3001-0402190003

CH2M HILL
Mound, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, OH
45343-3030

CH2MHILL

ER-080/03
June 5, 2003

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

SUBJECT: Contract No. DE-AC24-03OH20152
Contract Deliverable 039 - PRS Documents
PRS 267 PACKAGE, PUBLIC REVIEW DRAFT

Dear Mr. Provencher:

Paul Lucas from your office has approved the release of the following documents for public review:

- PRS 267 Package, Public Review Draft
- Response to OEPA Comments on PRS 267 Addendum 1, Draft

USEPA had no comments on the PRS 267 Package Addendum 1 Draft. OEPA comments were incorporated. If we do not hear from the Core Team members regarding adequacy of comment incorporation by close of business 9 June 2003, the document will enter public review. The public review period is 11 June 2003 through 11 July 2003. Any public comments will be addressed in the final document. If you have any questions regarding the document, please contact Dave Rakel at Extension 4203.

Sincerely,

Monte A. Williams
Deputy Project Manager, Environmental Restoration

MAW/KMA/jdg

Enclosure

Approved: Paul Lucas 6/5/03
Paul Lucas Date
CERCLA Program Manager

cc: David Seely, USEPA, (1) w/attachments
Brian Nickel, OEPA, (4) w/attachments
Ruth Vandegrift, ODH, (1) w/attachments
Paul Lucas, DOE/MCP, (1) w/attachments
Lisa Rawls, DOE/MCP, w/o attachments
Randy Tormey DOE/OH, (1) w/attachments
Dann Bird, MMCIC, (3) w/attachments
J. D. Bonfiglio, MESH, (1) w/attachments
Monte Williams, CH2M HILL, (1) w/attachments
Dave Rakel, CH2M HILL, (1) w/o attachments
John Fulton, CH2M HILL, (1) w/o attachments
Gene Valett, CH2M HILL, (1) w/o attachments
AR Public Reading Room, (4) w/attachments
DCC, (1) w/attachments

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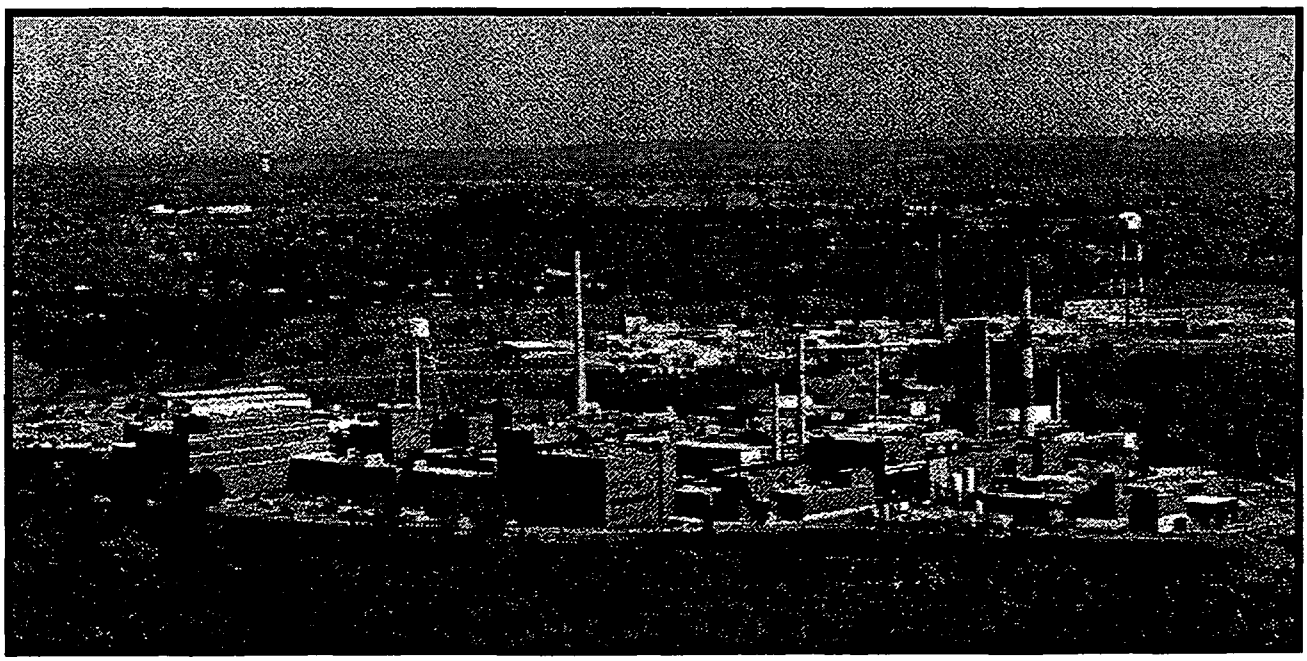
Program

Miamisburg Closure Project
Potential Release Site Package

PRS 267

Public Review Draft
June 2003



Response to Comments

from OEPA
on PRS 267 Addendum 1, Draft

Comment 1. Additional Areas of Concern, Paragraph 2, Page 2 of 7. Under "Additional Areas of Concern" on page 2 of 7, the comment is made in the second paragraph: "Results and location of the two historic results are presented on Figure 4."

Were any additional soil samples taken in these two locations during the PRS 266 RA, other than the FIDLER readings? Please include within this addendum any additional, more recent analytical results if taken during the attempted excavation of both locations during the PRS 266 RA. (Please see comment #4 below.)

Response 1. There were no additional soil samples taken at either of these locations. At location SCR660 a sediment sample was collected from inside a buried pipe. The sediment sample analysis result is indicated in a note on Figure 4 (see Response 4).

Comment 2. Additional Areas of Concern, Paragraph 3, Page 2 of 7. For clarity, please reference the results for the two soil samples, collected near the utility pole, in the text by rephrasing the last sentence: "Results and sample locations are presented on Figure 4 as Flag #1 and Flag #2."

Response 2. The text was edited as requested.

Comment 3. Page 6 of 7. Under the designated "SCR660" in the lower left corner, "th-232" should be changed to "Th-232."

Response 3. The correction was made.

Comment 4. Figure 4, Page 6 of 7. Under "SCR660" in the lower left corner, it is stated that "Sample collected within the excavation zone had Th-232 result below cleanup objective . . .". Please include this result. Also, since the sentence continues stating: ". . . additional excavation and verification sampling will be performed", please explain in the text (briefly) why this will be necessary. It is assumed that BWXTO either collected samples around or near the exposed corrugated pipe or additional contamination was detected on the survey instrument. Great care was taken to cover the pipe and exposed soil to prevent erosion.

Response 4. The text in the figure was edited to clarify that the only sample taken was sediment from inside a buried pipe (see Response 1).

ADDENDUM 1

SUPPORTING RA RECOMMENDATION

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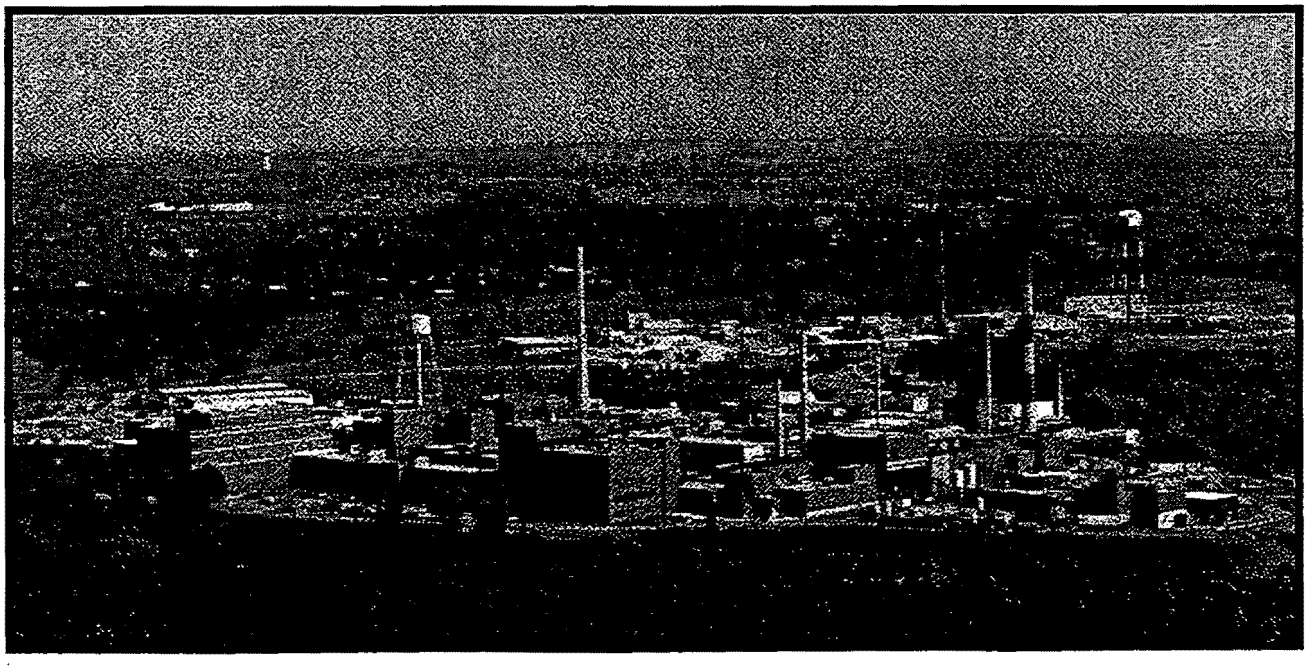
Miamisburg Closure Project
Potential Release Site Package
PRS 267
Addendum 1

Public Review Draft
June 2003



PRS HISTORY:

Potential Release Site (PRS 267) is identified as one of the site's historic thorium redrumming areas (Figure 1) and was binned Further Assessment (FA) by the Core Team on 18 December 1996. Further Assessment sampling was completed between April and July of 2002 per the Sampling and Analysis Plan (**SAP**)[1] approved by the Core Team.

FURTHER ASSESSMENT ACTIVITY:

The potential contaminant of concern (COC) for PRS 267 (thorium-232) was based on process history. Plutonium-238 was added as a potential COC based on historic plutonium-238 results above its screening level. All soil samples were analyzed per the SAP by onsite gamma spectroscopy and 10% were forwarded offsite for isotopic plutonium and thorium analysis.

FA sample locations are presented on Figure 2. The FA **Data Report**[2] presents a full account of soil sampling activities and sample results (onsite and offsite laboratory analyses). A summary of the results above screening levels is presented in Table 1. FA sample results for detected analytes above screening levels and cleanup objectives are shown on Figure 3.

Table 1: Summary of FA Results above Screening Levels (pCi/g)

Analyte	Max. Result	SL(6)	#MDA>SL	#detects>SL	CO(7)	#detects>CO
Ac-227+D	1.06U	0.56	3 of 80(1)	2 of 80(4)	4.6	0 of 80
Co-60	0.12U	0.07	28 of 80(2)	1 of 80	0.7	0 of 80
Pb-210+D	2.36	1.8	1 of 80	2 of 80	7.4	0 of 80
Pu-238	85.87U	55	2 of 80(3)	0 of 80	55	0 of 80
Ra-226+D	2.92	2.1	0 of 80	13 of 80	2.9	1 of 80
Th-228+D	10.2	1.61	0 of 9	3 of 9(5)	2.6	1 of 9
Th-230+D	22.66U	10MDA(8)	2 of 80	0	2.8	0 of 80
Th-232+D	14.62	1.47	0 of 80	5 of 80	2.1	4 of 80

SL: screening level U: not detected at the specified MDA
CO: cleanup objective
RBGV: Risk-Based Guideline Value
MDA: minimum detectable activity
CRDL: offsite lab contract-required detection limit
+D: incorporates daughter products in the risk calculation
(1) SL is greater than the offsite CRDL of 0.8 pCi/g (the other 2 MDAs were < the CRDL)
(2) SL is greater than onsite lab target MDA capability of 0.1 pCi/g and CRDL of 0.2 pCi/g
(3) The presence of other isotopes above background levels in the same area of interest as Pu-238 will commonly result in a higher MDA for Pu-238.
(4) 80 = onsite results + offsite results – superseded results
(5) offsite only analysis
(6) SL = 10^{-6} RBGV + background unless otherwise specified

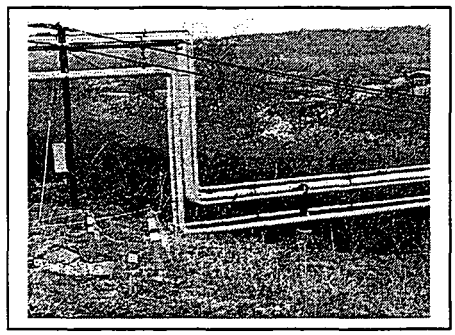
(7) CO = 10^{-5} RBGV + background unless otherwise specified
(8): If Th-230 is a contaminant of concern (COC), then the Screening Level is 1.99 pCi/g (10-6 RBGV (0.09 pCi/g) plus background (1.9 pCi/g)). If Th-230 is not a COC MCP will use our normal sample analysis process through gamma spectroscopy unless specified differently in a sampling and analysis plan. MCP will assure that the Th-230 MDA is less than 10 pCi/g (This implies a minimum laboratory counting time.). If Th-230 is detected greater than the MDA but below 10 pCi/g, MCP may re-analyze (gamma or alpha spectroscopy) the soil sample to confirm the absence or presence of Th-230. The MDA must be less than 10 pCi/g for the Th-230 result to be of value. 10 pCi/g is not a screening level for Th-230, rather an MDA for Th-230, at which gamma spec analysis can cease and results can be reported. It is more a reporting limit and defines the count time for the analysis suite because it is the limiting isotope (requires longest count to "see").

ADDITIONAL AREAS OF CONCERN

Historic Sample Results. Two locations southwest of PRS 267 (historic SCR626 and SCR660) have historic soil sample results of thorium-232 and plutonium-238 above cleanup objectives. **SCR626** is an add-on from PRS 266 RA. SCR626 is located directly under a ground-level overhead pipe (see photo below). The pipe prevented addressing this point as part of PRS 266 RA. Excavation of **SCR660** was also attempted as part of the PRS 266 RA. A FIDLER was required to locate the former sample point. Upon excavation of SCR660, a corrugated metal pipe was uncovered. Thorium-232 was identified at 24.35 pCi/g in the sediment collected from the pipe and removal ceased. SCR660 excavation is shown in foreground of photo below.

Neither of the two locations is within a PRS nor identified as a PRS. The Core Team determined that these locations be addressed as part of PRS 267. Results and locations of the two historic results are presented on Figure 4.

Samples Near Pole. Prior to collecting samples at B039, the ground surface was surveyed per RadCon standard practice. An area of elevated FIDLER readings was identified immediately northeast of B039, adjacent to a utility pole. Two soil samples were collected near the pole and confirmed the elevated FIDLER readings. Results and sample locations are presented on Figure 4 as Flag #1 and Flag #2.



FIGURES

Figure 1: Location of PRS 267
Figure 2: PRS 267 Sample Locations
Figure 3: FA Results above Screening Levels
Figure 4: Additional Locations

TABLES

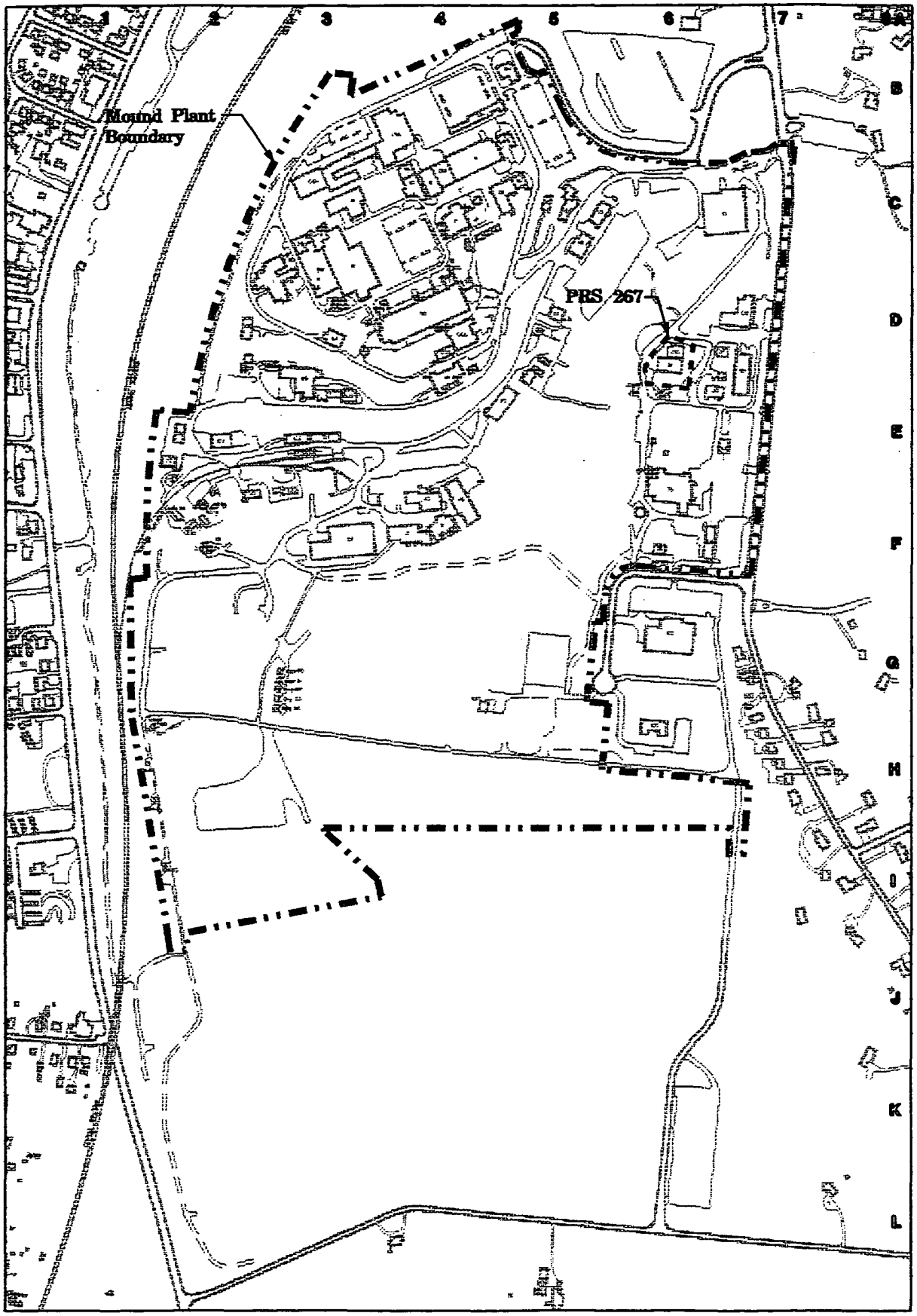
Table 1: Summary of FA Results above Screening Levels

REFERENCES:

1) PRS 267 Sampling & Analysis Plan, Final, April 2002
2) PRS 267 Data Report, Rev. 0, September 2002

PREPARED BY:

