

MOUND



**Environmental
Restoration
Program**

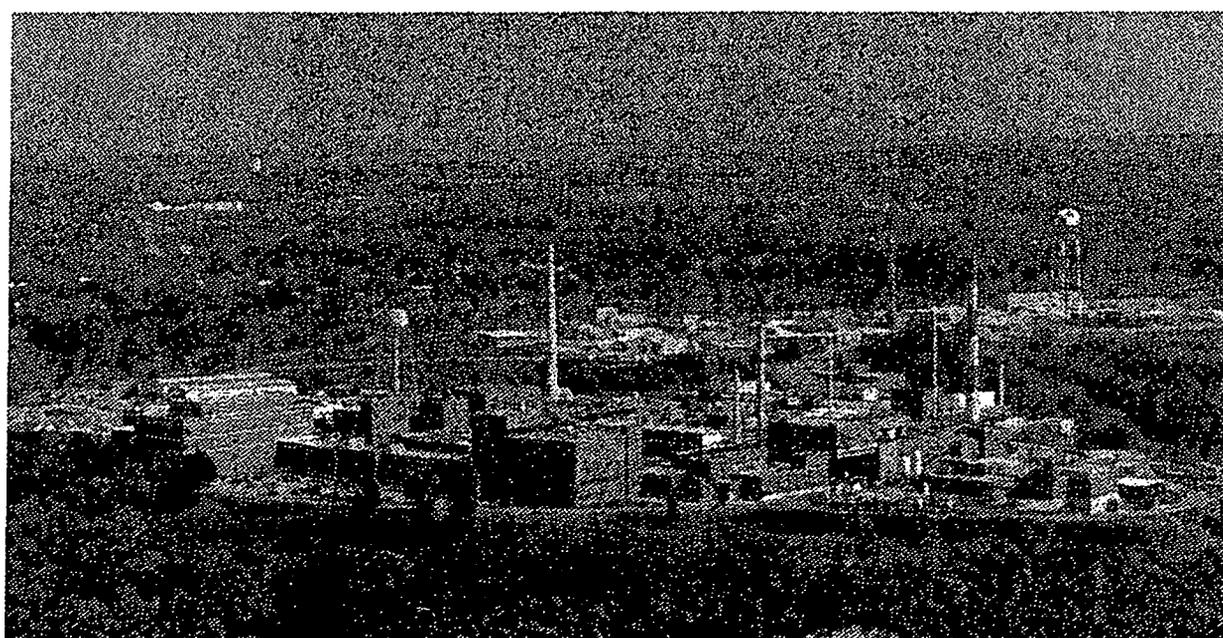


OhioEPA

MOUND PLANT

Potential Release Site Package

PRS # 235



MOUND



Environmental
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Program

MOUND PLANT POTENTIAL RELEASE SITE PACKAGE

Notice of Public Review Period



The following potential release site (PRS) packages will be available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio beginning May 8, 1997. Public comment will be accepted on these packages from May 8, 1997, through June 9, 1997.

- PRS 40: Soil Contamination - Bldg. 66 Parking Lot Area
- PRS 110: Soil Contamination - I Building
- PRS 113/114/115/116/117: Soil Contamination - Powerhouse/Former Tank Site - Powerhouse Fuel Oil Storage Tank
- PRS 235: Soil Contamination - Area southwest of Building 98
- PRS 304/313: Disposal Site for Contaminated Soils - Area southwest of Bldg. 105/Soil Contamination - Radiological Survey Site location S0982
- PRS 354: Soil Contamination
- PRS 356: Soil Contamination

Questions can be referred to Mound's Community Relations at (937) 865-4140.

MOUND



Environmental
Restoration
Program

MOUND PLANT POTENTIAL RELEASE SITE PACKAGE

Notice of Public Review Period



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- PRS 40: Soil Contamination - Bldg. 66 Parking Lot Area
- PRS 110: Soil Contamination - I Building
- PRS 113/114/115/116/117: Soil Contamination - Powerhouse/Former Tank Site - Powerhouse Fuel Oil Storage Tank
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- PRS 354: Soil Contamination
- PRS 356: Soil Contamination

Questions can be referred to Mound's Community Relations at (937) 865-4140.

PRS 235

REV	DESCRIPTION	DATE
0 PUBLIC RELEASE	Available for comments.	Mar. 19, 1997
1 FINAL	Comment period expired. Comments. Recommendation page annotated.	July 28, 1997



The Mound Core Team
P.O. Box 66
Miamisburg, Ohio 45343-0066

Ken, Gary,
Denny,

Joe, Mary S
7/21/97

July 17, 1997

Miamisburg Mound Community Improvement Corporation
720 Mound Road
COS Building 4221
Miamisburg, Ohio 45342-6714

Dear Mr. Bird:

The Core Team consisting of the U.S. Department of Energy Miamisburg Environmental Management Project (DOE-MEMP), U.S. Environmental Protection Agency (USEPA), and the Ohio Environmental Protection Agency (OEPA) appreciates the input provided by the public stakeholders of the Mound facility. The public stakeholders have significantly contributed to the forward progress that has been made on the entire release block strategy for establishing the safety of the Mound property prior to its return to public use after remediation and residual risk evaluation.

Attached please find responses to your June 16, 1997 comments on PRS packages 110, 113-117, 235, 304/313, 354, and 356, as well as the "Residual Risk Evaluation - Release Block H, April, 1997, Revision 0." Document revisions in accordance with the attached responses are expected to be completed in August, 1997.

Should the responses require additional detail, please contact Art Kleinrath at (937) 865-3587 and we will gladly arrange a meeting or telephone conference.

Sincerely,

DOE/MEMP:

Arthur W. Kleinrath
Arthur W. Kleinrath, Remedial Project Manager

USEPA:

Timothy J. Fischer
Timothy J. Fischer, Remedial Project Manager

OHIO EPA:

Brian K. Nickel
Brian K. Nickel, Project Manager

Reference: Responses to June 16, 1997 Miamisburg Mound Community Improvement Corporation Comments Regarding PRS Packages 113-117, 235, 304/313, 354, and 356

PRS 235

Substantive Comment:

- 1) The PRS package indicated that the coordinates of the elevated thorium sample locations became suspect because at least one of the samples was obtained at a depth of 20 feet. Bedrock in this area is believed to be much shallower. The PRS package indicated that the shallow bedrock interpretation is based on bedrock topography maps and information from the soil gas sampling report. The Core Team suspected that the coordinates had been reversed and asked that the sample locations be plotted with swapped coordinates. The revised locations fall within a recognized area of elevated thorium detections (PRS 266). On this basis, the Core Team recommends No Further Action for PRS 235. However, the only back-up information provided in the PRS package is soil gas sampling data indicating core sampler refusal at 18 inches to 2 feet. Core sampler refusal is apparently assumed to represent depth to bedrock. However, core sampler refusal can also be caused by contact with cobbles, utilities, and other impediments, not just contact with bedrock.

Are there other corroborating arguments to support the shallow bedrock interpretation on which the NFA decision is based? Is there conclusive evidence that the coordinates were in transposed?

Response:

- 1) *Transposition of the coordinates is supported by the known history in that same report. The transposition follows a known pattern of contamination. It is unlikely six (6) out of the eight (8) samples spread over 200 feet apart would be due to cobbles, utilities, and other impediments.*

The back-up information is soil gas confirmation sampling which is quantitative and measures actual soil concentrations. In any event, all thorium sample results were below guideline criteria.

Reference: Responses to June 16, 1997 Miamisburg Mound Community Improvement Corporation Comments Regarding PRS Packages 113-117, 235, 304/313, 354, and 356

PRS 235 - Continued

Substantive Comment:

- 2) The PRS package indicates that the eight (8) Soil Gas Confirmation survey samples showed concentrations of all analytes below background or their respective guideline criteria. However, several analytes were detected (or concentrations were estimated for detections below method detection limits - J-modifier data) for which the attached tables showed no background or construction worker guidelines were detected or available. These analytes include: methylene chloride, acenaphthene, benzo (g,h,i) perylene, fluorene, phenanthrene, carbazole, gamma-chlordane, endosulfan 1 (starred detection noted - does that mean detection in blanks?), endrin (starred detection noted - does that mean detection in blanks?), heptachlor, bismuth (B-modifier data - does that mean detection in blanks?), cobalt, lithium, magnesium (above background, aesthetic contaminant only), potassium (above background, aesthetic contaminant only), sodium (above background, aesthetic contaminant only), Cesium-137 (double the background and construction worker guideline).

How did the Core Team appraise these detections (i.e., were the J-modified values ignored?)?

Response:

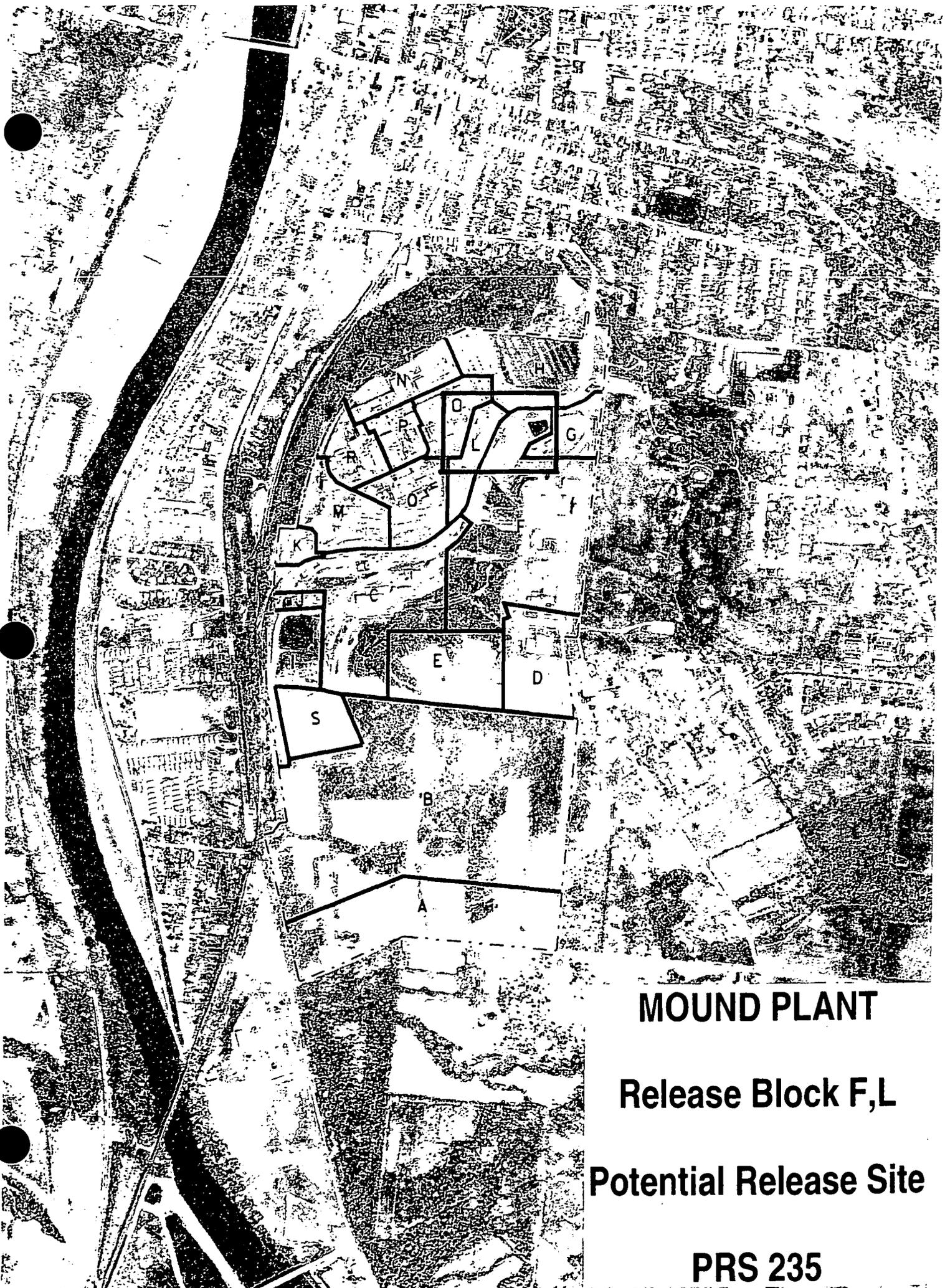
- 2) *The J-modified values were not ignored. They will come into the risk evaluation process later on at 1/2 the detection limit.*

We do take estimated values into account. All the chemicals that have guideline criteria were at or below the guideline criteria. In the case where there is no guideline criteria, they were compared by analogy to other chemicals of that family (i.e., PAH, VOC).

