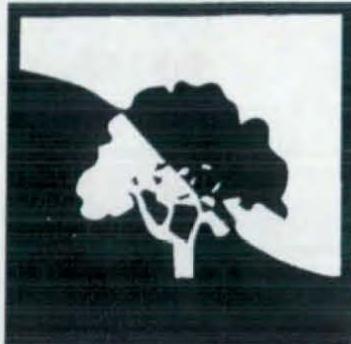


# MOUND



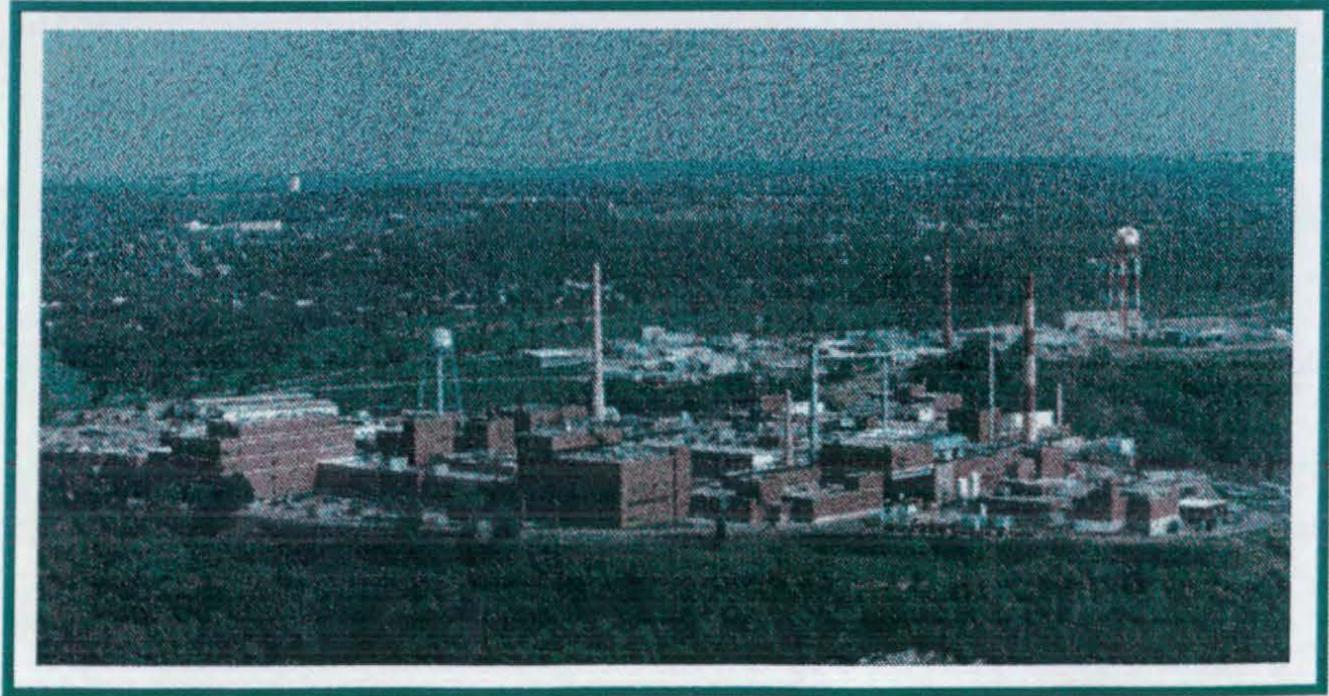
Environmental  
Restoration  
Program



# MOUND PLANT

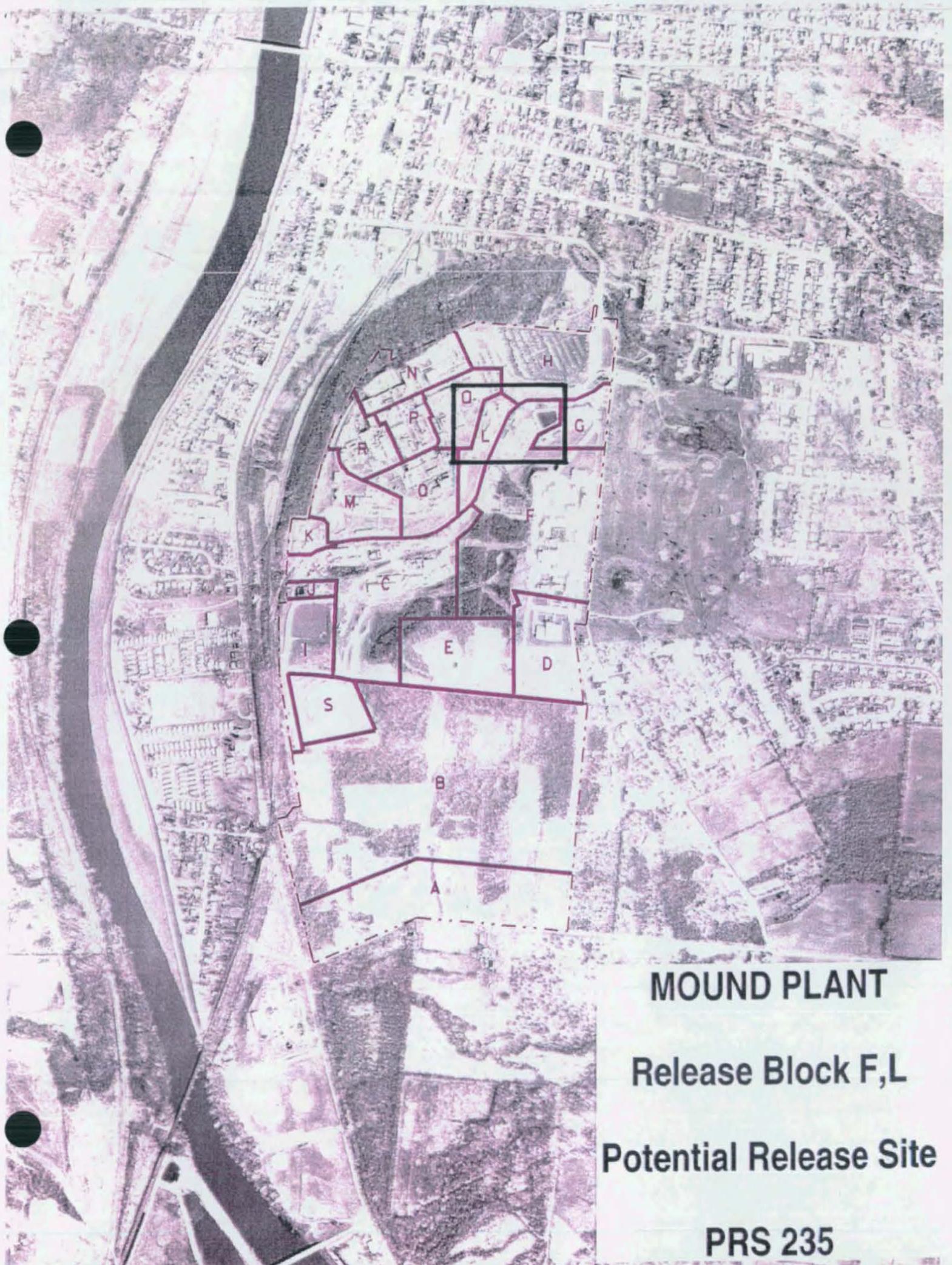
## Potential Release Site Package

### PRS # 235



PRS 235

REV	DESCRIPTION	DATE
0 PUBLIC RELEASE	Available for comments.	Mar. 19, 1997
1 FINAL		