Karen M. Arthur, CH2MHill, ER QA



Legend

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

0 100 200 400 600 800 1000
Scale in Feet

	05/21/02	ISSUE FOR GENERAL USE	SSP		

MOUND
Environmental Restoration Geographic Information System

SHEET 1 2 3 4 5 6
ISSUE A

( ) TITLE CLASSIFICATION

Figure 1
Location of PRS 267

PART CLASSIFICATION

MOUND CLASSIFICATION: UNCLASSIFIED

SIZE: D

MOUND NUMBER: gen_site_plan.dgn

SITE: SITE

SCALE: Graphic

SHEET 1 OF

STATUS: NO-REL-09/14/02

STATION / 4

gen_site_plan.dgn

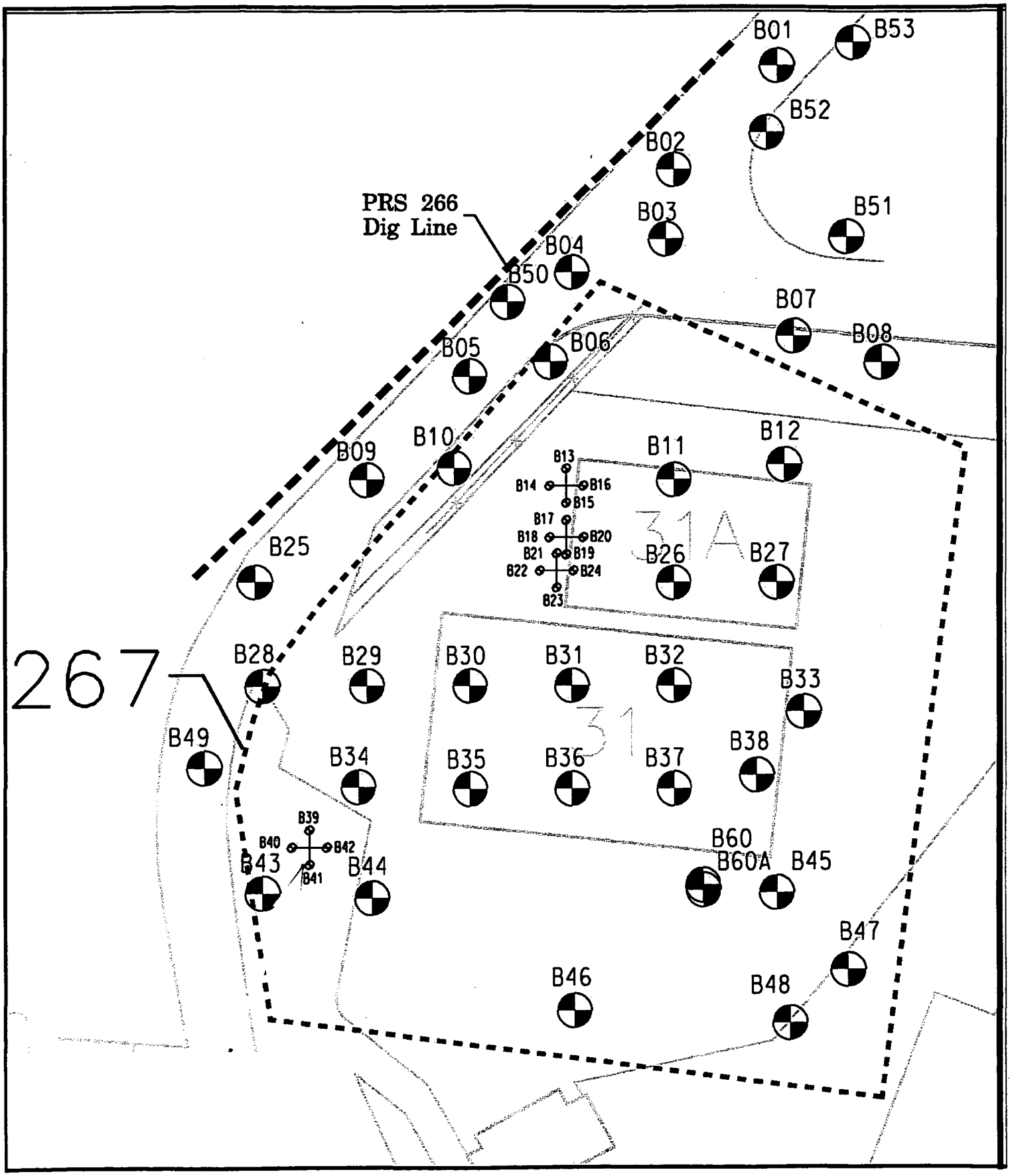


Figure 2: PRS 267 Sample Locations

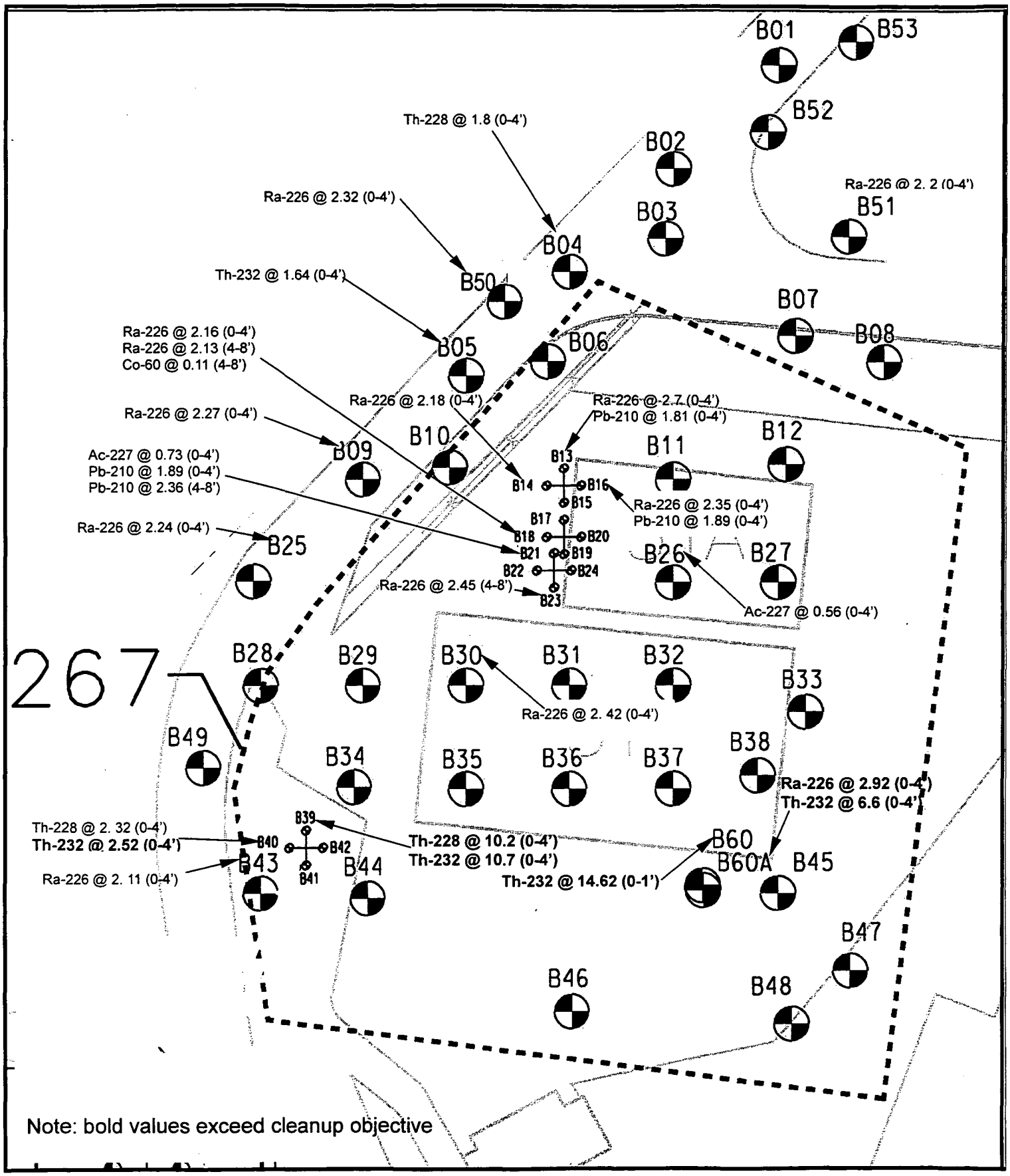
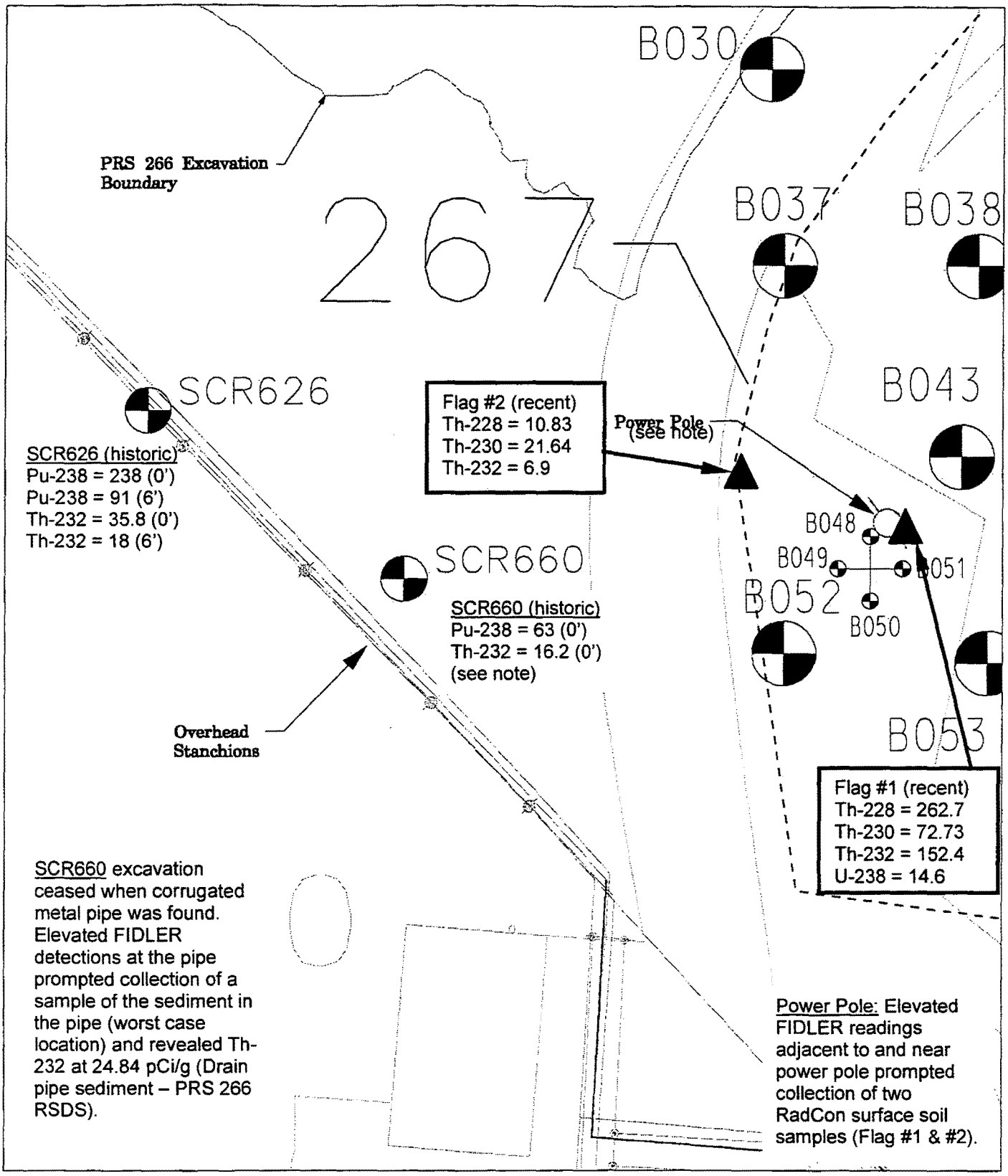


Figure 3: FA Detections above Screening Levels



NOTES:
-all results in pCi/g
-characterization borings shown for reference only

Figure 4: Additional Locations

MIAMISBURG CLOSURE PROJECT
PRS 267

RECOMMENDATION:

Potential Release Site (PRS 267) is identified as one of the site's historic thorium redrumming areas. It became a PRS based on historic operations and sample results above screening levels. Further Assessment was performed and confirmed that limited plutonium-238 (historic) and thorium-232 (historic results & recent results) remains at isolated locations at levels that exceed the cleanup objectives (10^{-5} Risk-Based Guideline Values plus background).

Additionally, two locations southwest of PRS 267 (historic location SCR626 and SCR660) have historic elevated results of thorium-232 and plutonium-238 above cleanup objectives. Excavation of SCR660 was attempted but ceased when a corrugated metal pipe was found with thorium-232 in excess of cleanup objective in the sediment. Neither of the two locations is within a PRS nor identified as a PRS, but will be addressed as part of the PRS 267 removal.

Therefore, the Core Team recommends a **Removal Action** for PRS 267, the corrugated metal pipe at SCR660, and SCR626.

A PRS Package recommendation page for a Removal Action signed by the Core Team constitutes the final step in the PRS Package process. Successful completion of the Removal Action will be documented via an On-Scene Coordinator (OSC) Report signed by the Core Team, which will be placed in the Public Reading Room.

CONCURRENCE:

DOE/MCP: 4/30/03
Robert S. Rothman, Remedial Project Manager (date)

USEPA: 5/21/03
David P. Seely, Remedial Project Manager (date)

OEPA: 4/30/03
Brian K. Nickel, Project Manager (date)

ORIGINAL DOCUMENT

SUPPORTING FA RECOMMENDATION

Miamisburg Closure Project

MIAMISBURG CLOSURE PROJECT
POTENTIAL RELEASE SITE PACKAGE
Notice of Public Review Period

The following Potential Release Site (PRS) package is available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio. Public comment on this document will be accepted June 11, 2003 through July 11, 2003.

PRS 267: Thorium Storage and Redrumming Area

Questions can be referred to Paul Lucas at (937) 847-8350 extension 314

PRS 267 Package Tracking Sheet

REVISION	DESCRIPTION	DATE
Regulator Release A	ADDED: • Other Soils Characterization Report results (recently released) • Risk Based Guideline Values to reference section • PETREX soil gas results • Statement that PRS 267 is an active site for waste shipments	**August 14, 1995**
Regulator Release B	ADDED: • Soil Gas Confirmation results. CHANGED: • Narrative to include supplemental data. • Binned Further Assessment required Dec. 18, 1996. The assessment will need to wait until this active site finishes operations.	**August 6, 1996** **August 29, 1996** **December 18, 1996**
Draft Proposed Final	Addendum 1 Draft submitted to CT. Binned RA on April 30, 2003. No USEPA comments. OEPA comments were incorporated. Added Addendum 1 to original package and submitted as Public Review Draft.	**April-May 2003**
Public Review Draft	Public review period: 11 June to 11 July, 2003.	**June 2003**
Final		

MOUND

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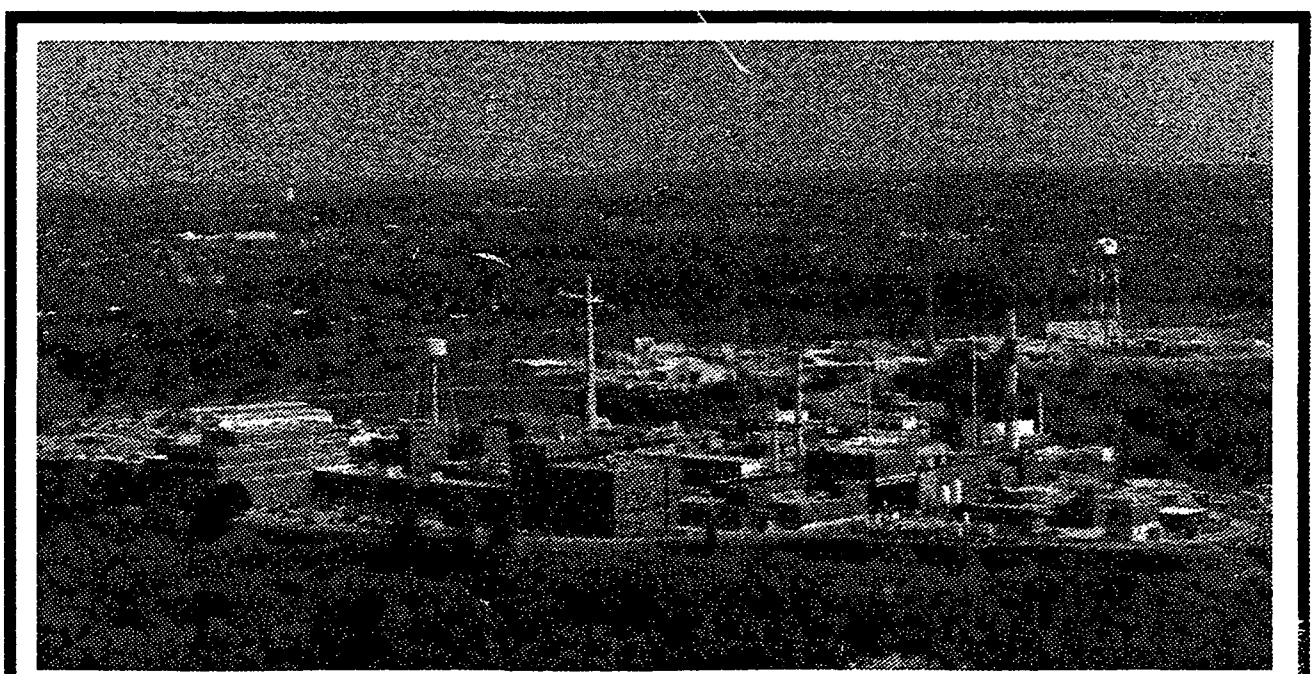
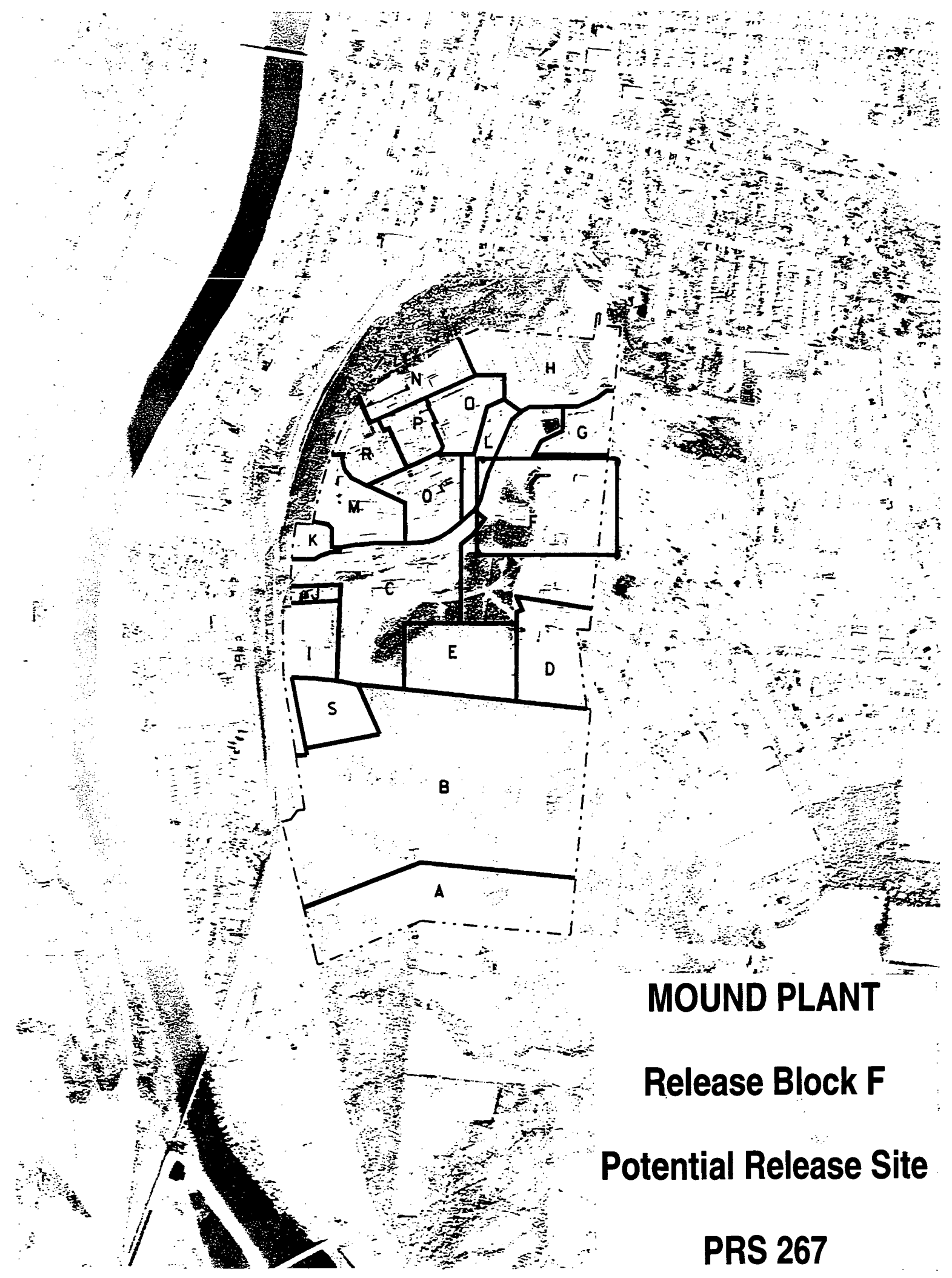
MOUND PLANT
Potential Release Site Package
PRS # 267