In the case of Cesium-137, it is between 10^{-5} to 10^{-6} , which is within the acceptable risk range of 10^{-4} to 10^{-6} per the National Contingency Plan (NCP).

In the case of magnesium, potassium, and sodium, they are within natural occurring variations.

We will make a modification to the package that explains the B-modifier and starred detection. These were inadvertently left off the table. For your information, B-modifier means analytes detected in blanks associated with this sample and starred detection means unconfirmed due to interference.

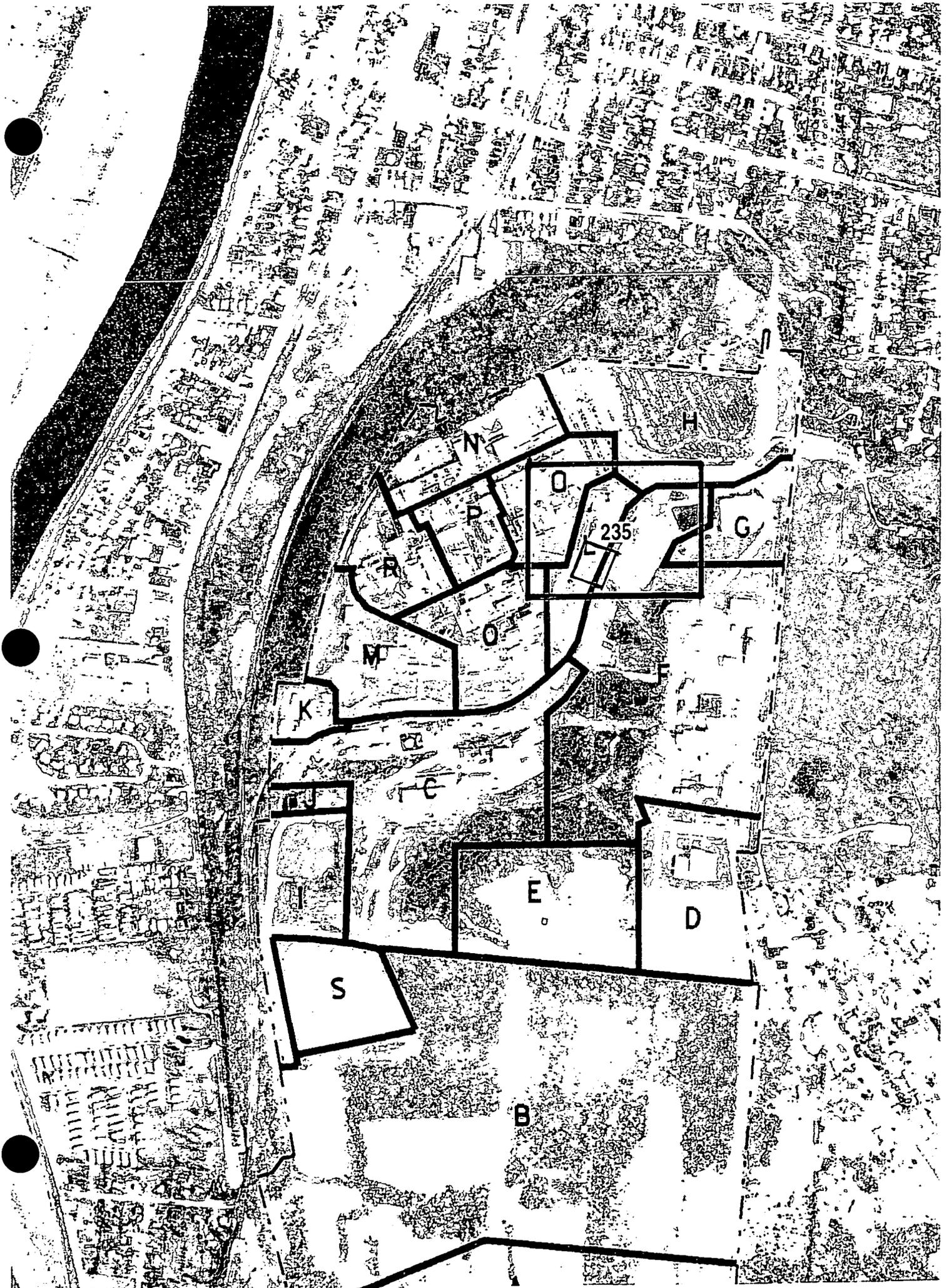


MOUND PLANT

Release Block F,L

Potential Release Site

PRS 235



S

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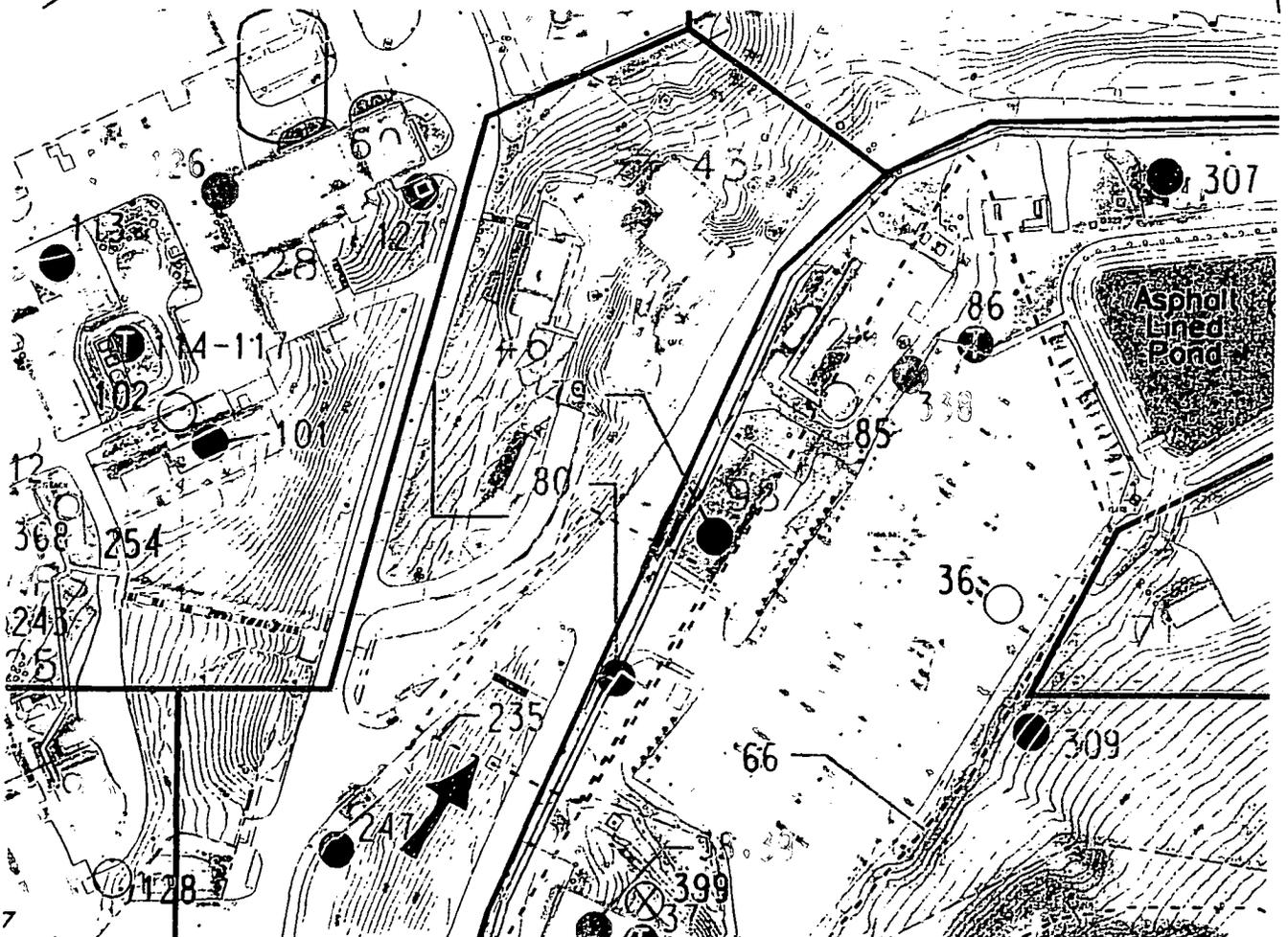
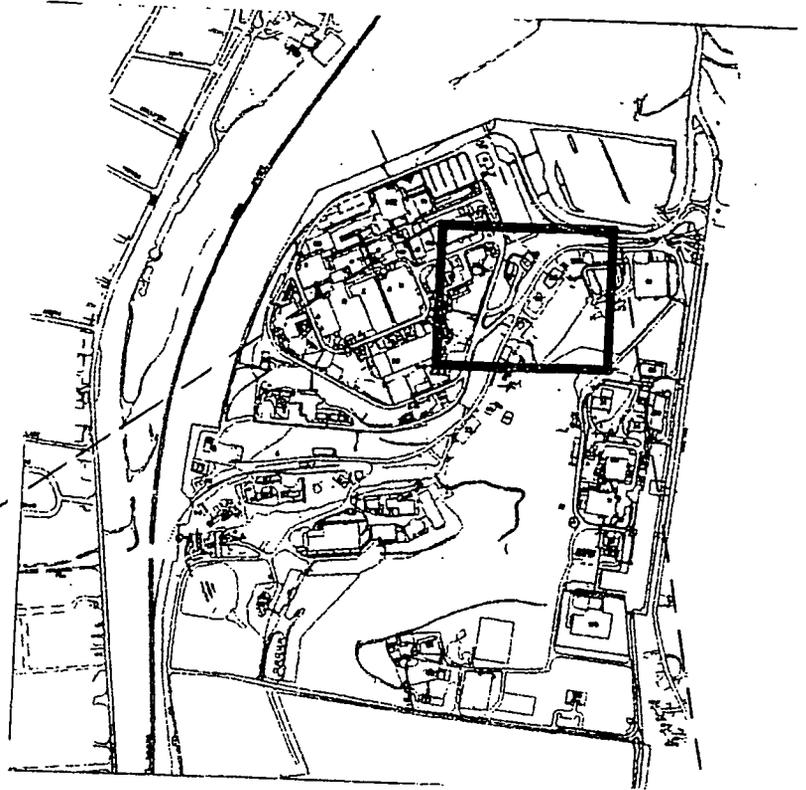
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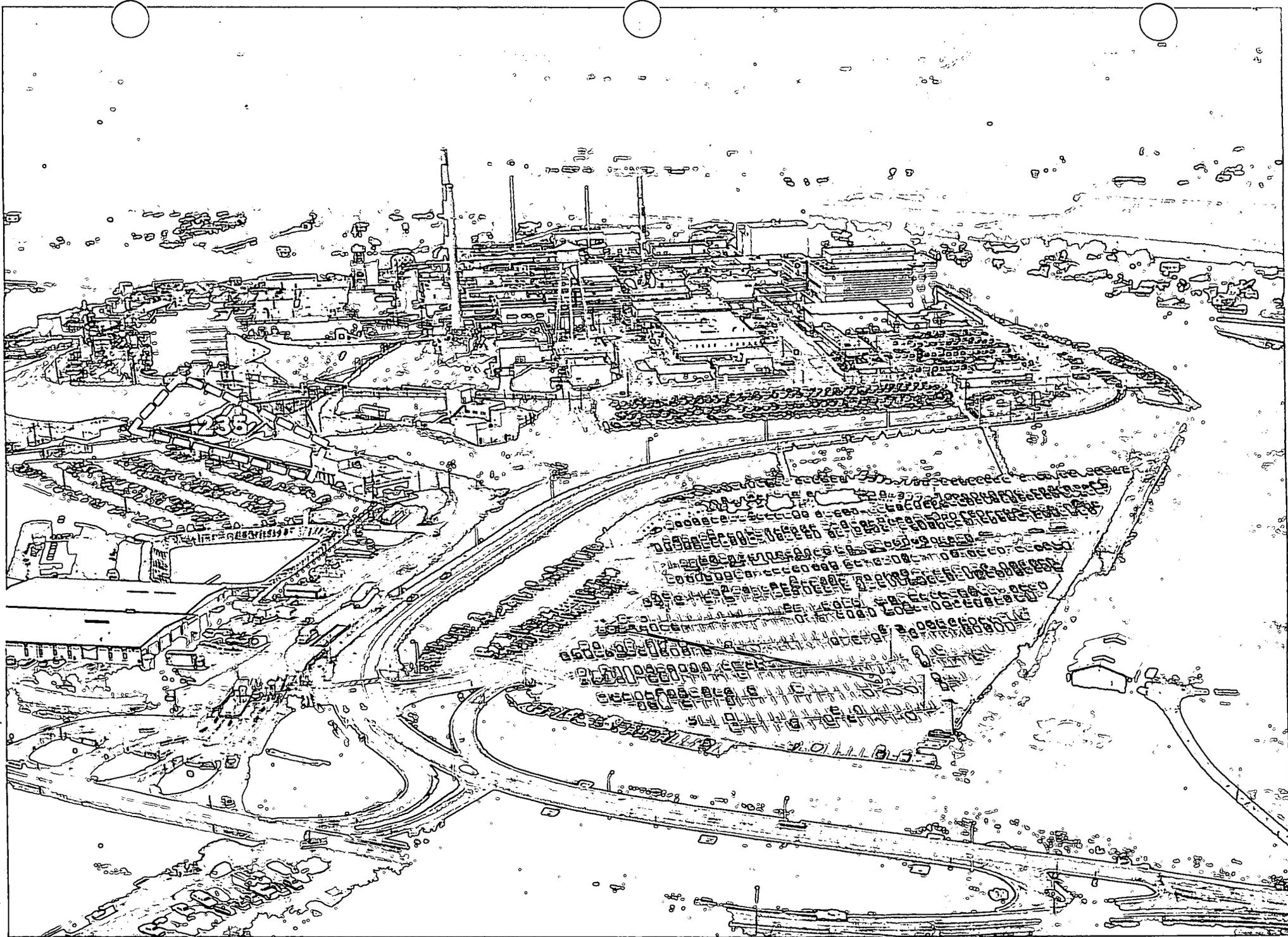
MOUND PLANT

