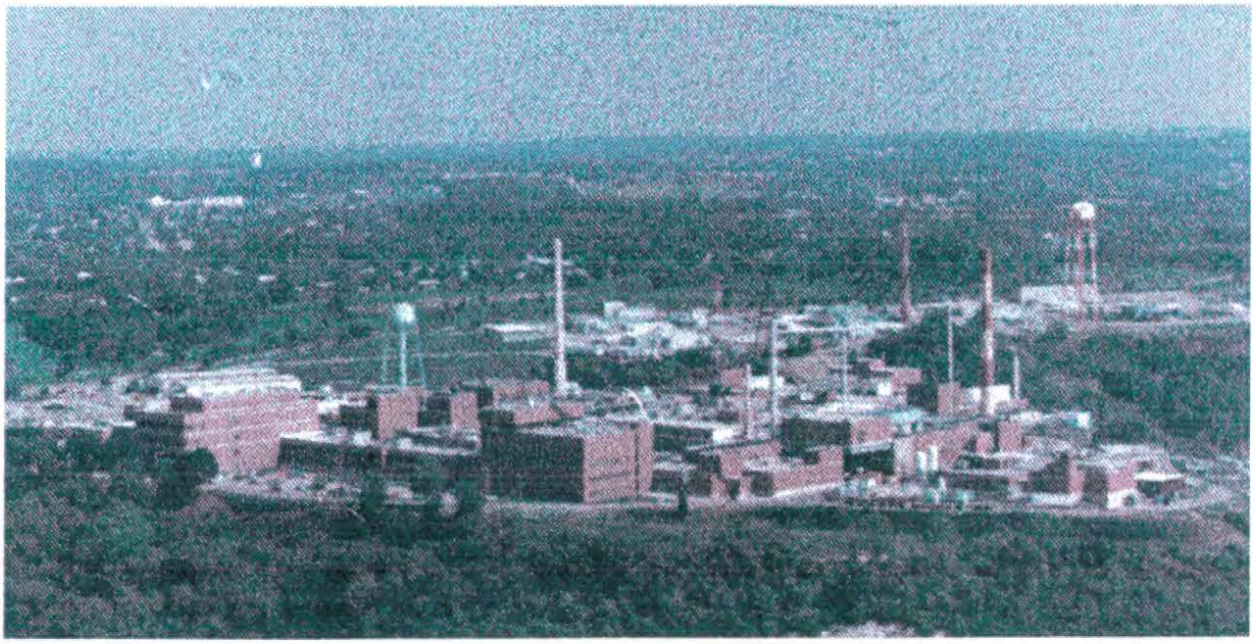
EG&G MOUND-30-03-03-03 9704010069

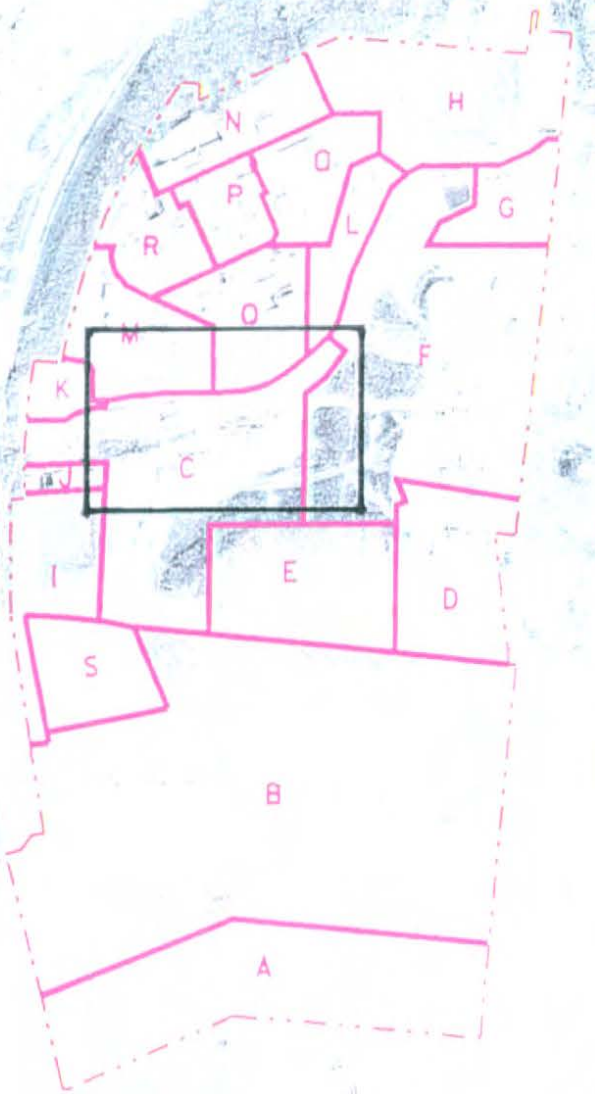
MOUND

Environmental
Restoration
Program

MOUND PLANT
Potential Release Site Package
PRS # 74



REV	DESCRIPTION	DATE
PUBLIC RELEASE 0	Available for comments.	Mar. 11, 1997
FINAL 1		

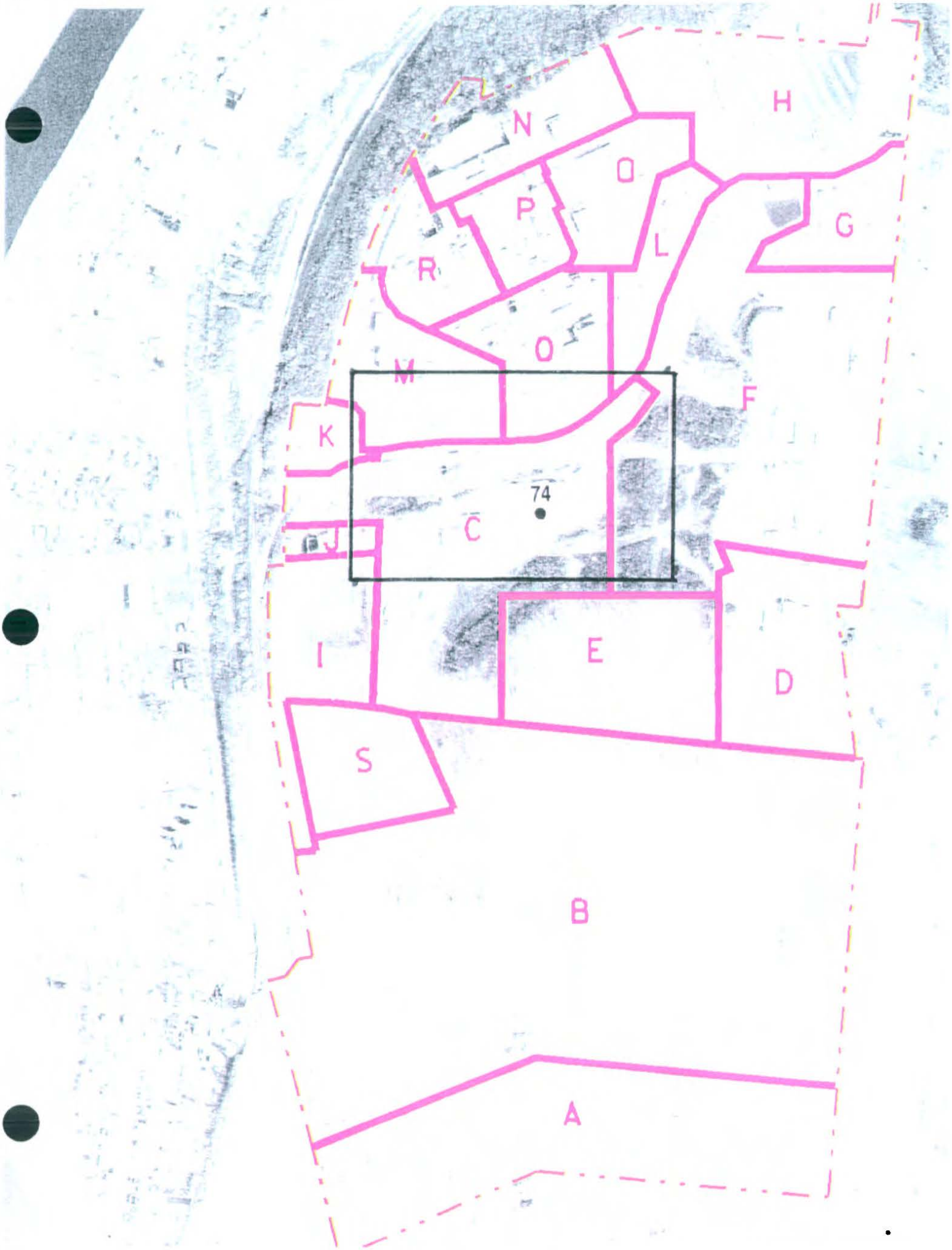


MOUND PLANT

Release Block C

Potential Release Site

PRS 74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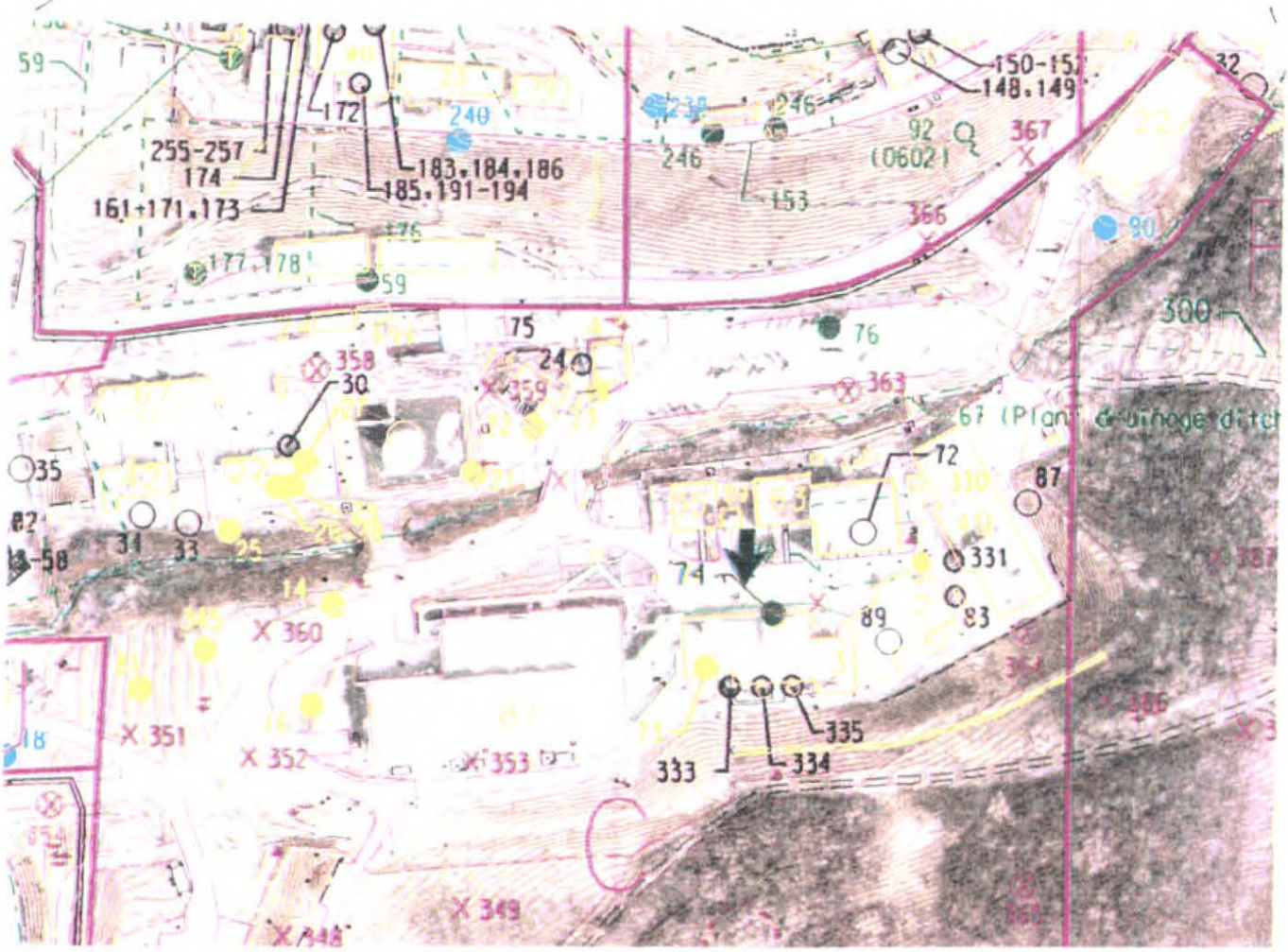
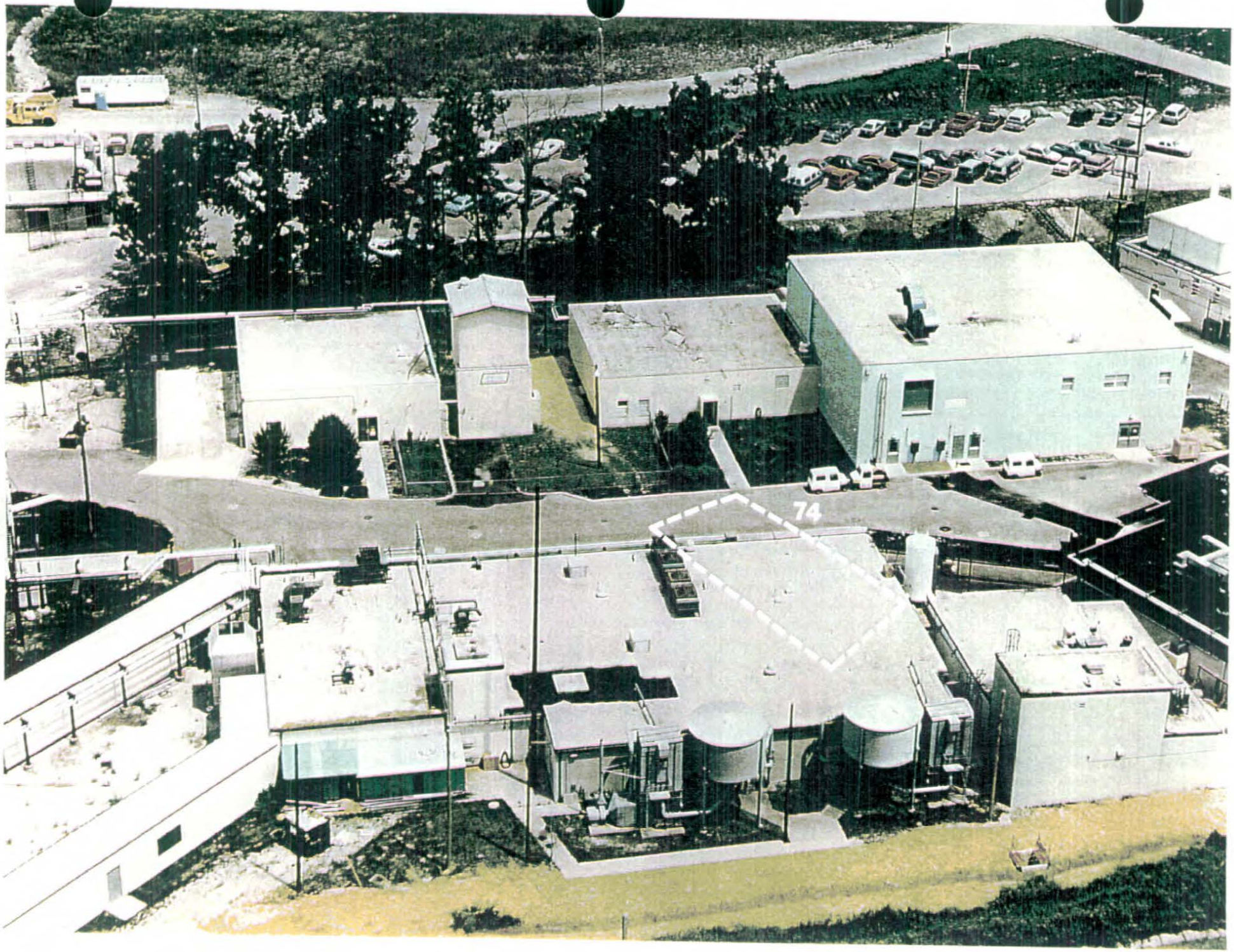
MOUND PLANT