MOUND PLANT

Release Block F

Potential Release Site

PRS 267

H
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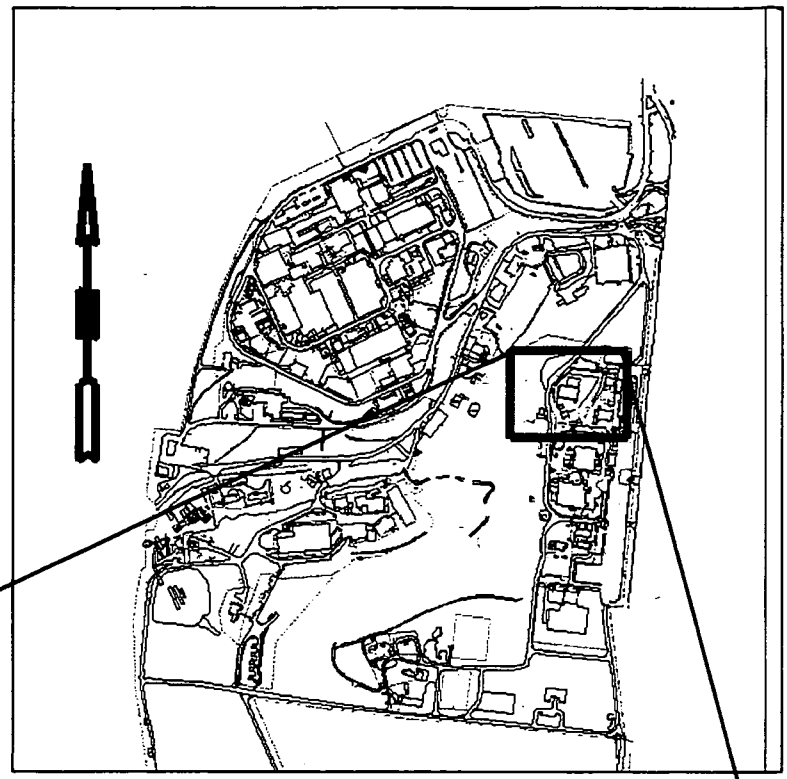
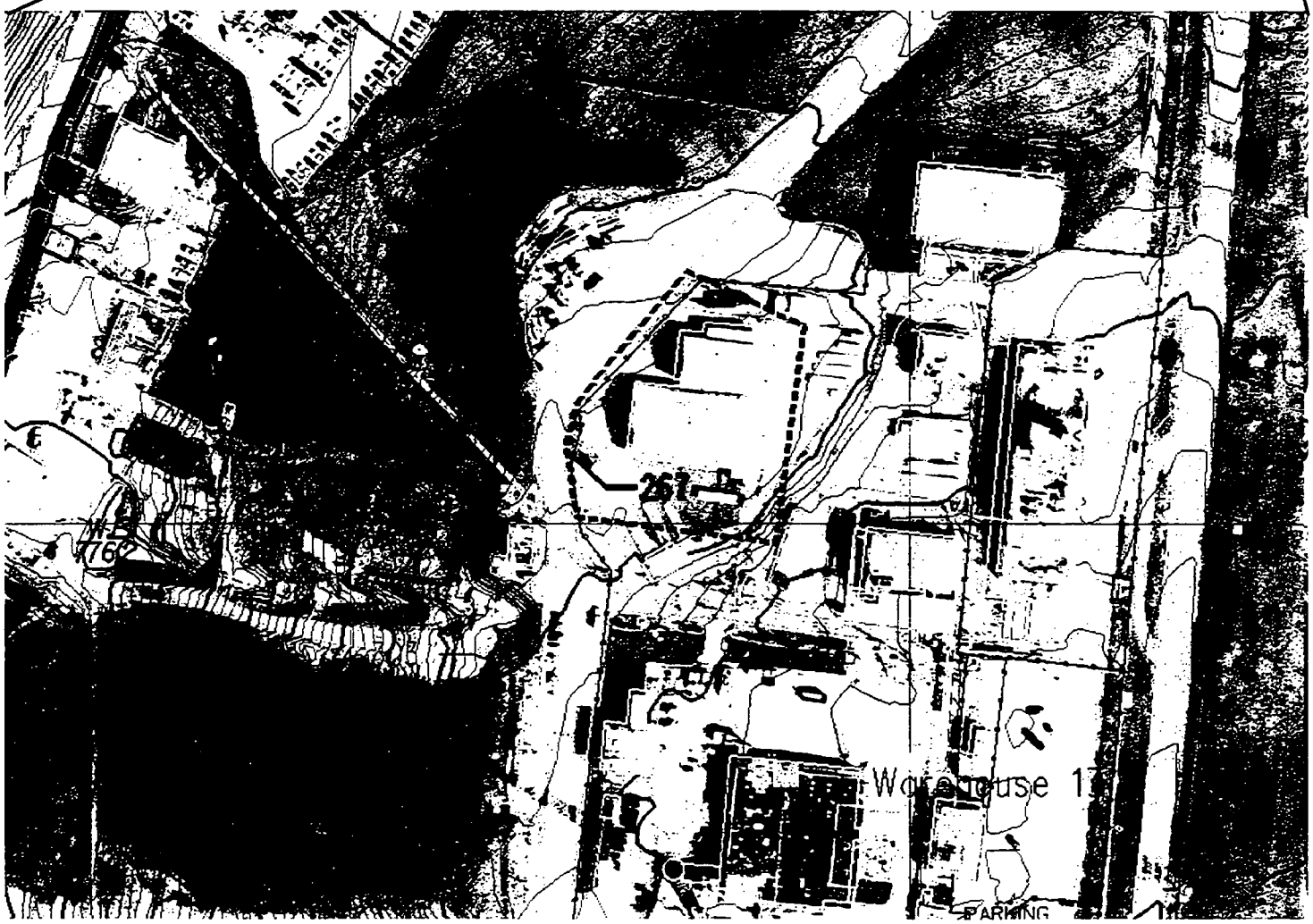
Mound Plant

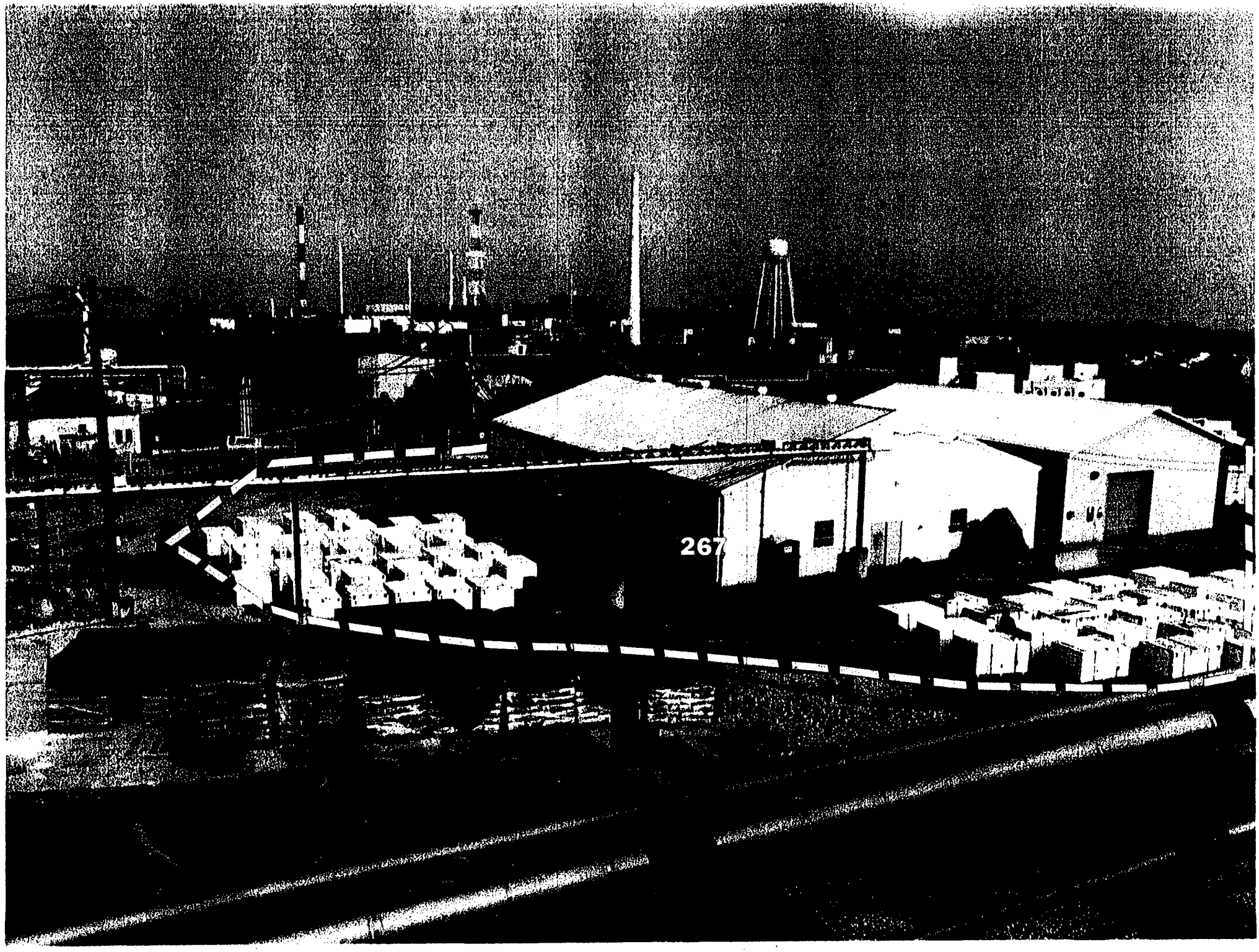
Release Block F

Potential Release Site

PRS 267






267

PRS 267

PRS HISTORY:

PRS 267 (also recognized as Area 9) was identified as a potential release site as a result of historical information and the Radiological Site Survey performed in October 1983.[2]

PROCESS DESCRIPTION:

The historical data suggests the radiological contamination associated with PRS 267 (approximately 40,000 square feet) was from a thorium-232 redrumming operation. In 1965, the surface soil was excavated from Area 9 and backfilled with clean soil. The excavated soil, which was heavily contaminated with Th-232, was moved to Area 8 (PRS 266). In 1966, Building 31 (6100 sq. ft.) was built on PRS 267 for the storage of radioactive contaminated waste (drums and boxes) and is currently an active radiological storage and shipping area.

CONTAMINATION:

1. In 1983, thorium-232 was detected at a maximum concentration of 12 pCi/g in surface soil.[2] The regulatory guideline criteria for thorium-232 is 5 pCi/g.[7] All plutonium detections were below the Mound ALARA guideline criteria of 25 pCi/g.[2]

2. Results from PETREX soil gas surveys showed the northern half of PRS 267 to have relatively high levels of aromatic and C5-C11 hydrocarbon ion counts.

3. In the summer of 1995, PRS 267 was sampled as part of the Other Soils Characterization. PRS 267 was divided into 15 foot grids and sampled for organics (via organic vapor analyzer), metals (via x-ray fluoroscope) and radionuclides (field detection via FIDLER and lab analysis via Mound soil screening). Sampling depth was 0 to 12 feet (unless refusal was encountered prior to 12 feet). Sample results were:

   A) Two samples exceeded Guideline Criteria for radioactivity:

Contaminant	Maximum Concentration Detected	Sample Depth	Guideline Criteria
Plutonium-238	156 pCi/g[5] (in soil)	4-7 ft[5]	25 pCi/g (Mound ALARA)
Plutonium-238	141 pCi/g[5] (in soil)	4-8 ft[5]	25 pCi/g (Mound ALARA)

NOTE: pCi/g = picocurries/gram, ft = feet

   B) Volatile organic compounds (VOCs) were detected during field screening predominately in surface soils surrounding Building 31 (no quantitative organic data was available because the scope of the investigation only included field screening for VOCs).[5]

   C) No metals were detected above Risk Based Soil Guidelines.[5, 6]

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report. (pages 7-8.1)
2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey Report. (pages 9-15)
3) OU9, Site Scoping Report: Volume 7 - Waste Management. (pages 16-21)
4) OU5, Operational Area Phase I Investigation Non-AOC Field Report. (pages 22-30)

OTHER REFERENCES:

5) Other Soils Characterization Report, Draft, January 1996. (pages 31-38)
6) Risk Based Soil Guideline Values, December 1995, Final, Revision 3. (pages 39-41)
7) Code of Federal Regulations, 40 CFR192.12 and 40 CFR192.41.

PREPARED BY:

Gerald F. Maul, Member of EG&G Technical Staff

PRS 267
SUPPLEMENTAL DATA

HISTORY:

In 1996, the quantitative ***Soil Gas Confirmation Sampling***[8] investigation sampled the *PETREX* soil gas locations with the highest *PETREX* ion counts in the northern and eastern sectors of the Mound plant. These locations were identified as *Soil Gas Confirmation Sampling* locations 2 and 4 (northern sector) and 5, 6 and 9 (eastern sector).

CONTAMINATION:

PRS 267 was not sampled during the *Soil Gas Confirmation Sampling*. However, the northern and eastern sector *PETREX* sample locations within PRS 267 had lower ion counts than the sampled northern and eastern sector *Soil Gas Confirmation* locations. Hence, the quantitative *Soil Gas Confirmation* results taken at the locations with the highest ion counts provide evidence about the risk of contamination at other locations with similar or lower ion counts such as the PETREX locations within PRS 267. The maps on pages 46 and 47 show the locations of the PETREX samples within PRS 267 relative to the *Soil Gas Confirmation Sampling* locations.

The following tables list the qualitative (*PETREX*) and quantitative (*Soil Gas Confirmation Sampling*) results for the locations with the highest ion counts. The table also compares these results to the relative ion counts for PETREX locations within PRS 267.

NORTHERN SECTOR

PETREX Soil Gas Contaminant Family	Maximum Ion Count[4]	Confirm Sample #	Confirmation Sample Results that Exceed Guideline Criteria (GC)	Maximum Ion Counts at PRS 267
Total Aromatic Hydrocarbons	7,780,673	2	None	1,737,343
Total Semivolatile Hydrocarbons	7,015,960	2	1300 ug/kg Benzo(a)pyrene (GC = 410 ug/kg [ref 5])	18,849
Total C5-C11 Petroleum Hydrocarbons	24,166,931	2	None	3,164,476
Total Halogenated Hydrocarbons	1,370,283	4	None	40,930

EASTERN SECTOR

PETREX Soil Gas Contaminant Family	Maximum Ion Count[4]	Confirm Sample #	Confirmation Sample Results that Exceed Guideline Criteria (GC)	Maximum Ion Counts at PRS 267
Total Aromatic Hydrocarbons	6,078,070	(#5)	None	5,315,457
Total Semivolatile Hydrocarbons	744,700	(#9)	None	22,143
Total C5-C11 Petroleum Hydrocarbons	11,565,340	(#5)	None	9,565,092
Total Halogenated Hydrocarbons	89,852	(#6)	None	67,782

The above tables and discussion make no conclusions about individual contaminant concentrations at PRS 267 only that the overall health risk from PRS 267 is expected to be similar to or less than that of the PETREX locations with the highest measured ion counts.

8) Soil Gas Confirmation Sampling, (Revision 0), May 1996. (pages 42-57)

PREPARED BY:

Gerald F. Maul, Member of EG&G Technical Staff

PRS 267

RECOMMENDATION:

CONCURRENCE:

DOE: _____

USEPA: _____

OEPA: _____

REFERENCE MATERIAL
PRS 267

Document Control No. _____

Environmental Restoration Program

OPERABLE UNIT 9 SITE SCOPING REPORT: VOLUME 12 – SITE SUMMARY REPORT

MOUND PLANT
MIAMISBURG, OHIO

December 1994

Final

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref	Releases	Media	Ref	Analytes*	Results	Ref
264	Explosive Waste Storage Bunker (Magazine 53)	I-7	In service	Classified, non-explosive wastes Explosion residuals (primarily aluminum residuals) Contaminants listed under Explosive Waste Storage Bunker (Magazine 53) Detonators, Detonating cord, Thermite, Pyrotechnic powders, Primary explosives High explosive powder, PETN, PBX, RDX, HMX, HNS, CP HNS (hexanitrostilbene)	4, 5, 18	None Suspected			No Data		
265	Biodegradation Unit	I-7	Inactive	Soapy wastewater containing explosives constituents	4, 5, 18	Suspected	S	7, 18	See Pyrotechnic Waste Shed		4
266	Area 8, Thorium-Contaminated Soils from Areas 1 and 9	F-9	Grounds	Thorium-232, Plutonium-238	1, 4, 5, 18	Thorium	S	4, 6	14, 15, 16	Table B.1 (Table V.3 in Ref. 6)	6
267	Area 9, Thorium Storage and Redrumming Area	F-9 G-9	Grounds	Plutonium-238, Thorium Thorium sludge constituents (c)	1, 4, 5, 18	Thorium	S	4, 6	14	Table B.1 (Table V.4 in Ref. 6)	6
268	Building 31, Contaminated Material Storage Building	F-9	In service	Plutonium-238 Thorium Tritium	4 3	None Suspected			See Area 9	Table B.5	6
	ding 36 Historic Gasoline ks (Tanks 239 and 240)	G-10	Historical	Gasoline	3	No information on when tanks were removed			No Data		
	erground Sanitary Sewer Lines G6 & G7	G-10	In Service	Organic solvents, plating solutions, laboratory chemicals, nitric acid, hydrochloric acid, methylene chloride, strong acids and bases	4	Suspected VOCs	S	4	3, 4, 5, 6, 9, 10, 11, 12, 13, 16	Tables B.6, B.7, B.8, and B.9	7
	ding 37 Sanitary Waste Tank (Tank 100)	F-10	In service	Sanitary wastes	3, 4	None Suspected			No Data		

1 - Soil Gas Survey - Freon 11, Freon 113, Trans-1,2-Dichloroethylene, Cis-1,2-Dichloroethylene, 1,1,1-Trichloroethane, Perchloroethylene, Trichloroethylene, Toluene
2 - Gamma Spectroscopy - Thorium-228, -230, Cobalt-60, Cesium-137, Radium-224, -226, -228, Americium-241, Actinium-227, Bismuth-207, Bismuth-210m, Potassium-40
3 - Target Analyte List
4 - Target Compound List (VOC)
5 - Target Compound List (SVOC)
6 - Target Compound List (Pesticides/Polychlorinated Biphenyl)
7 - Dioxins/Furans
8 - Extractable Petroleum Hydrocarbons (EPH)/Total Petroleum Hydrocarbons (TPH)
9 - Lithium
10 - Nitrate/Nitrite
11 - Chloride
12 - Explosives
13 - Plutonium-238
14 - Plutonium-238, Thorium-232
15 - Cobalt-60, Cesium-137, Radium-226, Americium-241
16 - Tritium

Reference List

1. DOE 1986 "Phase I Installation Assessment Mound (DRAFT)."
2. DOE 1992a "Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan (Final)."
3. DOE 1992c "Mound Plant Underground Storage Tank Program Plan & Regulatory Status Review (Final)."
4. DOE 1993a "Site Scoping Report: Volume 7 - Waste Management (Final)."
5. EPA 1988a "Preliminary Review/Visual Site Inspection for RCRA Facility Assessment of Mound Plant."
6. DOE 1993d "Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey (Final)."
7. DOE 1993c "Operable Unit 3, Miscellaneous Sites Limited Field Investigation Report."
8. DOE 1992d "Reconnaissance Sampling Report Decontamination & Decommissioning Areas, OU6, (Final)."
9. Fentiman 1990 "Characterization of Mound's Hazardous, Radioactive and Mixed Wastes."
10. DOE 1992f "Operable Unit 9, Site Scoping Report: Volume 11 - Spills and Response Actions (Final)."
11. Styron and Meyer 1981 "Potable Water Standards Project: Final Report."
12. DOE 1993b "Reconnaissance Sampling Report - Soil Gas Survey & Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill (Final)."
13. DOE 1993d "Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey (Final)."
14. DOE 1991b "Main Hill Seeps, Operable Unit 2, On-Scene Coordinator Report for CERCLA Section 104 Remedial Action, West Powerhouse PCB Site."
15. Halford 1990 "Results of South Pond Sampling."
16. DOE 1993e "Operable Unit 4, Special Canal Sampling Report, Miami Erie Canal."
17. DOE 1990 "Preliminary Results of Reconnaissance Magnetic Survey of Mound Plant Areas 2, 6, 7, and C."
18. DOE 1992a "Remedial Investigation/Feasibility Study, Operable Unit 9, Site-Wide Work Plan (Final)."
19. Rogers 1975 "Mound Laboratory Environmental Plutonium Study, 1974."
20. DOE 1992h "Ground Water and Seep Water Quality Data Report Through First Quarter, FY92."
21. Dames and Moore 1976 a, b "Potable Water Standards Project Mound Laboratory" and "Evaluation of the Buried Valley Aquifer Adjacent to Mound Laboratory."
22. DOE 1992i "Closure Report, Building 34 - Aviation Fuel Storage Tank."
23. DOE 1992j "Closure Report, Building 51 - Waste Storage Tank."
24. DOE 1994 "Operable Unit 1, Remedial Investigation Report."
25. EG&G 1994 "Active Underground Storage Tank Plan."

Document Control No: DGC
W.P. DAVIS

Environmental Restoration Program

OPERABLE UNIT 9, SITE SCOPING REPORT
VOLUME 3 - RADIOLOGICAL SITE SURVEY

MOUND PLANT
MIAMISBURG, OHIO

June 1993

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

The drilling and sampling were performed using an auger drill rig and a 2-ft, split-barrel sampler. As the split-barrel sampler was removed from the borehole, it was monitored for radioactivity contamination by Mound Plant health physics personnel using a FIDLER to detect radioactivity contamination that would pose a hazard to the workers present. After the soil was removed from the sampler and placed in sample containers, field team members wearing gloves brushed the remaining soil out of the sampler. The gloves were then monitored with an alpha scintillometer before the split-barrel sampler was used again. However, no standard decontamination was performed.

The core locations are shown in Plate 1. The core locations were surveyed by a licensed surveyor after drilling was completed. The available reports submitted to Mound Plant by the drilling subcontractors are presented in Appendix B.

2.1.4. Sample Analyses

2.1.4.1. FIDLER Screening

In order to identify samples with concentrations of plutonium-238 exceeding 25 pCi/g and total thorium exceeding 2 pCi/g, all of the soil samples collected were pulverized and then screened using a Bicron® FIDLER at the Mound Plant Soil Screening Facility, known as trailer 15 at the time of the Site Survey Project. The Soil Screening Facility is now located in the H Building at Mound Plant (Plate 1). The minimum detectable activity at which plutonium-238 can be reliably detected at the Mound Plant screening facility is estimated to be 25 pCi/g (Draper 1986b). The detection of plutonium-238 at lesser concentrations (12-25 pCi/g) was unreliable and had an estimated error of ±75 percent. The estimated error decreased with increasing sample activity; for samples with 25 to 100 pCi/g of plutonium-238, the estimated error was ±35 percent, and for samples with >100 pCi/g, the estimated error was ±30 percent (Casella and Bishop 1984). The minimum detectable activity for thorium from FIDLER screening was estimated to be about 2 pCi/g (Stought et al. 1988). The Mound Plant procedure for screening soil samples is provided in Appendix A.