Release Block F,L

Potential Release Site

PRS 235





PRS HISTORY:

PRS 235 is an area of land covering approximately 25,000 ft² located slightly uphill and to the southwest of Building 98. The Radiological Site Survey² analyzed soil samples for radioactivity and identified this PRS as an area of "possible elevated thorium".¹

CONTAMINATION:

I. Investigations:

Soil sampling during the Site Survey Project, Radiological Site Survey revealed a maximum thorium level of 37 pCi/g at a depth of 18 inches which exceeds the guideline value of 5 pCi/g surface and 15 pCi/g subsurface.² Plutonium was also detected at a concentration of 8.97 pCi/g which is less than the guideline of 25 pCi/g.

Additional soil samples were analyzed by the Area 7 Phase I investigation.⁴ The maximum soil concentrations of plutonium and thorium were below the guideline values listed above. This study detected tritium in bore hole B09 samples. The maximum tritium concentration of 58.5 pCi/g (at 5-12 feet underground) is well below the guideline value of 23500 pCi/g.

Soil gas samples were taken in the vicinity of PRS 235. Trichloroethane (1,1,1-TCA), was detected at concentrations less than the guideline value.³

II. Potential Contamination:

Contaminant	Maximum Concentration Detected	Guideline Criteria
Thorium	37 pCi/g	5/15 pCi/g
Plutonium-238	8.97 pCi/g	25 pCi/g (ALARA)
Tritium	58.5 pCi/g	23500 pCi/g
1,1,1-TCA	22 ppb	173400 ppb ⁵ (calculated)

READING ROOM REFERENCES:

- 1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 5-6.1)
- 2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 7-12)
- 3) Reconnaissance Sampling Report, Soil Gas Survey and Geophysical Investigations, Mound Plant, Main Hill and SM/PP Hill, February 1993. (pages 13-15)
- 4) OU5, Operational Area Phase I Investigation Area 7 Field Report, June 1995. (pages 16-19)

OTHER REFERENCES:

- 5) Comparison of Actual Soil Gas Values with Calculated Acceptable Soil Gas Values. (pages 20-22)

PREPARED BY:

Dean A. Buckner, Member of EG&G Technical Staff

PRS 235
(SUPPLEMENTAL DATA)

HISTORY:

In March 1996, the Soil Gas Confirmation survey took eight core samples in the PRS 235 area. Six did not reach the three foot depth anticipated because of interference with penetration of the sampling tool. Two reached only 18 inches in depth.

The quantitative analyses of these eight soil samples showed that concentrations of all the volatile, semivolatile, PCB, pesticide, explosive, metal, and radionuclide analytes were below their respective ALARA, regulatory, or 10^{-6} Risk Based guideline criteria. (One sample showed Cs-137 at 2×10^{-6} Risk Based guideline value).

REFERENCES:

6) Further Assessment, Soil Gas Confirmation Sampling, November 1996. (pages 23-37)

PREPARED BY:

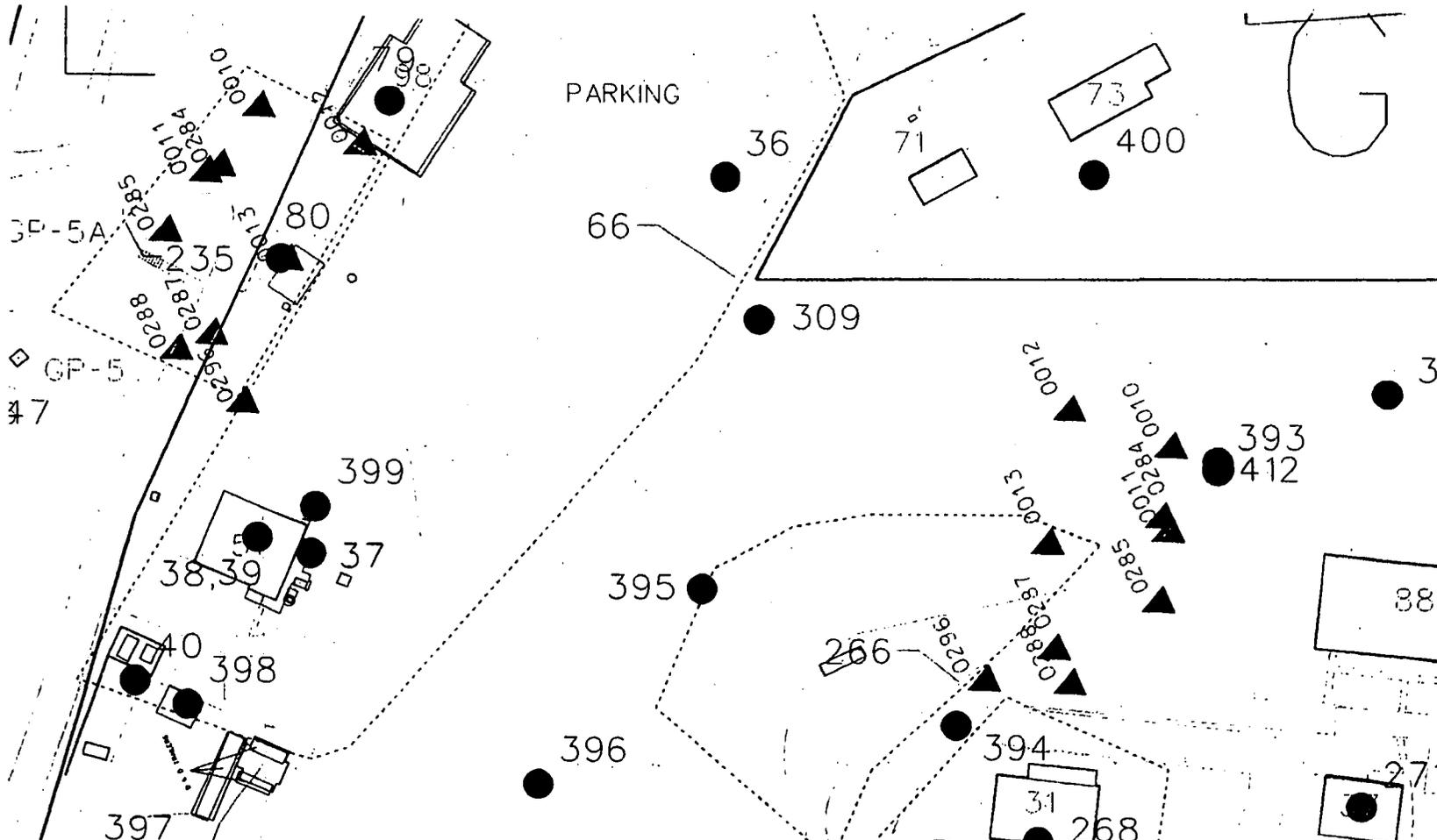
Dean A. Buckner, Member of EG&G Technical Staff

**PRS 235
(SUPPLEMENTAL DATA)**

HISTORY:

Data cited in the Radiological Site Survey² show thorium results obtained from depths of 20 feet. (See prints C0010, C0011, C0012 on pages 11 and 12.) However, bedrock topography maps and information from the Soil Gas Sampling report⁶ indicate that bedrock in the PRS 235 area is much shallower than 20 feet.