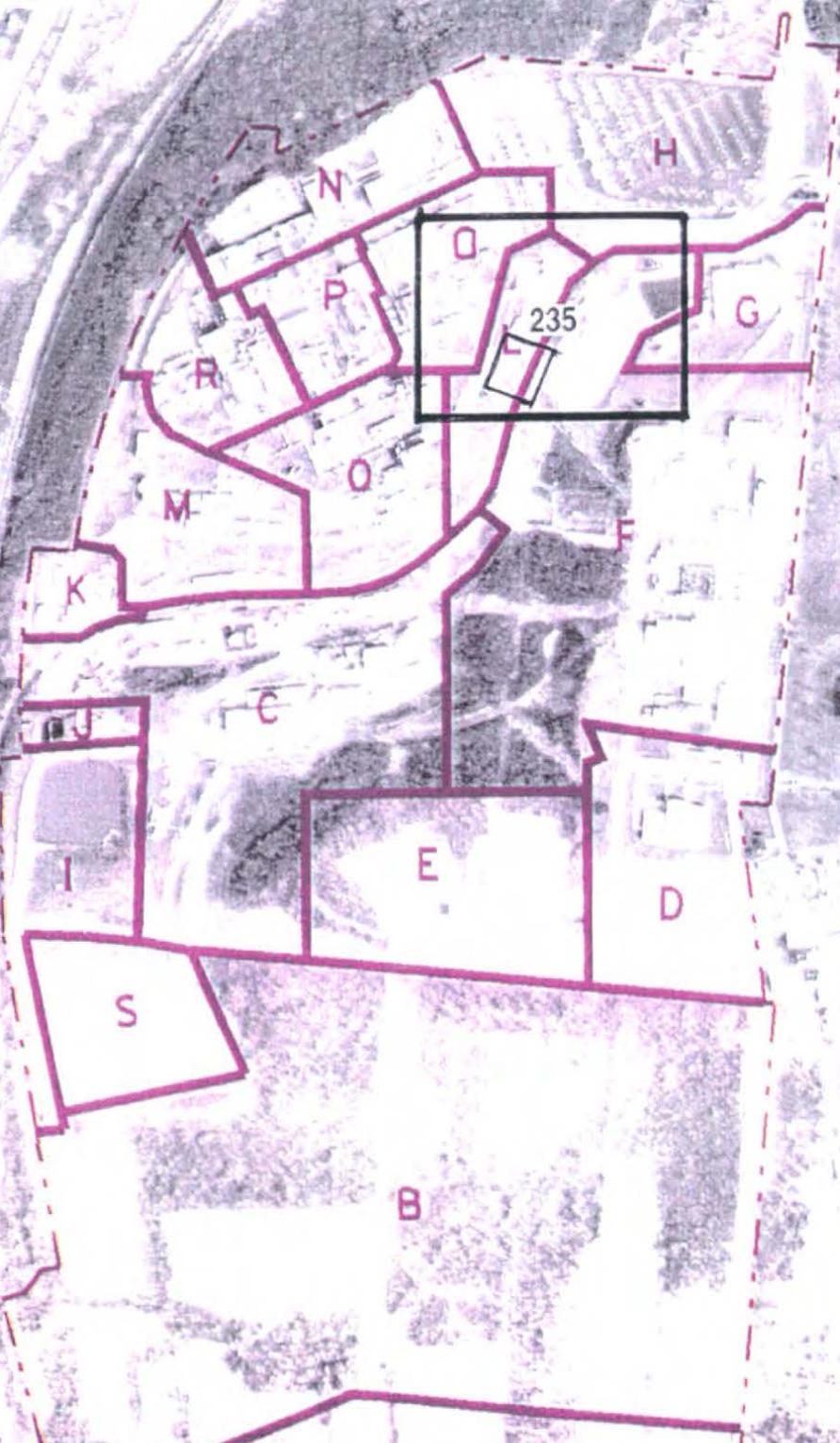


**MOUND PLANT**

**Release Block F,L**

**Potential Release Site**

**PRS 235**



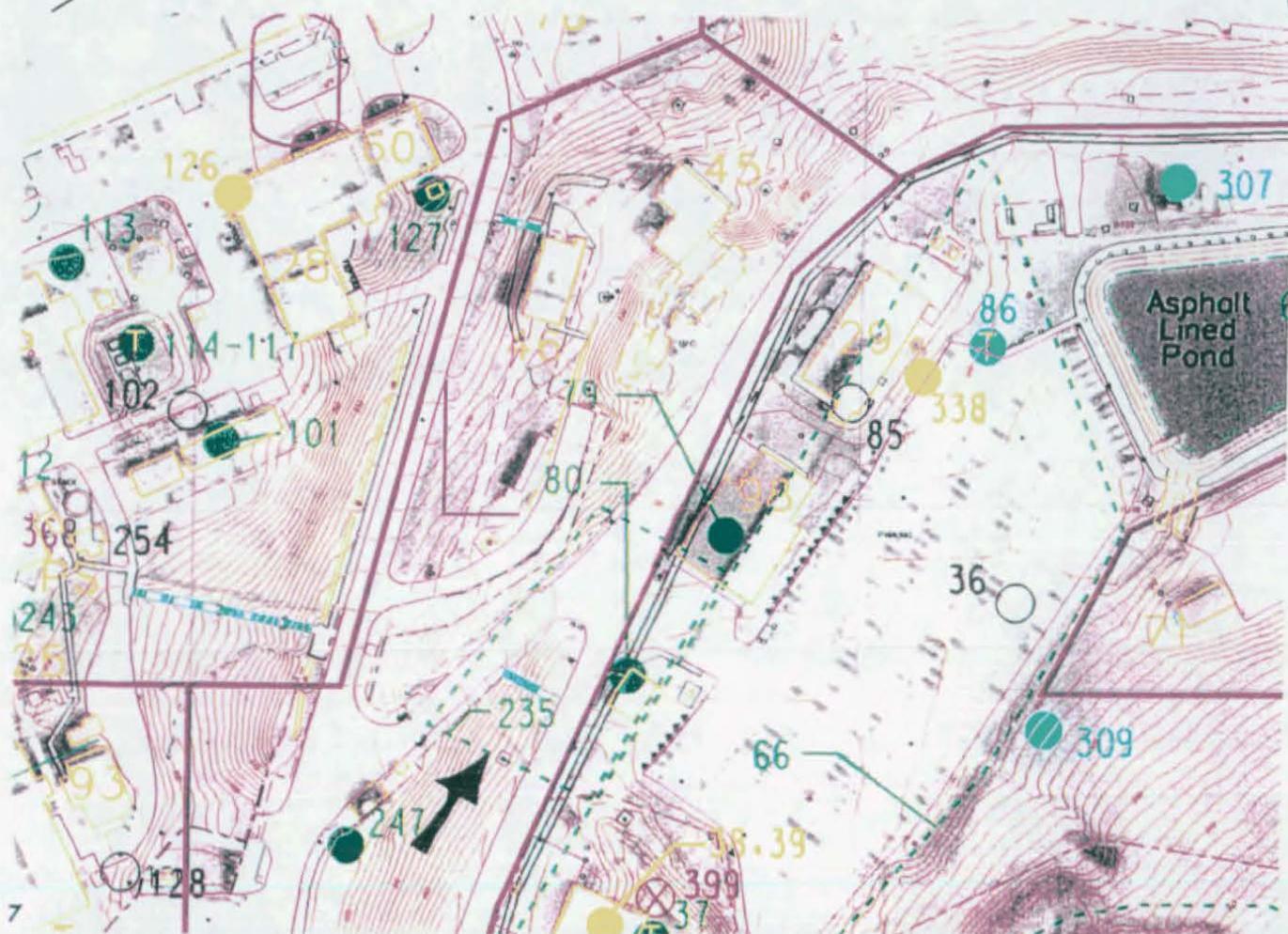
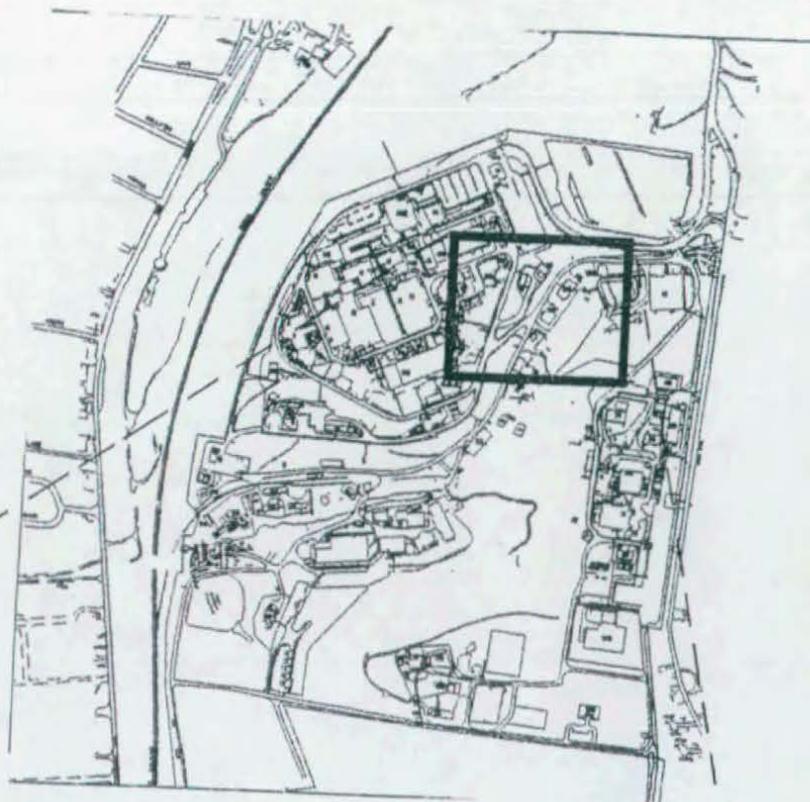
235

# MOUND PLANT

Release Block F,L

Potential Release Site

PRS 235





**PRS HISTORY:**

PRS 235 is an area of land covering approximately 25,000 ft<sup>2</sup> located slightly uphill and to the southwest of Building 98. The Radiological Site Survey<sup>2</sup> analyzed soil samples for radioactivity and identified this PRS as an area of "possible elevated thorium".<sup>1</sup>