Release Block C

Potential Release Site

PRS 74




74

PRS 74

PRS HISTORY:

Potential Release Site (PRS) 74 is identified as "The Quonset Hut",[1] a 40'x80' steel shell. Initially at Dayton Unit III, the hut was moved to Mound in 1949. The Quonset Hut was placed over a high density concrete floor. The hut was used as long term storage for some project materials, notably bismuth; for short term storage for contaminated containers, i.e. thorium drums; and as short term storage for rail shipments in and out of Mound.[2,3] There is no indication that the shell itself was ever contaminated, (now located elsewhere as Building 19), but the flooring it covered, may potentially have been contaminated. That concrete floor pad was removed in 1963.[4] The area in question is now under Building 3 and/or covered by the adjacent asphalt paving.[4] There is no history of any hazardous materials processes or activities taking place at this PRS.

CONTAMINATION:

In the mid 1980s, the Radiological Site Survey[2] took 5 surface samples in the vicinity of PRS 74 The maximum concentration of plutonium-238 detected was 0.96 pCi/g which is below the Mound ALARA (As Low As Reasonably Achievable) value of 25 pCi/g. Tritium was also detected at 0.4 pCi/ml (i.e. 400 pCi/L) which is below the MCL (Maximum Contaminant Level) of 20,000 pCi/L.

The principal radionuclide stored in the quonset hut was polonium-210 (Po-210), left in the major material, bismuth, after processing to separate the Po-210. Cobalt-60 could have been produced during the production of Po-210, and persisted as a trace contaminant. Other potential radioactive contaminants in the location are Thorium-232 and its decay products, and actinium-227 and radium-226 from stored reactor refuse. Potential non-radioactive contaminants would be bismuth, tellurium, lead, and beryllium. The nuclide of greatest concern, polonium-210, has a short half-life (138 days) and would have decayed in about four years. Cobalt-60, with a 5.3 year half-life, will have decayed to less than 1% of its original 1963 value by the year 1999.

READING ROOM REFERENCES:

1) Operable Unit 9, Site Scoping Report: Volume 12 - Site Summary Report. (pages 5-6.1)
2) Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey. (pages 7-12)
3) Operable Unit 9, Site Scoping Report: Volume 7 - Waste Management. (pages 13-20)

OTHER REFERENCES:

4) Site Plan, Drawing No. 300300 - 01001. (pages 21-24)

PREPARED BY:

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

PRS 74
(SUPPLEMENTAL DATA)

CONTAMINATION:

In 1994, the OU5 Operational Area I Investigation[5] analyzed the area around this site for volatile organic compounds (VOCs) and semi-volatiles (SVOCs) by PETREX qualitative gas. The OU5 Operational Area I Investigation[5] also analyzed soil for radioactivity via Mound FIDLER surveys and the soil screening facility.[5] Sample results corresponding to PRS 74 are listed relative to coordinates (9/10N, 15/16W) and nos. 1052, 1055, 1056 and 1059 within the referenced material.[5] Results showed:

- Total aromatic hydrocarbons ranged from moderately high to a high ion count (sample no. 1056).
- Total semivolatile hydrocarbons ranged from not detected to a moderately high ion count (sample no. 1056).
- Total petroleum hydrocarbons ranged from moderately high ion counts to a high ion count (sample no. 1056).
- Total halogenated hydrocarbons ranged from not detected to a moderately high ion count (sample no. 1056).

Radiological data from the four surface soil samples were identified by FIDLER screening and analyzed by Mound soil screening for plutonium-238 and thorium-232:[5]

- Plutonium-238 (Pu-238) maximum level contamination at 11 pCi/g.
- Thorium-232 (Th-232) contamination at less than the background level of 2.0 pCi/g.
- FIDLER survey measurements were below the contamination criteria.

All radiochemistry results are below the Guideline Criteria of 25 pCi/g for Pu-238 (ALARA - As Low As Reasonably Achievable) and 5 pCi/g for Th-232.[6]

In February 1996, the quantitative ***Soil Gas Confirmation Investigation***[7] was performed as the second phase to the original 1994 OU5, Operational Area Phase 1 qualitative PETREX Soil Gas Investigation. This quantitative survey sampled the PETREX soil gas locations with the highest PETREX ion counts in the western quadrant of the Mound plant. Locations with the highest ion counts were PETREX locations 1015, 1066 and 1093 which correspond to *Soil Gas Confirmation* samples 7, 11 and 18.

PRS 74 was not directly sampled but had lower ion counts than western quadrant locations that were sampled. Hence, the *Soil Gas Confirmation* results for the PETREX locations with the highest counts in Mound's western quadrant (samples #7, 11 and 18) provide correlating evidence about the risk of contamination at other western quadrant locations with similar or lower ion counts (i.e. PRS 74). The map on page 40 shows PRS 74 as well as the *Soil Gas Confirmation* sample locations.

The following table lists both the maximum qualitative PETREX ion counts in Mound's western quadrant and the corresponding quantitative *Soil Gas Confirmation* sampling results. The table also compares the results to the qualitative PETREX ion counts for PRS 74. The PETREX samples corresponding to PRS 74 are listed as sample nos. 1052, 1055, 1056 and 1059.

PETREX Soil Gas Contaminant Family	Maximum Ion Counts [1]	Confirm Sample #	Confirmation Sample Results that Exceed Guideline Criteria (GC)	Maximum Ion Counts at PRS 74[1]	
Total Aromatic Hydrocarbons	21,843,639	(#18)	None	12,436,663	(# 1056)
Total Semivolatile Hydrocarbons	1,389,465	(#18)	None	10,089	(# 1056)
Total C5-C11 Petroleum Hydrocarbons	30,786,838	(#7)	None	20,643,468	(# 1056)
Total Halogenated Hydrocarbons	892,683	(#11)	None	6,304	(# 1056)

The correlations made above make no conclusions about individual contaminant concentrations at PRS 74 only that the overall health risk at PRS 74 is expected to be similar to or less than that of the PETREX locations with the highest measured ion counts.

SUPPLEMENTAL REFERENCES:

5) Operable Unit 5, Operational Area Phase I Investigation, Non-AOC Report, Volume II, Final, (Revision 0), June 1995. (pages 25-35)
6) Code of Federal Regulations 40 CFR 192.12 and 40 CFR 192.41
7) Soil Gas Confirmation Sampling Investigation, Revision O, May 1996. (pages 36 - 52)

MOUND PLANT
PRS 074
FORMER WASTE STORAGE SITE - QUONSET HUT

RECOMMENDATION:

PRS 74 was identified as a Quonset Hut moved to Mound from Dayton Unit III in 1949. The Quonset Hut was placed over a high-density concrete floor. The flooring may have been contaminated from storage of radioactively contaminated containers. There is no indication that the shell of the hut was ever contaminated. The potentially contaminated concrete floor was removed in 1963. Therefore, NO FURTHER ASSESSMENT is recommended for PRS 74.

CONCURRENCE:

DOE/MEMP: Arthur 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 74

Document Control No. _____

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

December 1994

Final

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref	Releases	Media	Ref	Analytes[a]	Results	Ref
72	Area 13, Polonium-Contaminated Wood from Dayton Unit IV	H-7	Historical	Polonium-210	1, 4, 5	None Suspected	S	6	14	Tables B.1 and B.9	6
73	Evaporator Storage Area (AKA Lower storage area)	H-7	Historical	Actinium-227, Cesium-137, Radium-226	4				14, 15, 16	Table B.9 RSS[c] Locations S0692 and S0697 (Appendix E in Ref. 6)	6
74	Quonset Hut (former)	H-7	Historical	Polonium-210, cobalt-60, bismuth					14	Table B.9 RSS[c] Locations S0684, S0685, and S0689 (Appendix E in Ref. 6)	6
75	Railroad Siding	G-6 G-7	Inactive	Thorium and daughters	4	Suspected thorium	S	4	14	Table B.1	6
76	Warehouse 9	G-7	Historical	Thorium-232	4	Suspected thorium	S	4	No Data		
77	Warehouse 10	G-9	Historical	Polonium-210	4	None suspected			No Data		
78	Warehouse 13	G-9	Historical	Reactor waste including Strontium-90, Cesium-137, and Nickel-63	4	Cesium 137	S	4	No Data		
79	Warehouse 15	E-8	Historical	Radioactive waste Plutonium-238 wastes and sludge Thorium sludge constituents (c)	4	Suspected	S	4	See Area 7 (No. 66)	Table B.9	6
80	Warehouse 15A	F-8	Historical	Plutonium-238, thorium	4						
81	Drilling Mud Drum Storage Areas (3 locations)	H-5 I-4	Historical	Barium	4, 5, 18	None Suspected			No Data		
82	Building 57 Diesel Fuel Storage Tank (Tank 118)	H-5	In service	Diesel fuel	3				No Data		
83	Building 2 Propane Storage Tank (Tank 122)	H-7	Inactive	Propane	3				No Data		
	Building 56 Diesel Fuel Storage Tank (Tank 223)	F-5	Historical	Diesel fuel	3	Tank Removed			No Data		

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

Reference List

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

Document Control No. DGC

Environmental Restoration Program

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

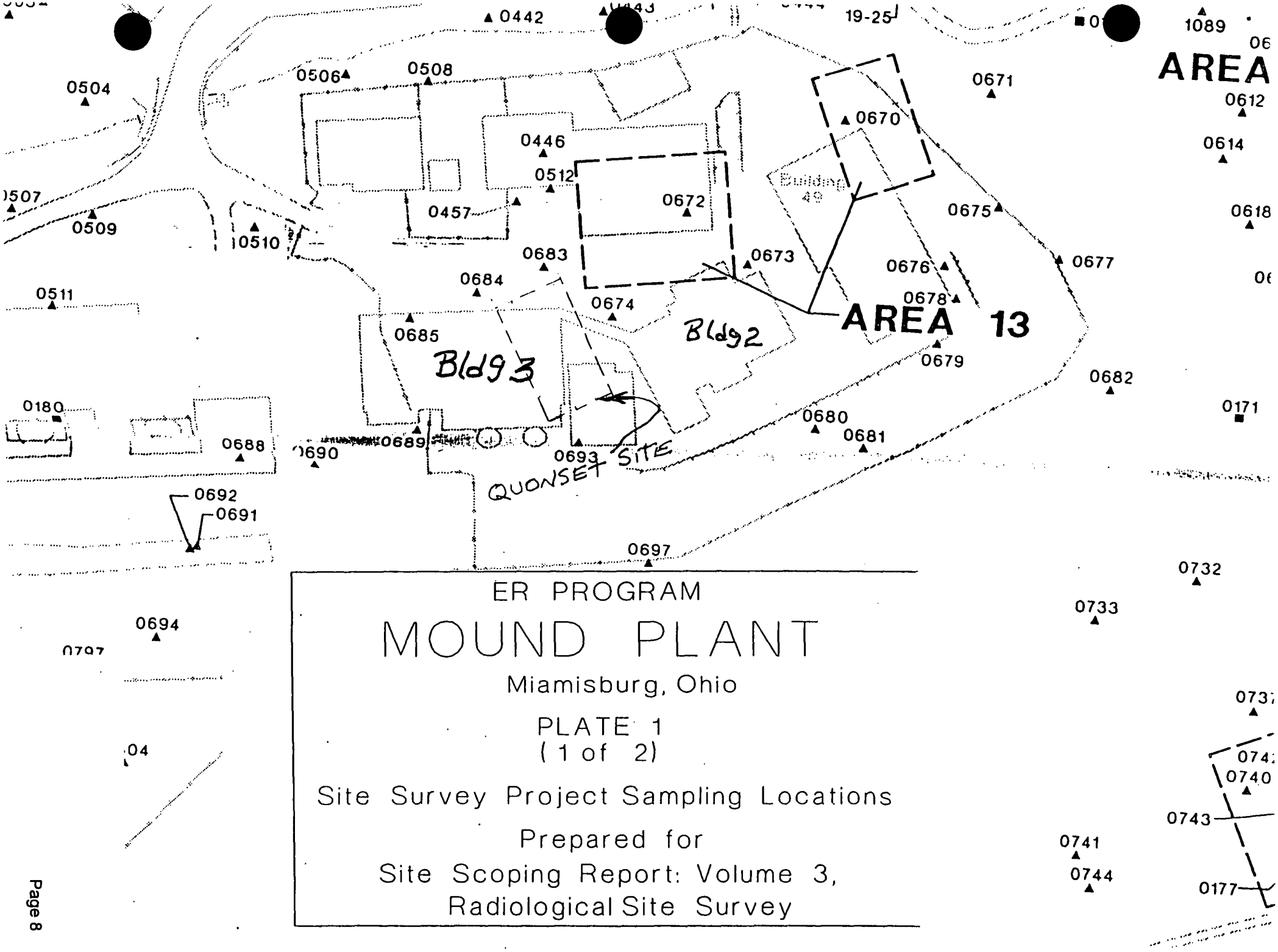
MOUND PLANT
MIAMISBURG, OHIO

June 1993

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies



ER PROGRAM

MOUND PLANT

Miamisburg, Ohio

PLATE 1
(1 of 2)