Because of this discrepancy and speculation that the data may be improperly plotted, the Core Team asked where these data points would fall if their plant survey coordinates were reversed. The following map shows where the data points fall with the X & Y coordinates swapped, and their proximity to PRS 266, a known area of thorium contamination.



Demonstration Of Where PRS 235 Site Survey Data Points Would Be If The Survey Coordinates Were Reversed

- LEGEND**
- 0010
 - ▲ = ORIGINAL SITE SURVEY LOCATION
 - ▲ = SITE SURVEY LOCATION W/SURVEY COORDINATES TRANSPOSED
 - = POTENTIAL RELEASE SITES

**MOUND PLANT
PRS 235
AREA OF ELEVATED THORIUM**

RECOMMENDATION:

This plot of soil (25000 ft²) was identified as an area of possible elevated thorium activity as a result of the 1983 Radiological Site Survey.

In that survey the maximum thorium concentration of 37 pCi/g was from core C0011 at 18 inches in depth. Other thorium concentrations above the 5/15 pCi/g regulatory limit were from C0010 (28 pCi/g), surface samples S0287 (9 pCi/g), S0288 (8 pCi/g), and S0296 (17 pCi/g). Subsequently, it was discovered that the location of these samples was in error due to coordinate transposition. The true location is in the vicinity of PRS 266, which has been deemed a response action.

Subsequently, in 1996, the Further Assessment Quantitative Soil Gas Confirmation Evaluation took eight core samples from 18 inches to 36 inches deep within the PRS-235 plot. All of the confirmation soil analyses detected radionuclides (including thorium) at concentrations less than the regulatory, ALARA and 10⁻⁶ Risk Based Guideline Criteria.

Therefore NO FURTHER ASSESSMENT (NFA) is recommended for PRS 235.

CONCURRENCE:

DOE/MB:

Arthur W. Kleinrath 2/19/97
Arthur W. Kleinrath, Remedial Project Manager (date)

USEPA:

Timothy J. Fischer 2/19/97
Timothy J. Fischer, Remedial Project Manager (date)

OEPA:

Brian K. Nickel 2/19/97
Brian K. Nickel, Project Manager (date)

SUMMARY OF COMMENTS AND RESPONSES:

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

- No comments were received during the comment period.
- Comment responses can be found on page 1-26 of this package.

REFERENCE MATERIAL
PRS 235

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 ^a	Results	Ref
231	T Building, Corridor 8 Alpha Wastewater Sump (Tank 233)	F-7	Historical Filled with concrete 1982	Alpha wastewater from process area floor drains	3, 4	Unknown - filled with concrete			No Data		
232	T Building, Corridor 7 Alpha Wastewater Sump (Tank 234)	F-7	Historical Filled with concrete 1982	Alpha wastewater from process area floor drains	3, 4	Unknown - filled with concrete			No Data		
233	Room T-63 Alpha Wastewater Sump (Tank 235)	F-7	Historical Filled with concrete 1982	Alpha wastewater from process area floor drains	3, 4	Unknown - filled with concrete			No Data		
234	Building 58 Diesel Fuel Storage Tank (Tank 222)	E-6	Historical	Diesel fuel	3	Tank Removed			No Data		
235	Area of Possible Elevated Thorium Activity	E-8	Grounds	Thorium	6	Possible fugitive dust	S	4, 6	1	SGS ^b Table B.3 Locations 2021, 2148, and 2149	12
	Survey Project Potential Hot Spot Location S0166	F-6	Grounds	Plutonium-238	6	Isolated activity from unknown sources			13	Table B.1	6
	Survey Project Potential Hot Spot Location S0175	E-5 E-6	Grounds	Cobalt-60, Cesium-137	6		14, 15	Table B.9 (Appendix E in Ref. 6)	6		
	Survey Project Potential Hot Spot Location S1092	G-7	Grounds	Thorium	6		14	Table B.9 (Appendix E in Ref. 6)	6		
	Survey Project Potential Hot Spot Location S0208	F-5	Grounds	Plutonium-238	6		13	Table B.9 (Appendix E in Ref. 6)	6		
	Survey Project Potential Hot Spot Location S0472	G-6	Grounds	Thorium	6		14	Table B.9 (Appendix E in Ref. 6)	6		

- 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."

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**



Table XI.1. (page 2 of 2)

Site	Plutonium-238 (pCi/g)	Thorium (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)	Actinium-227 (pCi/g)	Bismuth-207 (pCi/g)	Bismuth-210m (pCi/g)
Possible Elevated Thorium	8.97	37.69	--	LDL	LDL	1.5	LDL	--	--	--
Drainage Ditch	535.00	--	--	--	--	--	--	--	--	--
Railroad Siding	573	107	--	--	--	--	--	--	--	--
Overflow Pond	--	268	--	--	--	--	--	--	--	--
SW Building ^a Soils	--	--	3.83x10 ⁶	--	--	--	--	--	--	--
Building 48 Hillside	32,000	--	--	--	--	--	--	--	--	--
Building 66 Lot	7,000	--	--	--	--	--	--	--	--	--
Cobalt-60 Hot Spots	NR	NR	--	82	10	0.8	LDL	--	--	--
Plutonium-238 Hot Spots	81.0	<2	--	--	--	--	--	--	--	--
Remedial Action Guidelines ¹	100/25 ^a	5 surface ^b 15 subsurface	5,200 ^c	NE	80 ^d	5 surface ^b 15 subsurface	20 ^e	NE	NE	NE

¹The total thorium concentration was less than the background level of 2 pCi/g, using FIDLER screening; therefore, radiochemical analysis was not performed.

²Most of the results for this radionuclide for this area are reported as NR. See the area-specific tabulated results.

³Area 15 emits 1 Ci per year of radon, indicating the presence of radium-226.

⁴Sampling of Area 18 was verification sampling conducted after remedial action.

⁵SW Building soils were sampled in 1977 (Dames and Moore 1977).

⁶Current remedial action guidelines are subject to change, pending additional pathways analysis and risk assessment.

⁷Current D&D cleanup level is 100 pCi/g (DOE 1983); 25 pCi/g, if feasible (as low as reasonably achievable (ALARA)).

⁸remedial action guideline (CFR 1990)

⁹remedial action guideline (DOE 1983)

¹⁰value for Area 7 does not include value at Building 66

¹¹value indicated is thorium-230 isotope

¹²value is mean during verification sampling after cleanup

¹³highest residual level after verification cleanup

¹⁴Dashes indicate that no data are available for the given area and given radionuclide.

¹⁵IDLER - field instrument for the detection of low-energy radiation

¹⁶DL - The measured concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-241; and 1 pCi/g for radium-226 and actinium-227.

¹⁷IE - Not established

¹⁸NR - No result

¹⁹CI/g - picocuries per gram

²⁰CI/mL - picocuries per milliliter

²¹l - curie

5.9. AREAS OF POSSIBLE ELEVATED THORIUM ACTIVITY

Evaluation of the Site Survey Project data indicates that both isolated and contiguous areas of elevated thorium activity, above the Mound Plant guidelines of 5 (surface) and 15 (subsurface) pCi/g, may exist beyond the areas with numerical indicators. Inspection of Plate 5 suggests that low-level thorium activity may be spread to the areas northwest of Areas 8 and 9 across Area 7. Considering that the thorium project actually involved redrumming operations in Areas 7 and 9, the mechanism of contaminant transport would have been fugitive dust emissions. This is largely consistent with the distribution of thorium depicted in Plate 5. Since this region of the upper valley of the plant has undergone considerable new construction and has been paved with asphalt since the redrumming operations, the isopleth concentrations depicted in Plate 5 may now be represented by spotty contamination in actual field conditions. Samples from locations C0007, C0028, S0307, S0425 are indicated as possible hot spots on Plate 1.

Indications of elevated levels of thorium adjacent to Area 8 (Plate 5) are substantiated by samples collected since the Site Survey Project. Samples were apparently collected north and west of the fence line and south of Building 61 (Plate 1). Results reported from the Mound Plant Soil Screening Facility (MRC 1985) indicate thorium concentration that ranged from 1 to 28 pCi/g and plutonium-238 concentrations from 3 to 58 pCi/g. Approximately 24 samples were collected and analyzed, but the individual sample locations were not established for this report. The data sheets are included in Appendix E.



An area of possible elevated thorium activity is noted on Plate 1, west of Area 7. This area is located slightly uphill and to the southwest of Building 98. Table V.6 presents the results of the locations that have been included in this area. The maximum concentration of thorium reported, 37.69 pCi/g, was detected in the sample collected from core location C0011 at a depth of 18 inches. Thorium levels in excess of the Mound Plant cleanup levels (5 pCi/g for the first 15 cm of soil and 15 pCi/g for below 15 cm depth) were also measured in samples from core location C0010 and surface locations S0287 and S0288 (Table V.6).

Mound Plant drawings #FSE16472 (DOE 1992f) indicates the depth to bedrock in this area of Mound Plant is approximately 180 inches, or about 15 ft. The core locations in this area were sampled to at least 216 inches. Based on the Mound Plant drawing referenced above, it appears that the core locations in this area were sampled to bedrock, although boring logs are not available.

A second area of low-level but possibly wide-spread thorium contamination is indicated in Area 1 (Plates 1 and 5). This area was also involved with thorium storage and repackaging, but has experienced several cleanup activities, as previously described. Sample locations S0971 and S0982 (Table V.7), indicated as possible hot spots on Plate 1, may represent outlying areas of contamination associated with operations in Area 1.

Table V.6. Mound Site Survey Project - Area of Possible Elevated Thorium Activity

Plate 1 Location ^a	Coordinates		MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium ^b (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
	South	West										
C0010	1900	2350	1734	05-83	18	0.36	b					
			1735	05-83	36	0.16	11.15					
			1736	05-83	54	NR	18.00					
			1737	05-83	90	0.03	14.41					
			1738	05-83	108	0.03	27.83	←				
			1739	05-83	162	0.01	5.76					
			1740	05-83	180	0.01	b					
			1741	05-83	198	<0.01	b					
			1742	05-83	216	0.01	5.44					
			1743	05-83	228	<0.01	b					
C0011	1925	2400	1784	05-83	18	8.97	37.69	←	LDL	LDL	1.5	LDL
			1785	05-83	72	0.42	4.43					
			1786	05-83	90	0.20	b					
			1787	05-83	108	0.31	b					
			1788	05-83	126	0.46	b					
			1789	05-83	198	0.44	b					
			1790	05-83	216	0.84	11.13					

^aMap locations are given using a "C" to designate core locations and an "S" to designate surface locations.

^bA "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

LDL - The measured concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-241; and 1 pCi/g for radium-226.