**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.<sup>2</sup> 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.<sup>4</sup> 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.<sup>3</sup>

**II. Potential Contamination:**

<b>Contaminant</b>	<b>Maximum Concentration Detected</b>	<b>Guideline Criteria</b>
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 <sup>5</sup> (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  $2 \times 10^{-6}$  Risk Based guideline value).

**REFERENCES:**

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

**PREPARED BY:**

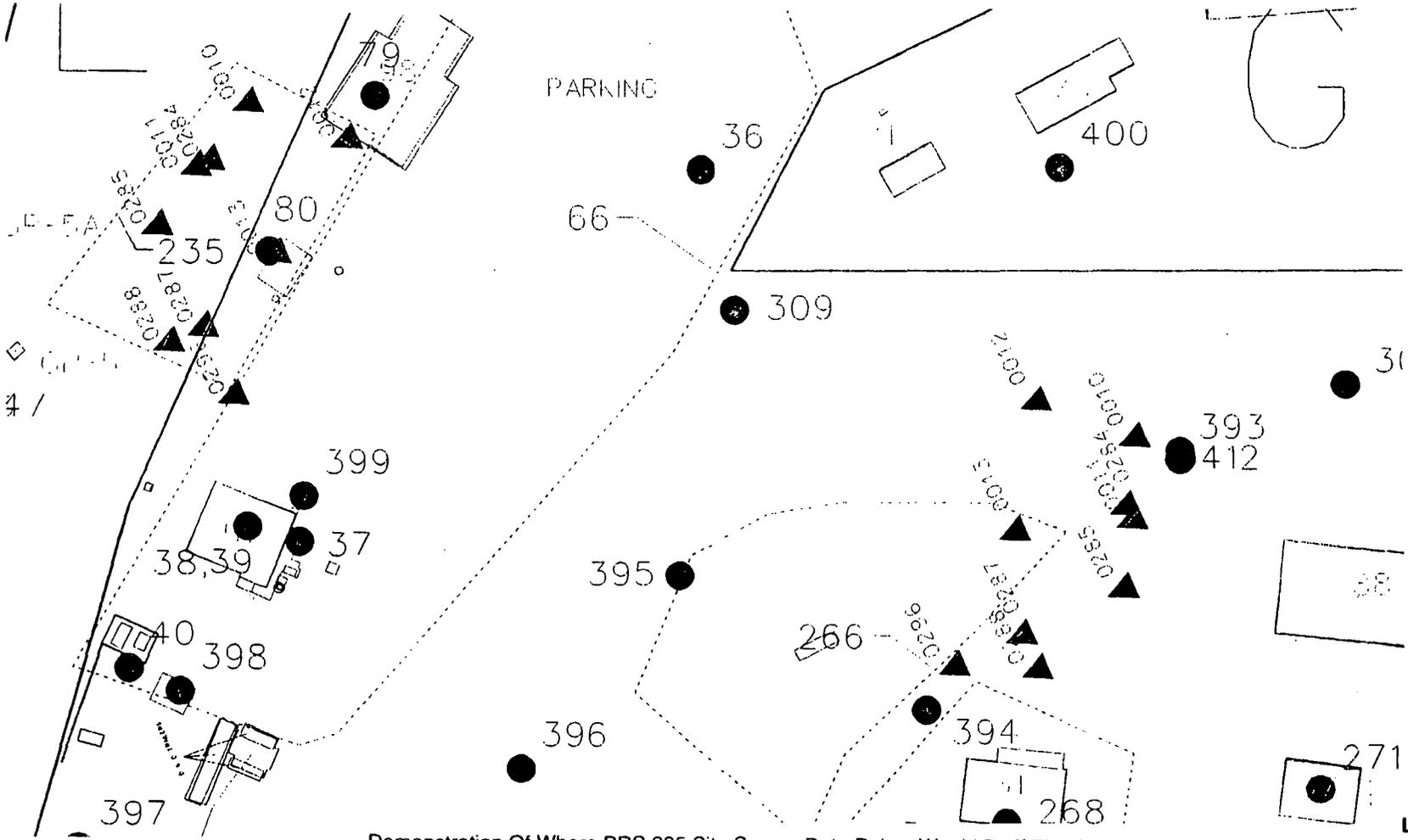
Dean A. Buckner, Member of EG&G Technical Staff