Site Survey Project Sampling Locations

Prepared for
Site Scoping Report: Volume 3,
Radiological Site Survey

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
C0169	3575	2720	2473	08-83	18	0.07	b					
			2474	08-83	36	0.03	b					
			2475	08-83	54	0.21	b					
S0667	3575	2770	5830	07-84	0	0.38	b					
S0668	3575	2870	5831	07-84	0	0.02	b					
			2837	10-83	0	0.02	b					
C0170	2700	3000	8264	10-84	72	0.24	b					
			8264	10-84	162	0.03	b					
(The same MRC ID was given for both depths.)												
S0670	2705	3175	4029	10-83	0	0.34	b					
S0671	2725	3075	4118	10-83	0	5.74	b					
S0672	2725	3300	4027	10-83	0	0.43	b					
S0673	2775	3275	4043	10-83	0	0.08	b	0.15				
S0674	2775	3375	4028	10-83	0	0.54	b					
S0675	2800	3100	7196	09-84	0	0.28	b					
S0676	2825	3150	7193	09-84	0	0.09	b					
S0677	2850	3075	7197	09-84	0	0.11	b					
S0678	2850	3151	4030	10-83	0	0.21	b	0.98				
S0679	2875	3175	7194	09-83	0	0.05	b					
S0680	2900	3275	7195	09-84	0	0.34	b					
S0681	2925	3250	4031	10-83	0	0.28	b					

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
S0682	2950	3075	7198	09-84	0	0.07	b		LDL	LDL	1.1	LDL
S0683	2725	3405	4036	10-83	0	0.30	b					
S0684	2725	3455	7115	09-84	0	0.04	b					
S0685	2725	3505	4035	10-83	0	0.60	b					
S0686	2750	2580	7116	09-84	0	0.06	b					
S0689	2775	2580	7118	09-84	0	0.25	b					
S0688	2775	3655	4034	10-83	0	0.40	b					
S0689	2800	3530	7119	09-84	0	0.21	b					
S0690	2800	3605	7117	09-84	0	0.73	b					
S0691	2825	3705	7122	09-84	0	1.03	b					
S0692	2825	3710	7123	09-84	0	2.51	b		LDL	1.3	0.9	LDL
S0693	2850	3430	4037	10-83	0	0.96[c]	b	0.40				
S0694	2875	3755	4033	10-83	0	0.40	b	0.38				
S0695	2925	3505	7120	09-84	0	0.11	b					
S0696	2925	3580	7121	09-84	0	0.78	b					
S0697	2950	3420	4038	10-83	0	0.10	b	0.15				
S0698	2950	3580	4119	10-83	0	0.28	b					
S0699	3250	4390	5980	07-84	0	0.22	b					
S0700	3250	4440	5909	07-84	0	0.48[c]	b					

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
C0289	2422.7	2081.0	None[d]	07-84	0	NR	0.6					
			None[d]	07-84	12	NR	1.1					
			None[d]	07-84	24	NR	0.5					
			None[d]	07-84	36	NR	0.8					
			None[d]	07-84	48	NR	1.0					
			None[d]	07-84	60	NR	0.8					
C0290	2401.5	2102.1	None[d]	07-84	0	NR	0.7					
			None[d]	07-84	12	NR	0.8					
			None[d]	07-84	24	NR	0.8					
			None[d]	07-84	36	NR	0.8					
			None[d]	07-84	48	NR	0.6					
			None[d]	07-84	60	NR	0.9					
			None[d]	07-84	72	NR	0.8					
C0291	2915.3	2490.3	None[d]	07-84	0	NR	0.6					
			None[d]	07-84	12	NR	0.4					
			None[d]	07-84	24	NR	0.5					
			None[d]	07-84	36	NR	0.4					
			None[d]	07-84	48	NR	0.4					
			None[d]	07-84	60	NR	0.3					
			None[d]	07-84	72	NR	0.5					
			None[d]	07-84	84	NR	0.4					
			None[d]	07-84	96	NR	0.7					
			None[d]	07-84	108	NR	0.6					
			None[d]	07-84	120	NR	0.3					
			None[d]	07-84	132	NR	0.3					
S1092	2185	3362	8413	12-84	f	0.31	323.5[g]					

[a]C denotes core location and S denotes surface sample location on Plate 1.

[b]Thorium results of ≤ 2 pCi/g are listed as "b".

[c]Verification sample analyzed for QA/QC.

[d]No MRC ID assigned because *in situ* gamma spectrometry was performed for thorium-232.

[e]Gamma results could not be confirmed using the gamma spectroscopy printout given in this appendix.

[f]The depth for this sample was given as "SS". For mapping purposes (Plates 1 and 5), this is assumed to be a surface sample.

[g]Sample results were given isotopically for this sample and included 0.99 pCi/g thorium-228; 321 pCi/g thorium-230; and 1.5 pCi/g thorium-232, for a total of 323.5 pCi/g.

If these areas were contaminated with cesium-137 during the reactor waste decontamination program, it is very likely that strontium-90 may also be present. None of the analytical procedures used during the Site Survey Project was capable of identifying strontium-90 contamination.

9.2. LOWER STORAGE AREA

The process waste treatment equipment used in the reactor waste decontamination program was diverted to use in the radium-actinium program. Once that program was terminated in 1955, the equipment was dismantled and stored on the ground in the vicinity of Building 3. These process/units underwent decontamination prior to their removal from the SW Building. No information is available as to the level of decontamination achieved. The soil in this area has the potential to be contaminated with radium-226 and its daughters, as well as fission products such as strontium-90 and cesium-137.

Few samples appear to have been collected in the approximate location of the historic lower storage area. No cores were obtained from the area. Surface samples S0689 and S0690 (Plate 1) indicate plutonium-238 concentrations of 0.21 and 0.73 pCi/g, respectively (Appendix E). Neither of these samples were analyzed for gamma radiation. Sample S0692 is slightly uphill from the other two sample points with cesium-137 and radium-226 contamination at 1.3 and 0.9 pCi/g, respectively. The exact location of the historic lower storage area is speculative, but may be indicated by the trace contamination noted in the Site Survey Project data.

9.3. FORMER QUONSET HUT AREA

The quonset hut, now known as Building 19, has a long history at Mound Plant. The structure was first moved to Mound Plant during the D&D of the historic Dayton units (DOE 1992g). It was first erected in the lower valley area and served as a central point for shipping, receiving and storing radioactive feed and waste materials. In the early 1960s, it was moved to its present location along the western border of the plant. In the early 1950s, the quonset hut served as a storage facility for the bismuth sludges from the polonium processing program. It also served as the central receiving and storage facility for the reactor wastes that came in from Hanford and Oak Ridge (DOE 1992c).

Few samples appear to have been collected in the former location of the quonset hut. No cores were obtained from the area. Surface samples S0674, 0683, 0684 and S0693 (Plate 1) indicate plutonium-238 concentrations of 0.54, 0.3, 0.04 and 0.96 pCi/g, respectively (Appendix E). The sample from location S0693 also indicated 0.4 pCi/mL tritium (Appendix E). None of these samples appear to have been analyzed by gamma spectrometry.

Document Control No. DGC

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

July 1992

DRAFT FINAL

(Revision 0)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory

A building known as the Bonebreak Theological Seminary, dating from 1879, located at 160 West First Street in Dayton, was rented and hastily renovated. It was occupied in October 1943 and became known as Unit III. A steel Quonset hut and several small block buildings were erected to increase the usable space for machine operations, a powerhouse, and a cafeteria. Unit III finally consisted of 20 buildings (Moyer 1956).

In February 1944, the U.S. Army Corps of Engineers (COE) rented the Runnymede Playhouse located in Oakwood, Ohio, at the southern boundary of Dayton, and turned it over to MCC. The Runnymede facility was a relatively large, private recreational building constructed in 1927 by the Talbott family for private activities. This facility, known as Unit IV, included several greenhouses, an indoor tennis court, a stage, a squash court, lounges, and an outdoor swimming pool. Part of the structure had a corrugated glass roof (Gilbert 1969).

During the early years of the Dayton Project, MCC also independently operated a facility, known as Unit II, for the production of rocket propellant. Explosives produced at Unit II included ammonium picrate and ammonium nitrate; however, no radioactive materials were handled at this location. Scrap explosives were burned onsite at Unit II. No fuel wastes, refuse, or other waste materials were buried on-plant. Radioactive materials were not handled, so there was no nuclear disposal to be considered. MCC phased out this operation around the fall of 1945 (Meyer 1979b).

In the Dayton Project, polonium was not produced at Unit I. The production process was set up initially at Units III and IV and later, in 1948, at Mound Laboratory (known as Unit V). In subsequent years, various research projects that did involve radioisotopes were undertaken at Unit I, some of which were transferred from Mound. Work was done under Atomic Energy Commission (AEC) and, subsequently, Nuclear Regulatory Commission (NRC) licenses. These projects involved relatively small quantities of various isotopes such as carbon-14 and tritium. Some sealed sources were used in curie quantities. Trace quantities were discharged to the domestic sewer but under rigid controls according to the terms of the licenses and the provisions of 10 Code of Federal Regulations (CFR) Part 20. Radioactive material was not buried onsite. Solid waste was packaged in compliance with the stringent Interstate Commerce Commission (ICC) regulations. In the early years of operations at Unit I, other toxic materials, such as spent acids, were disposed of in onsite acid pits and allowed to neutralize in the soil. For example, 5-gallon containers of hydrochloric acid were emptied into an acid pit every few days (Meyer 1979b).

The principal contaminant at the Dayton units was polonium-210 (DOE 1986). Other contaminants included tellurium, bismuth, cobalt, nickel, beryllium, and thorium (Hochwalt 1948). Tellurium was a common contaminant in the irradiated bismuth slugs. Cobalt was a common impurity in the aluminum

cans used to jacket the bismuth slugs. Other impurities were also present and are described in the polonium section of this report. The nickel and beryllium originated from the polonium source and initiator production programs as well. The extent of thorium use at the Dayton units probably involved research quantities of materials.

The work at the Dayton units principally involved the separation and purification of polonium-210. Work also involved research and development of calorimetry and other instruments for measuring small quantities of alpha-emitting radionuclides, such as polonium. Other work included mechanical development of micro beam balances and electronic equipment and limited biological research on the toxic effects of polonium (Svirbely et al. 1947). Neutron and alpha particle sources, powered by polonium-210, were manufactured for sale to government and research organizations.

Pilot plant investigations of waste disposal by incineration were started in February 1948 at Unit III. The first pilot plant operated about six weeks (MCC 1949).

All radioactive waste generated at Unit III was packaged in strong, leak-proof containers according to ICC regulations and shipped on government vehicles to Oak Ridge National Laboratory (ORNL) for onsite burial. No materials were buried onsite at Unit III or sent to city landfills or other disposal sites. Disposal was controlled. Wastewater containing low-level alpha activity was discharged to the Dayton sewer system and was monitored at the Great Miami River by health physics personnel (Bradley 1951a). All operations ceased at Unit III in 1948. The facilities and site were decontaminated and turned over to the Dayton Board of Education, the site owner (Halbach 1949). Some Unit III block structures were demolished and transported to Mound for disposal. The Quonset hut was dismantled and subsequently rebuilt at Mound and still stands today as Building 19.

All radioactive waste was handled at Unit IV in the same manner as at Unit III. It was packaged and shipped by government vehicles to ORNL for burial. The principal isotope was polonium-210. Radioactive waste was not buried onsite or in the immediate area of Unit IV. All operations at Unit IV ceased and were transferred to Mound late in 1948. By the spring of 1950, all Unit IV structures, services, and utilities were removed, and the soil was excavated to a depth of 7 ft (Halbach 1950). Highly contaminated materials were packaged and shipped to ORNL for burial. Most of the Unit IV structure was transported to Mound for disposal. Clean fill dirt replaced the excavated soil, and the site was completely landscaped to blend with the surrounding well-kept, upper-class suburban Oakwood neighborhood. The property was then returned to the Talbott family estate.

Radioactive materials present at the warehouse were limited to trace quantities of polonium-210 from the analysis of environmental monitoring samples, bioassay samples from tl

2.1.2.2. Bismuth Metal Recovery

At the beginning of the polonium program, the bismuth oxychloride sludge produced in the HH Building was stored at Mound for possible recovery of the bismuth and re-irradiation at the Hanford facility (McEwen 1952b). In 1948, an electrolytic process was developed that successfully recovered bismuth, and in March 1950, seven bismuth slugs were produced from recovered metal. These were sent to Hanford for neutron irradiation. In 1952, Mound constructed a bismuth metal recovery facility in the HH Building, with the capacity to produce 17,000 pounds of bismuth annually, that would process the accumulated drums of bismuth sludge (Belcher 1952b). The amount of sludge being stored at Mound in 1952 was equivalent to 62,000 pounds of bismuth. This amount of sludge represented approximately 200 55-gallon drums, which were reportedly stored inside of T Building (Grasso 1991b). In 1953, a large quantity of high purity bismuth was located at the Brookhaven National Laboratory. This material, amounting to 64 tons, was made available to Mound and was sufficient to satisfy requirements for several years. This eliminated the need for the recovery facility and the recommendation was made that it be dismantled (Anson et al. 1953).