MRC ID - Monsanto Research Corporation Identification

NR - No result given

pCi/g - picocuries per gram

pCi/mL - picocuries per milliliter

Table V.6. (page 2 of 2)

Plate 1 Location ^a	Coordinates		MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium ^b (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
	South	West										
C0012	1950	2300	1725	05-83	18	0.13	b					
			1726	05-83	36	0.16	5.44		LDL	LDL	1.0	LDL
			1727	05-83	54	0.20	5.88					
			1728	05-83	72	0.05	b					
			1729	05-83	108	0.05	b					
			1744	05-83	126	0.01	b					
			1730	05-83	162	0.03	b					
			1731	05-83	180	0.02	2.96					
			1732	05-83	216	0.02	b					
			1733	05-83	234	0.02	b					
C0013	2000	2375	1745	05-83	18	0.06	b					
			1746	05-83	72	0.05	b					
			1747	05-83	90	0.15	b					
			1748	05-83	108	0.29	b					
			1749	05-83	117	0.05	3.18					
S0284	1925	2390	6752	08-84	0	0.03	b					
S0285	1950	2440	4092	10-83	0	0.07	b					
S0287	2025	2440	5985	07-84	0	0.95	8.94 ←		LDL	LDL	0.8	LDL
S0288	2025	2465	5986	07-84	0	0.29	8.09 ←					
S0296	2075	2440	5984	07-84	0	1.56	16.59 ←					

Environmental Restoration Program

**RECONNAISSANCE SAMPLING REPORT
SOIL GAS SURVEY AND GEOPHYSICAL
INVESTIGATIONS, MOUND PLANT
MAIN HILL AND SM/PP HILL**

**REPORT
APPENDICES A, B AND D**

**MOUND PLANT
MIAMISBURG, OHIO**

February 1993

**Department of Energy
Albuquerque Field Office**

Environmental Restoration Program
EG&G Mound Applied Technologies



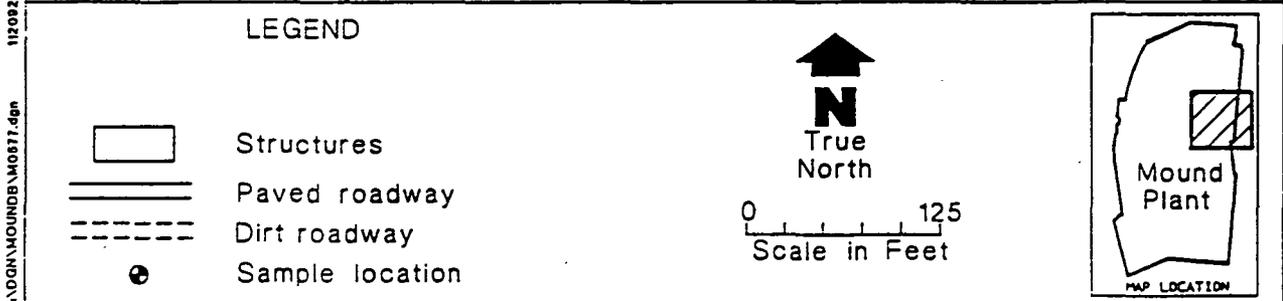
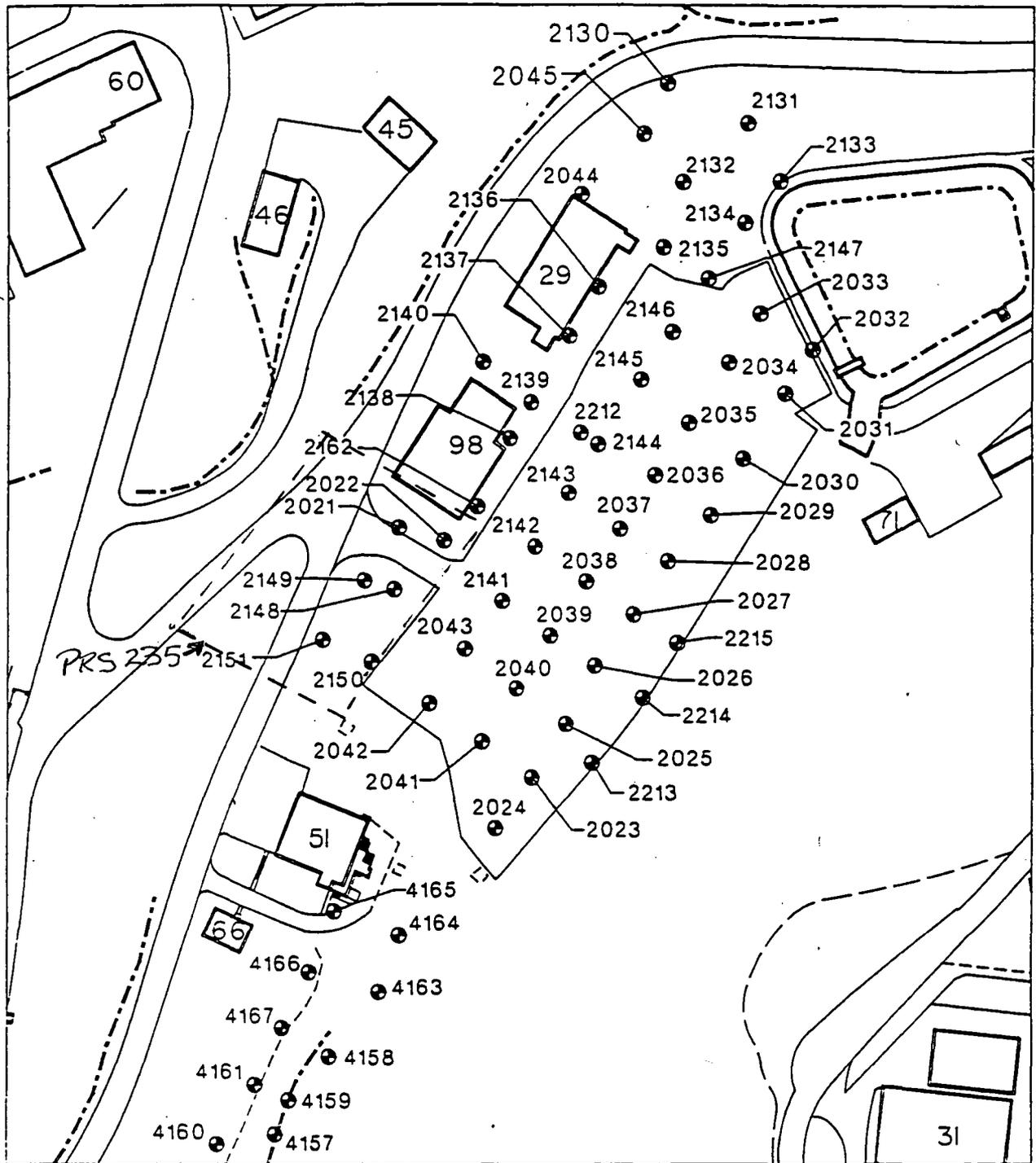


Figure 2.4: Area 7 and Building 51 sample

TABLE II.10 SUMMARY OF POSITIVE DETECTIONS—AREA 7
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN-12DCE	CIS-12DCE	111TCA	PCE	TCE	TOLUENE
MND-01-2021-0005	1 AUG 92	---	---	---	---	---	---	---	3
MND-01-2022-0005	1 AUG 92	---	---	---	---	---	---	---	3
MND-01-2023-0005	1 AUG 92	---	---	---	---	---	---	---	3
MND-01-2024-0005	1 AUG 92	---	---	---	---	---	---	---	3
MND-01-2025-0005	1 AUG 92	---	---	---	---	---	---	---	37
MND-01-2026-0005	1 AUG 92	---	---	---	---	---	---	---	133
MND-01-2027-0005	1 AUG 92	---	---	---	---	9	---	---	825
MND-01-2031-0005	1 AUG 92	---	---	---	---	---	---	---	13
MND-01-2032-0005	2 AUG 92	---	---	---	---	---	---	---	3
MND-01-2033-0005	2 AUG 92	---	---	---	---	---	---	---	3
MND-01-2034-0005	2 AUG 92	---	---	---	---	---	---	---	3
MND-01-2034-1005	2 AUG 92	---	---	---	---	---	---	---	3
MND-01-2036-0005w	3 AUG 92	---	---	---	---	---	---	---	242 *
MND-01-2036-1005w	3 AUG 92	---	---	---	---	---	---	---	218 *
MND-01-2039-0005	2 AUG 92	---	---	---	3	---	---	---	---
MND-01-2044-0005	3 AUG 92	---	---	---	---	---	---	---	18 *
MND-01-2137-1005	24 AUG 92	---	---	---	---	6	---	---	5
MND-01-2138-0005	24 AUG 92	71	---	---	---	2	---	---	80
MND-01-2139-0005	25 AUG 92	32	4	---	---	---	---	---	3 *
MND-01-2141-0005	25 AUG 92	---	---	---	10	---	---	---	5 *
MND-01-2142-0005	25 AUG 92	---	---	---	---	---	---	---	11 *
MND-01-2142-1005	25 AUG 92	---	---	---	---	---	---	---	11 *
MND-01-2145-0005	25 AUG 92	---	---	---	---	---	---	---	5 *
MND-01-2146-0005	25 AUG 92	---	33	---	---	---	6	---	---
MND-01-2147-0005	25 AUG 92	---	13	---	---	---	---	---	---
MND-01-2148-0005	26 AUG 92	---	---	---	---	22	---	---	---
MND-01-2149-0005	26 AUG 92	---	---	---	---	---	---	---	5 *
MND-01-2149-1005	26 AUG 92	---	---	---	---	---	---	---	5 *
MND-01-2150-0005	26 AUG 92	---	---	---	---	2	---	---	5 *
MND-01-2162-0005	30 AUG 92	---	---	---	---	---	---	---	---
MND-01-2212-0015	26 SEP 92	---	10	---	---	---	---	---	---
MND-01-2213-0005	26 SEP 92	---	---	---	---	---	---	---	11
MND-01-2214-0005	26 SEP 92	---	---	---	---	---	---	---	5
MND-01-2215-0005	26 SEP 92	---	---	---	---	---	---	---	11

Notes:

- Only sample locations having positive detections are shown.
- *: Associated trip, ambient, equipment or field blank contained specified compound.
- B: Indicates blank sample.
- w: Indicates water sample.