**PRS 235**  
**(SUPPLEMENTAL DATA)**

**HISTORY:**

Data cited in the Radiological Site Survey<sup>2</sup> 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 report<sup>6</sup> 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 ft<sup>2</sup>) 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<sup>-6</sup> 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 \_\_\_\_\_ to \_\_\_\_\_

- No comments were received during the comment period.
- Comment responses can be found on page \_\_\_\_\_ 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 <sup>a</sup>	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 <sup>b</sup> 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**

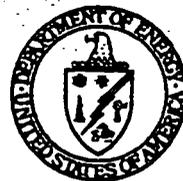


Table XI.1. (page 2 of 2)

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	8.87	37.68	--	LDL	LDL	1.5	LDL	--	--	--
Drainage Ditch	535.00	--	--	--	--	--	--	--	--	--
Railroad Siding	573	107	--	--	--	--	--	--	--	--
Overflow Pond	--	268	--	--	--	--	--	--	--	--
SW Building <sup>a</sup> Soils	--	--	3.83x10 <sup>6</sup>	--	--	--	--	--	--	--
Building 48 Hillside	32,000	--	--	--	--	--	--	--	--	--
Building 66 Lot	7,000	--	--	--	--	--	--	--	--	--
Cobalt-60 Hot Spots	NR	NR	--	82	10	0.6	LDL	--	--	--
Plutonium-238 Hot Spots	61.0	<2	--	--	--	--	--	--	--	--
Remedial Action Guidelines <sup>1</sup>	100/25 <sup>2</sup>	5 surface <sup>b</sup> 15 subsurface	5,200 <sup>3</sup>	NE	80 <sup>4</sup>	5 surface <sup>b</sup> 15 subsurface	20 <sup>5</sup>	NE	NE	NE

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

<sup>b</sup>Most of the results for this radionuclide for this area are reported as NR. See the area-specific tabulated results.

<sup>c</sup>Area 15 emits 1 Ci per year of radon, indicating the presence of radium-226.

<sup>d</sup>Sampling of Area 18 was verification sampling conducted after remedial action.

<sup>e</sup>SW Building soils were sampled in 1977 (Dames and Moore 1977).

<sup>f</sup>Current remedial action guidelines are subject to change, pending additional pathways analysis and risk assessment.

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

<sup>h</sup>Remedial action guideline (CFR 1990)

<sup>i</sup>Remedial action guideline (DOE 1983)

<sup>j</sup>value for Area 7 does not include value at Building 66

<sup>k</sup>value indicated is thorium-230 isotope

<sup>l</sup>value is mean during verification sampling after cleanup

<sup>m</sup>highest residual level after verification cleanup

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

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

DL - 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.

IE - Not established

NR - No result

CI/g - picocuries per gram

CI/mL - picocuries per milliliter

i - 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 <sup>a</sup>	Coordinates		MRC ID No.	Depth (inch)	Plutonium-238 (pCi/g)	Thorium <sup>b</sup> (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)	
	South	West										Mo-Yr
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					

<sup>a</sup>Map locations are given using a "C" to designate core locations and an "S" to designate surface locations.

<sup>b</sup>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

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 <sup>a</sup>	Coordinates		MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium <sup>b</sup> (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	
<del>S0288</del>	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**