2.1.4.2. Radiochemical Analysis for Plutonium-238

Because of the high error (±75 percent) involved in the FIDLER screening of samples containing less than 25 pCi/g of plutonium-238, all soil samples were radiochemically analyzed by Mound Plant for plutonium-238. The lower detection limit (LDL) for plutonium-238 by this method was estimated to be 0.01 pCi/g, with a relative precision (two standard deviations) of 25 percent. The overall precision of the plutonium-238 measurements was reported to be about 18 percent (DOE 1991b). The Mound

Plant procedure for the radiochemical analysis of soil samples for plutonium-238 is provided in Appendix A.

2.1.4.3. Radiochemical Analysis for Thorium

Samples with thorium concentrations in excess of 2 pCi/g by FIDLER screening were also radiochemically analyzed for thorium, resulting in the radiochemical analysis of about 12 percent of the samples. The LDLs for the thorium isotopes using radiochemical procedures were estimated to be

- 0.3 pCi/g for thorium-228, with a relative precision of 60 percent;
- 0.3 pCi/g for thorium-230, with a relative precision of 30 percent; and
- 0.1 pCi/g for thorium-232, with a relative precision of 70 percent.

The overall precision for the thorium measurement was reported to be about 25 percent. The thorium results were reported in pCi of total thorium per gram of soil, isotopes were not identified. The Mound Plant procedure for the radiochemical analysis of soil samples for thorium is provided in Appendix A.

2.1.4.4. Gamma Spectroscopy

Gamma spectroscopy was performed by Mound Plant on approximately 350 (18 percent) of the soil samples in order to verify the identity of the radionuclides present when screening indicated the presence of gamma-emitting radionuclides, but little excess plutonium or thorium was identified by radiochemical analysis. Gamma spectroscopy is capable of detecting a variety of gamma-emitting radionuclides; the radionuclides detected in samples collected during the Site Survey Project included cobalt-60, cesium-137, radium-226, actinium-227, and americium-241. No other gamma-emitting radionuclides with gamma energies below 1.5 millielectron volts (MeV) were detected, although the project report stated that subsequent sampling and analysis in some areas indicated bismuth-207 and bismuth 210m. No polonium-210 peaks were detected in the Site Survey Project samples, confirming that polonium-210, which was used at Mound Plant in the 1950s, is no longer present due to radioactive decay (half-life of 138.4 days). The LDLs for cesium-137, cobalt-60, and americium-241 were given with the original data, and were estimated to be 0.5 pCi/g for each. The LDLs for radium-226 and actinium-227 were estimated to be 1.0 pCi/g for both (Stought 1990). The Mound Plant procedure for gamma spectroscopy is provided in Appendix A.

0285, 0286, 0287, 0288, 0289, and 0290 (Plate 1). Appendix C contains the report provided by RMC on the *in situ* thorium analysis. Mound Plant personnel report that the *in situ* analysis was performed by driving pipes through the soils to bedrock and lowering the detector down the pipes. The logs for the drilling to install these pipes are located in Appendix B.

The maximum thorium concentration reported for Area 8, 254.3 pCi/g, was detected in the sample collected from core location 0045 at a depth of 80 inches (C0045 on Table V.3 and core location 0045 on Plate 1). Plutonium-238 was detected in several samples. The maximum concentration, 34.4 pCi/g, was detected in the sample collected from surface location 0333 (S0333 on Table V.3). As shown in Plate 5, the area of elevated thorium concentrations appears to extend north, down the slope of the hill, and in general, extends beyond the original boundaries of the low-lying area. Therefore, it is probable that some transport of contaminated sediments by surface water has occurred from Area 8. All other values detected were less than 10 pCi/g. The original Site Survey Project Report (Stought et al. 1988) noted that post site survey D&D FIDLER screening data indicated thorium levels much higher than 10,000 counts per minute. This information suggests that levels of thorium greater than those given in Table V.3 may be present in Area 8.

Based on the *in situ* analysis performed in Area 8, which involved driving pipes to bedrock, the depth to bedrock ranges from 72 to 144 inches (6 to 12 ft). The remaining core locations in the area (0034, 0036, and 0038), which were sampled to depths of 108, 114, and 108 inches, may also have been sampled to bedrock, but boring logs are not available for these locations.

5.7. AREA 9

Area 9 is located on the north end of the SM/PP Hill, surrounding Building 31 (Plate 1). This area was used for storage and redrumming operations of thorium sludges from the mid-1950s to the early 1960s. The Site Scoping Report: Volume 6 - Photo History (DOE 1992b) documents the use of the area for open drum storage through 1959. In 1966, thorium-contaminated soils were pushed over the edge of the hillside to the adjacent Area 8. Area 9 was backfilled with clean soil and is currently covered with asphalt. Area 9, as shown in Plate 1, is based on a review of the site survey data conducted during the preparation of this report, and is similar to that depicted in the original report.

The samples collected in Area 9 during the Site Survey Project were analyzed for plutonium-238 and thorium (Table V.4). Only relatively low levels of plutonium-238, with a maximum level of 8.15 pCi/g were detected at location C0040. Three of the samples collected contained thorium concentrations in excess of 2 pCi/g. These were the samples collected from core location 0039 at a depth of 18 inches (5.62 pCi/g), from core location 0043 at a depth of 18 inches (6.22 pCi/g), and from surface location 0339 (12 pCi/g). This evaluation of the Area 9 samples is based on a review of the site

survey data conducted during the preparation of this report, and appears to be relatively comparable to the summaries presented in the original Site Survey Project Report. The original report did note that post site survey D&D Program core sampling was conducted in this area. Thorium concentrations as high as 150 pCi/g were detected, but thorium concentrations were generally in the range of 5 to 15 pCi/g. No data reports of the D&D Program were found during research for this report.

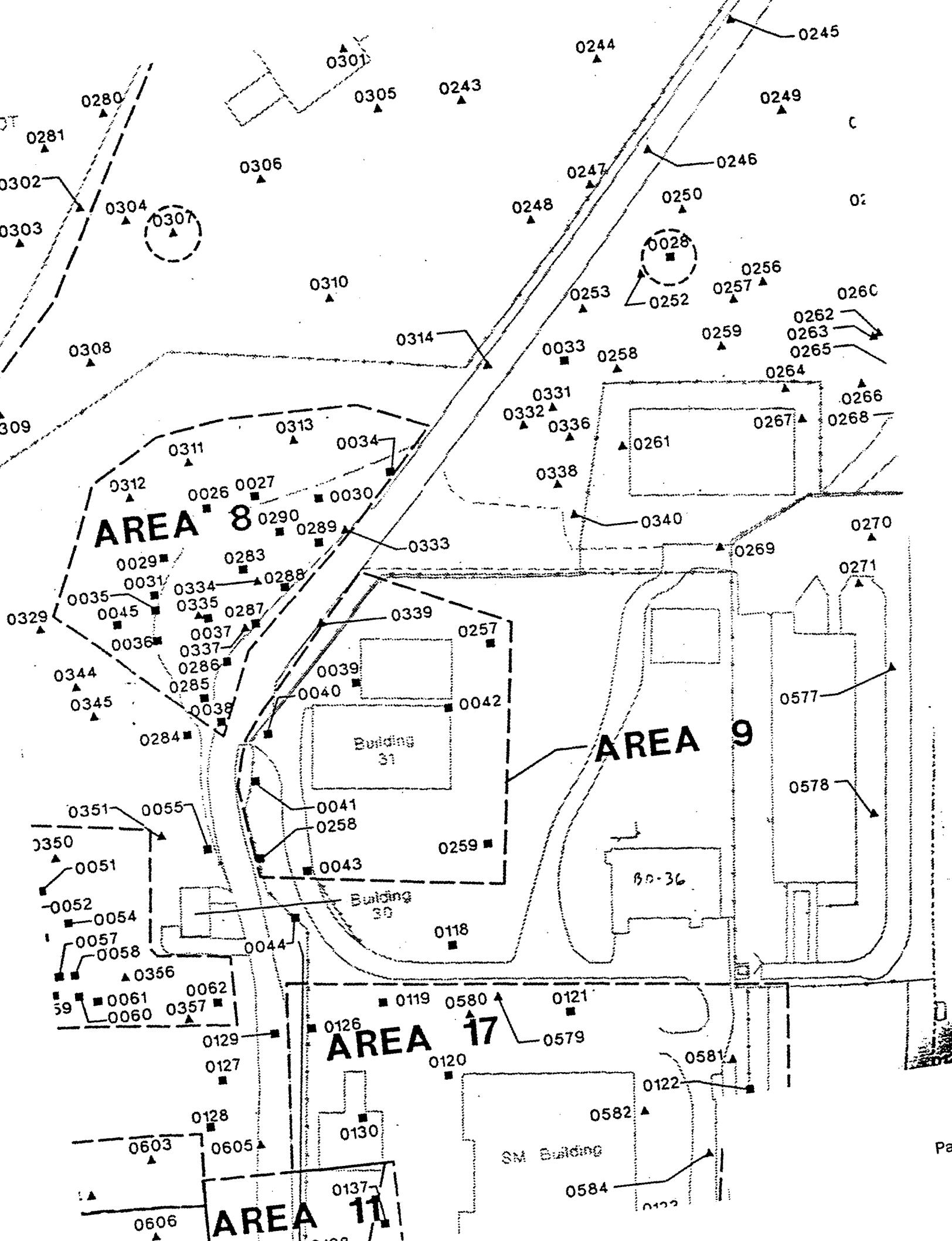
Mound Plant drawing #FSE16472 (DOE 1992f) indicates the depth to bedrock in this area is approximately 48 to 96 inches (4 to 8 ft). The maximum depth sampled during the Site Survey Project was 54 inches, or 4.5 ft. Most of the core locations were sampled at depths of 18 to 36 inches. Because the boring logs for Area 9 are not available, it is not known if sampling was performed until bedrock was reached.

5.8. AREA 12

Area 12 is located on the SM/PP Hill, adjacent to Areas 10 and 11 (Plate 1). In 1965, thorium-contaminated soils from Area 1 were buried in a trench in Area 12. Pipelines that carried radioactive wastes from the PP Building to the WD Building passed through this area. This area contains elevated levels of plutonium-238, perhaps from work performed at the WTS (Area 15) or runoff from Area 11 (subsections 4.1.2 and 4.1.7). Another smaller area of plutonium-238 contamination was located west and downgradient of Area 12. This contamination may also be the result of surface water transport from Areas 11 and 12. The boundaries of Area 12 shown on Plate 1 are based on a review of the site survey data during preparation of this report, and are similar to the area depicted in the original Site Survey Project Report.

Table V.5 gives the results of the Site Survey Project sampling in Area 12, which are similar to the results summarized in the original Site Survey Project Report. The maximum plutonium-238 and thorium concentrations reported were 13 pCi/g and 189.9 pCi/g, respectively. These concentrations were detected in a sample collected from core location 0131 at a depth of 54 inches (Plate 1, CO131 on Table V.5).

In situ gamma spectroscopy for thorium-232 was performed at two core locations (CO145 and CO291, Table V.5). The maximum thorium-232 concentration measured using this technique was 22 pCi/g. This concentration was detected in the samples collected from location CO145 at depths of 24 and 36 inches. Most core locations were sampled to a total depth of 132 to 180 inches; however, the maximum sampling depth was 234 inches (Table V.5). Mound Plant drawing #FSE16472 (DOE 1992f) indicates the depth to bedrock in this area is 120 to 234 inches. It appears that the Area 12 core locations may have been sampled until bedrock was reached, but the boring logs are not available.


AREA 8
AREA 9
AREA 17
AREA 11
Building 31
Building 30
BO-36
SM Building
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0244
0301
0305
0243
0249
0280
0281
0246
0247
0306
0302
0304
0307
0248
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0606

Table V.4. Mound Site Survey Project - Area 9

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)
C0039	2525	2110	1977	05-83	18	0.59	5.62
			1978	05-83	36	0.04	b
C0040	2525	2185	1979	05-83	18	0.82	b
			1980	05-83	36	8.15	b
			1981	05-83	54	0.82	b
C0041	2550	2210	1982	05-83	18	2.30	b
			1983	05-83	54	0.29	b
C0042	2575	2060	1974	05-83	18	1.36	b
			1975	05-83	24	0.07	b
C0043	2625	2210	1971	05-83	18	0.65	6.22
			1972	05-83	36	0.14	b
S0339	2475	2110	7114	08-84	0	0.74	12
C0257	2550	2010	1976	05-83	18	0.47	b
C0258	2600	2235	1985	05-83	36	0.04	b
C0259	2675	2085	1973	05-83	18	0.55	b

[a]Map locations are given using a "C" to designate core locations and an "S" to designate surface locations.
[b]A "b" indicates that the total thorium concentration was less than the background level of 2.0 pCi/g, using FIDLER screening. Therefore, radiochemical analysis was not performed.
FIDLER - field instrument for the detection of low-energy radiation
MRC ID - Monsanto Research Corporation Identification
pCi/g - picocuries per gram

RADIOCHEMICAL ANALYSIS

Document Control No. _____

Environmental Restoration Program

EG&G MOUND-29-01 -01 -07 -07 -9502080001

OPERABLE UNIT 9, SITE SCOPING REPORT: VOLUME 7 - WASTE MANAGEMENT

MOUND PLANT
MIAMISBURG, OHIO

February 1993

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Department of Energy
Albuquerque Field Office

Environmental Restoration Program
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barium chloride followed by a pH adjustment to 6. This step resulted in the precipitation of the radium isotopes. No analytical data were found to indicate the concentrations of radium-228 and -224 present in the raffinate or wastewater. This aqueous waste went to the 30,000-gallon influent tanks in the WD Building. It is not known whether it was treated or simply diluted and released to the Great Miami River. The tributyl phosphate and nitric acid wastes were probably drummed for shipment and burial offsite, but this has not been confirmed. The equipment used in the pilot plant, including the columns, glassware, pumps, and other equipment, was cleaned and subsequently used for the protactinium-231 separations (Meyer 1956c).

The production-scale thorium refinery facility that was planned for construction at Mound required extensive construction in the SW Building. Construction of the foundations for the refinery equipment was nearly complete in the west side of the SW Building when excavations for the refinery exposed a section of contaminated soil and gravel that had resulted from leakage of radium-actinium process wastes from the sump located on the west side of room SW1-A. The sump served the "hot" side of the old cave in which the radium and actinium was processed. About 200 ft^3 of contaminated soil and gravel were excavated and dumped into an old septic tank. The septic tank was a remnant from the plant construction in the late-1940s and is currently included in Area 4 (DOE 1992g).

The majority of the waste generated by the thorium refinery project at Mound was associated with the storage of the 1,650 tons of thorium-containing sludges. Some of the drums in which the thorium was shipped were in poor condition when they arrived; many of the drums were apparently frozen when they were shipped and had thawed in transit, resulting in contamination of the interiors of the boxcars. These boxcars underwent decontamination procedures before being allowed to leave the facility. In some cases, the interior flooring and other contaminated material was removed, and some of the flooring was replaced.

Equipment necessary to conduct the redrumming was initially installed in Warehouse 15 (Figure 2.9), but the high levels of radon caused the operation to be moved outdoors (Thomas 1991). One report indicates that some redrumming took place by an AEC contractor other than MCC. The drums were washed, and the resulting "thorium decantate," amounting to 630 drums of wastewater, was diluted and released to the river in early January 1956 (Meyer 1956a). This release probably took place either to the storm sewer or the NPDES Outfall 001 pipeline to the Great Miami River.

The highly corrosive nature of the sludges resulted in drum leakage and subsequent soil contamination. The repacking of leaking drums became an ongoing activity. Somewhere between 15,000 and 20,000 steel drums had to be disposed of before the sludge was put into storage in Building 21 (Meyer 1979a). Corroded drums were collapsed and buried at Mound in the areas now known as Areas 2 and

7 (Figure 2.9). Used drums were not cleaned and contained residual amounts of the thorium sludges. Soils contaminated with thorium at the areas of redrumming and around the silo (Building 21) were removed to other areas and were generally dumped over the western slopes of the SM/PP Hill. The areas of redrumming are now known as Areas 3 and 8. Area 1 surrounds the old silo, and Areas 8, 12, and perhaps 7 received the contaminated soils (DOE 1992g). Equipment used during redrumming operations, including a flatbed truck and a conveyor belt, is known to have been buried in Area 7 (Figure 2.9). Nothing is known of the fate of the thorium metal. Mound reviewed the options for disposal of the thorium in April 1973 (MRC 1973a). This report indicated that some material had been sold prior to 1973. There is no specific mention of the thorium metal. An inventory of the thorium that was stored at Mound as of April 1973 does not include thorium metal. When Mound decided to sell the thorium residues, the invitation to bid, dated November 1, 1973, did not mention thorium metal available for sale (MRC 1973d).

2.6. THORIUM-230 (IONIUM) PROGRAMS

Ionium is an alpha-active thorium isotope with a half-life of 8.05×10^4 years. Ionium and thorium-230 are names that have been used interchangeably to identify this isotope. The interest in ionium goes back to 1946 (Peppard 1949), when a survey was conducted to identify sources of ionium. This survey looked at various fractions obtained from processing uranium and its ores to identify sources of ionium and protactinium-231 (Bruehlman 1947). In 1949, the ionium program reached a second milestone when a pilot plant was constructed at ANL to process 3,600 gallons of Mallinckrodt sparged turbid liquor from a material referred to as the airport cake, a raffinate produced by the diethyl ether solvent extraction of uranium (Peppard 1949). The material containing ionium was being produced at the Mallinckrodt Chemical Works uranium refinery in St. Louis, Missouri (Fariss 1955; Eichelberger and Scott 1956a).

In July 1955, Mound submitted a proposal to the AEC to design and install a facility that would be used for process chemistry development. The work would isolate ionium from raffinates produced at Mallinckrodt (McCarthy 1955). In November 1955, Mound received a directive to proceed with the design and construction of this facility, with a target completion date of February 1956 (Johnson 1955). The process chemistry research and development took place in the R Building. The larger columns required for production separation also were assembled in the R Building. Ionium was to be used as a tracer element in the Redwing test program and kilogram quantities of ionium were needed for weapons diagnostic tests. Between April 6 and May 18, 1956, five shipments of a total of 400 g of ionium were made to the AEC (Haubach 1956a, 1956b, 1956c, 1956d).

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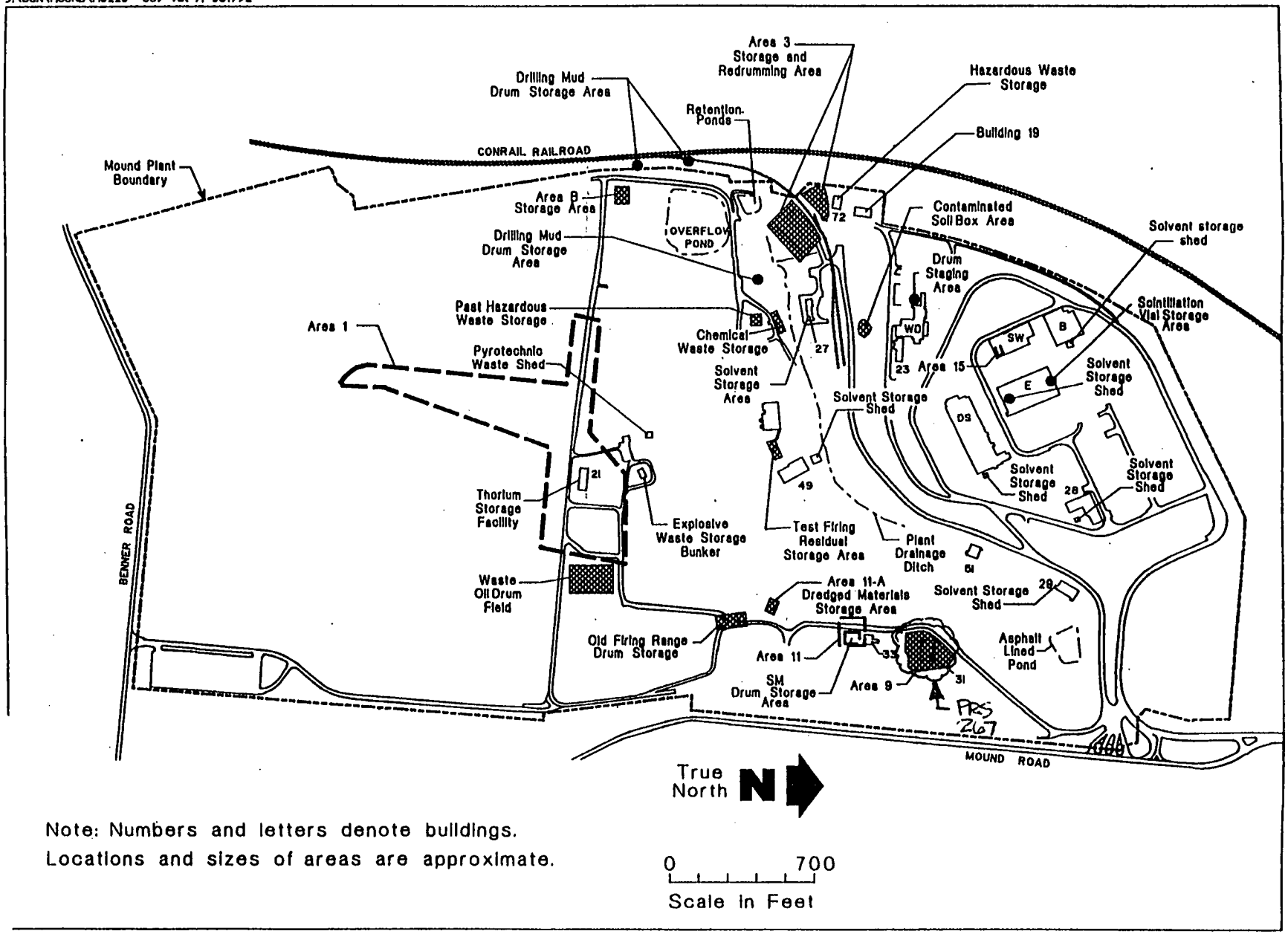

Note: Numbers and letters denote buildings.
Locations and sizes of areas are approximate.