Environmental Restoration Program

**OPERABLE UNIT 5
OPERATIONAL AREA PHASE I INVESTIGATION
AREA 7 FIELD REPORT**

**MOUND PLANT
MIAMISBURG, OHIO**

VOLUME I - TEXT

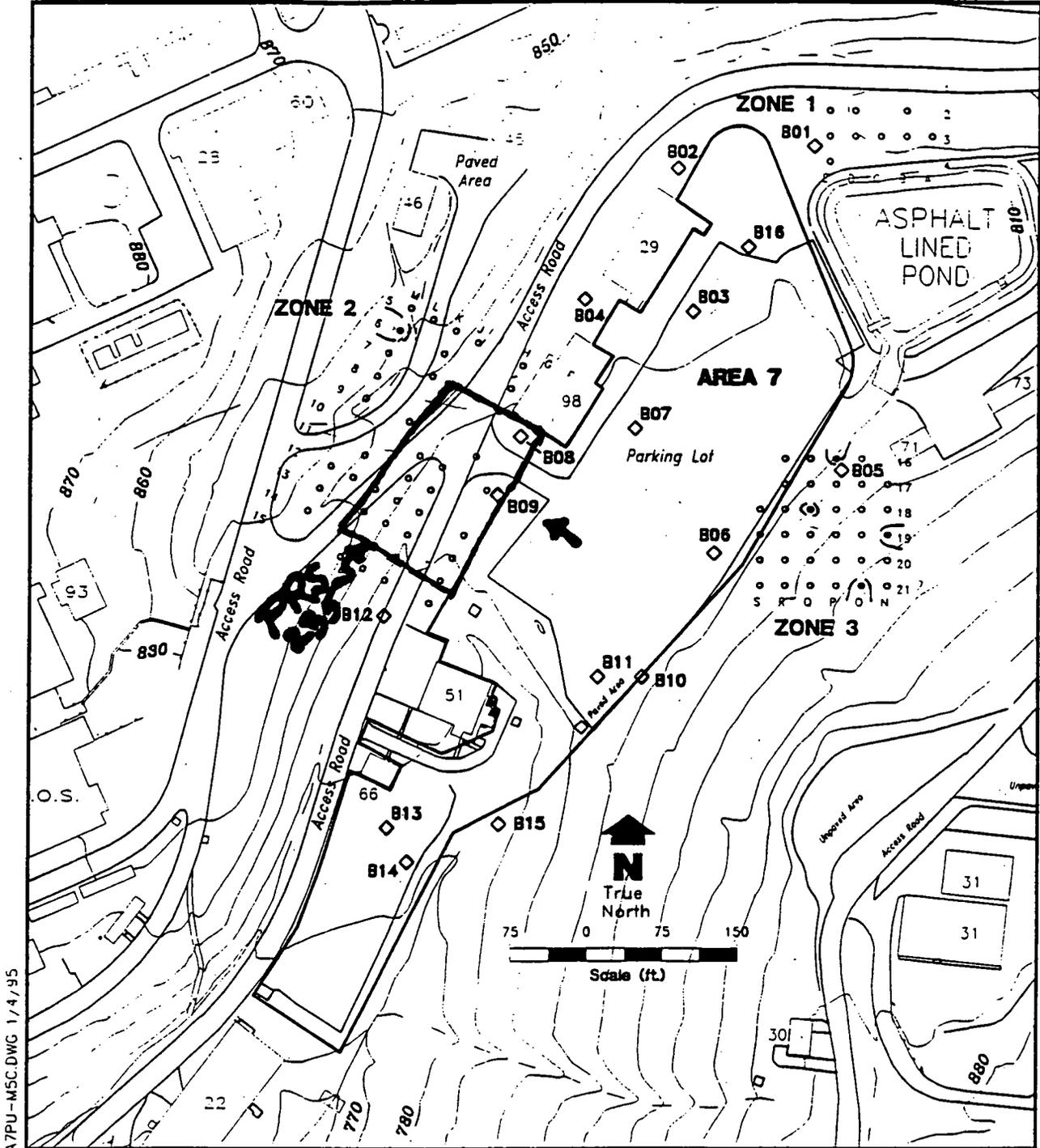
June 1995

Final (Revision 0)

**U.S. Department of Energy
Ohio Field Office**



EG&G Mound Applied Technologies



FRA7PU-M5C.DWG 1/4/95

LEGEND	
	Structures
	Ephemeral Stream
	Paved/Unpaved Roadway
	Area Boundary (Estimated)
	Soil Boring
	Locations of Pu-238 Concentrations < 25 pCi/g
	Locations of Pu-238 Concentrations ≥ 25 pCi/g
	Contours for Pu-238 Concentrations Between 25 - 50 pCi/g
	Grid System (Spacing is 25 ft.)
	-780- Topographic Interval

Figure 2.3. Areas of Elevated Surface Pu-23

Table III.6. Maximum Concentrations by Borehole of Radionuclides Detected in Subsurface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration			Number of Samples with Detects
	Value (pCi/g)	Borehole	Depth (ft BGS)	
Actinium-227	44.68	B16	15-18	2
Cesium-137	0.11	B16	5-7	1
Potassium-40	34.08	B02	5-7	45
Plutonium-238	2.98	B14	25-30	13
Plutonium-239/240	0.27	B14	25-30	3
Radium-226	1.29	B16	15-18	44
Thorium-228	3.07J	B07	15-17	26
Thorium-230	1.23	B06	5-10	34
Thorium-232	1.75J	B07	15-17	42
Tritium	58.5	B09	5-12	8
Uranium-234	2.21J	B07	15-17	36
Uranium-235	0.25	B01	5-7	19
Uranium-238	2.28J	B07	15-17	50

pCi/g - picocuries per gram
ft BGS - feet below ground surface
J - estimated value

3.3.1.5. Subsurface Soil Organic Data

Volatile Organic Compounds

Fifty-three subsurface soil samples were collected and analyzed for VOCs. Eight were detected in subsurface soil samples from Area 7 soil borings. Table III.7 shows maximum concentrations, associated boreholes and depths, and the total number of samples in which the contaminant was detected. Acetone was detected more frequently than the other VOCs, followed by toluene and hexane. B09, B11, and B14 each showed two maximum concentrations. B09 and B11 are located in the central portion of Area 7 and B14 is located to the south.

4.3.1. Presentation of Historical Subsurface Soil Radiological Data

~~During the Mound Site Survey Project, Ac-227 was found in samples from core locations 0008 and 0009, near the suspected location of the septic tank (see Figure 4.1). The maximum concentration of 1,400 pCi/g was found in core 0008 at a depth of 12.0 feet BGS with high concentrations reaching a depth of 18.0 feet BGS. 200 pCi/g of Ac-227 was found in core 0009 at a depth of 7.5 feet BGS.~~

The maximum Pu-238 concentration was 8.97 pCi/g at a depth of 1.5 feet BGS from core 0011. This core is located west of the parking lot in Zone 2 which is designated as an area of "Possible Elevated Thorium" (DOE 1992a).

The maximum subsurface total thorium concentration was 41.63 pCi/g at a depth of 4.5 feet BGS. This was found in core 0007 in Zone 1 north of the asphalt-lined pond. Other significant levels of total thorium detected include 37.69 pCi/g from core 0011 at a depth of 1.5 feet BGS and 27.83 pCi/g from core 0010 at a depth of 9.0 feet BGS. These two cores are located in Zone 2 which is designated as an area of "Possible Elevated Thorium".

~~Subsurface soil samples from two wells (0322 and 0395) and a boring (0384) in Area 7 were collected during the OU9 Hydrogeologic Investigation (see Figure 4.2). These samples were analyzed for a wide range of radionuclides, as shown in Table IV.5.~~

~~The highest Pu-238 concentration of 1.73 pCi/g was from well 0395 at a depth of 30-35 feet BGS. Pu-238 was detected in boring 0384 at 0.563 pCi/g from 2-4 feet BGS and in well 0322 at 0.0686 pCi/g from 5-10 feet BGS.~~

~~The maximum total thorium concentration of 6.69 pCi/g was detected in boring 0384 at a depth of 13-14.5 feet BGS. Total thorium was detected in well 0322 at 4.44 pCi/g from 35-40 feet BGS and in well 0395 at 3.78 pCi/g from 10-15 feet BGS.~~

4.3.2. Comparison of Historical Subsurface Soil Radiological Data to Phase 2 Data

~~Historical sampling events suggest some subsurface soil radiological contamination in Area 7. As discussed above, Ac-227 was found at a maximum concentration of 1,400 pCi/g~~

COMPARISON OF ACTUAL SOIL GAS
VALUES WITH CALCULATED
ACCEPTABLE SOIL GAS VALUES

SCREENING POTENTIAL RELEASE SITES BASED ON SOIL GAS READINGS

Soil gas readings can be utilized in the PRS screening process to identify potential release sites that may present a potential soil contamination problem for volatile organics. The soil gas survey that was conducted at Mound as part of the "Reconnaissance Sampling Report—Soil Gas Survey and Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill" investigated 8 volatile compounds. The concentrations of these compounds in the in the vapor phase within the pore spaces of the soil can be correlated to the actual soil contaminant concentrations by utilizing a method developed by ICF Kaiser Engineers. This technique has been used with US EPA Region IX approval at a large Superfund site contaminated with many of the same chemicals found at relatively low levels in soils at the Mound Plant.

The soil concentration can be estimated from the soil gas values by the following equation:

$$C_t = (C_g/P_b) * [(P_b * K_d / H) + [p_w / H] + [p_t - p_w]]$$

where

C _g	concentration of volatile chemical concentrations as soil vapor in ng/ml
P _b	Bulk density of the soil in g/ml
K _d	soil/water partition coefficient in ml/g
H	Dimensionless Henry's Law Constant
p _w	water filled porosity
p _t	total porosity
C _t	target soil concentration in ng/g or ug/kg (ppb)

The technique that Mound Plant will use for screening a PRS, is to compare the soil gas values obtained at a PRS with soil gas concentrations that are known to be below any regulatory or health based level of concern. The risk based guideline values for the Mound Plant (DOE, December 1995) soils are based upon 10⁻⁶ risk levels or a hazard index of 1. These values correspond to direct soil exposure to persons who's activities place them at the highest risk, in particular inhalation and ingestion by a Mound Plant construction worker.

Another potential exposure path must be considered, however. The potential for some of the organic contaminants to leach into ground water must be considered in developing protective soil screening levels. A "Mound Plant Soil Screening Level" paper explains the calculation of soil screening levels. For all of the chemicals that the soil gas survey identified, the calculated soil screening level soil concentrations are below the standard guideline values, therefore they are more conservative and are appropriate to be used as the basis for the soil gas calculations.

By re-arranging the equation, and using either the soil guideline values or the soil screening levels as the target soil concentration, a soil gas concentration can be calculated; this calculated soil gas concentration can be compared to the actual observed soil gas values:

$$C_g = (P_b * C_t) / [(P_b * K_d / H) + [p_w / H] + [p_t - p_w]]$$

The values of the soil specific and chemical parameters for this equation are summarized as follows:

P _b	1.6	Bulk density of the soil in g/ml
p _w	0.15	water filled porosity
p _t	0.43	total porosity
f _{oc}	0.02	fraction organic material in soil (used in developing the SSL values)

Typical chemicals that are detected with soil gas sampling are:						
NAME	H	Kd	Calculated Acceptable Soil Screening Level Value	Calculated Acceptable Soil Gas Reading	Calculated Acceptable Soil Gas Reading	
		ml/g	mg/kg (ppm)	ng/ml		ppb
Toluene	2.52E-01	3.42	22.06	1.56E+03		14800
Trichloroethene (TCE)	4.35E-01	2.24	0.07	1.26E+01		2400
111 Trichloroethane (TCA)	7.63E-01	2.2	3.01	9.46E+02		173400
Trans-1,2 Dichloroethene (DCE)	2.29E-01	1	0.70	1.41E+02		35700
cis-1,2 Dichloroethene (DCE)	1.85E-01	2.78	0.31	1.97E+01		3500
Freon 11	NA	NA				
Freon 113	NA	NA				
Tetrachloroethene (PCE)	7.09E-01	2.78	0.09	2.13E+01		3100

na not available

IF THE SOIL GAS READING IS BELOW THE VALUES IN THE CALCULATED SOIL GAS READING COLUMN (SHADED), THEN THERE IS NO THREAT TO GROUNDWATER FROM THIS PRS.