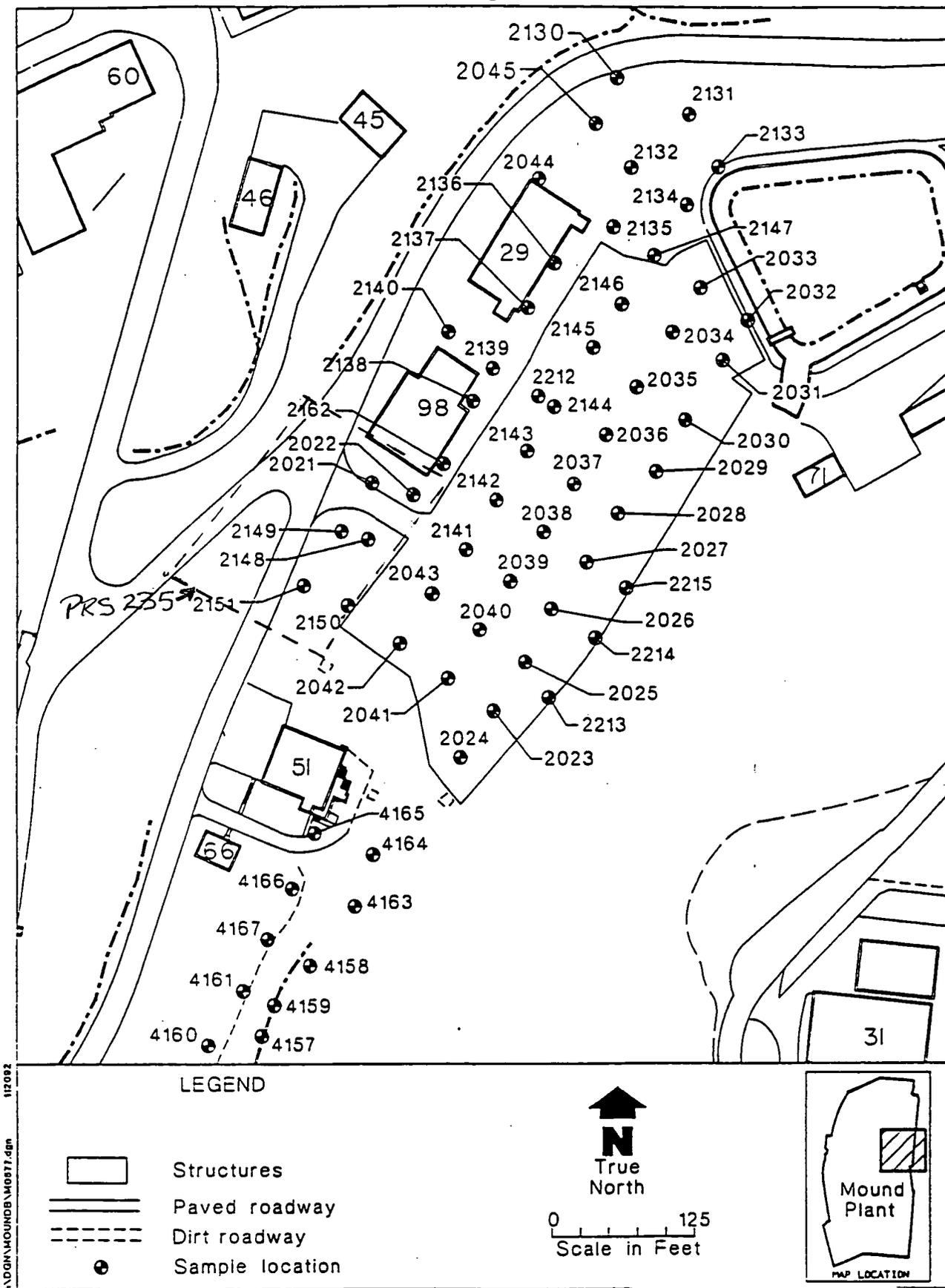


Figure 2.4: Area 7 and Building 51 sample

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	/	/	/	/	/	/	/	3
MND-01-2036-1005w	3 AUG 92	/	/	/	/	/	/	/	242 *
MND-01-2039-0005	2 AUG 92	/	/	/	/	/	/	/	218 *
MND-01-2044-0005	3 AUG 92	/	/	/	3	/	/	/	/
MND-01-2137-1005	24 AUG 92	/	/	/	/	6	/	/	16 *
MND-01-2138-0005	24 AUG 92	11	/	/	/	2	/	/	5
MND-01-2139-0005	25 AUG 92	32	4	/	/	/	/	/	80
MND-01-2141-0005	25 AUG 92	/	/	/	10	/	/	/	3 *
MND-01-2142-0005	25 AUG 92	/	/	/	/	/	/	/	5 *
MND-01-2142-1005	25 AUG 92	/	/	/	/	/	/	/	11 *
MND-01-2145-0005	25 AUG 92	/	/	/	/	/	/	/	11 *
MND-01-2146-0005	25 AUG 92	/	/	/	/	/	/	/	5 *
MND-01-2147-0005	25 AUG 92	/	33	/	/	/	6	/	/
MND-01-2148-0005	26 AUG 92	/	3	/	/	/	/	/	/
MND-01-2149-0005	26 AUG 92	/	/	/	/	22	/	/	/
MND-01-2149-1005	26 AUG 92	/	/	/	/	/	/	/	5 *
MND-01-2150-0005	26 AUG 92	/	/	/	/	/	/	/	5 *
MND-01-2162-0005	30 AUG 92	/	/	/	/	2	/	/	5 *
MND-01-2212-0015	26 SEP 92	/	/	/	/	/	/	/	/
MND-01-2213-0005	26 SEP 92	/	10	/	/	/	/	/	/
MND-01-2214-0005	26 SEP 92	/	/	/	/	/	/	/	11
MND-01-2215-0005	26 SEP 92	/	/	/	/	/	7	/	5
		/	/	/	/	/	/	/	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

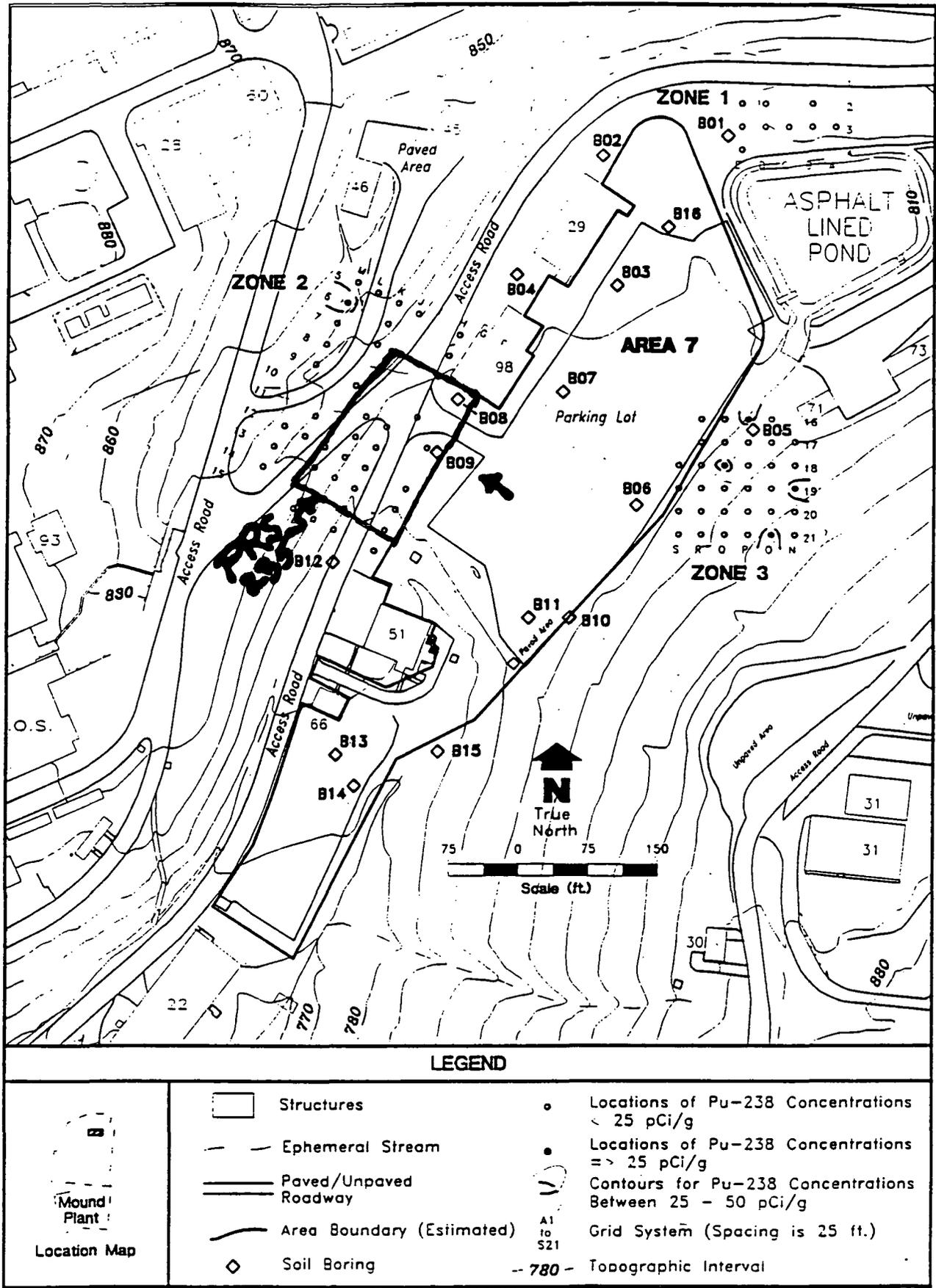
Final (Revision 0)

U.S. Department of Energy  
Ohio Field Office



EG&G Mound Applied Technologies

FRA7PU-M5C.DWG 1/4/95



**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 in core 0008 at a depth of 12.0 feet BGS.~~

**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 <sub>g</sub>	concentration of volatile chemical concentrations as soil vapor in ng/ml
P <sub>b</sub>	Bulk density of the soil in g/ml
K <sub>d</sub>	soil/water partition coefficient in ml/g
H	Dimensionless Henry's Law Constant
p <sub>w</sub>	water filled porosity
p <sub>t</sub>	total porosity
C <sub>t</sub>	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<sup>-6</sup> 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 <sub>b</sub>	1.6	Bulk density of the soil in g/ml
p <sub>w</sub>	0.15	water filled porosity
p <sub>t</sub>	0.43	total porosity
foc	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 <sub>2</sub> O	K <sub>d</sub>	Calculated/Acceptable	Calculated/Acceptable	Calculated/Acceptable
			Soil Screening Level Value	Soil Gas Reading	Soil Gas Reading
		ml/g	(mg/kg) (ppm)	ng/ml	ppb
Toluene	2.52E-01	3.42	22.06	1.56E+03	41400
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	5600
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**