Figure 5.1 Waste storage areas.

Closed containers of mixed waste are transported from the laboratory generating the material to Building 23, using a box-type or flatbed truck with rails. The truck is marked "Dangerous." Mixed waste is not transported off-plant; such waste is stored pending completion of waste characterization and identification of an acceptable waste treatment/disposal option. One hundred 55-gallon drums were stacked three-high during the 1988 site inspection (EPA 1988). Building 23 is one-story, 30 ft by 117 ft, and constructed of concrete block walls. The storage area is 30 ft by 40 ft with a concrete floor sloping to a 3-ft diameter, 6-ft deep concrete sump. The sump is not double contained. The sump has a sump pump with a flex-hose that can route the liquids to the storm sewer if clean or to WD Building or drums if contaminated (Hopkins, D 1991). An automatic sprinkler system is in the interior of the building, and two loading docks are on the front side of the building. The site inspection (EPA 1988) reported a release of tar-like substance near the radioactive waste drums in the northeast corner of Building 23, but the source of the leak was unidentified. The tar-like substance was later identified as a non-hazardous/non-radioactive material and was disposed of accordingly (Hopkins, D 1991). Approximately 85 gallons of scintillation vial wastes (and associated packaging materials) are generated annually.

5.1.3. Building 31, Contaminated Material Storage Building

The Building 31 Contaminated Material Storage Building (Figure 5.1) was built in 1966 and is located on the SM/PP Hill, (MRC 1978c). The building was originally used to store recoverable plutonium wastes that had been moved from the SM storage field east of Building 21 (McMannon 1963-1967). It is now used for interim storage of packaged radioactive waste waiting final disposition. The building is a one-story, sheet-metal building occupying 6,100 ft^2. The radioactive waste storage room was originally divided into three bays, but has been converted to a single large bay. The floor is a concrete slab with no drains or sumps or curbing. The waste is normally noncombustible equipment or soil contaminated with plutonium-238 or tritium. Waste stored in Building 31 is packaged in either drums or boxes that meet LSA or TRU criteria (Davis 1991).

5.1.4. Area 3, Thorium Storage and Redrumming Area (Historical)

Area 3 is in the lower valley area southwest of the Main Hill (Slaught et al. 1988) and includes Buildings 19, 42, 55, 57 and 72 (Figure 5.1). These buildings serve various purposes, including salvage operations, effluent monitoring, sewage treatment, and hazardous waste storage. In 1954 and 1955, about 6,000 55-gallon drums of thorium sludge were delivered by rail to Mound (MRC 1973; Meyer 1973). Some thorium drums were stored in Area 3 for prolonged periods during which time exposure to the elements and internal exposure to corrosive solutions necessitated frequent redrumming (MRC 1973a). Leakage and redrumming operations resulted th

the soil. In 1965, the thorium-contaminated soil was reportedly excavated and the area backfilled with clean soil (MRC 1985a; Stoughton et al. 1988). This claim could not be verified through research for this report. The Mound Site Survey Project (1982-1985) (DOE 1991c) analyzed soil samples from Area 3 and found elevated concentrations of plutonium and thorium. Maximum plutonium-238 concentration of 50.60 pCi/g and maximum thorium concentration of 5.30 pCi/g. The plutonium contamination may have resulted from runoff from the rupture of the WTS line between the WD Building and the SM/PP area complex in 1969 (DOE 1991c). Building 72 is currently used to store drums of hazardous waste prior to shipment for off-plant disposal. Wastes stored in this area may include organic solvents (e.g., acetone, isopropanol, methanol, trichloroethene), waste oils; paints and thinners; spent plating solutions containing chromium, cadmium, nickel, and copper; photoprocessing wastes; and polymer wastes (EPA 1988).

5.1.5. Area 9, Thorium Storage and Redrumming Area (Historical)

Area 9, the former Thorium Storage and Redrumming Area, is located under and around Building 31 (Figure 5.1). Building 31 was constructed in 1966 (MRC 1985a) and is on the eastern border of the site on the SM/PP Hill. It is currently used to stage both alpha and beta solidified and packaged wastes prior to shipment to off-plant disposal locations. In 1954 and 1955, 6,000 55-gallon drums of thorium sludge were delivered to Mound (MRC 1973a; Meyer 1979a). Some of these drums were stored at Area 9, and prolonged outside storage and internal exposure to corrosive solutions necessitated their frequent repackaging to ensure containment of the ore residue. Redrumming was initiated in April 1966 (Meyer 1956d). It became routine to repackage 20 to 45% of the drums annually. Drums were eventually moved to Area 1 where the thorium sludge was removed and placed in Building 21 (Thorium Sludge Storage Facility) beginning in July 1964. In 1965, an area of approximately 40,000 ft^2 was excavated from Area 9 and backfilled with clean soil to remove thorium-contaminated soils, which were subsequently deposited in Area 8 (MRC 1985a; DOE 1991c). The area is currently covered with asphalt. Low levels of plutonium and thorium contamination were detected in soils in this area (maximum plutonium-238 concentration of 8.15 pCi/g and maximum thorium concentration of 12 pCi/g) during the 1982 to 1985 Radiological Site Survey (DOE 1991c).

5.1.6. Building 21, Thorium Sludge Storage Facility (Historical)

Building 21 is southeast of the Building 90 blockhouse in the southern portion of Mound (Figure 5.1). Building 21 became operational in July 1964 (MRC 1973a), but is currently empty and is to be decommissioned. The building is 112 ft by 36 ft by 14 ft high and is completely enclosed with the walls and roof constructed of iron and steel (MRC 1973a). It was constructed on concrete with a 10-inch-thick floor and 14- to-16-inch-thick walls, which were intended to act as cantilevered retaining

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OPERABLE UNIT 5
OPERATIONAL AREA PHASE I INVESTIGATION
NON-AOC FIELD REPORT

MOUND PLANT
MIAMISBURG, OHIO

VOLUME I - TEXT

June 1995

Final (Revision 0)

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

samplers were wiped and prepared for shipment. On October 12, 1994, the samplers were sent as a batch to NERI for analysis.

2.2.1.4. Non-AOC East

Soil Gas Sampler Installation

Two sets of timers and 63 data samplers were installed on nine days between August 24 and September 1, 1994. Locations of the timers and data samplers are shown in Appendix E, Plate 1.

Soil Gas Sampler Retrieval

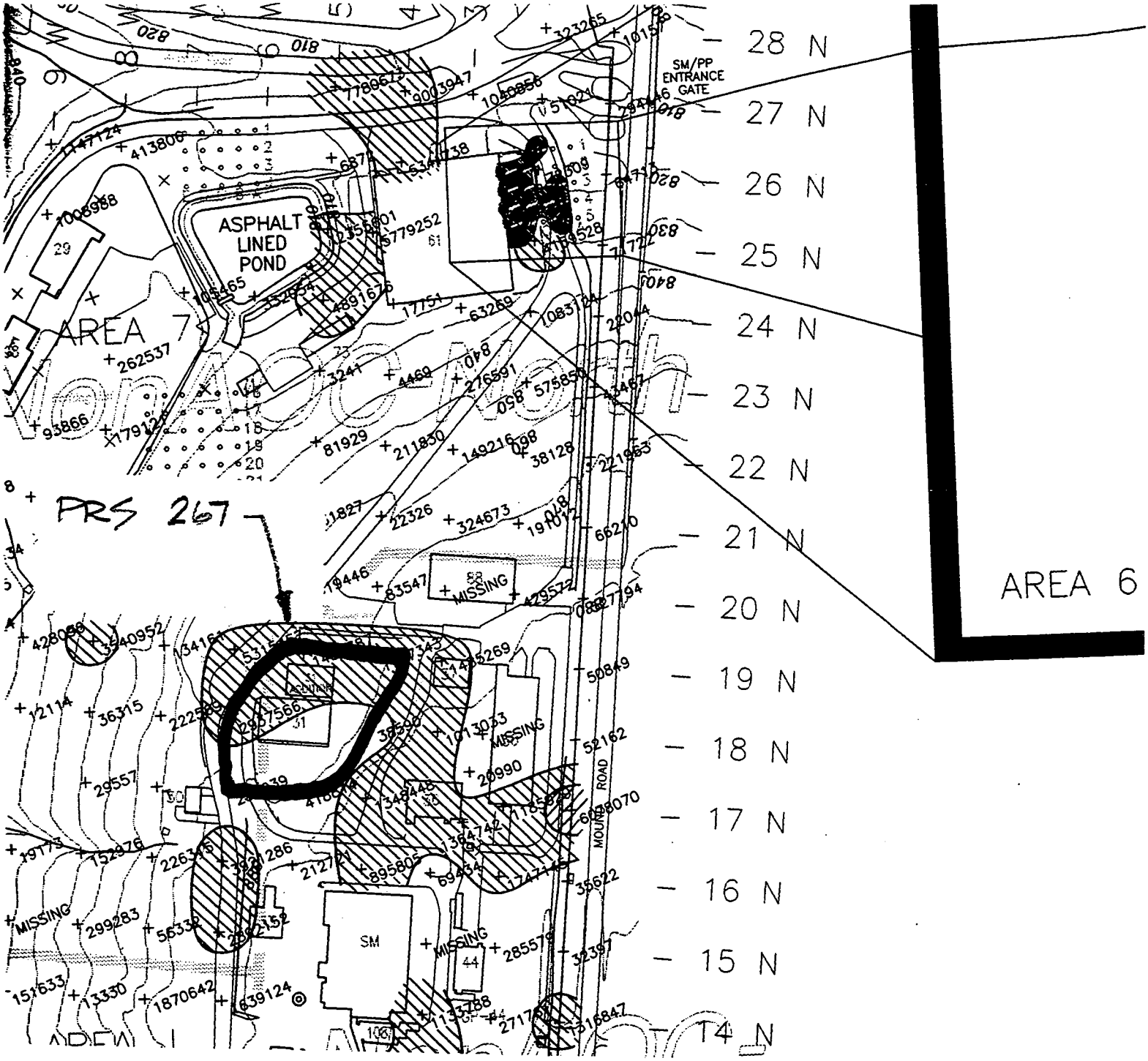
On August 29, 1994, one timer from each of the two timer sets was retrieved, wiped, and sent to NERI for analysis. The analysis of the timer at grid coordinate 20N4 indicated low levels of C_5 - C_9 hydrocarbons and the timer at grid coordinate 9N7 indicated low levels of C_5 - C_9 hydrocarbons, mainly aromatics (benzene and toluene). NERI requested that the second timer from each timer set be retrieved after 13-14 days of exposure. The second timers were retrieved and sent to NERI on September 6, 1994 for analysis. The analysis of these timers indicated low to moderate levels of petroleum hydrocarbons. Based on these responses, NERI recommended an exposure time of approximately 28 days per data sampler.

Samplers were extracted on four days between September 22 and October 11, 1994. One sampler, at grid coordinate 7N4, broke during retrieval. The wires were extracted and placed in a clean tube. Five samplers at grid coordinates 11N5, 12N3, 15N3, 18N2, and 20N3, could not be retrieved because of broken "guy" wires and/or collapse of the holes. The remaining samplers were wiped and prepared for shipment. On October 12, 1994, the samplers were sent as a batch to NERI for analysis.

2.2.1.5. Area 61

Soil Gas Sampler Installation

One timer set and 25 data samplers were installed on August 11, 1994. Locations of the timers and data samplers are shown in Appendix E, Plate 1.

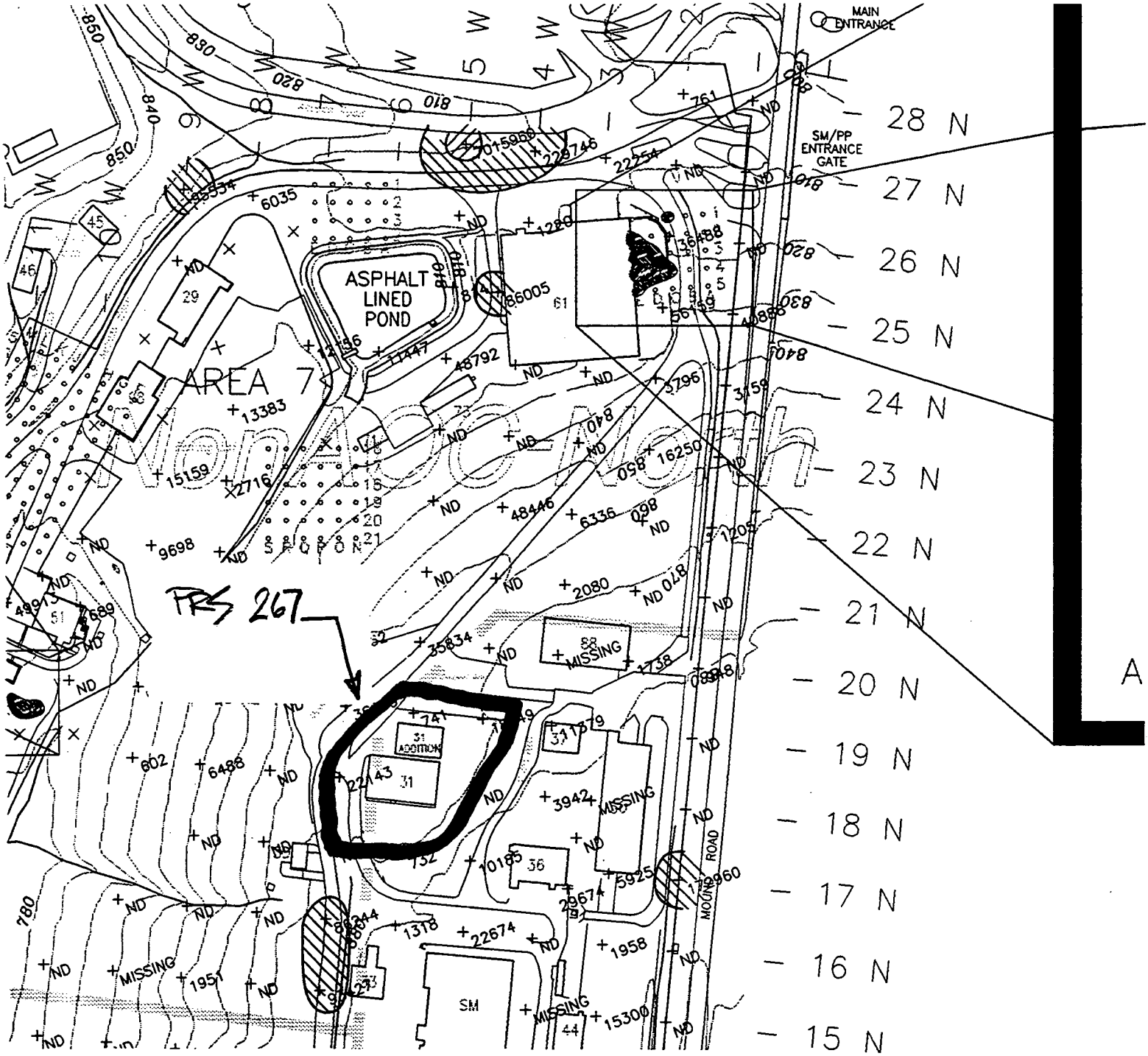


LEGEND				
Relative Response Values (in ion counts):				
NonAOC–South	NonAOC–West	NonAOC–East	NonAOC–North	Area 61
≥ 4,200,000	≥ 20,000,000	≥ 5,000,000	≥ 10,000,000	≥ 5,800,000
850,000–4,199,999	2,600,000–19,999,999	850,000–4,999,999	1,500,000–9,999,999	1,400,000–5,799,999

Relative Response

Total Aromatic Hydrocarbons

Plate 2

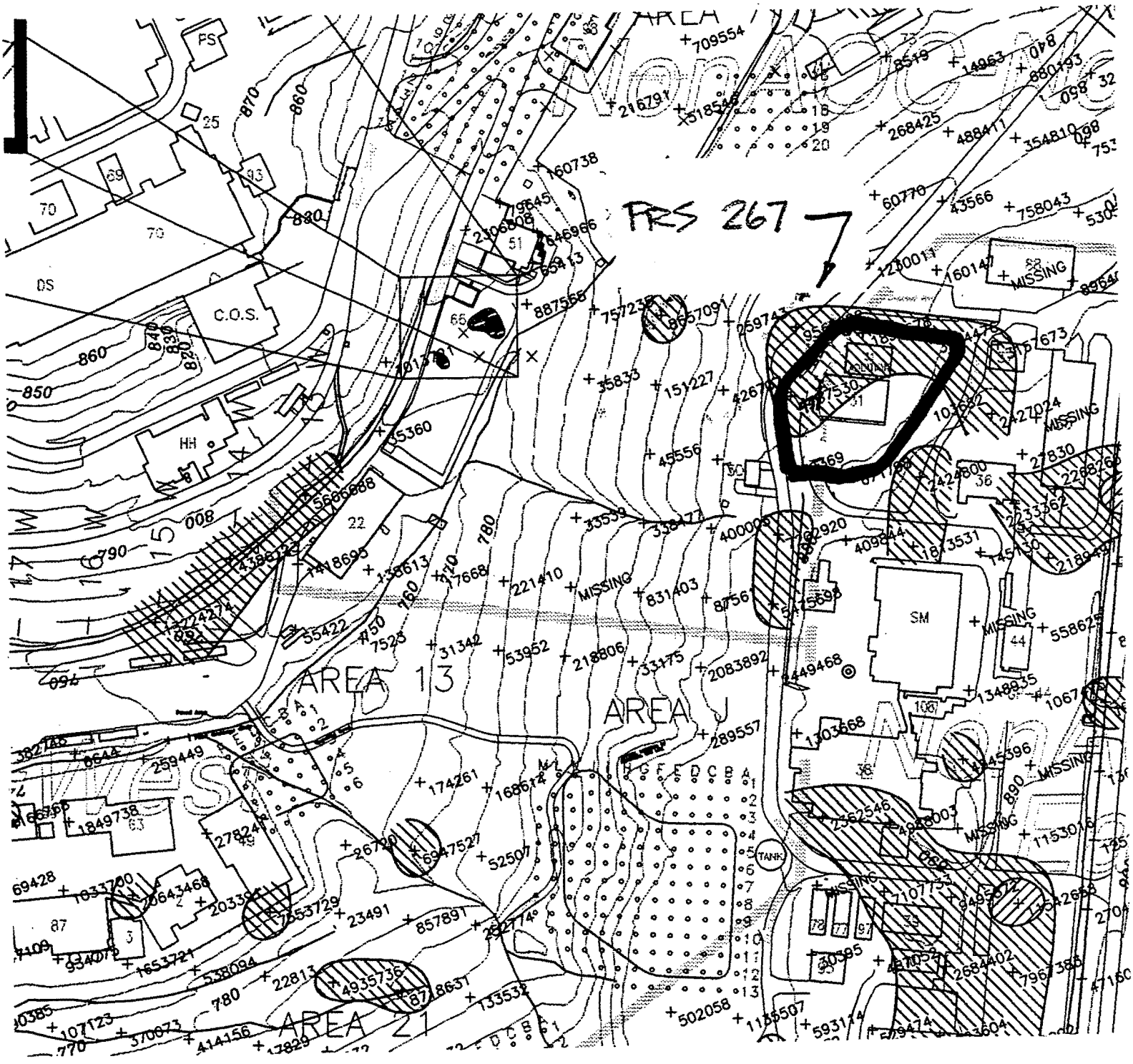


LEGEND				
Relative Response Values (in ion counts):				
NonAOC–South	NonAOC–West	NonAOC–East	NonAOC–North	Area 61
≥ 70,000	≥ 1,000,000	≥ 300,000	≥ 800,000	≥ 1,400,000
7,000–69,999	100,000–999,999	30,000–299,999	80,000–799,999	180,000–1,399,999