The soil screening level values are calculated using the Soil Screening Methodology. The Potential Release Site is assumed to be more than 100 meters from a potential drinking water source with an aquifer thickness of 15 meters and a source size of 10 meters. The hydraulic gradient is assumed to be 0.01 which is conservative for most of the Mound Plant PRSs. In special instances where the PRS lies less than 100 meters from a potential drinking water source, or the hydraulic gradient is much less than 0.01, new SSL values and new acceptable soil gas values will be calculated for that particular PRS.

MOUND



**Environmental
Restoration
Program**

Further Assessment

Soil Gas Confirmation Sampling

**Mound Plant
Miamisburg, Ohio**

November 1996

Revision 1

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	Dimethylphthalate	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

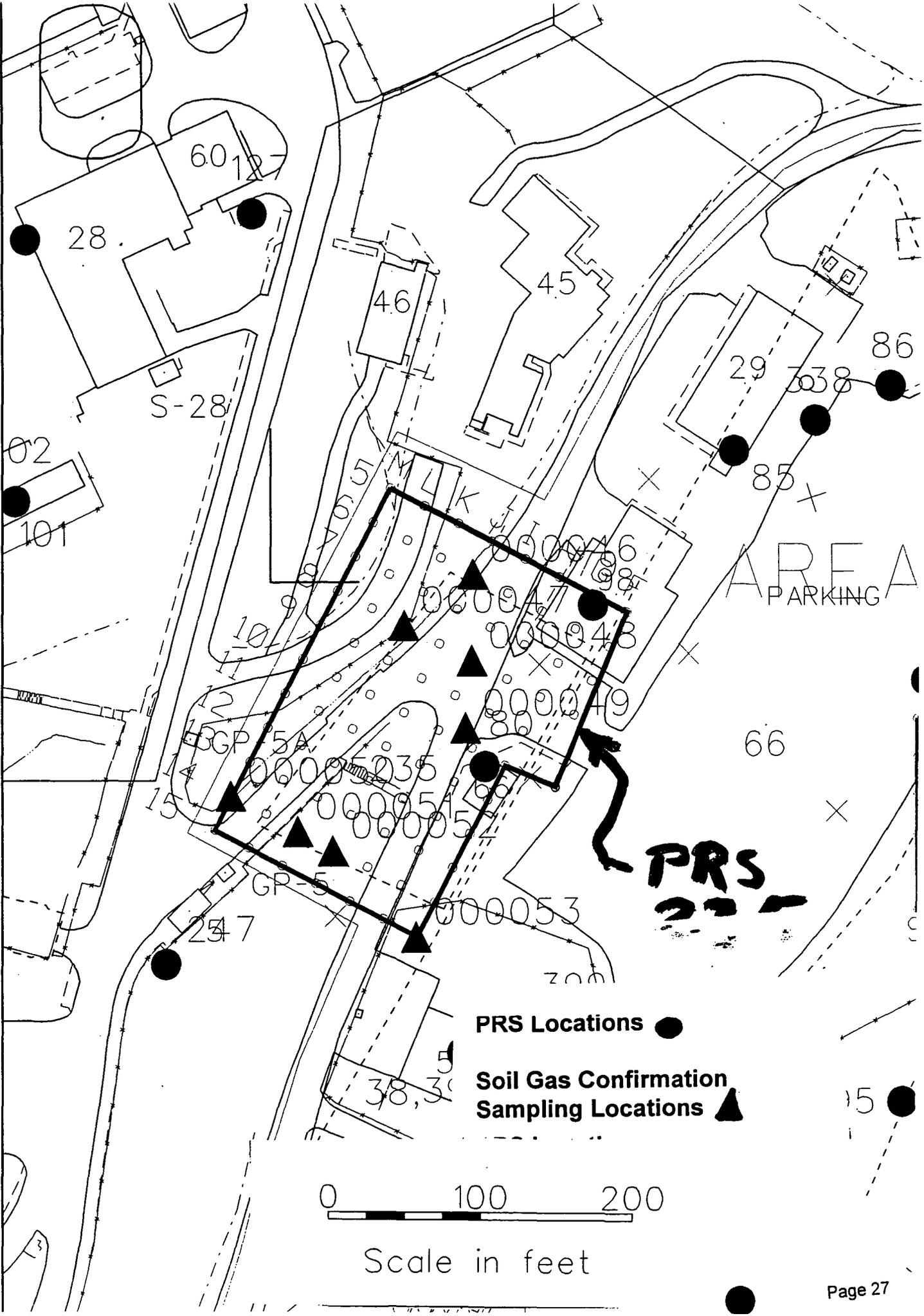
Aluminum	Copper	Potassium
Antimony	Cyanide	Selenium
Arsenic	Iron	Silver
Barium	Lead	Sodium
Beryllium	Lithium	Thallium
Bismuth	Magnesium	Tin
Cadmium	Manganese	Vanadium
Calcium	Mercury	Zinc
Chromium	Molybdenum	Nitrate/Nitrite
Cobalt	Nickel	Explosives (USATHAMA,PETN)

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.



PRS Locations ●

Soil Gas Confirmation
Sampling Locations ▲

0 100 200

Scale in feet

Table A.1

Detected Volatile Organic Compounds ($\mu\text{g}/\text{kg}$)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-A61-000042	SGC-A61-000043	SGC-A61-000045	SGC-A61-000046	SGC-A61-000053
PETREX Sample Area			AREA 61	AREA 61	AREA 61	AREA 7	AREA 7
Acetone	NA	21000000			8 J	17	
1,2-Dichloroethene (total)	NA	43000000					
2-Butanone	NA	93000000		5 J-C	5 J		
Benzene	NA	8.90E+03					
Carbon Disulfide	NA	280000					
Chloroform	NA	3100					
Chloromethane	NA	NA					
Ethylbenzene	NA	480					
Methylene Chloride	NA	3.95E+05	6	9		9	4 J
Tetrachloroethene	NA	21000000					
Toluene	NA	250000		2 J	3		
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 ($\mu\text{g}/\text{kg}$)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-A61-000054 AREA 7	SGC-A61-000055 AREA 7	SGC-A13-000057 AREA 13	SGC-A13-000058 AREA 13	SGC-A13-000059 AREA 13
PETREX Sample Area							
Acetone	NA	21000000					
1,2-Dichloroethene (total)	NA	43000000					
2-Butanone	NA	93000000					
Benzene	NA	8.90E+03					
Carbon Disulfide	NA	280000					
Chloroform	NA	3100					
Chloromethane	NA	NA					
Ethylbenzene	NA	480					
Methylene Chloride	NA	3.95E+05	7			7	
Tetrachloroethene	NA	21000000					
Toluene	NA	250000		1 J			3 J
Trichloroethene	NA	41000			3 J		
Xylene (total)	NA	430000000					1 J

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-A66-000041	SGC-A61-000042	SGC-A61-000043	SGC-A61-000044	SGC-A61-000047	SGC-A61-000048	SGC-A61-000049
PETREX Sample Area			NORTH	AREA 61	AREA 61	AREA 61	AREA 7	AREA 7	AREA 7
Acenaphthene	NA	NA	97 J					19 J	27
Acenaphthylene	NA	NA							
Anthracene	NA	64000000	110 J					33 J	36
Benzo(a)anthracene	NA	4.10E+03	420				18 J	62 J	77
Benzo(a)pyrene	NA	410	430				23 J	55 J	76
Benzo(b)fluoranthene	NA	4100	380				23 J	53 J	69
Benzo(g,h,i)perylene	NA	NA	310 J					52 J	32
Benzo(k)fluoranthene	NA	41000	360 J				23 J	46 J	63
Bis(2-ethylhexyl)phthalate	NA	2.15E+05	4400 D				43 J		34
Butylbenzylphthalate	NA	43000000							
Carbazole	NA	NA	97 J						
Chrysene	NA	410000	490		28 J		29 J	86 J	90
Di-n-butyl phthalate	NA	21000000				34 J			
Di-n-octyl phthalate	NA	4300000							
Dibenz(a,h)anthracene	NA	410	92 J						20
Dibenzofuran	NA	NA	35 J						
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8500000	1000	26 J	25 J		45 J	150 J	230
Fluorene	NA	NA	60 J					27 J	26
Indeno(1,2,3-cd)pyrene	NA	4.10E+03	290 J					30 J	43
2-Methylnaphthalene	NA	NA							
Naphthalene	NA	NA	26 J						
Phenanthrene	NA	NA	720		35 J		25 J	170 J	220
Phenol	NA	130000000							
Pyrene	NA	6400000	880	21 J	80 J		50 J	180 J	200

No entry - not detected

J - Value is an est. quantity

D - Sample was diluted

NA - Value not available

H - Analyzed outside holding time

* - Unconfirmed due to interference

mg/kg - micrograms per kilogram

Table A.2.
Detected Semivolatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-A61-000050 AREA 7	SGC-A61-000051 AREA 7	SGC-A61-000052 AREA 7	SGC-A61-000053 AREA 7	SGC-A13-000056 AREA 13	SGC-A13-000057 AREA 13
PETREX Sample Area								
Acenaphthene	NA	NA J						
Acenaphthylene	NA	NA						
Anthracene	NA	64000000 J	26 J			79 J		
Benzo(a)anthracene	NA	4.10E+03 J	130 J		20 J	210 J		
Benzo(a)pyrene	NA	410 J	130 J		20 J	190 J		
Benzo(b)fluoranthene	NA	4100 J	110 J		22 J	140 J		
Benzo(g,h,i)perylene	NA	NA J	96 J			120 J		
Benzo(k)fluoranthene	NA	41000 J	130 J		19 J	150 J		
Bis(2-ethylhexyl)phthalate	NA	2.15E+05 J					27 J	28 J
Butylbenzylphthalate	NA	43000000						
Carbazole	NA	NA				24 J		
Chrysene	NA	410000 J	150 J		26 J	210 J		
Di-n-butyl phthalate	NA	21000000						
Di-n-octyl phthalate	NA	4300000						
Dibenz(a,h)anthracene	NA	410 J	29 J			35 J		
Dibenzofuran	NA	NA						
Diethyl phthalate	NA	NA						
Fluoranthene	NA	8500000 J	290 J	30 J	47 J	480	22 J	
Fluorene	NA	NA J						
Indeno(1,2,3-cd)pyrene	NA	4.10E+03 J	79 J			100 J		
2-Methylnaphthalene	NA	NA						
Naphthalene	NA	NA						
Phenanthrene	NA	NA J	140 J		31 J	290 J		
Phenol	NA	130000000						
Pyrene	NA	6400000 J	260 J	26 J	45 J	390	18 J	

No entry - not detected
 J - Value is an est. quantity
 D - Sample was diluted
 NA - Value not available
 H - Analyzed outside holding time
 * - Unconfirmed due to interference
 mg/kg - micrograms per kilogram

Table A.3.