**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	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

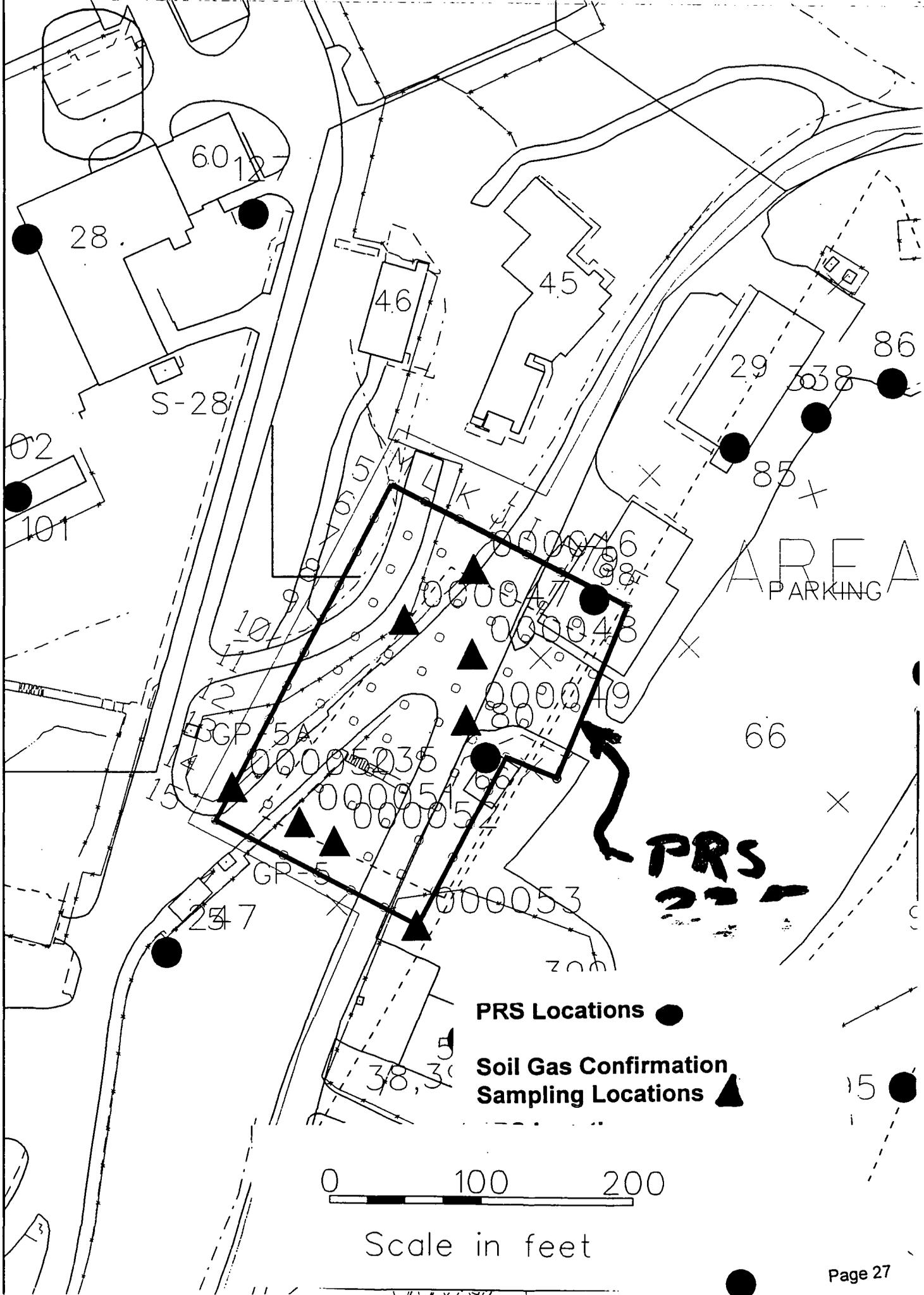
Aluminum	Copper	Potassium
Antimony	Cyanide	Selenium
Arsenic	Iron	Silver
Barium	Lead	Sodium
Beryllium	Lithium	Thallium
Bismuth	Magnesium	Tin
Cadmium	Manganese	Vanadium
Calcium	Mercury	Zinc
Chromium	Molybdenum	Nitrate/Nitrite
Cobalt	Nickel	Explosives (USATHAMA,PETN)

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 ▲



Scale in feet

Table A.1. Soil Gas Confirmation Detected Volatile Organic Compounds (cont.)

ANALYTE	SGC A61 000042	SGC A61 000043	SGC A61 000045	SGC A61 000046	SGC A61 000053	SGC A61 000054	Background	10 <sup>6</sup> Construction Worker Guidelines
VOLATILES (µg/Kg)								
Acetone			8 J	17			NA	10500000
1,2-Dichloroethene (total)							NA	21500000
2-Butanone		5 J-C	5 J				NA	46500000
Benzene							NA	8900
Carbon Disulfide							NA	1400000
Chloroform							NA	NA
Chloromethane							NA	NA
Ethylbenzene							NA	480
Methylene Chloride	6	9	8	9	4 J	7	NA	NA
Tetrachloroethene							NA	10500000
Toluene		2 J	3 J				NA	1250000
Trichloroethene							NA	41000
Xylene (total)							NA	215000000

- J - Numerical value is an estimated quantity
- NA - Value not available
- D - Sample was diluted
- C - Estimated due to error in calibration
- µg/kg - micrograms per kilogram

NONE ENTRY INDICATES ANALYTE NOT DETECTED.

Table A.2. Soil Gas Confirmation Detected Semivolatile Organic Compounds (cont.)

ANALYTE	SGC A61 000047	SGC A61 000048	SGC A61 000049	SGC A61 000050	SGC A61 000051	SGC A61 000052	Background	10 <sup>6</sup> Construction Worker Guidelines
<b>SEMIVOLATILES (µg/Kg)</b>								
Acenaphthene		19 J	27 J				NA	NA
Acenaphthylene							NA	NA
Anthracene		33 J	36 J	26 J			NA	32000000
Benzo(a)anthracene	18 J	62 J	77 J	130 J		20 J	NA	4100
Benzo(a)pyrene	23 J	55 J	76 J	130 J		20 J	NA	410
Benzo(b)fluoranthene	23 J	53 J	69 J	110 J		22 J	NA	4100
Benzo(g,h,i)perylene		52 J	32 J	96 J			NA	NA
Benzo(k)fluoranthene	23 J	46 J	63 J	130 J		19 J	NA	41000
Bis(2-ethylhexyl)phthalate	43 J		34 J				NA	215000
Butylbenzylphthalate							NA	215000000
Carbazole							NA	NA
Chrysene	29 J	86 J	90 J	150 J		26 J	NA	410000
Di-n-butyl phthalate							NA	105000000
Di-n-octyl phthalate							NA	21500000
Dibenz(a,h)anthracene			20 J	29 J			NA	410
Dibenzofuran							NA	NA
Diethyl phthalate							NA	NA
Fluoranthene	45 J	150 J	230 J	290 J	30 J	47 J	NA	42500000
Fluorene		27 J	26 J				NA	NA
Indeno(1,2,3-cd)pyrene		30 J	43 J	79 J			NA	4100
2-Methylnaphthalene							NA	NA
Naphthalene							NA	NA
Phenanthrene	25 J	170 J	220 J	140 J		31 J	NA	NA
Phenol							NA	650000000
Pyrene	50 J	180 J	200 J	260 J	26 J	45 J	NA	32000000

Table A.2. Soil Gas Confirmation Detected Semivolatile Organic Compounds (cont.)