Relative Response

Total Semivolatile Hydrocarbons

Plate 3

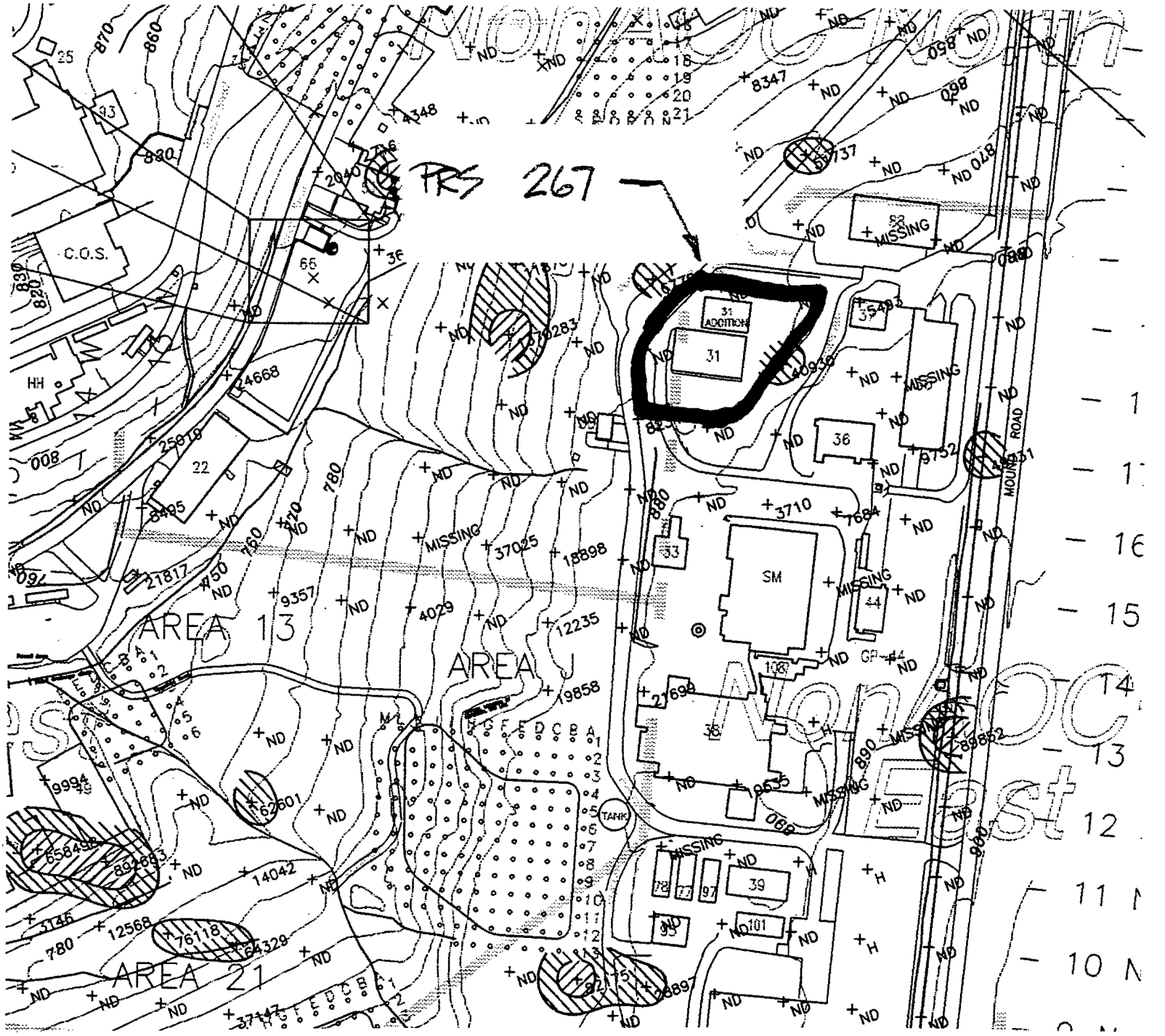


LEGEND				
Relative Response Values (in ion counts):				
NonAOC–South	NonAOC–West	NonAOC–East	NonAOC–North	Area 61
≥ 8,000,000	≥ 29,000,000	≥ 11,500,000	≥ 23,000,000	≥ 25,000,000
1,500,000–7,999,999	3,000,000–28,999,999	1,600,000–11,499,999	4,000,000–22,999,999	3,000,000–24,999,999

Relative Response

Total C5–C11
Petroleum Hydrocarbons

Plate 4



LEGEND				
Relative Response Values (in ion counts):				
NonAOC–South	NonAOC–West	NonAOC–East	NonAOC–North	Area 61
≥ 500,000	≥ 500,000	≥ 80,000	≥ 400,000	≥ 250,000
50,000–499,999	50,000–499,999	20,000–79,999	40,000–399,999	35,000–249,999

Relative Response

Total Halogenated Hydrocarbons

Plate 5

MOUND SOIL SCREEN DATA

APPENDIX D

RADIOLOGICAL DATA (FIDLER SURVEY MOUND SOIL SCREENING FACILITY DATA) FOR NON-AOC POINTS

	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
SMPID	Contamination Criteria CH1	FIDLER Readings CH1	Contamination Criteria CH2	FIDLER Readings CH2	FIDLER Readings Out Channel	Plutonium - 238		Thorium - 232	
	Units: CPM	Units: CPM	Units: KCPM	Units: KCPM	Units: KCPM	Units: pCi/g		Units: pCi/g	
	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	Note:	RESULTS	Note:
15N01	253.5	190	12.48	10.0	NC	21	a	1.1	a
15N02	122.2	110	5.59	4.5	NC	WIPE	c	WIPE	c
15N03	130	80	6.5	6.0	NC	0	a	0	a
15N06	130	75	6.5	5.0	NC	NR		NR	
15N07	170.3	115	9.72	8.5	NC	30	b	1	a
15N08	170.3	155	9.72	9.0	NC	NR		NR	
15N09	170.3	125	9.72	10.5	NC	17 17	a a	1.2 1.1	a a
15N10	170.3	100	9.72	7.5	NC	19	a	0.9	a
15N11	170.3	120	9.72	8.5	NC	3	a	1	a
15N12	157.3	100	8.45	6.0	NC	17	a	0.6	a
15N13	157.3	85	8.45	4.5	NC	WIPE	c	WIPE	c
15N14	157.3	108	8.45	6.0	NC	NR		NR	
16N01	253.5	170	10.0	10.5	NC	17	a	1.1	a
16N02	122.2	70	5.59	4.5	NC	WIPE	c	WIPE	c
16N03	130	100	6.5	5.0	NC	0	a	0.5	a
16N04	130	150	6.5	9.0	NC	78	b	1.2	a
16N05	NC	NC	NC	NC	NC	243	b	1.2	a
16N06	130	45	6.5	4.5	NC	WIPE	c	WIPE	c
16N07	170.3	80	9.72	5.0	NC	4	a	1	a
16N08	170.3	45	9.72	4.5	NC	9	a	0.6	a
16N09	170.3	130	9.72	7.5	NC	NR		NR	
16N10	170.3	125	9.72	6.5	NC	NC		NC	
16N11	157.3	110	8.45	5.5	NC	NC		NC	
16N13	157.3	55	8.45	5.5	NC	NR		NR	
17N01	253.5	100	12.48	5.5	NC	0	a	0.5	a
17N02	130	80	6.5	4.5	NC	WIPE	c	WIPE	c
17N04	130	80	6.5	4.0	NC	WIPE	c	WIPE	c
17N05	130	90	6.5	4.0	NC	WIPE	c	WIPE	c

MOUND SOIL SCREEN DATA

APPENDIX D

RADIOLOGICAL DATA (FIDLER SURVEY MOUND SOIL SCREENING FACILITY DATA) FOR NON-AOC POINTS

	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
SMPID	Contamination Criteria CH1	FIDLER Readings CH1	Contamination Criteria CH2	FIDLER Readings CH2	FIDLER Readings Out Channel	Plutonium - 238		Thorium - 232	
	Units: CPM	Units: CPM	Units: KCPM	Units: KCPM	Units: KCPM	Units: pCi/g		Units: pCi/g	
	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	Note:	RESULTS	Note:
17N06	130	100	6.5	5.0	NC	0	a	0.9	a
17N07	170.3	150	9.72	6.5	NC	21	a	1.2	a
17N08	170.3	130	9.72	8.0	NC	19	a	1.2	a
17N09	170.3	80	9.72	5.5	NC	NC		NC	
17N10	170.3	100	9.72	6.0	NC	NC		NC	
17N11	170.3	90	9.72	7.0	NC	NC		NC	
17N12	152.1	40	8.45	4.5	NC	6	a	0.6	a
18N01	253.5	185	12.48	9.0	NC	16	a	1.1	a
18N02	130	80	6.5	4.0	NC	WIPE	c	WIPE	c
18N03	130	75	6.5	5.0	NC	WIPE	c	WIPE	c
18N04	130	60	6.5	4.5	NC	6	a	0.8	a
18N06	130	90	6.5	6.5	NC	WIPE	c	WIPE	c
18N07	170.3	100	9.72	7.0	NC	13	a	0.7	a
18N08	170.3	170	9.72	11.0	NC	22	a	1.1	a
18N09	170.3	150	9.72	10.5	NC	NR		NR	
18N12	152.1	100	8.45	6.5	NC	0	a	0.3	a
19N01	253.5	155	12.48	9.5	NC	3	a	0.6	a
19N02	130	85	6.5	4.0	NC	NC		NC	
19N03	130	70	6.5	5.0	NC	4	a	0.8	a
19N04	130	60	6.5	4.0	NC	WIPE	c	WIPE	c
19N05	130	65	6.5	4.0	NC	WIPE	c	WIPE	c
19N06	130	60	6.5	5.0	NC	WIPE	c	WIPE	c
19N07	176.8	325	8.97	20.0	45	56	b	15.9	b
19N08	176.8	125	8.97	7	NC	25	b	2.4	b
						39	b	0.9	a
19N09	176.8	170	8.97	9.5	NC	10	a	1.1	a
19N10	176.8	70	8.97	3.5	NC	3	a	0.2	a
20N01	253.5	95	12.48	5.0	NC	16	a	0.6	a
20N02	130	105	6.5	6.5	NC	8	a	0.7	a

APPENDIX D

RADIOLOGICAL DATA (FIDLER SURVEY MOUND SOIL SCREENING FACILITY DATA) FOR NON-AOC POINTS

	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
SMPID	Contamination Criteria CH1	FIDLER Readings CH1	Contamination Criteria CH2	FIDLER Readings CH2	FIDLER Readings Out Channel	Plutonium - 238		Thorium - 232	
	Units: CPM	Units: CPM	Units: KCPM	Units: KCPM	Units: KCPM	Units: pCi/g		Units: pCi/g	
	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	Note:	RESULTS	Note:

NR - Not recorded
NC - No sample/reading taken
NA - Reading not taken; contamination criteria not exceeded.
a - Mound Soil Screening Facility detection level not exceeded.
b - Concentration at or above the Mound Soil Screening Facility detection level.
c - Results of the wipe sample were less than 20 disintegrations per minute.
CPM - Counts per minute
KCPM - Counts per minute x 1000
pCi/g - Picocuires per gram

MOUND SOIL SCREEN DATA

DRAFT
OTHER SOILS CHARACTERIZATION REPORT

MOUND PLANT
MIAMISBURG, OHIO

JANUARY 1996

U.S. DEPARTMENT OF ENERGY
OHIO FIELD OFFICE

DECONTAMINATION AND DECOMMISSIONING PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES

Area 9

Of the 160 locations projected for Area 9 sampling, 106 locations were sampled and screened. The remainder were eliminated due to the presence of utilities or other physical constraints (curbing and fencing).

Area 10

Of the 28 locations projected for Area 10 sampling, 4 were eliminated due to physical constraints (massive concrete slab or steep slopes of a narrow ravine). Prior to sampling, the services of a local contractor were required to remove brush, small trees, dead wood and branches. All of Area 10 and access to the area required clearing in order to mobilize sampling equipment into the area.

Area 12

Of the 70 locations projected for Area 12 sampling, 23 were eliminated due to the presence of overhead high voltage power lines and underground utilities.

A majority of the Area 12 samples were collected by the field team while wearing Level C respiratory protection. Level of protection and required personnel protective equipment were defined in the RWP and outlined in the site HASP.

Field instruments indicated elevated radiological activity in the soil along the west boundary of the area. After consultation with the Mound Project Engineer, additional sampling was conducted west of the original area boundary.

Prior to sampling, the services of Mound's heavy equipment operators were required to remove brush, small trees, dead wood and branches from the locations to be sampled. A total of 22 additional borings were required in order to define the lateral extent of radiological contamination in this area.

Area 20

Of the 50 locations projected for Area 20 sampling, 37 locations were sampled and screened. The remainder were eliminated due to the presence of a bank of underground high voltage power lines, other underground utilities or other physical constraints (guardrail and ditch).

Area 23

Of the 70 locations projected for Area 23 sampling, 27 locations were sampled and screened. The remainder were eliminated due to the presence of overhead power lines, underground utilities or other physical constraints (guardrail and ditch).

Data exceeding the action levels are tabulated below. These tables identify samples from areas of potential contamination. Graphic representations of the Other Soils areas and Hot Spots with a data overlay have been included to facilitate interpretation, and aid in the computation of soil cleanup volumes.

Where Mound Rad Lab method detection limits exceed specified action levels, a symbol indicating the undetermined nature of the data ("U") accompanies the spreadsheet entry.

Table 5.2 shows the action levels used in the Other Soils Field Program to identify potentially contaminated soil.

Table 5.2 Field Action Levels

Field Instruments	Action Level
FIDLER	
Channel 1 (Pu)	1000 cpm Above Background
Channel 2 (Th)	5000 cpm Above Background
OVA	1 Meter Unit Above Background
OVM	1 Meter Unit Above Background
PXRF	
Arsenic	102.07 mg/Kg
Barium	1489 mg/Kg
Cadmium	NA
Chromium (High)	NA
Chromium (Low)	164.43 mg/Kg
Lead	172 mg/Kg
Mercury	NA
Selenium	NA
Silver	2559 mg/Kg
Mound Rad Lab	
Plutonium 238	25 pCi/g
Thorium 232	5 pCi/g
Radium 226	5 pCi/g
Cesium 137	15 pCi/g *
Americium 241	20 pCi/g

* NRC Limit

The action level for Cesium 137 was reduced for this report from the D&D action level of 80 pCi/g to the NRC action level of 15 pCi/g. The basis for adjusting this limit can be found in a communication with the Nuclear Regulatory Commission (NRC) which discusses decommissioning criteria and maximum acceptable isotope concentrations in soil. A copy of the communiqué may be found in Appendix H.

Area 5

Thirteen samples in Area 5 triggered field screening action levels:

Area 9

Sixty samples in Area 9 triggered field screening action levels:

- Fifty-five samples exceeded limits for hazardous compounds
- Three samples exceeded limits for radionuclides
- Two samples exhibited elevated levels of both radiological and hazardous compounds

Organic vapors from soil samples peaked at 300 meter units on both the OVA and OVM. Elevated concentrations of Pu238were found in excess of D&D limits in soil samples collected from the site. Maximum concentration detected was 156.2 pCi/g.

Table 5.6 shows Area 9 field results exceeding action levels. Figure 5.5 graphically represents Area 9 field sampling results.

Area 10

Twenty-two samples in Area 10 triggered field screening action levels:

- Twenty samples exceeded limits for hazardous compounds
- Two samples exhibited elevated levels of both radiological and hazardous compounds

No organic vapors were detected in soil samples at the site. Elevated concentrations of chromium and lead were detected by the PXRF. Pu238 was found in excess of 41 pCi/g in soil samples collected from the site.

Table 5.7 shows Area 10 field results exceeding action levels. Figure 5.6 graphically represents Area 10 field sampling results.

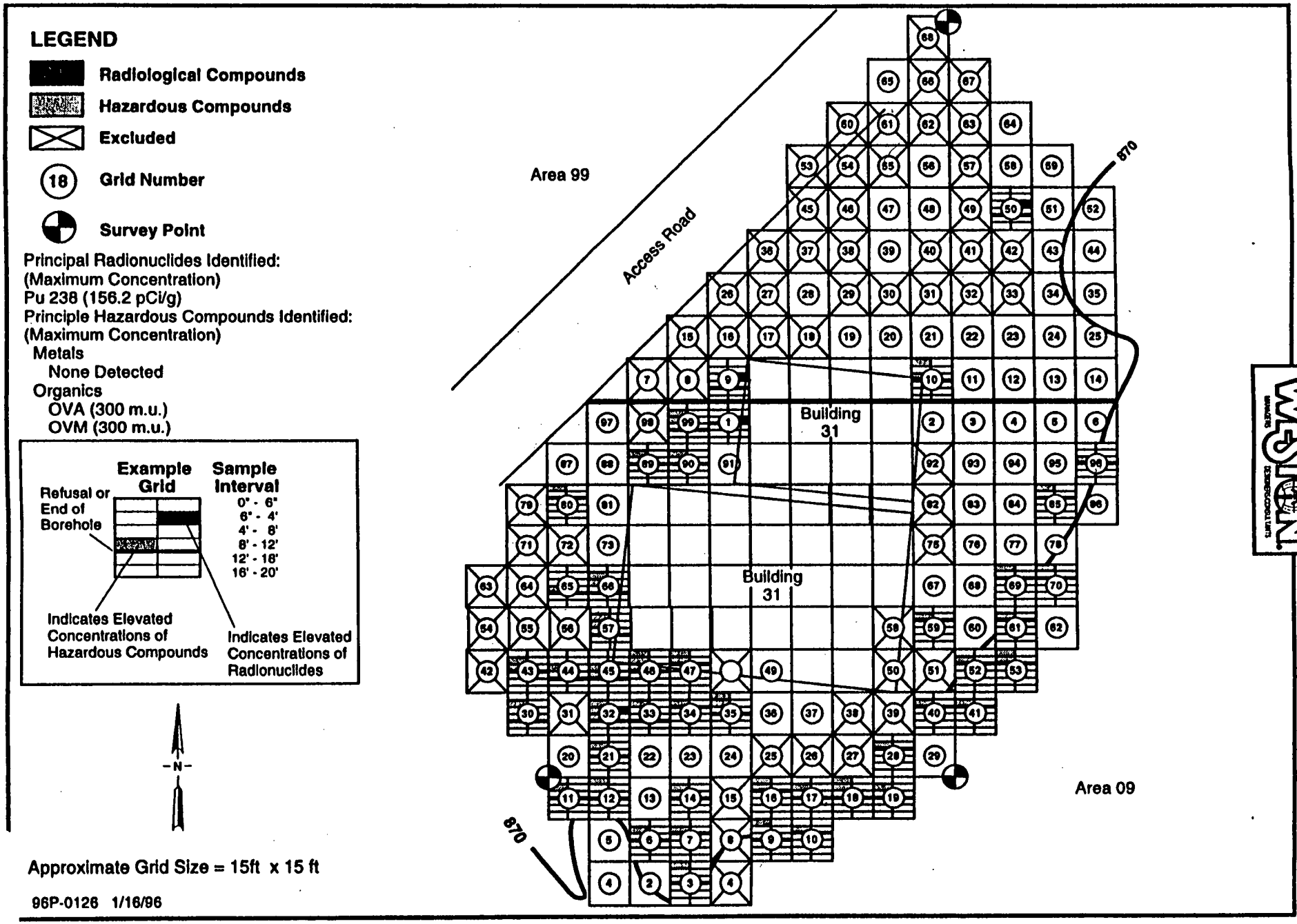


FIGURE 5.5 AREA 9

Key to interpreting sample data:

Sample nomenclature is of the form **XXYY-ZZ00**

Where:
XX = Area designation

YY = Sample Location
- 01 = Historical Hot Spot Location
- 02 = Approx 10 feet north of historical location
- 03 = Approx 10 feet south of historical location
- 04 = Approx 10 feet west of historical location
- 05 = Approx 10 feet east of historical location

ZZ = Sample Type
- 50 = Soil

00 = Sample Depth
- 01 = Surface
- 04 = 0-4 feet
- 08 = 4-8 feet
- 12 = 8-12 feet

Table 5.6 Area 9 Field Sampling Results (continued)

Sample ID	PXRF Metals								
	As (102.07)	Ba (1489)	Cd	Cr HI	Cr LO (164.43)	Pb (172)	Hg	Se	Ag (2559)
0903-5001	NA	NA	NA	NA	NA	NA	NA	NA	NA
0906-5004	<34	141.19	128.09	<347	<60.7	<10	<37	<14	<29
0907-5003	NA	NA	NA	NA	NA	NA	NA	NA	NA
0909-5001	<34	105.97	<44.5	<347	<60.7	32.826	<37	<14	47.0049
0910-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0911-5004	<34	139.13	<44.5	<347	<60.7	<10	<37	<14	31.3284
0912-5001	<34	96.033	<44.5	<347	<60.7	31.255	<37	<14	73.8863
0914-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0916-5001	NA	NA	NA	NA	NA	NA	NA	NA	NA
0916-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0917-5004	50.8	189.33	<44.5	<347	<60.7	<10	<37	<14	70.2629
0918-5001	<34	274.89	<44.5	<347	<60.7	56.752	<37	<14	50.9996
0918-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0919-5005	42.191	124.52	<44.5	<347	<60.7	12.84	<37	<14	62.0563
0921-5004	<34	123.36	<44.5	<347	<60.7	<10	<37	<14	41.4312
0928-5002	NA	NA	NA	NA	NA	NA	NA	NA	NA
0930-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0932-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0932-5008	NA	NA	NA	NA	NA	NA	NA	NA	NA
0932-5012	NA	NA	NA	NA	NA	NA	NA	NA	NA
0933-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0934-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0935-5001	NA	NA	NA	NA	NA	NA	NA	NA	NA
0935-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0940-5002	NA	NA	NA	NA	NA	NA	NA	NA	NA
0941-5002	NA	NA	NA	NA	NA	NA	NA	NA	NA
0943-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0943-5008	NA	NA	NA	NA	NA	NA	NA	NA	NA
0944-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0945-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0945-5008	NA	NA	NA	NA	NA	NA	NA	NA	NA
0946-5001	<34	75.848	<44.5	<347	<60.7	17.992	<37	<14	48.2058
0946-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0946-5008	NA	NA	NA	NA	NA	NA	NA	NA	NA
0947-5001	<34	111.79	<44.5	<347	<60.7	25.781	<37	<14	58.5454
0947-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0952-5003	NA	NA	NA	NA	NA	NA	NA	NA	NA
0953-5001	<34	77.153	<44.5	<347	<60.7	21.554	<37	<14	57.5036
0953-5002	NA	NA	NA	NA	NA	NA	NA	NA	NA
0957-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0957-5008	NA	NA	NA	NA	NA	NA	NA	NA	NA
0959-5003	<34	114.63	<44.5	<347	<60.7	17.048	<37	<14	63.1958
0961-5003	<34	87.831	<44.5	<347	<60.7	21.264	<37	<14	93.5365
0965-5012	40.876	150.03	<44.5	<347	<60.7	11.762	<37	<14	78.1253
0966-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0966-5008	NA	NA	NA	NA	NA	NA	NA	NA	NA
0969-5001	<34	89.87	<44.5	<347	<60.7	<10	<37	<14	60.6576
0970-5001	NA	NA	NA	NA	NA	NA	NA	NA	NA
0980-5001	34.39	80.815	<44.5	360.61	<60.7	26.902	<37	<14	91.3945
0985-5001	<34	98.138	<44.5	<347	<60.7	<10	<37	<14	87.8689
0989-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0990-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0996-5008	<34	166.54	<44.5	<347	<60.7	25.411	<37	<14	42.4183
0999-5004	NA	NA	NA	NA	NA	NA	NA	NA	NA
0999-5008	<34	114.17	<44.5	<347	<60.7	15.551	<37	<14	43.0901
9901-5007	49.188	137.16	<44.5	<347	<60.7	<10	<37	<14	66.5832
9909-5008	58.673	84.24	86.352	<347	<60.7	<10	<37	<14	98.2014
9910-5001	<34	90.004	59.064	<347	<60.7	<10	<37	<14	85.6333
9910-5008	<34	183.61	<44.5	<347	<60.7	<10	<37	<14	<29
9950-5008	NA	NA	NA	NA	NA	NA	NA	NA	NA

This table lists only those samples whose reported concentrations exceeded the Other Soils field action levels.