2.1.2.3. Separation of Polonium from Bismuth by Distillation

A major element of the polonium program was to develop improved processes for the separation of polonium from bismuth. During the period from 1949 to 1952, Mound conducted experimental work on the separation of polonium by distillation (Endebrock and Engle 1953). This work turned into a materials research program; however, as of 1953, no satisfactory alloys had been found that remained inert to bismuth and polonium under the conditions required for distillation.

2.1.3. Waste Generation

Liquid and gaseous wastes were generated in the T, HH, and WD buildings resulting from the production of polonium-210. In T Building, two aqueous waste streams were generated as a result of the aluminum can and irradiated bismuth slug separation and the polonium-210 recovery and purification processes. These waste streams were highly acidic and contained high concentrations of chloride, nitrate, aluminum, and bismuth. In addition to their acid nature, these waste streams contained gamma- and beta-emitting radioisotopes that were generated during the neutron irradiation of trace elements contained in the aluminum can and bismuth metal. The trace impurity metals contained in 2S aluminum included iron, manganese, copper, lead, tin, zinc, silicon, titanium, nickel, magnesium, chromium, vanadium, bismuth, and gallium (Payne 1948, Lange 1963). The trace impurity metals found in bismuth included silver, arsenic, calcium, cadmium, iron, magnesium, tellurium, selenium, and antimony (Lange 1963). As a result of neutron activation, gamma-emitting isotopes of

the trace metals contained in 2S aluminum and bismuth were produced by an (n,γ) reaction. The most important isotopes were silver-110, cobalt-60, and iron-59 with half-lives of 270 days, 5.3 years, and 45 days, respectively (Moyer 1956, Watrous 1948). Isotopes of lesser interest included selenium-75 (127 days), tellurium-125,127,129 (30-90 days), and antimony-124 (60 days) (Lange 1963). Except for cobalt-60, which has a half-life of 5.3 years, these decayed out several years after polonium processing ceased at Mound.

The aqueous wastes generated in the polonium process were sent to the HH Building for pretreatment prior to being transferred to WD for final treatment. The HH and T Buildings were connected by a 6-ft-diameter concrete tunnel that contained four Pyrex waste lines, which were suspended from the roof of the tunnel. The Pyrex lines were 4 inches in diameter and were used to carry polonium process wastes to the HH Building for treatment. The acidic aluminum chloride waste from the decanning operation was transferred from the T Building to the HH Building via one of the 4-inch Pyrex waste lines. The bismuth chloride solutions were also transferred to HH Building for treatment via a separate 4-inch Pyrex waste line.

The bismuth and aluminum wastes were managed and treated separately. The rationale for keeping these two waste streams separated was that the long range goal was to develop a bismuth metal recovery process and build a refinery at Mound. It was planned that the reclaimed bismuth metal would be fabricated into slugs and shipped to the Hanford Test Reactor for re-irradiation (McEwen 1952b).

This recovery never actually came to pass. The bismuth salts were stored in the Quonset hut until 1954 when they were shipped offsite for burial (Bradley 1953h, 1954b,c). The shipment of this waste was completed by September 1954 (Bradley 1954d). As the program continued through the 1960s, the bismuth wastes, sometimes referred to as the HH sludge, were staged inside T Building and shipped offsite weekly (MRC 1961a; Adams 1964; Adams et al. 1966; Anderson and Sheehan 1966, 1968a, 1968b, 1969). The wastes from the decanning operations were stored at the old explosives bunker, at least through the mid-1950s, and shipped either weekly or monthly. During the later years, the decanning operations wastes were handled with the bismuth sludge.

The dissolution of the bismuth slug with hydrochloric and nitric acids and the denitrification of the bismuth solution by formaldehyde or formic acid resulted in the generation of nitric oxide, nitrogen dioxide, and carbon dioxide. These gases were scrubbed with sodium hydroxide, and the basic scrubber solution containing sodium nitrate and nitrite was transferred to the 30,000-gallon influent tanks for treatment in the WD Building. A bismuth recovery process was developed involving the

volumes and locations of contaminated soil, and the costs of stabilizing or removing the contaminated soils (Stought et al. 1988). The project was the culmination of about 10 years of effort on the part of Mound to obtain funding for the study.

Two areas of contaminated soils were identified by the Site Survey Project as the priority areas for D&D removal, both associated with the WTS pipeline from the SM Building and Building 38 to the WD Building. One area was below the WD Building where the high-risk waste line had ruptured in 1969 and the other was the entire WTS pipeline itself. These areas are now referred to as Areas 14 and 19, respectively, and are described along with the other areas in the Site Scoping Report: Volume 3 - Radiological Survey Report (DOE 1991c). The Site Scoping Report provides a full tabulation of the Site Survey Project data (Stought et al. 1988) and reviews other data handling and analysis procedures within the context of the CERCLA requirements.

The current program started in 1978 after the plutonium-238 processing operations declined through the mid- to late-1970s. The 10-year plan included the complete removal of the SM Building and the entire WTS that ran from the SM Building to the WD Building, among other smaller projects (MRC 1978b). As described above, these areas were contaminated with plutonium-238 from the processing and recovery operations. The SM Building consists of offices, the plutonium processing areas, laboratories, maintenance shops, and building services. The WTS comprised about 2,650 linear feet of two 1-1/2-inch steel pipes at 6 to 25 ft below grade, an associated storage and pumping facility (Building 41), and associated soils. The D&D activities typically have been two-phased: (1) cleaning equipment, removing it from affected areas, and packaging it in approved containers for shipment off-plant; and (2) performing extensive structural decontamination on the affected areas to remove or seal contamination.

3.8.1. Waste Generation

The wastes generated by the D&D Program generally reflect the contaminants from the processes used in the facility being decontaminated as well as the waste produced by the work itself. Radioactive wastes from the D&D Program at Mound have generally been alpha- and tritium-bearing.

The D&D of the older Dayton facilities included the complete removal of Dayton Unit IV and removal of the smaller buildings at Unit III. Contaminated buildings, debris, and equipment were brought to Mound, because the short-lived polonium-210 isotope with a 138-day half-life would soon decay. Five "tropical huts" and the Quonset hut were moved from Unit III to Mound for the storage of contaminated materials (Bradley 1949). These huts were reassembled in the plant valley near where Building 3 stands today (see subsection 5.1). ~~Records of the projects indir~~

Warehouses 15 and 15A were located along the upper reach of the plant drainage ditch, in the approximate position of the present Building 98. Warehouse 15, the larger of the two with 6,000 ft^2, lay northeast of Warehouse 15A (Figure 5.2). These two warehouses were shown in the historical maps of the upper valley compiled in the Photo History Report (DOE 1992c) but were not labeled. Both structures were wooden construction. Warehouse 15 had a concrete floor and Warehouse 15A had a wooden floor. Because of their ease of access and location, away from the Main Hill, these warehouses were used as general storage areas for radioactive wastes and for truck loading facilities. Warehouse 15 was used as a general storage area for plant operations (office supplies, furniture, etc.). In the mid-1950s, thorium redrumming operations were conducted in Warehouse 15, but were moved outdoors because of elevated radiation levels, possibly radon. Logbooks indicate that, from December 1954 (MCC 1951-1952) through the mid-1960s, Warehouse 15A served as one of the general sites for storage and loading of radioactive waste for offsite shipment (MRC 1961-1968). Radioactive trash, plutonium sludge from SM, polonium sludge from WD, and waste from other operations were picked up from the process areas and stored until loaded into vans for shipment offsite. The floor of the warehouses were typically scrubbed with solutions of dilute hydrochloric acid to remove contamination. In April 1965, the waste storage and loading operations were transferred to the newly constructed Building 23. Both Buildings 15 and 15A were sold for salvage in the mid-1960s. The floors may have remained in place until they were bulldozed into the ravine in the early 1970s. The site of warehouse 15 is currently occupied by Building 98. The site of warehouse 15A is currently occupied by the paved parking entrance adjacent to Building 98. The ravine fill east of the old warehouses is included in the ER Program as Area 7 (DOE 1992c).

5.1.11. Lower Storage Area (Historical)

The lower storage area was an open storage area located behind what is now Building 2 in the lower valley area; the lower storage area was originally behind the Quonset hut (Figure 5.2). The area was used from 1955 to 1960 to store the waste evaporator equipment that had been removed from room SW-1B as part of the D&D of the radium-actinium operations. The equipment consisted of several waste liquid holding tanks and the evaporator itself. The equipment was decontaminated, capped, and stored in the open field. No data are known to exist on the level of decontamination, but a personal interview suggested that the equipment was washed externally until no wipeable levels were observed (Garner 1991). Also stored in the area were the holding tanks from the Purex pilot plant. These tanks were dismantled in March 1953 and stored in the lower area (MCC 1952-1957). Their final disposition was not determined, but they may have been shipped offsite in 1960 with other equipment. In January 1959, equipment from the decommissioned HH sludge facility was stored in the lower area (MCC 1951-1961). This equipment was probably also shipped offsite in 1960, but no record of shipment was found. The ground surface of the storage area was surveyed by radiological field

instruments during the initial phases of the Site Survey Project (Stought et al. 1988), but nothing was detected (Garner 1991).

5.1.12. Quonset Hut Storage Building (Building 19)

The Quonset hut is a one-story, corrugated-metal building originally erected at Dayton Unit III during the Manhattan Project. During the D&D of the Dayton units, the Quonset hut was moved to Mound for equipment storage. It was first erected in the plant valley in the area now occupied by Building 3 (Figure 5.2). During the 1950s, the Quonset hut was used for the storage of radioactive wastes from polonium and may have served to store other radioactive wastes, such as the shipments of Purex wastes for the reactor waste research program (Bradley 1952e). From 1949 to 1954, the bismuth chloride residues from the polonium project were moved from their staging area in T Building to the Quonset hut for storage. By August 1953, over 600 30-gallon drums were stored on a high density concrete pad at the Quonset hut (Bradley 1953h). Shipments of these drums to ORNL for burial began in April 1954 (Bradley 1954a; 1954c) and were completed by September 1954 (Bradley 1954d). Low-risk and high-risk wastes from the radium-actinium program, which had been stored in Warehouse 13 and the explosives bunker, respectively, were moved to the Quonset hut for shipment offsite (Bradley 1953h). In 1957, some damaged thorium drums were also stored in the Quonset hut (Meyer 1957b). It is apparent that some time after this, radioactive wastes were stored or staged at other buildings such as Warehouse 15 for shipment offsite. When or how this happened is unknown. In 1963, the Quonset hut was moved to its present location and now serves as the salvage and surplus sales facility (Figure 5.2).

5.1.13. SM Drum Storage Areas (Area 11 and Others)

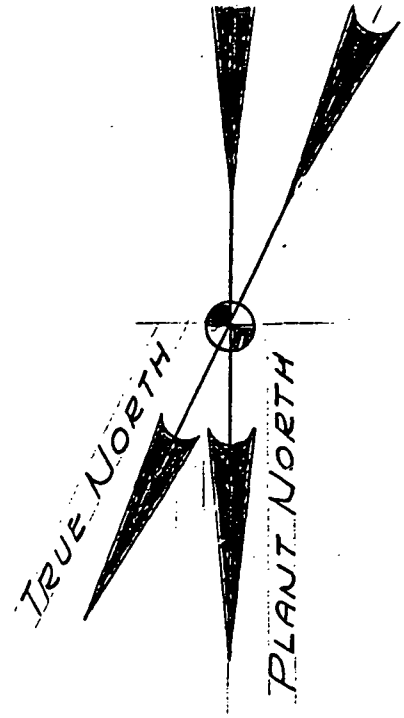
Associated with the SM Building plutonium operations were several drum storage areas. These areas were located on the SM/PP Hill adjacent to the SM Building (Figure 5.2). From 1961 to 1966, at least three areas west, south and southwest of the SM Building were used for open storage of drums and boxes of plutonium wastes. The plutonium wastes included materials destined for plutonium recovery and well as disposal. In 1966, the use of open the open storage areas was curtailed and the plutonium waste packages moved to Building 31.

From 1961 to 1963, significant quantities of solid recoverable plutonium waste was generated that did not go to the plutonium recovery because methods and facilities for recovery did not exist. Plutonium wastes were packaged into 30-gallon poly-lined steel drums and saved for future processing. These 30-gallon drums were stored along the west side of SM Building, in the vicinity south of Building 33. This storage area is known as Area 11 (DOE 1991c). In June 1964,

Site Plan
Drawing No. 300300 - 01001

749

745



GRAPHIC SCALE

20 10 5 0 20 40 60

SCALE: 1" = 20'

8-84 NUMBERED

NO.	DATE	REVISIONS	BY	CK.	PROJ. ENGR.	A. E. C. APP.
	8/26/64	AS BUILT DRAWING	CR			
1	8/25/64	ADDED - DETAILS 1, 2, 3; CURB DETAILS; RESURFACE EXIST. ROAD; PAVING SOUTH OF BLDG. #3; TWO NEW CONC. FLUMES, EXTEND CURB 126'; CHANGED BLDG. COORDINATES.	CR			

U. S. ATOMIC ENERGY COMMISSION

DAYTON AREA OFFICE

MOUND LABORATORY

MIAMISBURG OHIO

TEST FIRING ADDITION

BUILDING No. 3

SITE PLAN

CONTRACT NO. (A-E	AT (29-2) - 1426
BUDGET NO.	
DRAWN	SJG
CHECKED	AMC
A.-E. APPROVED	
DESIGNER	AMC
JOB ENGR.	
PROJ. MGR.	AMC
SCALE	1" = 20'
DATE	

SUBMITTED: ENGINEER - ARCHITECT 5/17/63

RECOMMENDED: MONSANTO 5/21/63

APPROVED: A. E. C.

SAMBORN, STEKETEE, OTIS and EVANS

ENGINEERS and ARCHITECTS

L-O-F BUILDING TOLEDO, OHIO

DRAWING NO. G-1

REV.

300300

FINISH CONTOURS — 745

CONCRETE (NEW)

BLACKTOP (NEW)

FENCE (EXIST.)

FENCE (NEW)

FENCE (EXIST. TO BE REMOVED)

FINISH ELEVATION 748.5

FENCE (TEMPORARY SECURITY)

REBUILT BLACKTOP

RESURFACED BLACKTOP

762

EXIST. ELEC. M.H.

