$172,080	$0	$0	$0
Excavate, Direct Load, and Haul (5 ft lifts, lower elevations, high % debris)	$450,753	$0	$0	$0
Gamma Spec lab Costs (clean scan)	$86,366	$0	$0	$0
Alpha Spec Lab costs (10% of Gamma)	$12,204	$0	$0	$0
LLR Waste Management and Disposal	$11,276,057	$0	$0	$0
Mixed Waste Treatment and Disposal	$812,930	$0	$0	$0
Haz Waste Treatment and Disposal	$12,664	$0	$0	$0
Placement and Compaction of Purchased Backfill	$830,109	$0	$0	$0
Site restoration - Top soil Placement and Hydroseed ~250x700 ft area	$339,336	$0	$0	$0
Labwork Summary	**$315,155**	**$1,019,579**	**$323,954**	**$386,896**
Waste Mangement Summary	**$37,789,667**	**$13,008,654**	**$11,982,589**	**$12,908,135**
Excavation (includes labwork)	**$3,630,231**	**$4,683,057**	**$2,660,538**	**$3,002,928**
Backfill/Site Restoration	**$2,993,222**	**$1,377,578**	**$884,202**	**$961,088**

APPENDIX G

PRS 66/80/40 Acceptable Debris Backfill Details

PRS 66 Slopeback/Overburden Area Acceptable Debris Backfill

Size Independent			
	Acceptable Backfill		
Debris Type	Yes	No	Comment
Natural Rock/Stone/Cobbles	X		No representative sampling or scanning required
Tree Roots / Vegetation	X		No representative sampling or scanning required
Concrete	X		MARSSIMS-like representative scanned and potentially crushed in concrete crusher
Brick/Block/Mortar	X		MARSSIMS-like representative scanned and potentially crushed in concrete crusher
Asphalt	X		MARSSIMS-like representative scanned and potentially crushed in concrete crusher
Ceramic Tile	X		Unless multiples found in contiguous zone; representative sampling required
Vinyl Floor Tiles	X		Unless multiples found in contiguous zone; representative sampling required
Roofing Shingles	X		Unless multiples found in contiguous zone; representative sampling required
Rebar		X	Either removed from concrete crusher or loose
Metal Drums		X	
Plastic Drums		X	
Paint Cans		X	
Sheetmetal		X	
Steel Drainage Pipe		X	
Plastic Drainage Pipe		X	
Clay/Concrete Drainage Pipe		X	
Electrical Conduit		X	
Electrical Fixtures		X	
Metal/Wood Cabinets		X	
Rubber Hoses		X	
Closed Containers		X	
Vehicles & Appliances		X	

PRS 66 Slopeback/Overburden Area Acceptable Debris Backfill

Visual Debris Removal - Removed if visually seen; no sifting through stacks required			
	Acceptable Backfill		
Debris Type	Yes	No	Comment
Electrical Boxes / Fittings		X	
Plastic Bottles		X	
Rubber/Cloth Gloves/Boots		X	
Rags		X	
Batteries		X	
Metal Hand Tools		X	

Size Dependent - Guidelines Established for Field Decisions			
	Acceptable Backfill		
Debris Type	Yes	No	Comment
Steel Wire	X		Less than 3 Feet in Length; no representative sampling or scanning required
Electrical Wire	X		Less than 3 Feet in Length; no representative sampling or scanning required
Wood	X		Less than 3 Feet in Length; no representative sampling or scanning required
Vinyl/Plastic Siding/Sheeting	X		Less than 3 Feet in Length; no representative sampling or scanning required
Cardboard	X		Less than 3x3 Feet; no representative sampling or scanning required

Incidental Objects - Not Segregated from soil but scanned with soil.			
	Acceptable Backfill		
Debris Type	Yes	No	Comment
Metal Shavings	X		When noting a pocket, each bucket removed will be field scanned
Pop Bottle / Caps	X		No representative sampling or scanning required
Nails	X		No representative sampling or scanning required
Wood Splinters	X		No representative sampling or scanning required
Crushed/Broken Glass	X		No representative sampling or scanning required
Paper	X		No representative sampling or scanning required
Office Supplies	X		No representative sampling or scanning required
Steel Spikes / Staples	X		No representative sampling or scanning required
Nuts/Bolts	X		No representative sampling or scanning required
Styrofoam Pieces	X		No representative sampling or scanning required