Table 5.6 Area 9 Field Sampling Results

Sample ID	FIDLER		Organics		Rad Laboratory				
	Channel 1 (1K)	Channel 2 (5K)	OVA	OVM	Pu 238 (25)	Th 232 (5)	Ra 226 (5)	Cs 137 (15)	Am 241(20)
0903-5001	NA	NA	NA	10 •					
0906-5004	<1000	<5000	30 •	<1	<25	<5	NA	NA	NA
0907-5003	<1000	<5000	10 •	<1	<25	<5	NA	NA	NA
0909-5001	NA	NA	10 •	10 •					
0910-5004	<1000	<5000	20 •	<1	<25	<5	NA	NA	NA
0911-5004	<1000	<5000	4 •	<1	<25	<5	NA	NA	NA
0912-5001	NA	NA	1 •	<1					
0914-5004	<1000	<5000	40 •	40 •	<25	<5	NA	NA	NA
0916-5001	NA	NA	200 •	200 •					
0916-5004	<1000	<5000	200 •	200 •	<25	<5	NA	NA	NA
0917-5004	<1000	<5000	40 •	40 •	<25	<5	NA	NA	NA
0918-5001	NA	NA	10 •	10 •					
0918-5004	<1000	<5000	20 •	20 •	<25	<5	NA	NA	NA
0919-5005	<1000	<5000	10 •	<1	<25	<5	NA	NA	NA
0921-5004	<1000	<5000	10 •	NA	<25	<5	NA	NA	NA
0928-5002	<1000	<5000	20 •	<1	<25	<5	NA	NA	NA
0930-5004	<1000	<5000	30 •	<1	<25	<5	NA	NA	NA
0932-5004	<1000	10000 •	60 •	NA	<25	<5	NA	NA	NA
0932-5008	<1000	<5000	60 •	NA	<25	<5	NA	NA	NA
0932-5012	<1000	<5000	20 •	NA					
0933-5004	<1000	<5000	105 •	20 •	<25	<5	NA	NA	NA
0934-5004	<1000	<5000	20 •	20 •	<25	<5	NA	NA	NA
0935-5001	NA	NA	10 •	20 •					
0935-5004	<1000	<5000	10 •	10 •	<25	<5	NA	NA	NA
0940-5002	<1000	<5000	10 •	NA	<25	<5	NA	NA	NA
0941-5002	<1000	<5000	300 •	NA	<25	<5	NA	NA	NA
0943-5004	<1000	<5000	200 •	300 •					
0943-5008	<1000	<5000	210 •	300 •					
0944-5004	<1000	<5000	110 •	10 •	<25	<5	NA	NA	NA
0945-5004	<1000	<5000	50 •	NA	<25	<5	NA	NA	NA
0945-5008	<1000	<5000	40 •	NA	<25	<5	NA	NA	NA
0946-5001	NA	NA	10 •	<1					
0946-5004	<1000	<5000	40 •	8 •	<25	<5	NA	NA	NA
0946-5008	<1000	<5000	40 •	8 •	<25	<5	NA	NA	NA
0947-5001	NA	NA	2 •	<1					
0947-5004	<1000	<5000	10 •	10 •	<25	<5	NA	NA	NA
0952-5003	<1000	<5000	1 •	NA					
0953-5001	<1000	<5000	2 •	NA	<25	<5	NA	NA	NA
0953-5002	<1000	<5000	300 •	NA	<25	<5	NA	NA	NA
0957-5004	<1000	<5000	50 •	10 •	<25	<5	NA	NA	NA
0957-5008	<1000	<5000	4 •	2 •	<25	<5	NA	NA	NA
0959-5003	<1000	<5000	6 •	NA	<25	<5	NA	NA	NA
0961-5003	<1000	<5000	4 •	NA	<25	<5	NA	NA	NA
0965-5012	<1000	<5000	2 •	<1	<25	<5	NA	NA	NA
0966-5004	<1000	<5000	2 •	NA	<25	<5	NA	NA	NA
0966-5008	<1000	<5000	20 •	NA					
0969-5001	NA	NA	2 •	NA					
0970-5001	<1000	<5000	20 •	<1					
0980-5001	<1000	<5000	20 •	<1					
0985-5001	NA	NA	2 •	<1					
0989-5004	<1000	<5000	40 •	10 •	<25	<5	NA	NA	NA
0990-5004	<1000	<5000	200 •	100 •					
0996-5008	<1000	<5000	2 •	<1	37 •	<5	NA	NA	NA
0999-5004	<1000	<5000	50 •	50 •	<25	<5	NA	NA	NA
0999-5008	<1000	<5000	<1	10 •	<25	<5	NA	NA	NA
9901-5007	<1000	<5000	<1	NA	156.2 •	0.47	0.85	<0.02	<0.03
9909-5008	<1000	<5000	<1	NA	141.1 •	0.41	1.07	<0.02	<0.03
9910-5001	NA	NA	1 •	NA					
9910-5008	<1000	<5000	1 •	NA	<25	<5	NA	NA	NA
9950-5008	<1000	<5000	<1	<1	27 •	<5	NA	NA	NA

This table lists only those samples whose reported concentrations exceeded the Other Soils field action levels.

RISK-BASED GUIDELINE VALUES

MOUND PLANT
MIAMISBURG, OHIO

December 1995

Submitted to the
Office of Southwestern Area Programs (EM-453)
Environmental Restoration
and the
Miamisburg Area Office
U.S. DEPARTMENT OF ENERGY

Prepared by
HAZARDOUS WASTE REMEDIAL ACTIONS PROGRAM
Environmental Management and Enrichment Facilities
Managed by
LOCKHEED MARTIN ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

FINAL
(REVISION 3)

TABLE 4A

Construction/Mound Employee - Soil/Sediment Guideline Values: Chemicals (Units = mg/kg)

CHEMICAL	Ingestion				Inhalation				Ingestion + Inhalation			
	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1
High Explosives												
HMX				5.50e+04								
PETN												
RDX	2.70e+03	2.70e+02	2.70e+01	3.20e+03								
Inorganics												
Aluminum												
Antimony				4.25e+02								
Arsenic				3.20e+02	6.00e+05	6.00e+04	6.00e+03					
Barium				7.50e+04				1.55e+07				7.50e+04
Beryllium	7.00e+01	7.00e+00	7.00e-01	5.50e+03	3.65e+06	3.65e+05	3.65e+04		7.00e+01	7.00e+00	7.00e-01	
Cadmium (Diet)				1.05e+03	5.00e+06	5.00e+05	5.00e+04					
Chromium III				1.05e+06								
Chromium VI				5.50e+03	7.50e+05	7.50e+04	7.50e+03					
Cobalt												
Copper												

TABLE 4A

Construction/Mound Employee - Soil/Sediment Guideline Values: Chemicals (Units = mg/kg)

CHEMICAL	Ingestion				Inhalation				Ingestion + Inhalation			
	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1
Cyanide				2.15e+04								
Iron												
Lead												
Lithium												
Manganese (Diet)				1.50e+05				1.55e+06				1.35e+05
Mercury				3.20e+02				9.50e+06				3.20e+02
Nickel				2.15e+04								
Silver				5.50e+03								
Thallium												
Vanadium				7.50e+03								
Zinc				3.20e+05								
Organics												
1,1,1-Trichloroethane												
1,1-Dichloroethane				1.05e+05				3.90e+01				3.90e+01
1,2-Dichloroethane	3.30e+03	3.30e+02	3.30e+01		1.70e+03	1.70e+02	1.70e+01		1.10e+03	1.10e+02	1.10e+01	

MOUND

Environmental
Restoration
Program

Further Assessment

Soil Gas Confirmation Sampling

Mound Plant
Miamisburg, Ohio

May 1996

Revision 0

Department of Energy

EG&G Mound Applied Technologies

Table I.1 Soil Analyte List

Volatile Organic Compounds

Acetone	Dibromochloromethane	4-Methyl-2-Pentanone
Benzene	1,1-Dichloroethane	Styrene
Bromodichloromethane	1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
Bromoform	1,1-Dichloroethene	Tetrachloroethene
Bromomethane	1,2-Dichloroethene (total)	1,1,1-Trichloroethane
2-Butanone	1,2-Dichloropropane	1,1,2-Trichloroethane-
Carbon Disulfide	cis-1,3-Dichloropropene	Trichloroethene
Carbon Tetrachloride	trans-1,3-Dichloropropene	Toluene
Chlorobenzene	Ethylbenzene	Vinyl Acetate
Chloroethane	2-Hexanone	Vinyl Chloride
Chloroform	Methylene Chloride	Xylenes (total)
Chloromethane		

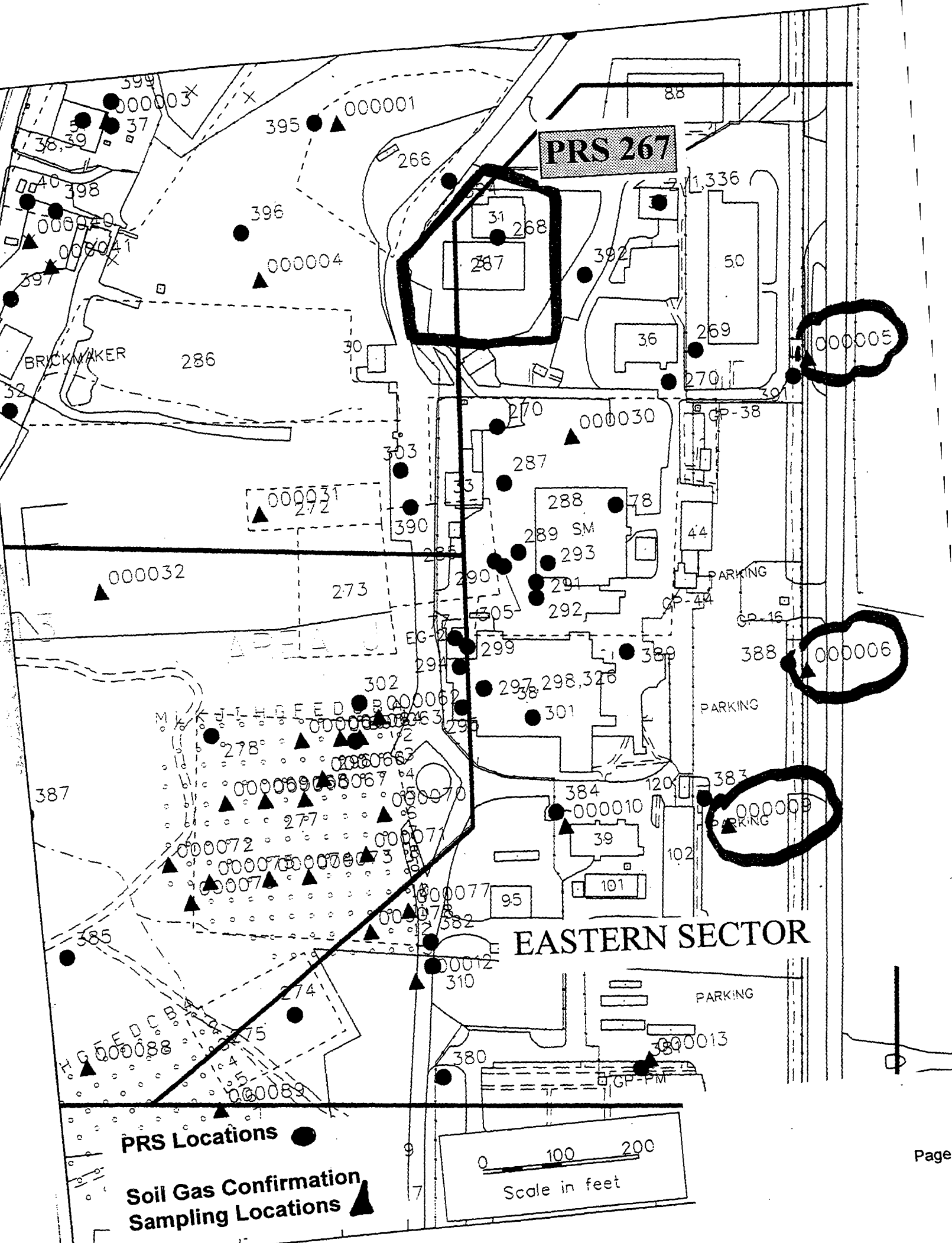
Semivolatile Organic Compounds

Acenaphthene	Chrysene	Hexachlorobenzene
Acenaphthylene	Dibenz(a,h)anthracene	Hexachlorobutadiene
Anthracene	Dibenzofuran	Hexachlorocyclopentadiene
Benzo(a)anthracene	1,2-Dichlorobenzene	Hexachloroethane
Benzo(a)pyrene	1,3-Dichlorobenzene	Indeno(1,2,3-cd)pyrene
Benzo(b)fluoranthene	1,4-Dichlorobenzene	Isophorone
Benzo(g,h,i)perylene	3,3-Dichlorobenzidine	2-Methylnaphthalene
Benzo(k)fluoranthene	2,4-Dichlorophenol	2-Methylphenol
bis(2-Chloroethoxy)methane	Diethylphthalate	4-Methylphenol
bis(2-Chloroethyl)ether	2,4-Dimethylphenol	Naphthalene
bis(2-Ethylhexyl)phthalate	Dimethyphthalate	2-Nitroaniline
4-Bromophenyl-phenylether	Di-n-butylphthalate	3-Nitroaniline
Butylbenzylphthalate	Di-n-octylphthalate	4-Nitroaniline
Carbazole	4,6-Dinitro-2-methylphenol	Nitrobenzene
4-Chloroaniline	2,4-Dinitrophenol	2-Nitrophenol
4-Chloro-3-methylphenol	2,4-Dinitrotoluene	4-Nitrophenol
2-Chloronaphthalene	2,6-Dinitrotoluene	N-Nitroso-di-n-propylamine
2-Chlorophenol	Fluoranthene	N-Nitroso-diphenylamine
4-Chlorophenyl-phenylether	Fluorene	2,2-oxybis(1-Chloropropane)
Pentachlorophenol	Pyrene	2,4,5-Trichlorobenzene
Phenanthrene	1,2,4-Trichlorobenzene	2,4,6-Trichlorobenzene
Phenol		

Table I.1 Soil Analyte List (Continued)		
Pesticides/PCB's		
Aroclor-1016	Delta-BHC	Endosulfan II
Aroclor-1221	Gamma-BHC	Endosulfan sulfate
Aroclor-1232	alpha-Chlordane	Endrin
Aroclor-1242	gamma-Chlordane	Endrin aldehyde
Aroclor-1248	4,4'-DDD	Endrin ketone
Aroclor-1254	4,4'-DDE	Heptachlor
Aroclor-1260	4,4'-DDT	Heptachlor epoxide
Aldrin	Dieldrin	Methoxychlor
Alpha-BHC	Endosulfan I	Toxaphene
Beta-BHC		
Inorganics		
Aluminum	Copper	Potassium
Antimony	Cyanide	Selenium
Arsenic	Iron	Silver
Barium	Lead	Sodium
Beryllium	Lithium	Thallium
Bismuth	Magnesium	Tin
Cadmium	Manganese	Vanadium
Calcium	Mercury	Zinc
Chromium	Molybdenum	Nitrate/Nitrite
Cobalt	Nickel	Explosives (USATHAMA,PETN)
Radionuclides		
Americium-241	Plutonium-238	Thorium-230
Bismuth-207	Plutonium-239/240	Thorium-232
Bismuth-210	Potassium-40	Uranium-234
Cesium-137	Radium-226	Uranium-235
Cobalt-60	Thorium-228	Uranium-238

Table I.2. Variance From 3-Foot Sampling Depth Specification

Location	Description of Variance
SGC-NAC-000001	Core sampler hit refusal at 2 feet.
SGC-NAC-000002	Relocated due to utilities.
SGC-NAC-000003	Core sampler hit refusal at 2 feet.
SGC-NAC-000004	Core sampler hit refusal at 18 inches.
SGC-NAC-000005	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-NAC-000006	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-NAC-000007	Core sampler hit refusal at 18 inches.
SGC-NAC-000008	Drilled to 2 feet due to utilities.
SGC-NAC-000010	Drilled to 1 foot; hand-augered rest due to utilities; flag against building, so sample taken 6 feet from flag.
SGC-NAC-000012	Drilled to 2 feet due to utilities.
SGC-SAN-000018	Core sampler hit refusal at 2 feet; relocated from inside clarifier.
SGC-NAC-000029	Core sampler hit refusal at 18 inches.
SGC-A61-000043	Sampled 1 foot from flag.
SGC-A61-000047	Drilled to 2 feet due to utilities.
SGC-A61-000048	Drilled to 2 feet due to utilities.
SGC-A61-000049	Relocated due to utilities.
SGC-A61-000051	Core sampler hit refusal at 18 inches.
SGC-A61-000052	Relocated due to utilities; core sampler hit refusal at 18 inches.
SGC-A61-000053	Core sampler hit refusal at 2 feet.
SGC-A13-000056	Core sampler hit refusal at 18 inches
SGC-A13-000058	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-A13-000060	Core sampler hit refusal at 1 foot.
SGC-AOJ-000064	Core sampler hit refusal at 2 - 3 inches.
SGC-AOJ-000066	Core sampler hit refusal at 4 inches.
SGC-AOJ-000067	Core sampler hit refusal at 6 inches.
SGC-AOJ-000069	Core sampler hit refusal at 2 feet.
SGC-A03-000080	Core sampler hit refusal at 20 inches
SGC-A03-000081	Drilled to 2 feet due to utilities.
SGC-A03-000082	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-A03-000083	Sampled 25 feet from original location due to storm sewer; core sampler hit refusal at 18 inches.
SGC-A03-000087	Core sampler hit refusal at 2 feet.
SGC-A21-000088	Core sampler hit refusal at 18 inches.
SGC-A21-000090	Core sampler hit refusal at 20 inches.
SGC-SDB-000097	Relocated due to utilities.
SGC-SDB-000098	Relocated from inside a building.
SGC-SDB-000101	Relocation of SGC-SDB-000099; first location surveyed incorrectly.
SGC-SDB-000102	Relocation of SGC-SDB-000100; first location surveyed incorrectly.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EASTERN SECTOR
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Soil Gas Confirmation Sampling Locations
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Scale in feet
BRICKMAKER
PARKING
SM
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GP-44
GP-16
GP-PM
000001
000003
000004
000005
000006
000008
000009
000010
000012
000013
000030
000031
000032
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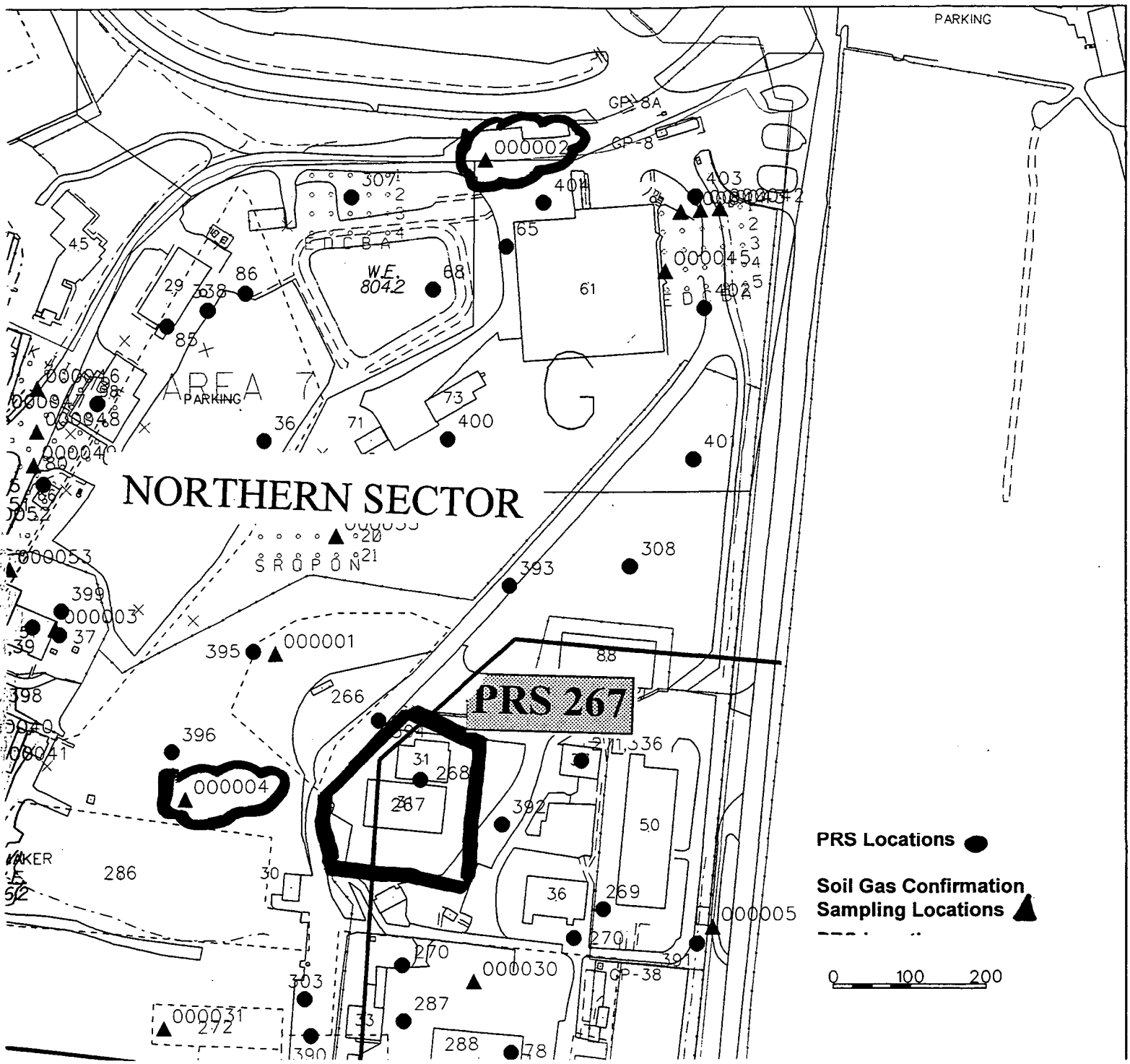
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GP-8A
GP-8
000002
307
404
403
65
45
86
29
W.E.
804.2
68
61
000045
85
AREA 7
PARKING
73
36
71
400
401
NORTHERN SECTOR
SROPON
308
393
399
000003
37
395
000001
88
266
PRS 267
396
31
268
267
392
50
000004
286
30
36
269
000005
270
000030
GP-38
303
287
000031
272
288
78
PRS Locations
Soil Gas Confirmation Sampling Locations
0
100
200