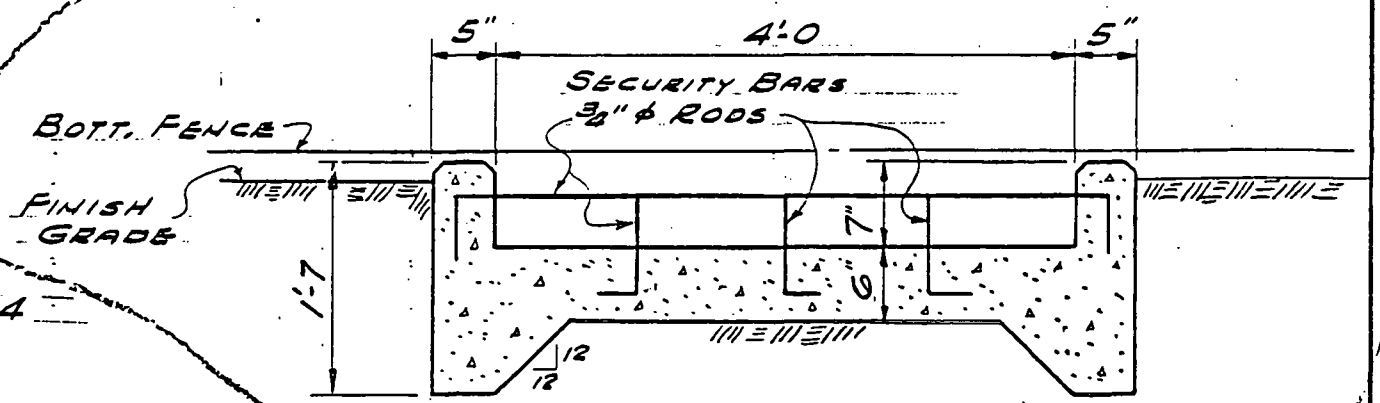
758

754

NOTES:

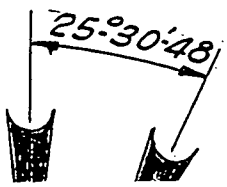
*EXIST. QUONSET TO BE REMOVED BY MONSANTO, G.C. TO REMOVE FDNS.

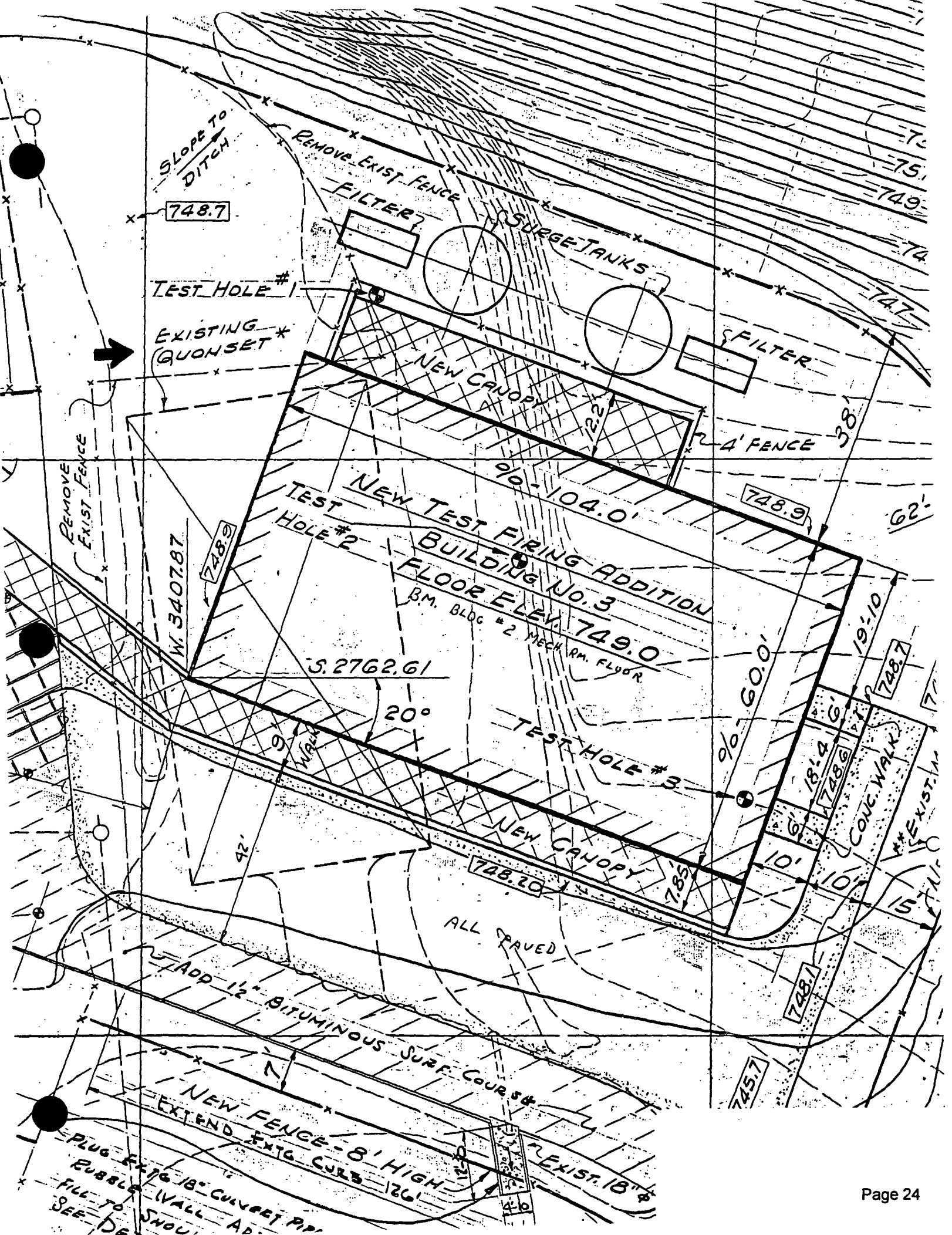
**EXIST. ELECTRICAL M.H. - TOP @ EL. 749.0'±. SLOPE GRADE AWAY FROM M.H. - DO NOT DISTURB.



DETAIL "3"

SCALE: 3/4" = 1'-0"




SLOPE TO DITCH
748.7
REMOVE EXIST FENCE
FILTER
SURGE TANKS
TEST HOLE #1
EXISTING QUONSET
FILTER
NEW CANOPY
12.2
4' FENCE
38'
REMOVE EXIST FENCE
W. 3407.87
748.9
NEW TEST FIRING ADDITION
TEST HOLE #2
BUILDING NO. 3
FLOOR ELEV. 749.0
B.M. BLDG #2 MECH RM. FLOOR
748.9
62'
S. 2762.61
20°
9' WALK
TEST HOLE #3
NEW CANOPY
748.20
7.85
42'
19'-10
748.7
18'-4
748.6
CONC. WALK
EXIST.
10'
10'
15
ALL PAVED
ADD 1½" BITUMINOUS SURF. COURSE
748.1
745.7
NEW FENCE - 8' HIGH
EXTEND EXTG CURB
26'
EXIST. 18"
PLUG EXTG 18" CULVERT PIPE
RUBBLE WALL
FILL TO SHOULD
SEE DE

Document Control No._____

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

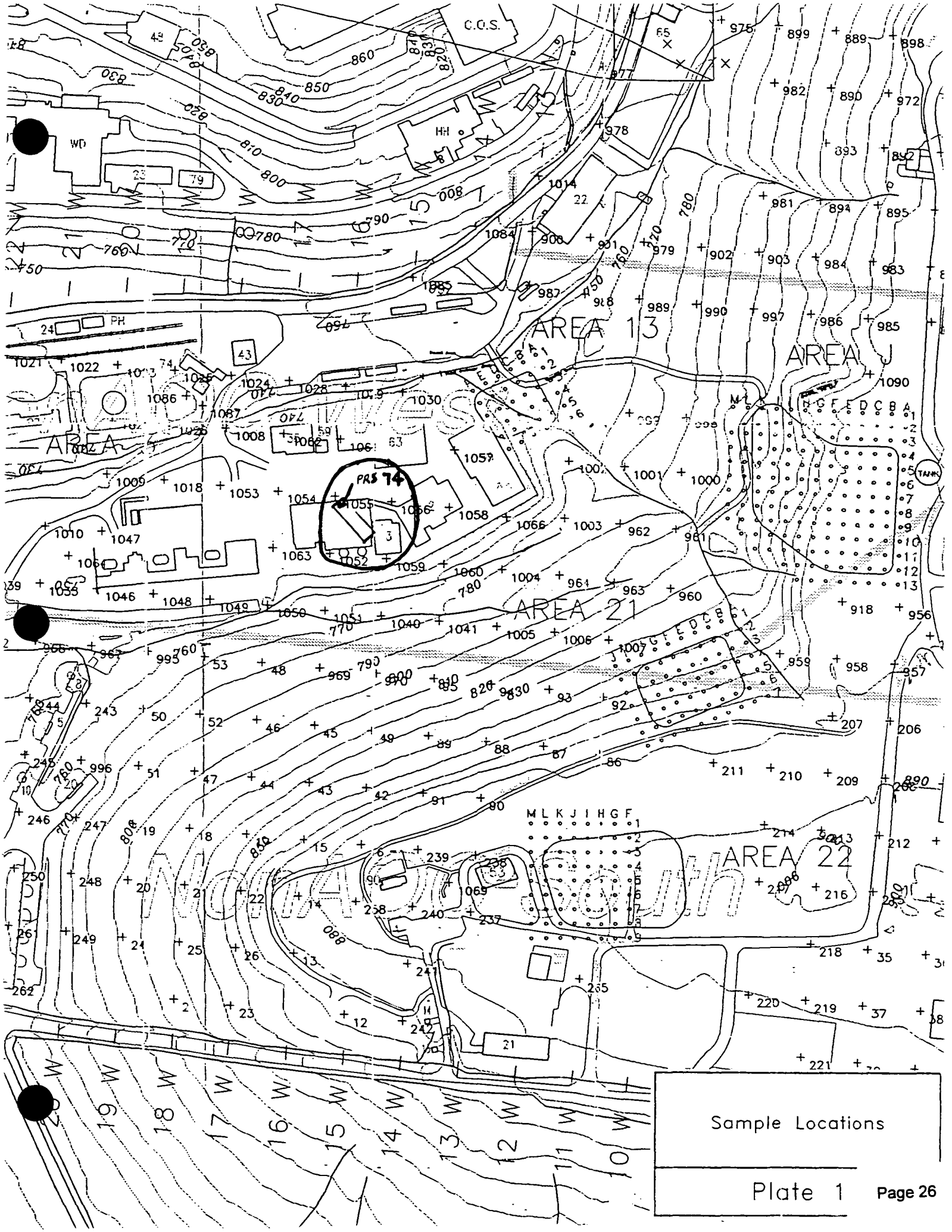
VOLUME II - APPENDICES A-G

June 1995

Final (Revision 0)