Detected Pesticides/PCB's ($\mu\text{g}/\text{kg}$)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-	SGC-NAC-	SGC-NAC-	SGC-A66-	SGC-A61-
			000008	000010	000031	000041	000044
PETREX Sample Area			WEST	EAST	NORTH	NORTH	AREA 61
Aroclor-1248	ND	380	48			110	98
Aroclor-1254	ND	4300	43				55
Alpha-Chlordane	ND	NA					
Gamma-Chlordane	ND	NA					
4,4'-DDT	9000	13000					
Dieldrin	ND	185		4.4	5 *		
Endosulfan I	ND	NA				3.4 *	2.4
Endosulfan II	NA	NA					
Endrin	ND	NA			11 *		
Heptachlor	ND	NA					

No entry - not detected

* - Unconfirmed due to interference

NA - Value not available

ND - No detections in background samples

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)

No detections in Area 7,
PKS 235

Table A.3.

Detected Pesticides/PCB's ($\mu\text{g}/\text{kg}$)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-A13-000060	SGC-AOJ-000067	SGC-AOJ-000071	SGC-A03-000081
PETREX Sample Area			AREA 13	AREA J	AREA J	AREA 3
Aroclor-1248	ND	380				
Aroclor-1254	ND	4300		52	44	
Alpha-Chlordane	ND	NA			14 *	
Gamma-Chlordane	ND	NA	3.7		12 *	
4,4'-DDT	9000	13000				3.7
Dieldrin	ND	185				
Endosulfan I	ND	NA *				
Endosulfan II	NA	NA				4.4
Endrin	ND	NA				
Heptachlor	ND	NA	2.9			

No entry - not detected

* - Unconfirmed due to interference

NA - Value not available

ND - No detections in background samples

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)

No detections in AREA 7,
PRS 235

Table A.4.
Detected TAL Inorganics (mg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-A66-00041	SGC-A61-00042	SGC-A61-00043	SGC-A61-00044	SGC-A61-00045	SGC-A61-00046	SGC-A61-00047	SGC-A61-00048	SGC-A61-00049	SGC-A61-00050
PETREX Sample Area			NORTH	AREA 61	AREA 61	AREA 61	AREA 61	AREA 7				
TAL INORGANICS (mg/kg)												
Aluminum	19000	NA	030	860	3600	1540	1500	14700	8630	1230	7040	2690
Antimony	NA	85		0.79 B		0.23 B						
Arsenic	8.6	64	3.2	6.4	3	5.0	3.7	2.1 B	3.6	3.6	3.8	5.3
Barium	180	1.50E+04	9.1 B	97.3 BJ	238 BJ	238 B	167 B	45 B	45.4 B	16.7 B	34.7 B	19 B
Beryllium	1.3	0.7		0.13 B		0 B	0.12 B	0.86	0.25		0.13 B	0.14 B
Bismuth	NA	NA						1.5 B				
Cadmium	2.1	210				0 B			0.42 B	0.19 B	0.32 B	0.3 B
Calcium	310000	NA	189000	189000	161000	15200	148000	58000	124000	193000	168000	217000
Chromium	20	1.10E+05	3.7	8 J	8 J	4	4.6	20.8	12.3	4.8	11.4	5.4
Cobalt	19	NA	3 B	6.1 B	4 B	2 B	2 B	19.4	9.1 B	1.5 B	7.8 B	3 B
Copper	28	NA	2.1	3.1 J	10 J	1	8	24.4	17.5	5.1 B	14	29.1
Cyanide	ND	4300	0.58 B									
Iron	35000	NA	8300	18500 J	10300 J	810	6910	30400	19900	4910	17100	6510
Lead	48	NA	11.6	9.2 J	5.9 J	6	6	2.6	11.5	5	7.7	26.7
Lithium	28	NA	11 B	14.3 B	12.5 B	7 B	5.6 B	38.6	19 B	4.6 B	20.9 B	10.3 B
Magnesium	40000	NA	6860	23400 J	61000 J	5560	65800	10500	33700	108000	30400	102000
Manganese	1400	27000	27	784 J	363 J	26	235	1080	518	221	570	264
Mercury	ND	64							0.13			
Molybdenum	27	NA	0.82 B	1.6 B	3 B	2 B	1.7 B		2.1 B	1.7 B	1.4 B	0.51 B
Nickel	32	4.30E+03	7.6 B	14.8	10.4	7 B	6.7 B	34.6	19.6	8.9	16.8	6.4 B
Potassium	1900	NA	562 B	600 B	52 B	28 B	441 B	3280	1210	297 B	1170	555 B
Selenium	NA	NA		0.45 BJ								
Silver	1.7	1100	0.3 B					0.21 B				0.21 B
Sodium	240	NA	329 B	1540 J	88 BJ	21 B	566 B	216 B	439 B	998 B	1030 B	616 B
Thallium	0.48	NA		0.67 BJ								
Tin	20	NA		4.4 B	1 B		1.2 B	1.2 B				0.89 B
Vanadium	25	1500	7.1 B	10.4 J	12 J	5	7.1	19.7	15.5	7.6	10.8	6.7
Zinc	140	64000	46.8	39.1 J	25 J	29	25.7	66.8	57.4	13.1	46.6	254
OTHER INORGANICS												
% Solids (%)	NA	NA	89.4	83.6	94.8	96.2	93	81.8	85.6	94.8	86.3	85
Nitrate/Nitrite (mg-N/kg)	NA	NA	2	1.4	0.84	0.58	2.1	1.6	7.9	1.6	1.5	1.8

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 TAL Inorganics (mg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-A61-000051	SGC-A61-000052	SGC-A61-000053	SGC-A61-000054	SGC-A61-000055	SGC-A13-000056	SGC-A13-000057	SGC-A13-000058	SGC-A13-000059	SGC-A13-000060
PETREX Sample Area			AREA 7	AREA 13								
TAL INORGANICS (mg/kg)												
Aluminum	18000	NA	9810	6900	3890	10200	11300	1600	5860	1960	4000	4700
Antimony	NA	85			0.23 B			0.31 B	1.79 B			0.88 B
Arsenic	8.8	64	5	3.2	3.3	1.2 B	6.7	3.5 B	4.3 B	8.1	4.7	5
Barium	180	1.50E+04	52.4	26.6 B	30.2 BJ	39.5 B	77.4	1.7 B	4.8 B	8.3 B	6.1	40.7 B
Beryllium	1.3	0.7	0.53	0.12 B		0.66	0.8		0.09 B			
Bismuth	NA	NA	1.3 B									
Cadmium	2.1	210	0.27 B	0.28 B				1	2.6	0.18 B	2.4	2
Calcium	310000	NA	98100	264000	181000	205000	15500	149000	170000	157000	137000	139000
Chromium	20	1.10E+05	16.4	9	7.8 J	12.9	15.5	4	5.8	2	5	
Cobalt	19	NA	9.8 B	7.3 B	4.3 B	10.5 B	13	9 B	5.6 B	7 B	4.8 B	5.7 B
Copper	28	NA	25.3	12.2	13.9 J	13.7	15.5	2	7.7	11	1.5	12
Cyanide	ND	4300										
Iron	35000	NA	21900	16500	11400 J	20800	24400	5880	12800	4960	10200	11700
Lead	48	NA	16.7	12.7	11.2 J	4	22.1	3.3	9.9	4	6	9
Lithium	28	NA	24.5	19.6 B	14 B	20.8 B	15.5 B	3.6 B	5 B	6 B	8.9 B	7.1 B
Magnesium	40000	NA	18400	11600	47900 J	5290	4720	6400	45900	7900	6500	3370
Manganese	1400	27000	684	728	471 J	886	933	33	65	99	215	57
Mercury	ND	64			0.08 B							
Molybdenum	27	NA	1.9 B	0.82 B	0.96 B		1.1 B	1.3 B	1 B	2 B	2.5 B	1.8 B
Nickel	32	4.30E+03	20.8	14.1	10.5	19.1	19.1	4.4 B	9	3 B	0.7	9.6
Potassium	1900	NA	1770	1010 B	565 B	1700	1450	874 B	904 B	50 B	85 B	72.5 B
Selenium	NA	NA										
Silver	1.7	1100	0.3 B		0.19 B							
Sodium	240	NA	875 B	199 B	911 BJ	268 B	94.8 B	227 B	365 B	20 B	48 B	26.3 B
Thallium	0.46	NA										
Tin	20	NA	1.5 B		0.9 B				2 B		2.2 B	0.9 B
Vanadium	25	1500	17.1	9.6	8.6 J	14.1	21.6	5.7 B	11.4	3.4	10.1 B	11.6
Zinc	140	84000	120	66.1	73 J	40	54.6	31.5	29.3	37.7	37.7	9
OTHER INORGANICS												
% Solids (%)	NA	NA	82.6	83	85.3	84.6	77.3	81.3	88.9	93.7	82.8	81
Nitrate/Nitrite (mg-N/kg)	NA	NA	1.6	4.6	2.3	2.6	2.1	9	3.8	19	1.3	2.4

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 Value	Industrial Scenario Guideline Criteria	SGC-A61-000046	SGC-A61-000047	SGC-A61-000048	SGC-A61-000049	SGC-A61-000050
PETREX Sample Area			AREA 7				
Americium-241	ND	4.95					
Bismuth-207	ND	0.175					
Bismuth-210	ND	NA					
Cesium-137	0.42	4.60E-01					
Cobalt-60	NC	0.1					
Plutonium-238	0.13	5.5	0.173	0.0549	0.00517	0.0318	0.138
Plutonium-239/240	0.18	5.5					
Potassium-40	37	NA	20.9	18	2.93	3.55	23.2
Radium-226+D	2	1.40E-01	0.69	0.727	0.325	0.549	0.794
Thorium-228+D	1.5	0.85	0.786	0.79	0.116	0.204	0.796
Thorium-230	1.9	44	0.729	0.729	0.249	0.426	0.763
Thorium-232	1.4	50	0.883	0.627	0.114	0.158	0.835
Uranium-234	1.1	37.5	0.707	0.705	0.201	0.357	0.723
Uranium-235+D	0.11	3.35	0.0475	0.024			
Uranium-238+D	1.2	11	0.87	0.853	0.16	0.302	0.885

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 Value	Industrial Scenario Guideline Criteria	SGC-A61-000051	SGC-A61-000052	SGC-A61-000053	SGC-NAC-000054	SGC-A61-000055
PETREX Sample Area			AREA 7	AREA 7	AREA 7		AREA 7
Americium-241	ND	4.95					
Bismuth-207	ND	0.175					
Bismuth-210	ND	NA					
Cesium-137	0.42	4.60E-01	0.718				
Cobalt-60	NC	0.1					
Plutonium-238	0.13	5.5	2.25	0.0678	0.756	0.147	0.215
Plutonium-239/240	0.18	5.5	0.0221	0.00605	0.00562	0.00291	
Potassium-40	37	NA	20.2	30.2	9.48	22	18.6
Radium-226+D	2	1.40E-01	1.01	0.81	0.532	0.629	1.02
Thorium-228+D	1.5	0.85	0.928	0.879	0.419	0.948	1.35
Thorium-230	1.9	44	0.833	0.835	0.594	0.867	1.14
Thorium-232	1.4	50	0.718	0.976	0.0346	0.896	1.16
Uranium-234	1.1	37.5	0.675	0.653	0.467	0.645	1.02
Uranium-235+D	0.11	3.35	0.0565			0.0541	0.0428
Uranium-238+D	1.2	11	0.734	0.648	0.387	0.816	1.02

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)