Table A.1

Detected Volatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006
PETREX SAMPLE AREA			NORTH	NORTH	NORTH	EAST	EAST
Acetone	NA	21000000	36				
1,2-Dichloroethene (total)	NA	43000000					
2-Butanone	NA	93000000	12				
Benzene	NA	8.90E+03	1 J				
Carbon Disulfide	NA	280000					
Chloroform	NA	3100			67		
Chloromethane	NA	NA					
Ethylbenzene	NA	480					
Methylene Chloride	NA	3.95E+05	6			7	8
Tetrachloroethene	NA	21000000					
Toluene	NA	250000	1 J	1 J			
Trichloroethene	NA	41000					
Xylene (total)	NA	430000000					

No entry - not detected
J - Numerical value is an estimated quantity
C - Identification confirmed by GC/MS
mg/kg - micrograms per kilogram

Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.1

Detected Volatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006
PETREX SAMPLE AREA			NORTH	NORTH	NORTH	EAST	EAST
Acetone	NA	21000000	36				
1,2-Dichloroethene (total)	NA	43000000					
2-Butanone	NA	93000000					
Benzene	NA	8.90E+03	1 J				
Carbon Disulfide	NA	280000					
Chloroform	NA	3100					
Chloromethane	NA	NA					
Ethylbenzene	NA	480					
Methylene Chloride	NA	3.95E+05	6			7	8
Tetrachloroethene	NA	21000000					
Toluene	NA	250000	1 J	1 J			
Trichloroethene	NA	41000					
Xylene (total)	NA	430000000					

No entry - not detected
J - Numerical value is an estimated quantity
C - Identification confirmed by GC/MS
mg/kg - micrograms per kilogram

Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.2.

Detected Semivolatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000007
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST
Acenaphthene	NA	NA		190 J	63 J				
Acenaphthylene	NA	NA		730				42 J	
Anthracene	NA	64,000,000		1300	66 J		25	55 J	
Benzo(a)anthracene	NA	4,100		1500	180 J		16[illegible] J	[illegible] J	57 J
Benzo(a)pyrene	NA	410		1300	[illegible] J		[illegible] J	450	65 J
Benzo(b)fluoranthene	NA	4,100		1000	1[illegible] J		190 J	460	67 J
Benzo(g,h,i)perylene	NA	NA		550	[illegible] J		100 J	260	26 J
Benzo(k)fluoranthene	NA	41,000		1000	160 J		190 J	4[illegible]	58 J
Bis(2-ethylhexyl)phthalate	NA	215,000							
Butylbenzylphthalate	NA	43,000,000							
Carbazole	NA	NA		600	[illegible]			34 J	
Chrysene	NA	410,000		1500	22[illegible]		240 J	490	6[illegible] J
Di-n-butyl phthalate	NA	21,000,000	120			280 J			
Di-n-octyl phthalate	NA	4,300,000							
Dibenz(a,h)anthracene	NA	410		180 J	40 J		37	[illegible] J	
Dibenzofuran	NA	NA		1100	23				
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8,500,000		3400 D	[illegible]		400 J	800	110 J
Fluorene	NA	NA		1500	42				
Indeno(1,2,3-cd)pyrene	NA	4,100		690	120 J		[illegible] J	[illegible]0 J	[illegible]
2-Methylnaphthalene	NA	NA		970					
Naphthalene	NA	NA		4000 D	24				
Phenanthrene	NA	NA		4700 D	[illegible]		150 J	280 J	53 J
Phenol	NA	130,000,000							
Pyrene	NA	6,400,000	24 J	2700 D	4[illegible]0		340 J	[illegible]	120 J

No entry - not detected
J - Value is an est. quantity
D - Sample was diluted
NA - Value not available
H - Analyzed outside holding time
µg/kg - micrograms per kilogram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.2.

Detected Semivolatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000007
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST
Acenaphthene	NA	NA		190 J	[illegible] J				
Acenaphthylene	NA	NA		730				42 J	
Anthracene	NA	64,000,000		300	66 J		25 J	55 J	
Benzo(a)anthracene	NA	4,100		15[illegible]	180 J		160 J	350 J	57 J
Benzo(a)pyrene	NA	410		1300	180 J		200 J	450	65 J
Benzo(b)fluoranthene	NA	4,100		1000	180 J		190 J	400	[illegible] J
Benzo(g,h,i)perylene	NA	NA		550	110 J		100 J	260 J	26[illegible]
Benzo(k)fluoranthene	NA	41,000		100[illegible]	[illegible] J		190 J	440	58[illegible]
Bis(2-ethylhexyl)phthalate	NA	215,000							
Butylbenzylphthalate	NA	43,000,000							
Carbazole	NA	NA		600	62 J			34 J	
Chrysene	NA	410,000		1500	220		240 J	490	68 J
Di-n-butyl phthalate	NA	21,000,000	120 J			[illegible]0 J			
Di-n-octyl phthalate	NA	4,300,000							
Dibenz(a,h)anthracene	NA	410		180[illegible]	40 J		37 J	87 J	
Dibenzofuran	NA	NA		1100	23 J				
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8,500,000		3400 D			400 J	800	[illegible]0 J
Fluorene	NA	NA		1500	42				
Indeno(1,2,3-cd)pyrene	NA	4,100		69[illegible]	120 J		130 J	320 J	36 J
2-Methylnaphthalene	NA	NA		[illegible]0					
Naphthalene	NA	NA		[illegible]00 D	24 J				
Phenanthrene	NA	NA		47[illegible] D	380		150 J	280 J	53[illegible]
Phenol	NA	130,000,000							
Pyrene	NA	6,400,000	24 J	2700 D	440		340 J	730	[illegible]20 J

No entry - not detected
J - Value is an est. quantity
D - Sample was diluted
NA - Value not available
H - Analyzed outside holding time
µg/kg - micrograms per kilogram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.2.

Detected Semivolatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000009	SGC-NAC-000010	SGC-NAC-0000[illegible]	SGC-NAC-000012	SGC-NAC-0000[illegible]	SGC-NAC-000016	SGC-NAC-000[illegible]7
PETREX Sample Area			EAST	EAS[illegible]	[illegible]ST	EAST	SOUT[illegible]	SOUTH	SOUT[illegible]
Acenaphthene	NA	NA							
Acenaphthylene	NA	NA							
Anthracene	NA	64,000,000							
Benzo(a)anthracene	NA	4,100				18 J		47 J	
Benzo(a)pyrene	NA	410				21		[illegible] J	
Benzo(b)fluoranthene	NA	4,100				[illegible] J		39	
Benzo(g,h,i)perylene	NA	NA						33 J	
Benzo(k)fluoranthene	NA	41,000				17 J		46 J	
Bis(2-ethylhexyl)phthalate	NA	215,000	71 J		36 J	35 J		100	
Butylbenzylphthalate	NA	43,000,000							
Carbazole	NA	NA							
Chrysene	NA	410,000		20 J		22 J		51 J	
Di-n-butyl phthalate	NA	21,000,000							
Di-n-octyl phthalate	NA	4,300,000							
Dibenz(a,h)anthracene	NA	410							
Dibenzofuran	NA	NA							
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8,500,000		31 J		38 J		100 J	28 J
Fluorene	NA	NA							
Indeno(1,2,3-cd)pyrene	NA	4,100						27 J	
2-Methylnaphthalene	NA	NA							
Naphthalene	NA	NA					61 J		
Phenanthrene	NA	NA						63 J	
Phenol	NA	130,000,000							
Pyrene	NA	6,400,000		31 J	20 J	37 J		87 J	26 J

No entry - not detected
J - Value is an est. quantity
D - Sample was diluted
NA - Value not available
H - Analyzed outside holding time
µg/kg - micrograms per kilogram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.4.
Detected Inorganics

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000007	SGC-NAC-000008	SGC-NAC-000009
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST	WEST	EAST
TAL INORGANICS (mg/kg)											
Aluminum	19000	NA	11000	4190	1910	11400	7970	7780	10200	2820	18700
Antimony	NA	85		0.23 B		0.24 B	0.41			0.27 B	0.91 B
Arsenic	8.6	64	B	2.1 B	2.9	1.4 B		2	1.9		11.1
Barium	180	15,000	6	20.7 B	B	47.1 B	3.6	86.	B	23.	
Beryllium	1.3	1	0.56		0. B	0.65	0.38	0.28	.28		.9 B
Bismuth	NA	NA									0.85 B
Cadmium	2.1	210		0.25 B	.19 B		0.36 B	0.5 B	0.33 B	0.22 B	6
Calcium	310000	NA	162000	159000	500	152000	15 00	86200	00	113000	5940
Chromium	20	110,000	13.2	6.7	3.8	15.2		11	14	5.7	20.3
Cobalt	19	NA	9 B	4.5 B	2.3 B	10.1 B	7.6 B	.6 B	11	B	13
Copper	26	NA	1 2	11.9	9.9	17.1	14.5	15.2	16.2	.9	19.2
Cyanide	ND	4,300									
Iron	35000	NA	300	10600	5	21800	17200	700	23000	60	29400
Lead	48	NA	7	5.2	1	8.6	30.9	2	7.2	5	22.2
Lithium	26	NA	2 B	12.5 B	.2	23 B	7 B	10.3	3 B	8.2 B	14.7 B
Magnesium	40000	NA	6160	57800	900	5670	52 0	35600	00	47900	45
Manganese	1400	27,000	69	384	270	612	383	589	493	256	28
Mercury	ND	64			0.13						
Molybdenum	27	NA	.43 B	1.2 B	0.77 B		B	1.5 B	B	1.4 B	1.8 B
Nickel	32	4,300	18.4	9.9	6.4 B	20.6	11.1	16	22.6	8.1 B	24.5
Potassium	1900	NA	780	742 B	346	2080	574 B	4 B	1590	46 B	1420
Selenium	NA	NA									
Silver	1.7	1,100			0 B						
Sodium	240	NA	228	888 B	50 B	137 B	411 B	8 B	246 B	1 B	1010 B
Thallium	0.46	NA									
Tin	20	NA	1.1			1.4 B	1 B			4.5 B	1.6 B
Vanadium	25	1,500	14	8.3	4.7	16.3	23.1	18.9	.2	7.4	
Zinc	140	64,000	6	29.5		67	59	69.2	53.8	36.6	1.8
OTHER INORGANICS											
% Solids (%)	NA	NA	83	93.8	5	83.3	78.4	75	8	95	8.9
Nitrate/Nitrite (mg-N/kg)	NA	NA	2	1.8	2	2.1	7.2	4.8	1.6	26.5	2.2

No entry - not detected
mg/kg - milligrams/kilogram
NA - Value not available
NC - Background not comp
ND - No detections in background samples
mg-N/kg - milligrams per kilogram, reported as nitrogen
J - Numerical value is an estimated quantity
B - Analyte detected in blanks associated with this sample
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.4.
Detected Inorganics

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000007	SGC-NAC-000008	SGC-NAC-000009
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST	WEST	EAST
TAL INORGANICS (mg/kg)											
Aluminum	19000	NA	11000	4190	1910	1140	7970	7780	7200	28	18700
Antimony	NA	85		0.23 B		0.24	0.41 B			0 B	0.91 B
Arsenic	8.6	64	1.5 B	2.1	2.9 B	1.4 B	7	7.2	1.9 B	3.2	11.1
Barium	180	15,000	16	20	23.7 B	47.1 B	73.6	86.4	26.2 B	23.2 B	163
Beryllium	1.3	1	0.5		2 B	0.65	0.38	0.28	0.28		0.9 B
Bismuth	NA	NA									0.85 B
Cadmium	2.1	210		0.25 B	0.19		0.36 B	0.5 B	0 B	0.22 B	6
Calcium	310000	NA	162000	0000	95500	152 0	13600	86200	83900	113000	5940
Chromium	20	110,000	13.2	7	3.8	5.2	13	11.6	14	5.7	20.3
Cobalt	19	NA	9.8 B	4	2.3 B	0.1 B	7.6 B	7.6 B	1 B	3.3 B	13
Copper	26	NA	16.2	11.9	9.9	1	14.5	15.2	3.2	13.9	19.2
Cyanide	ND	4,300									
Iron	35000	NA	2130	10600	680	21800	17200	17700	23000	7	29400
Lead	48	NA		5.2		8.6	30.9	25.1	7.2	5.9	22.2
Lithium	26	NA	1 B	12.5 B		23 B	7.7 B	10.3 B	3.2 B	8.2 B	14.7 B
Magnesium	40000	NA	16	57800	27 00	5670	5210	35600	21600	47900	4500
Manganese	1400	27,000	695	384	270	612	383	589	493	256	728
Mercury	ND	64			0.13						
Molybdenum	27	NA	0.43 B	1.2 B	0.77 B		1.7 B	1.5 B	0 B	1.4 B	1.8 B
Nickel	32	4,300	18.4	9	6.4 B	6	11.1	16.1		8.1 B	24.5
Potassium	1900	NA	1780		346 B	2080	574 B	744 B	1590	463 B	1420
Selenium	NA	NA									
Silver	1.7	1,100			0.24 B						
Sodium	240	NA	228 B	888 B	150 B	137 B	411 B	348 B	246 B	1 B	1010 B
Thallium	0.46	NA									
Tin	20	NA	1			1.4 B	1 B			4.5 B	1.5 B
Vanadium	25	1,500	14.9	8.3	4.7	16.3	23.1	18.9	14	7.4	42.7
Zinc	140	64,000	53.3	29.5		67	59	69.2		36.6	71.8
OTHER INORGANICS											
% Solids (%)	NA	NA	9	8	88.5	3.3	78.4	75	83.9	5	78.9
Nitrate/Nitrite (mg-N/kg)	NA	NA		1.8	1.2	2.1	7.2	4.8	1.6	26.5	2.2

No entry - not detected
mg/kg - milligrams/kilogram
NA - Value not available
NC - Background not comp
ND - No detections in background samples
mg-N/kg - milligrams per kilogram, reported as nitrogen
J - Numerical value is an estimated quantity
B - Analyte detected in blanks associated with this sample
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.5.

Detected Radionuclides (pCi/g)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST
Americium-241	ND	4.95					
Bismuth-207	ND	0.18					
Bismuth-210	ND	NA					
Cesium-137	0.42	0.46					
Cobalt-60	NC	0.10					
Plutonium-238	0.13	5.5	1.42	0.069	0.[illegible]	0.087	0.543
Plutonium-239/240	0.18	5.5			0.0[illegible]2		
Potassium-40	37	NA	21.[illegible]	2.95	[illegible].53	27.4	15.1
Radium-226+D	2	0.14	[illegible]	0.478	0.508	1.16	[illegible]
Thorium-228+D	1.5	0.85	1.[illegible]	0.277	[illegible].37	1.24	1.[illegible]
Thorium-230	1.9	44	[illegible].814	0.374	0.6[illegible]1	0.98	1.19
Thorium-232	1.4	50	1.3	0.184	0.31[illegible]	1.17	0.95
Uranium-234	1.1	38	2.1[illegible]	0.401	0.[illegible]19	0.934	0.874
Uranium-235+D	0.11	3.4	0.[illegible]4		0.04	0.0349	0.[illegible]8
Uranium-238+D	1.2	11.0	[illegible]5	0.392	0.[illegible]12	0.918	0.91[illegible]

No entry - not detected
ND -No detections in background samples
NA - Data not available
NC - Background value not computed
pCi/g - picocuries per gram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.5.

Detected Radionuclides (pCi/g)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST
Americium-241	ND	4.95					
Bismuth-207	ND	0.18					
Bismuth-210	ND	NA					
Cesium-137	0.42	0.46					
Cobalt-60	NC	0.10					
Plutonium-238	0.13	5.5	1.42	0.659	0.833	0.087	0.543
Plutonium-239/240	0.18	5.5			0.0252		
Potassium-40	37	NA	21.7	2.95	6.53	27.4	15.1
Radium-226+D	2	0.14	1.03	0.478	0.508	1.16	1.22
Thorium-228+D	1.5	0.85	1.52	0.277	0.37	1.24	1.05
Thorium-230	1.9	44	0.814	0.374	[illegible]	[illegible]	1.19
Thorium-232	1.4	50	1.3	0.184	[illegible]	[illegible]	0.95
Uranium-234	1.1	38	[illegible]	0.401	[illegible]	[illegible]	0.874
Uranium-235+D	0.11	3.4	0.0974		[illegible]	[illegible]	0.0328
Uranium-238+D	1.2	11.0	2.35	0.392	0.512	[illegible]	0.913

No entry - not detected
ND -No detections in background samples
NA - Data not available
NC - Background value not computed
pCi/g - picocuries per gram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.5.

Detected Radionuclides (pCi/g)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000006	SGC-NAC-0000[illegible]	SGC-NAC-00[illegible]	SGC-NAC-000009	SGC-NAC-[illegible]0010
PETREX Sample Area			EAST	[illegible]ST	[illegible]ST	EAST	[illegible]ST
Americium-241	ND	4.95					
Bismuth-207	ND	0.18					
Bismuth-210	ND	NA					
Cesium-137	0.42	0.46	0.861				
Cobalt-60	NC	0.10					
Plutonium-238	0.13	5.5	4.32	0.537	0.08[illegible]	0.0233	[illegible]0.107
Plutonium-239/240	0.18	5.5					
Potassium-40	37	NA	14.3	[illegible]0.8	[illegible].72	12.9	[illegible]
Radium-226+D	2	0.14	0.87	[illegible].37	[illegible].571	0.764	0.91[illegible]
Thorium-228+D	1.5	0.85	1.06	[illegible]0.431	0.678	0.779	0.9[illegible]
Thorium-230	1.9	44	1.18	0.582	0.541	1.09	[illegible].27
Thorium-232	1.4	50	1.18	0.328	0.554	0.838	[illegible]0.708
Uranium-234	1.1	38	0.761	0.551	[illegible]361	0.712	[illegible]97
Uranium-235+D	0.11	3.4					0.045
Uranium-238+D	1.2	11.0	0.815	0.5[illegible]	0.414	0.774	1.[illegible]

No entry - not detected
ND -No detections in background samples
NA - Data not available
NC - Background value not computed
pCi/g - picocuries per gram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)