ANALYTE	SGC A61 000053	SGC A13 000056	SGC A13 000057	SGC A13 000058	SGC A13 000060	SGC A13 000061	Background	10 <sup>6</sup> Construction Worker Guidelines
SEMIVOLATILES (µg/Kg)								
Acenaphthene							NA	NA
Acenaphthylene							NA	NA
Anthracene	79 J				30 J		NA	320000000
Benzo(a)anthracene	210 J			29 J	71 J		NA	4100
Benzo(a)pyrene	190 J			28 J	67 J		NA	410
Benzo(b)fluoranthene	140 J			17 J	55 J		NA	4100
Benzo(g,h,i)perylene	120 J			13 J	60 J		NA	NA
Benzo(k)fluoranthene	150 J			22 J	63 J		NA	41000
Bis(2-ethylhexyl)phthalate		27 J	28 J		36 J	28 J	NA	215000
Butylbenzylphthalate							NA	215000000
Carbazole	24 J						NA	NA
Chrysene	210 J			32 J	81 J		NA	410000
Di-n-butyl phthalate							NA	105000000
Di-n-octyl phthalate							NA	21500000
Dibenz(a,h)anthracene	35 J						NA	410
Dibenzofuran							NA	NA
Diethyl phthalate							NA	NA
Fluoranthene	480	22 J		65 J	190 J		NA	42500000
Fluorene							NA	NA
Indeno(1,2,3-cd)pyrene	100 J			17 J	48 J		NA	4100
2-Methylnaphthalene							NA	NA
Naphthalene							NA	NA
Phenanthrene	290 J			35 J	140 J		NA	NA
Phenol							NA	650000000
Pyrene	390	18 J		57 J	140 J		NA	32000000

**Table A.3. Soil Gas Confirmation Detected Pesticides/PCB's**

ANALYTE	SGC NAC 000008	SGC NAC 000010	SGC NAC 000031	SGC A66 000041	SGC A61 000044	SGC A13 000060	Background	10 <sup>6</sup> Construction Worker Guidelines
<b>PESTICIDES/PCB (µg/kg)</b>								
Aroclor-1248	48			110	98		ND	380
Aroclor-1254	43				55		ND	21500
Alpha-Chlordane							ND	NA
Gamma-Chlordane						3.7	ND	NA
4,4'-DDT							13000	9000
Dieldrin		4.4	5*				ND	185
Endosulfan I				3.4*	2.4*		ND	NA
Endosulfan II							NA	NA
Endrin			11*				ND	NA
Heptachlor						2.9	ND	NA

**NOTE: Sample Nos. 46-53 are not shown. Therefore, no pesticides or PCBs were detected.**

Table A.4. Soil Gas Confirmation Detected TAL Inorganics (cont.)

ANALYTE	SGC A61 000043	SGC A61 000044	SGC A61 000045	SGC A61 000046	SGC A61 000047	SGC A61 000048	Background	10 <sup>6</sup> Construction Worker Guidelines
<b>INORGANICS (mg/kg)</b>								
Aluminum	3600	1540	1900	14700	8630	1230	19000	NA
Antimony		0.23 B					NA	425
Arsenic		5.1	3.7	2.1 B	3.6	3.6	8.6	320
Barium	23.8 BJ	23.8 B	16.7 B	45 B	45.4 B	16.7 B	180	75000
Beryllium		0.1 B	0.12 B	0.86	0.25		1.3	0.7
Bismuth				1.5 B			NA	NA
Cadmium		0.1 B			0.42 B	0.19 B	2.1	1050
Calcium	161000	152000	148000	58000	124000	193000	310000	NA
Chromium	8.2 J	4.2	4.6	20.8	12.3	4.8	20	1050000
Cobalt	4.4 B	2.8 B	2.4 B	19.4	9.1 B	1.5 B	19	NA
Copper	10.7 J	10	8.1	24.4	17.5	5.1 B	28	NA
Cyanide							ND	21400
Iron	10300 J	8100	6910	30400	19900	4910	35000	NA
Lead	5.9 J	6.3	5	2.6	11.5	5	48	NA
Lithium	12.6 B	7.4 B	5.6 B	38.6	19 B	4.6 B	26	NA
Magnesium	61000 J	55600	65800	10500	33700	108000	40000	NA
Manganese	388 J	261	235	1080	518	221	1400	135000
Mercury					0.13		NC	320
Molybdenum	1.3 B	2.5 B	1.7 B		2.1 B	1.7 B	27	NA
Nickel	10.4	7.3 B	6.7 B	34.6	19.6	8.9	32	21500
Potassium	572 B	287 B	241 B	3280	1210	297 B	1900	NA
Selenium							NA	NA
Silver				0.21 B			1700	5500000
Sodium	818 BJ	218 B	566 B	216 B	439 B	998 B	240	NA
Thallium							460	NA
Tin	1.1 B		1.2 B	1.2 B			20	NA
Vanadium	72.4 J	5.5	7.1	19.7	15.5	7.6	25	7500
Zinc	25.9 J	29.5	25.7	66.6	57.4	13.1	140	320000

Table A.4. Soil Gas Confirmation Detected TAL Inorganics (cont.)

ANALYTE	SGC A61 000049	SGC A61 000050	SGC A61 000051	SGC A61 000052	SGC A61 000053	SGC A61 000054	Background	10 <sup>6</sup> Construction Worker Guidelines
<b>INORGANICS (mg/kg)</b>								
Aluminum	7040	2690	9810	6900	3890	10200	19000	NA
Antimony					0.23 B		NA	425
Arsenic	3.8	5.3	5	3.2	3.3	1.2 B	8.6	320
Barium	34.7 B	19 B	52.4	26.6 B	30.2 BJ	39.5 B	180	75000
Beryllium	0.13 B	0.14 B	0.53	0.12 B		0.66	1.3	0.7
Bismuth			1.3 B				NA	NA
Cadmium	0.32 B	0.3 B	0.27 B	0.28 B			2.1	1050
Calcium	188000	217000	98100	264000	181000	205000	310000	NA
Chromium	11.4	5.4	16.4	9	7.8 J	12.9	20	1050000
Cobalt	7.8 B	3 B	9.8 B	7.3 B	4.3 B	10.5 B	19	NA
Copper	14	29.1	25.3	12.2	13.9 J	13.7	26	NA
Cyanide							ND	21400
Iron	17100	6510	21900	16500	11400 J	20600	35000	NA
Lead	7.7	26.7	16.7	12.7	11.2 J	4	48	NA
Lithium	20.9 B	10.3 B	24.5	19.6 B	14 B	20.8 B	26	NA
Magnesium	30400	102000	18400	11600	47900 J	5290	40000	NA
Manganese	570	264	684	728	471 J	88	1400	135000
Mercury					0.06 B		NC	320
Molybdenum	1.4 B	0.51 B	1.9 B	0.62 B	0.96 B		27	NA
Nickel	16.8	6.4 B	20.8	14.1	10.5	19.1	32	21500
Potassium	1170	555 B	1770	1010 B	565 B	1700	1900	NA
Selenium							NA	NA
Silver		0.21 B	0.3 B		0.19 B		1700	5500000
Sodium	1030 B	616 B	875 B	199 B	911 BJ	268 B	240	NA
Thallium							460	NA
Tin		0.89 B	1.5 B		0.9 B		20	NA
Vanadium	10.8	6.7	17.1	9.6	8.6 J	14.1	25	7500
Zinc	46.6	254	120	66.1	73 J	40	140	320000

Table A.5. Soil Gas Confirmation Detected Nitrate-Nitrite (cont.)