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies



Sample Locations

Plate 1

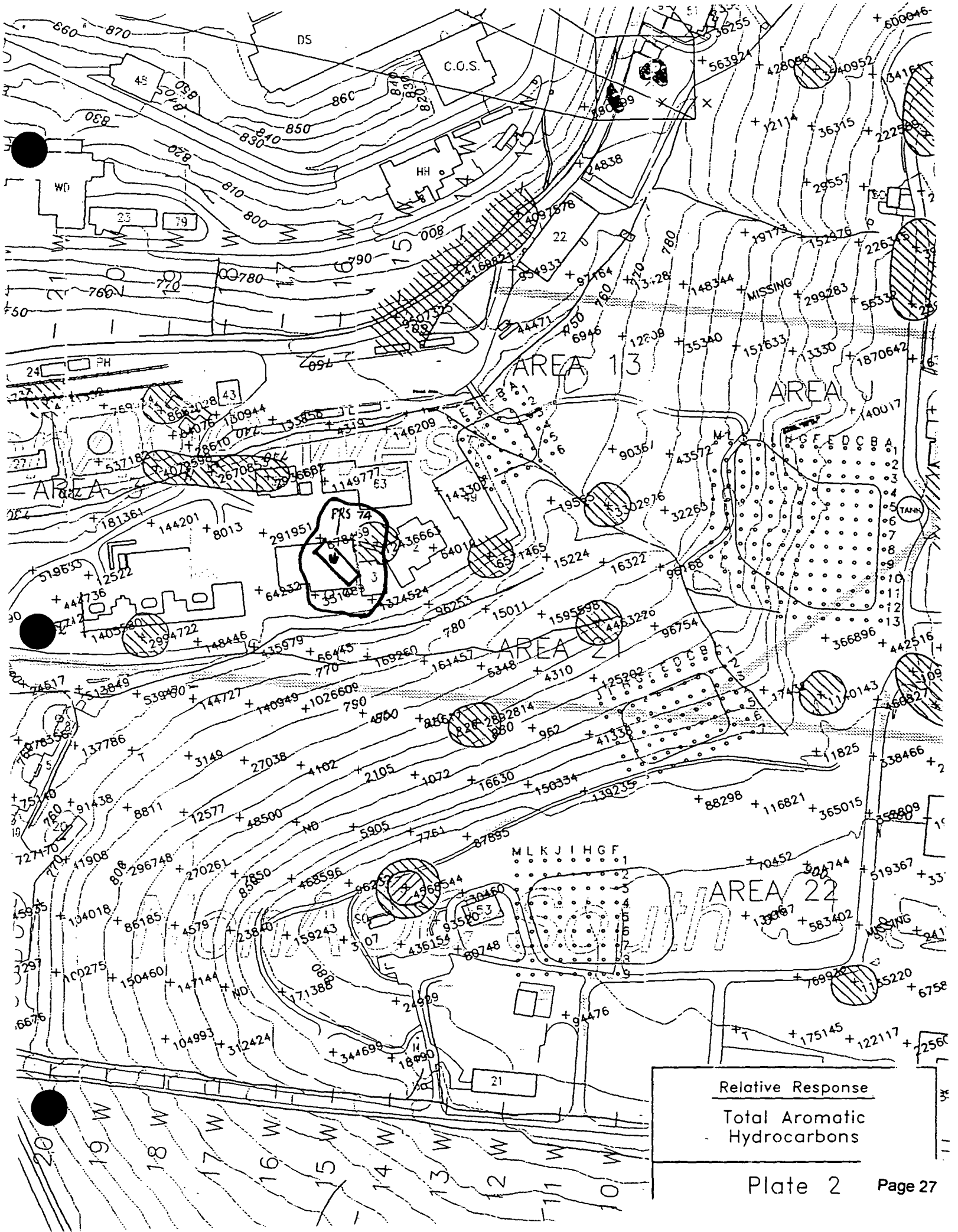
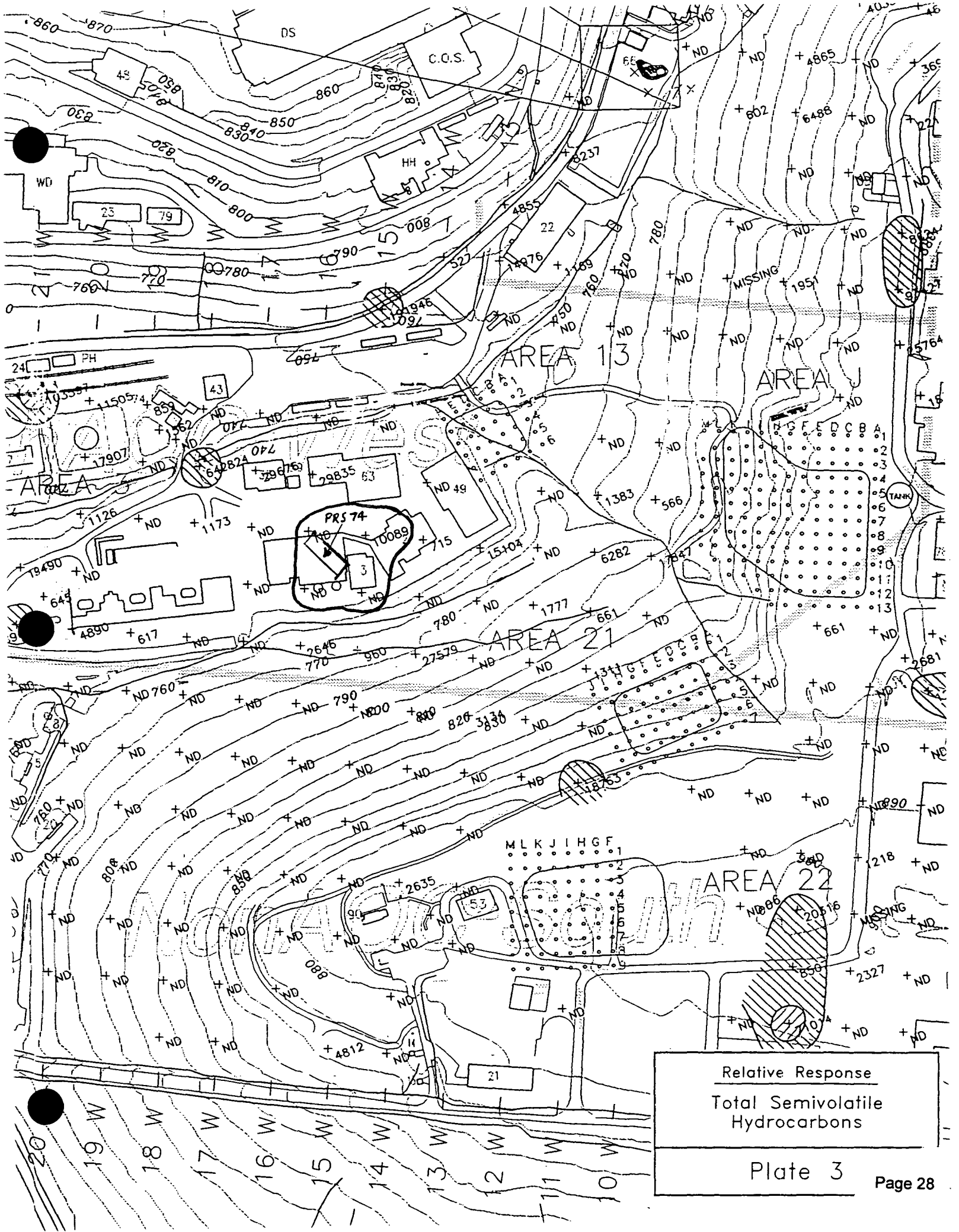
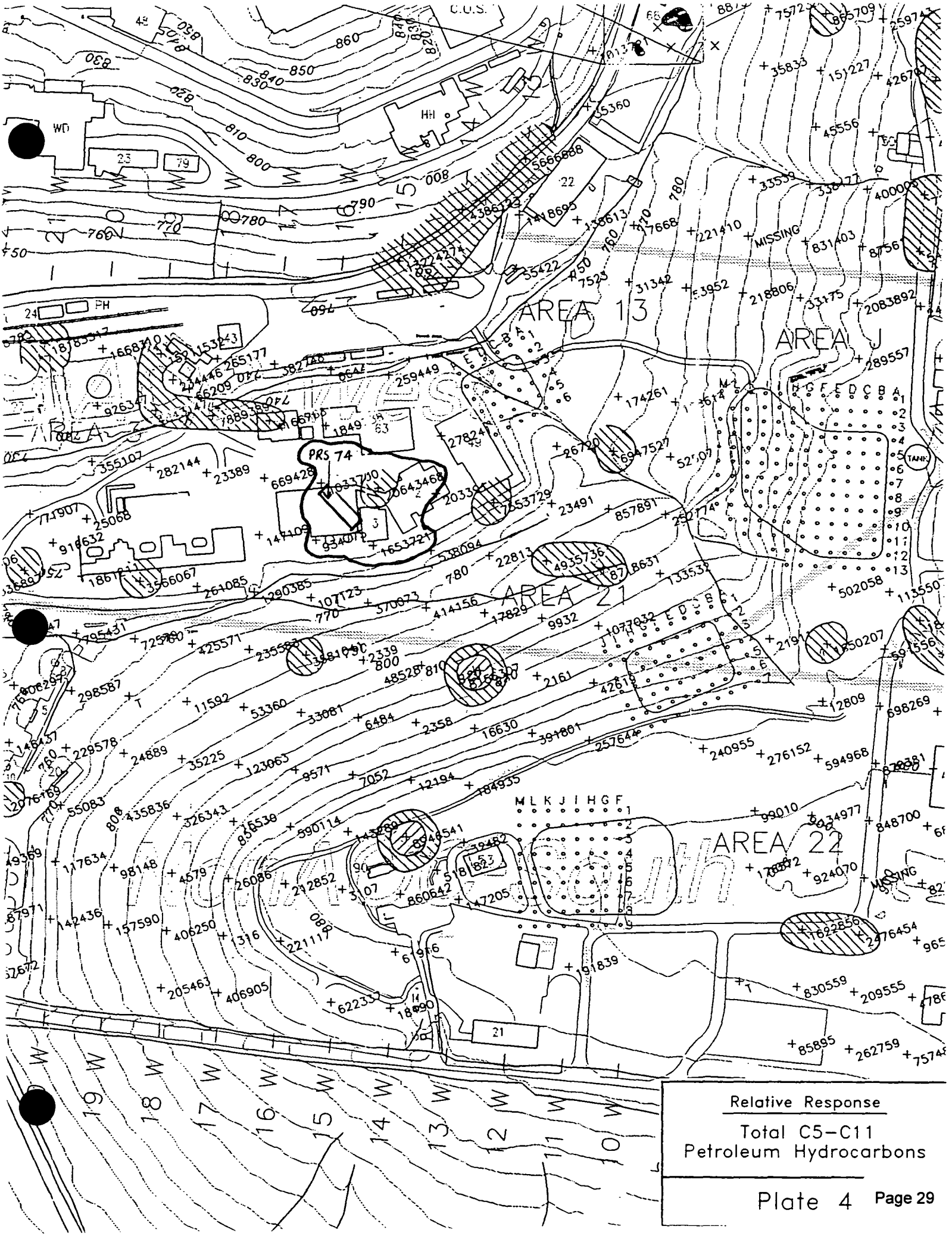

AREA 13
AREA 21
AREA 22
AREA 3
C.O.S.
DS
HH
WD
PH
TANK
FRS 74
MISSING
Relative Response
Total Aromatic Hydrocarbons

Plate 2

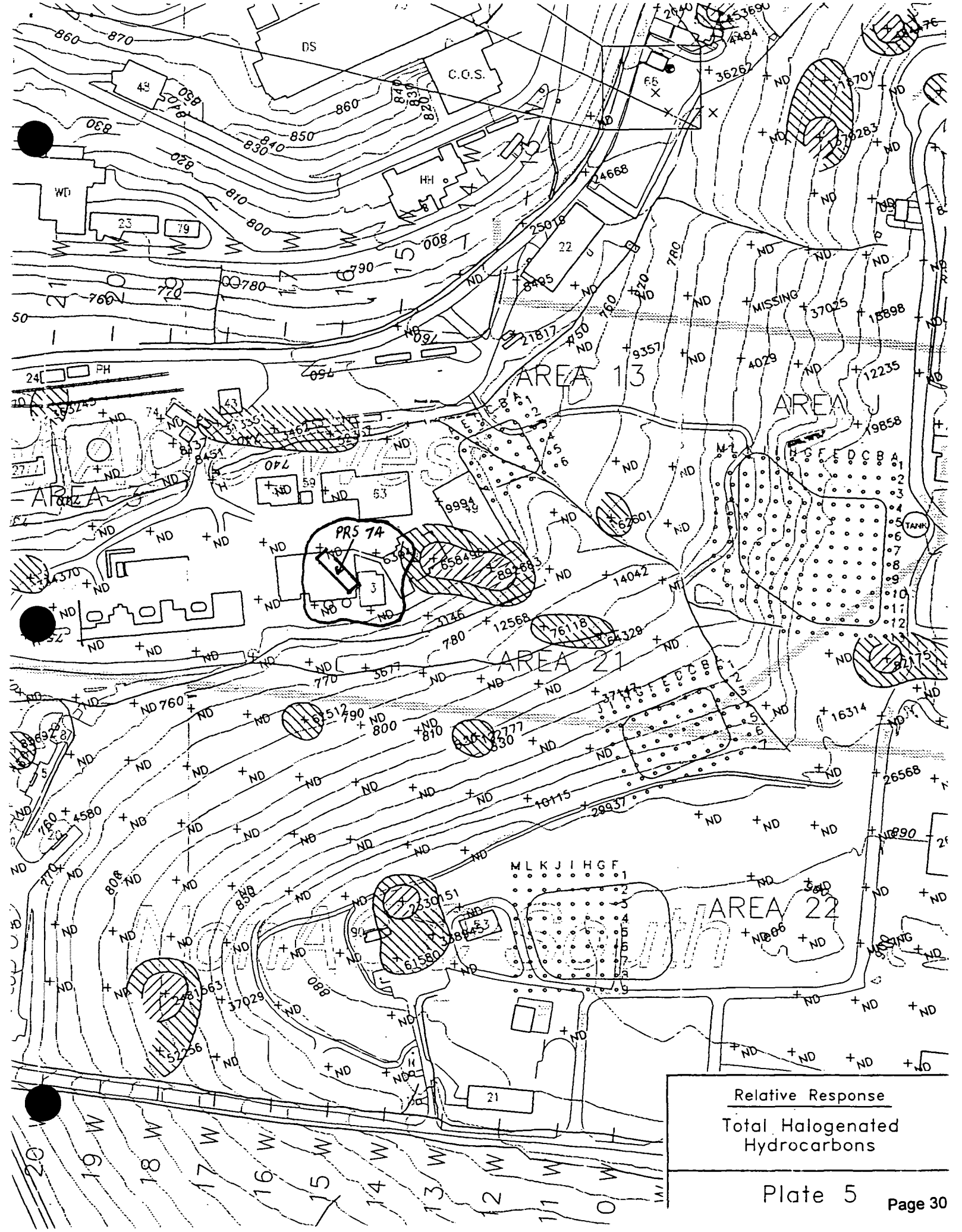

AREA 13
AREA 21
AREA 22
PRS 74
C.O.S.
DS
WD
HH
PH
TANK
MISSING
Relative Response
Total Semivolatile Hydrocarbons
Plate 3



Relative Response

Total C5–C11
Petroleum Hydrocarbons

Plate 4



Relative Response

Total Halogenated Hydrocarbons

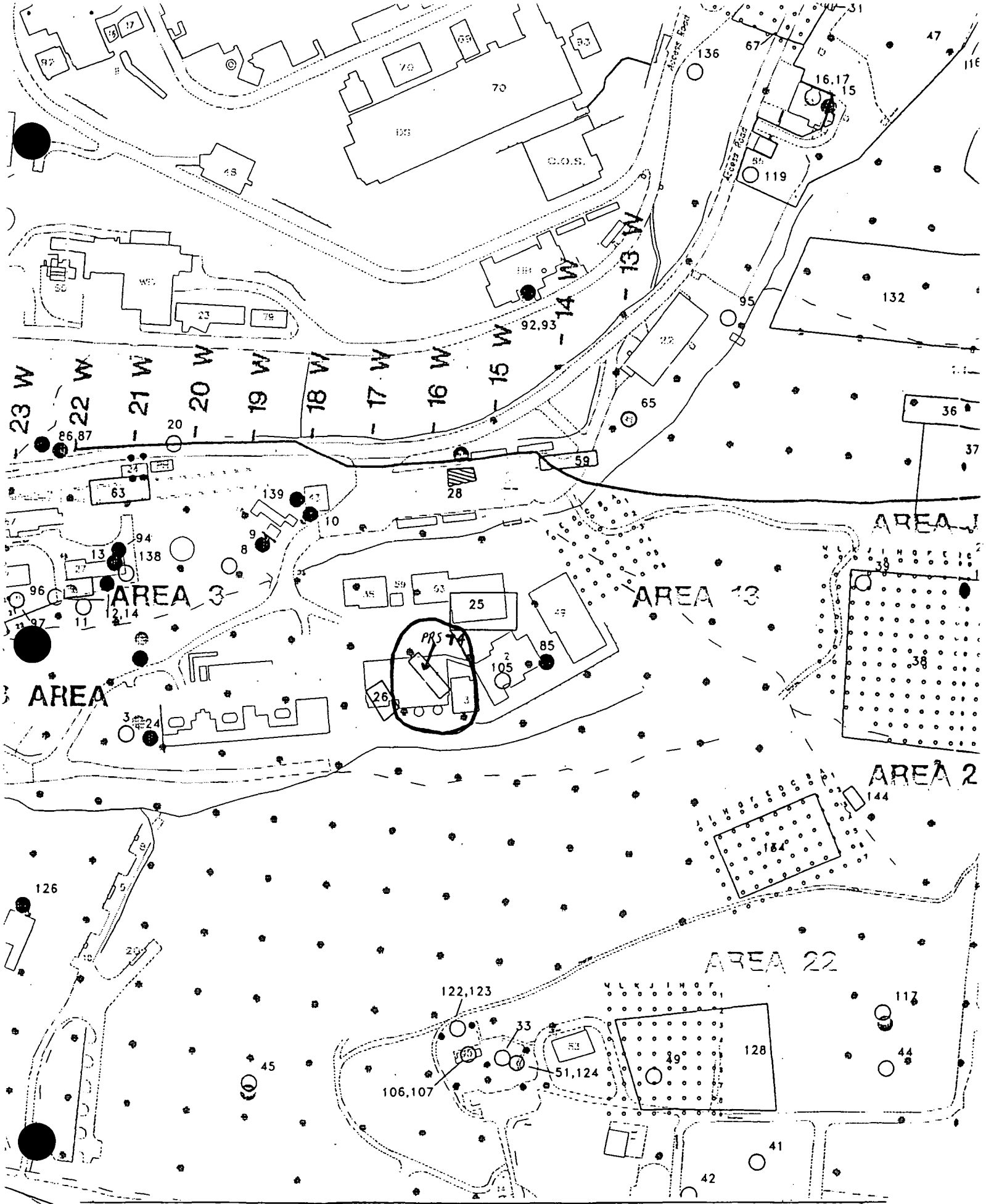
Plate 5

Table 2: NonAOC-West Petrex Soil Gas Survey Results

NERI Project: 2114-12E
Site: Operable Unit -5, USDOE Mound Facility
Analysis: Thermal Desorption - Mass Spectrometry
Date of Analysis: 11/9/94
Units: Ion Counts

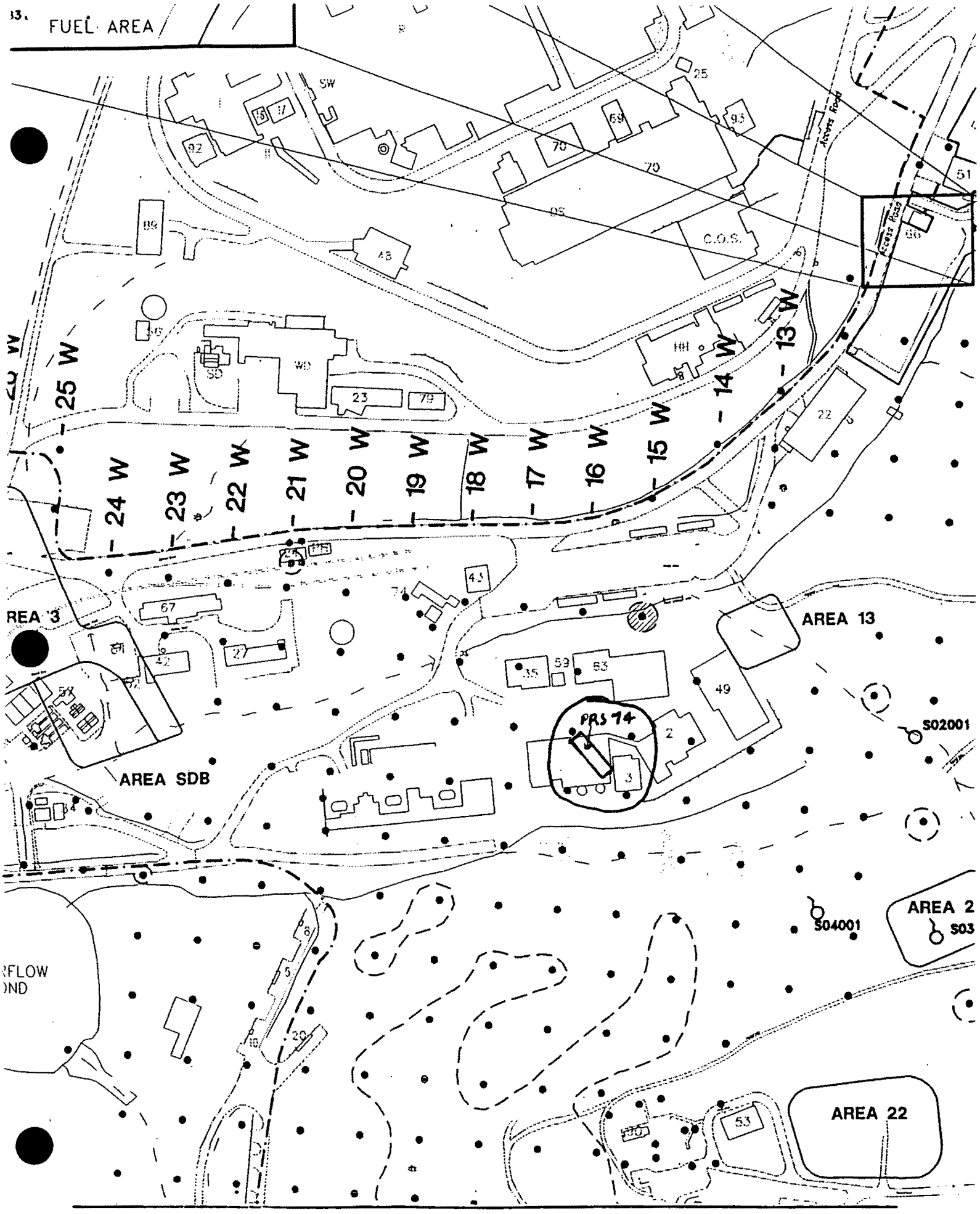
Table 2 (cont'd)

Sample #	Total Aromatic Hydrocarbons (a)	Total Semivolatile Hydrocarbons (b)	Total C5 to C11 Petroleum Hydrocarbons (c)	Total Halogenated Hydrocarbons (d)
1035	2,087,712	208,961	4,036,897	H
1039	546,090	9,996	741,506	ND
3039 (e)	516,065	21,227	733,093	ND
1040	169,260	960	370,073	3,677
1041	161,457	27,579	414,156	ND
1043	13,388,803	35,887	22,611,601	37,483
1044	107,749	ND	197,715	ND
1045	285,417	ND	566,535	4,393
1046	1,405,580	4,690	1,861,211	ND
1047	12,522	ND	25,068	ND
1048	2,994,722	617	3,566,067	ND
1049	148,446	ND	261,085	ND
1050	435,979	ND	1,290,385	ND
1051	66,445	2,646	107,123	ND
3051 (e)	64,919	752	112,256	ND
1052	351,489	ND	934,775	ND
1053	8,013	1,173	23,389	ND
1054	291,931	ND	669,428	ND
1055	678,469	ND	1,033,700	ND
1056	12,436,663	10,089	20,643,468	6,304
3056 (e)	12,445,999	13,823	21,137,796	8,479
1057	143,302	ND	278,241	9,994
1058	64,010	715	203,391	658,498
1059	1,374,524	ND	1,653,721	ND
1060	96,253	ND	538,094	3,146
1061	1,149,777	29,835	1,849,738	ND
1062	2,936,682	29,676	4,166,768	ND
1063	64,232	ND	147,109	ND
1064	444,736	645	916,632	ND
1065	862,915	9,049	1,900,950	7,323



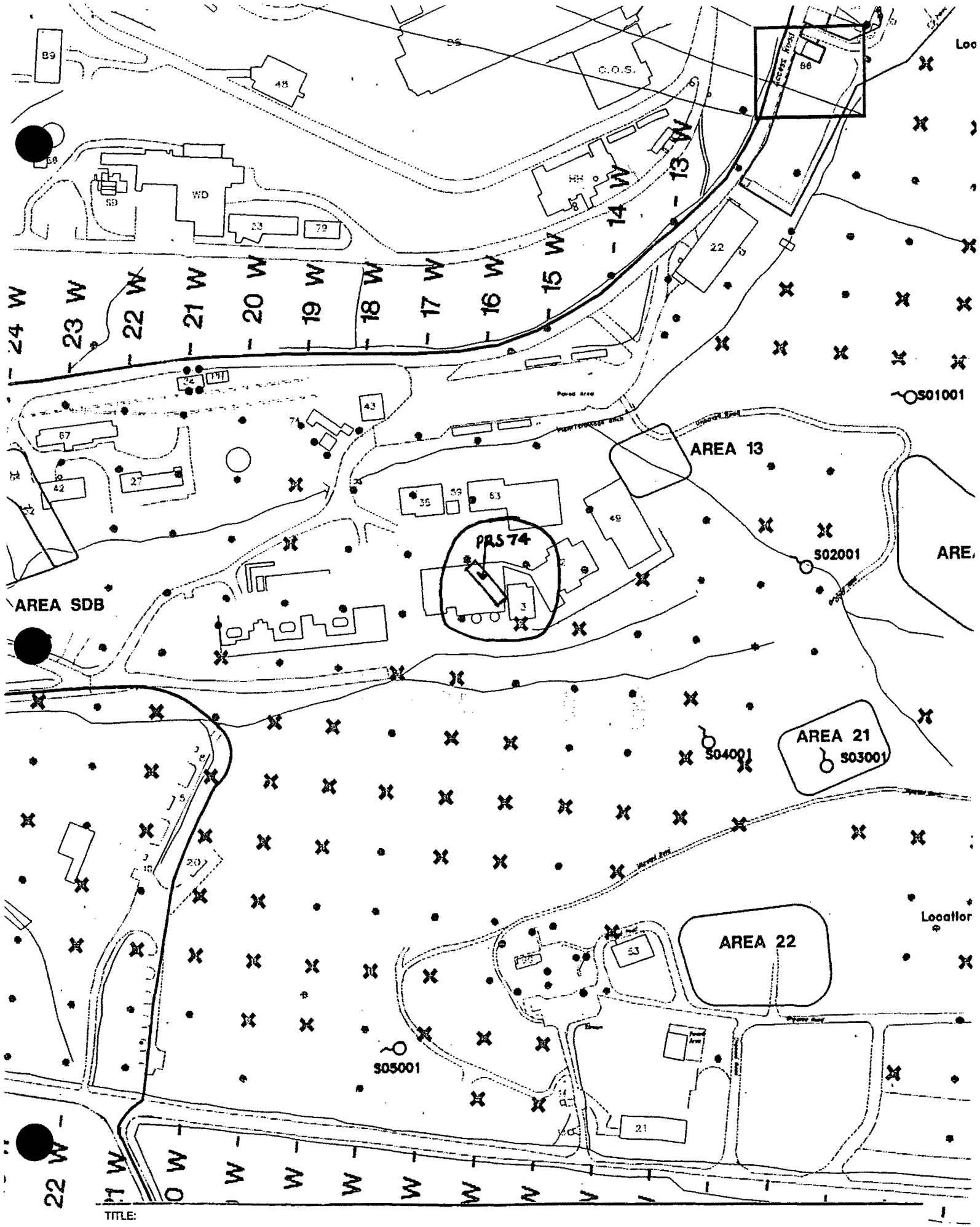
MOUND PLANT OPERABLE UNIT 5

PHASE 1 RI/FS OPERATIONAL AREA SAMPLING AND LOCATION OF POTENTIAL SITES OF CONTAMINATION



TITLE:

LOCATIONS OF ELEVATED SURFACE SOIL PU-238 ACTIVITY



TITLE:

AREAS OF ELEVATED RADIOLOGICAL ACTIVITY (FIDLER SURVEY)

APPENDIX D

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

	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
SMPID	Contamination Criteria CH1	FIDLER Readings CH1	Contamination Criteria CH2	FIDLER Readings CH2	FIDLER Readings Out Channel	Plutonium - 238		Thorium - 232	
	Units: CPM	Units: CPM	Units: KCPM	Units: KCPM	Units: KCPM	Units: pCi/g		Units: pCi/g	
	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	Note:	RESULTS	Note:
09N10	213.2	90	13.13	10.0	NC	25	b	0.9	a
09N11	213.2	70	13.13	4.5	NC	8	a	0.9	a
09N12	213.2	140	13.13	9.0	NC	18	a	1.2	a
09N13	213.2	140	13.13	9.0	NC	7	a	1.5	a
09N14	130	110	6.5	6.0	NC	14	a	0.8	a
09N15	130	105	6.5	6.0	NC	7	a	0.8	a
09N16	130	60	6.5	4.5	NC	11	a	0.6	a
09N17	130	80	6.5	4.5	NC	2	a	1.1	a
09N18	130	80	6.5	4.5	NC	NC		NC	
09N19	130	70	6.5	4.0	NC	NC		NC	
09N20	130	75	6.5	4.5	NC	NR		NR	
09N21	157.3	95	8.45	4.0	NC	NR		NR	
09N22	117.0	80	8.71	6.0	NC	NC		NC	
09N25	157.3	50	8.45	4.0	NC	WIPE	c	WIPE	c
09N26	157.3	80	8.45	4.0	NC	NR		NR	
09N27	143	100	6.63	7.5	NC	13	a	0.6	a
10N01	253.5	180	12.48	9.5	NC	4	a	1	a
10N02	122.2	100	5.59	4.0	NC	WIPE	c	WIPE	c
10N03	130	90	6.5	5.0	NC	WIPE	c	WIPE	c
10N04	130	80	6.5	5.0	NC	1	a	0	a
10N05	122.2	85	5.59	5.0	NC	11	a	0.9	a
10N10	213.2	70	13.13	8.5	NC	12	a	0.8	a
10N11	213.2	110	13.13	6.5	NC	2	a	0.6	a
10N12	213.2	90	13.13	9.5	NC	21	a	1.1	a
10N13	130	115	6.5	5.5	NC	4	a	0.9	a
10N14	130	50	6.5	4.5	NC	0	a	0	a
10N15	130	85	6.5	5.0	NC	0	a	0.6	a
10N16	130	60	6.5	4.0	NC	WIPE	c	WIPE	c
10N17	130	80	6.5	6.0	NC	0	a	0	a

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

Semivolatile Organic Compounds

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

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.