ANALYTE	SGC NAC 000025	SGC NAC 000026	SGC NAC 000027	SGC NAC 000028	SGC NAC 000029	SGC NAC 000030	Background	10 <sup>-6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	89.3	85.7	85.3	82.0	84.8	89.8	NA	NA
Nitrate/Nitrite (MG-N/KG)	2.0	3.4	2.6	3.6	3.5	3.7	26	NA
ANALYTE	SGC NAC 000031	SGC NAC 000032	SGC NAC 000033	SGC NAC 000034	SGC NAC 000035	SGC NAC 000036	Background	10 <sup>-6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	87.0	81.2	84.4	88.1	84.6	81.2	NA	NA
Nitrate/Nitrite (MG-N/KG)	4.8	4.2	1.1	3.7	3.5	2.2	26	NA
ANALYTE	SGC NAC 000037	SGC NAC 000038	SGC NAC 000039	SGC A66 000040	SGC A66 000041	SGC A61 000042	Background	10 <sup>-6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	75.3	84.6	81.8	84.4	89.4	83.0	NA	NA
Nitrate/Nitrite (MG-N/KG)	1.7	2.4	1.4	3.9	2.0	1.4	26	NA
ANALYTE	SGC A61 000043	SGC A61 000044	SGC A61 000045	SGC A61 000046	SGC A61 000047	SGC A61 000048	Background	10 <sup>-6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	94.8	96.2	93.0	81.8	85.6	94.8	NA	NA
Nitrate/Nitrite (MG-N/KG)	0.84	0.58	2.1	1.6	7.9	1.6	26	NA

Table A.5. Soil Gas Confirmation Detected Nitrate-Nitrite (cont.)

ANALYTE	SGC A61 000049	SGC A61 000050	SGC A61 000051	SGC A61 000052	SGC A61 000053	SGC A61 000054	Background	10 <sup>6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	86.3	85.0	82.6	83.0	85.3	84.6	NA	NA
Nitrate/Nitrite (MG-N/KG)	1.5	1.8	1.6	4.6	2.3	2.6	26	NA

ANALYTE	SGC A61 000055	SGC A13 000056	SGC A13 000057	SGC A13 000058	SGC A13 000059	SGC A13 000060	Background	10 <sup>6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	77.3	95.3	88.9	93.7	92.8	91.0	NA	NA
Nitrate/Nitrite (MG-N/KG)	2.1	1.9	3.8	1.9	3.3	2.4	26	NA

ANALYTE	SGC A13 000061	SGC AOJ 000062	SGC AOJ 000063	SGC AOJ 000064	SGC AOJ 000065	SGC AOJ 000066	Background	10 <sup>6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	90.5	86.6	94.9	91.2	86.5	86.5	NA	NA
Nitrate/Nitrite (MG-N/KG)	2.2	6.2	2.2	1.2	4.2	3.4	26	NA

ANALYTE	SGC AOJ 000067	SGC AOJ 000068	SGC AOJ 000069	SGC AOJ 000070	SGC AOJ 000071	SGC AOJ 000072	Background	10 <sup>6</sup> Construction Worker Guidelines
GENERAL ANALYTES								
% Solids (%)	80.7	84.0	82.0	88.2	86.1	87.6	NA	NA
Nitrate/Nitrite (MG-N/KG)	9.3	1.7	3.2	2.0	2.7	6.3	26	NA

Table A.6. Soil Gas Confirmation Detected Radionuclides (cont.)

ANALYTE	SGC A61 000043	SGC A61 000044	SGC A61 000045	SGC A61 000046	SGC A61 000047	SGC A61 000048	SGC A61 000049	Background	10 <sup>6</sup> Construction Worker Guidelines
<b>RADIONUCLIDES</b>									
Americium-241								ND	4.95
Bismuth-207								ND	0.175
Bismuth-210								ND	NA
Cesium-137								0.42	0.45
Cobalt-60								NC	0.1
Plutonium-238	0.104	0.109	0.0344	0.173	0.0549	0.00517	0.0318	0.13	5.5
Plutonium-239/240		0.00343						0.18	5.5
Potassium-40	10.9	12.9	4.87	20.9	18.0	2.93	3.55	37	NA
Radium-226	0.640	0.954	0.660	0.690	0.727	0.325	0.549	2	0.14
Thorium-228	0.681	0.634	0.196	0.786	0.790	0.116	0.204	1.5	0.85
Thorium-230	0.791	1.10	0.689	0.729	0.729	0.249	0.426	1.9	44
Thorium-232	0.592	0.593	0.287	0.883	0.627	0.114	0.158	1.4	50
Uranium-234	0.581	0.682	0.892	0.707	0.705	0.201	0.357	1.1	37.5
Uranium-235	0.0440	0.0417		0.0475	0.0240			0.11	3.35
Uranium-238	0.606	0.876	0.605	0.870	0.853	0.160	0.302	1.2	11

Table A.6. Soil Gas Confirmation Detected Radionuclides (cont.)

ANALYTE	SGC A61 000050	SGC A61 000051	SGC A61 000052	SGC A61 000053	SGC NAC 000054	SGC A61 000055	SGC A13 000056	Background	10 <sup>6</sup> Construction Worker Guidelines
<b>RADIONUCLIDES (pCi/g)</b>									
Americium-241								ND	4.95
Bismuth-207								ND	0.175
Bismuth-210								ND	NA
Cesium-137		0.718						0.42	0.46
Cobalt-60								NC	0.1
Plutonium-238	0.138	2.25	0.0678	0.756	0.147	0.215	0.0451	0.13	5.5
Plutonium-239/240		0.0221	0.00605	0.00562	0.00291			0.18	5.5
Potassium-40	23.2	20.2	30.2	9.48	22.0	18.6	9.27	37	NA
Radium-226	0.794	1.01	0.810	0.532	0.629	1.02		2	0.14
Thorium-228	0.796	0.928	0.879	0.419	0.948	1.35	0.283	1.5	0.85
Thorium-230	0.763	0.833	0.835	0.594	0.867	1.14	0.606	1.9	44
Thorium-232	0.835	0.718	0.976	0.0346	0.896	1.16	0.384	1.4	50
Uranium-234	0.723	0.675	0.653	0.467	0.645	1.02	0.374	1.1	37.5
Uranium-235		0.0565			0.0541	0.0428		0.11	3.35
Uranium-238	0.885	0.734	0.648	0.387	0.816	1.02	0.576	1.2	11