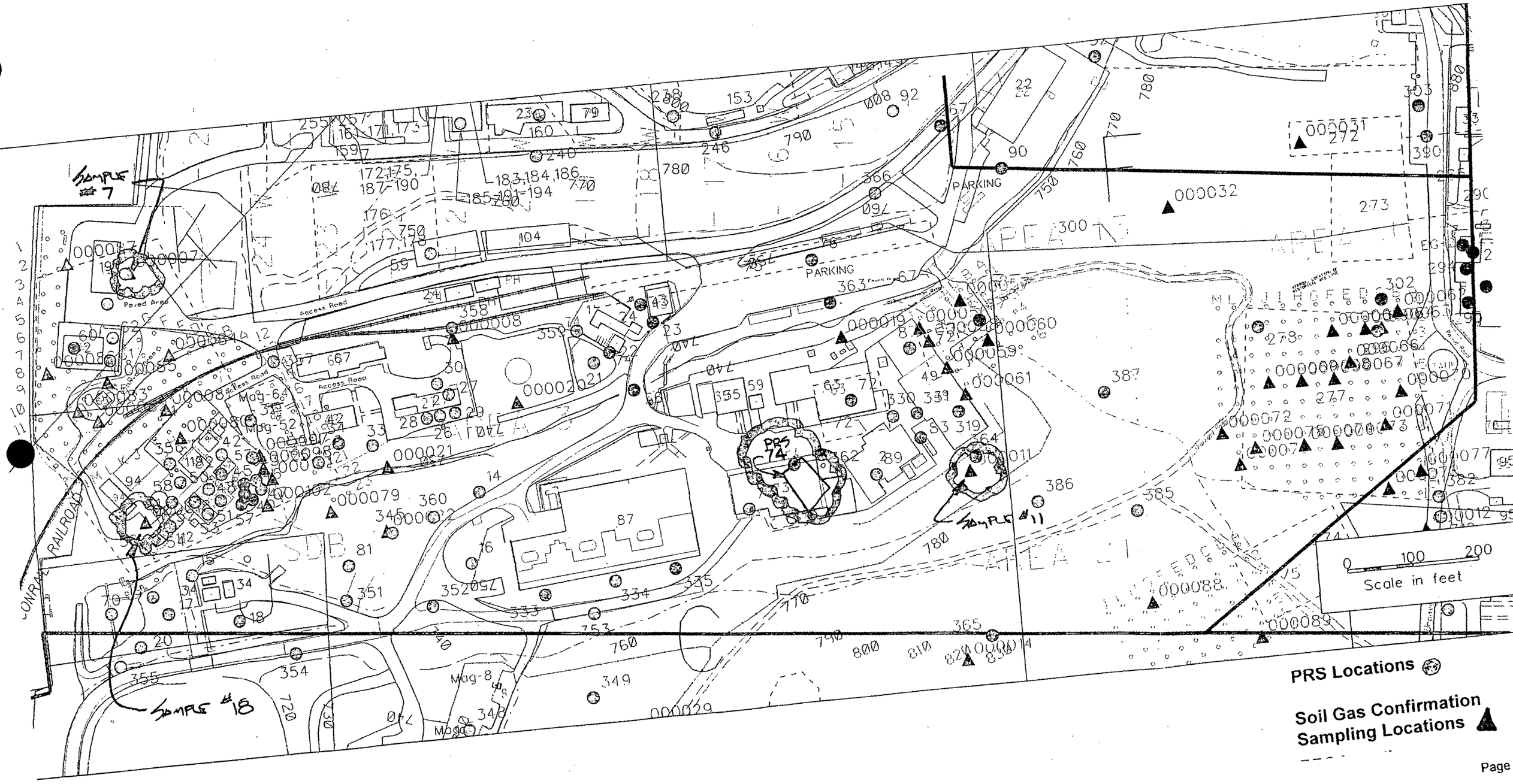

SAMPLE #7
SAMPLE #18
SAMPLE #11
PRS 74
PARKING
PARKING
Paved Area
Access Road
Access Road
Access Road
Mag-64
Mag-52
Mag-8
RAILROAD
000032
000031
000088
000089
000029
000079
000061
000060
000059
000072
000073
000077
000012
000014
000021
000102
000008
000007
000083
000085
000087
000019
000066
000067
000071
000088
000089
0 100 200
Scale in feet
PRS Locations
Soil Gas Confirmation Sampling Locations

Table A.1

Detected Volatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000007	SGC-NAC-000010	SGC-NAC-000011	SGC-NAC-000012	SGC-NAC-000013
PETREX SAMPLE AREA			WEST	EAST	WEST	EAST	EAST
Acetone	NA	21000000					
1,2-Dichloroethene (total)	NA	43000000					
2-Butanone	NA	93000000				8 J	10 J
Benzene	NA	8.90E+03					
Carbon Disulfide	NA	280000					4 J
Chloroform	NA	3100					
Chloromethane	NA	NA		4 J			
Ethylbenzene	NA	480					
Methylene Chloride	NA	3.95E+05		8			
Tetrachloroethene	NA	21000000					
Toluene	NA	250000			2 J		
Trichloroethene	NA	41000	7				7
Xylene (total)	NA	430000000					

No entry - not detected

J - Numerical value is an estimated quantity

C - Identification confirmed by GC/MS

mg/kg - micrograms per kilogram

Red = above Guideline Criteria (GC)

Green = above GC and below Background

Magenta = above Background and Below GC

Blue = above Background (no GC)

Table A.1

Detected Volatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000014	SGC-NAC-000015	SGC-NAC-000016	SGC-NAC-000017	SGC-NAC-000018
PETREX SAMPLE AREA			SOUTH	SOUTH	SOUTH	SOUTH	WEST
Acetone	NA	21000000					
1,2-Dichloroethene (total)	NA	43000000		96			
2-Butanone	NA	93000000					
Benzene	NA	8.90E+03		2 J			
Carbon Disulfide	NA	280000					
Chloroform	NA	3100					
Chloromethane	NA	NA					
Ethylbenzene	NA	480		1 J			
Methylene Chloride	NA	3.95E+05			8		10
Tetrachloroethene	NA	21000000					
Toluene	NA	250000		28		2 J	
Trichloroethene	NA	41000		3 J			
Xylene (total)	NA	430000000	1 J	4 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-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000008
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST
Acenaphthene	NA	NA		190 J	63 J				
Acenaphthylene	NA	NA		730				42 J	
Anthracene	NA	64,000,000		1300	66 J		25 J	55 J	
Benzo(a)anthracene	NA	4,100		1500	180 J		160 J	350 J	57 J
Benzo(a)pyrene	NA	410		1300	180 J		200 J	450	65 J
Benzo(b)fluoranthene	NA	4,100		1000	180 J		190 J	460	67 J
Benzo(g,h,i)perylene	NA	NA		550	110 J		100 J	260 J	26 J
Benzo(k)fluoranthene	NA	41,000		1000	160 J		190 J	440	58 J
Bis(2-ethylhexyl)phthalate	NA	215,000							
Butylbenzylphthalate	NA	43,000,000							
Carbazole	NA	NA		600	62 J			34 J	
Chrysene	NA	410,000		1500	220 J		240 J	490	68 J
Di-n-butyl phthalate	NA	21,000,000	120 J			280 J			
Di-n-octyl phthalate	NA	4,300,000							
Dibenz(a,h)anthracene	NA	410		180 J	40 J		37 J	87 J	
Dibenzofuran	NA	NA		1100	23 J				
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8,500,000		3400 D	480		400 J	800	110 J
Fluorene	NA	NA		1500	42 J				
Indeno(1,2,3-cd)pyrene	NA	4,100		690	120 J		130 J	320 J	36 J
2-Methylnaphthalene	NA	NA		970					
Naphthalene	NA	NA		4000 D	24 J				
Phenanthrene	NA	NA		4700 D	380		150 J	280 J	53 J
Phenol	NA	130,000,000							
Pyrene	NA	6,400,000	24 J	2700 D	440		340 J	730	120 J

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

All semivolatile organic compounds detected for samples #1 through #8 are listed on this page. No semivolatile organic compounds were detected for sample location 7.

Table A.2.

Detected Semivolatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000009	SGC-NAC-000010	SGC-NAC-000011	SGC-NAC-000012	SGC-NAC-000015	SGC-NAC-000016	SGC-NAC-000017
PETREX Sample Area			EAST	EAST	WEST	EAST	SOUTH	SOUTH	SOUTH
Acenaphthene	NA	NA							
Acenaphthylene	NA	NA							
Anthracene	NA	64,000,000							
Benzo(a)anthracene	NA	4,100				18 J		47 J	
Benzo(a)pyrene	NA	410				21 J		42 J	
Benzo(b)fluoranthene	NA	4,100				22 J		39 J	
Benzo(g,h,i)perylene	NA	NA						33 J	
Benzo(k)fluoranthene	NA	41,000				17 J		46 J	
Bis(2-ethylhexyl)phthalate	NA	215,000	71 J		36 J	35 J		100 J	
Butylbenzylphthalate	NA	43,000,000							
Carbazole	NA	NA							
Chrysene	NA	410,000		20 J		22 J		51 J	
Di-n-butyl phthalate	NA	21,000,000							
Di-n-octyl phthalate	NA	4,300,000							
Dibenz(a,h)anthracene	NA	410							
Dibenzofuran	NA	NA							
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8,500,000		31 J		38 J		100 J	28 J
Fluorene	NA	NA							
Indeno(1,2,3-cd)pyrene	NA	4,100						27 J	
2-Methylnaphthalene	NA	NA							
Naphthalene	NA	NA					61 J		
Phenanthrene	NA	NA						63 J	
Phenol	NA	130,000,000							
Pyrene	NA	6,400,000		31 J	20 J	37 J		87 J	26 J

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

Table A.2.

Detected Semivolatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000018	SGC-NAC-000020	SGC-NAC-000021	SGC-NAC-000024	SGC-NAC-000027	SGC-NAC-000028	SGC-NAC-000029
PETREX Sample Area			WEST	WEST	WEST	SOUTH	SOUTH	SOUTH	SOUTH
Acenaphthene	NA	NA		21 J					
Acenaphthylene	NA	NA			44 J				
Anthracene	NA	64,000,000			130 J				
Benzo(a)anthracene	NA	4,100	48 J	130 J	110 J				
Benzo(a)pyrene	NA	410	68 J	150 J	130 J				
Benzo(b)fluoranthene	NA	4,100	59 J	67 J	88 J				
Benzo(g,h,i)perylene	NA	NA	49 J	100 J	100 J				
Benzo(k)fluoranthene	NA	41,000	62 J	37 J					
Bis(2-ethylhexyl)phthalate	NA	215,000	1000			26 J	24 J	26 J	25 J
Butylbenzylphthalate	NA	43,000,000							
Carbazole	NA	NA			21 J				
Chrysene	NA	410,000	54 J	220 J	170 J				
Di-n-butyl phthalate	NA	21,000,000							
Di-n-octyl phthalate	NA	4,300,000				89 J			
Dibenz(a,h)anthracene	NA	410	40 J	24 J	28 J				
Dibenzofuran	NA	NA							
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8,500,000	84 J	180 J	320 J				
Fluorene	NA	NA			26 J				
Indeno(1,2,3-cd)pyrene	NA	4,100	53 J	46 J	73 J				
2-Methylnaphthalene	NA	NA							
Naphthalene	NA	NA							
Phenanthrene	NA	NA	27 J		220 J				
Phenol	NA	130,000,000							
Pyrene	NA	6,400,000	91 J	1400	310 J				

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

Table A.3.

Detected Pesticides/PCB's (µg/kg)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000008	SGC-NAC-000010	SGC-NAC-000031	SGC-A66-000041
PETREX Sample Area			WEST	EAST	NORTH	NORTH
Aroclor-1248	ND	380	48			110
Aroclor-1254	ND	4,300	43			
Alpha-Chlordane	ND	NA				
Gamma-Chlordane	ND	NA				
4,4'-DDT	9000	13,000				
Dieldrin	ND	185		4.4	5 *	
Endosulfan I	ND	NA				3.4 *
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)

All pesticides / PCB detections for samples #1 - #41 are listed on this page. No Pesticides or PCBs were detected for sample locations 7, 11 or 18.

Table A.4.

Detected Inorganics

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000007	SGC-NAC-000008	SGC-NAC-000009
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST	WEST	EAST
TAL INORGANICS (mg/kg)											
Aluminum	19000	NA	11000	4190	1910	11400	7970	7780	10200	2820	18700
Antimony	NA	85		0.23 B		0.24 B	0.41 B			0.27 B	0.91 B
Arsenic	8.6	64	1.5 B	2.1 B	2.9 B	1.4 B	7	7.2	1.9 B	3.2	11.1
Barium	180	15,000	48.6	20.7 B	23.7 B	47.1 B	73.6	86.4	26.2 B	23.2 B	163
Beryllium	1.3	1	0.56		0.12 B	0.65	0.38	0.28	0.28		0.9 B
Bismuth	NA	NA									0.85 B
Cadmium	2.1	210		0.25 B	0.19 B		0.36 B	0.5 B	0.33 B	0.22 B	6
Calcium	310000	NA	162000	159000	95500	152000	13600	86200	83900	113000	5940
Chromium	20	110,000	13.2	6.7	3.8	15.2	13	11.6	14.3	5.7	20.3
Cobalt	19	NA	9.8 B	4.5 B	2.3 B	10.1 B	7.6 B	7.6 B	11 B	3.3 B	13
Copper	26	NA	16.2	11.9	9.9	17.1	14.5	15.2	16.2	13.9	19.2
Cyanide	ND	4,300									
Iron	35000	NA	21300	10600	5680	21800	17200	17700	23000	7660	29400
Lead	48	NA	6.7	5.2	11.2	8.6	30.9	25.1	7.2	5.9	22.2
Lithium	26	NA	21 B	12.5 B	6.2 B	23 B	7.7 B	10.3 B	3.2 B	8.2 B	14.7 B
Magnesium	40000	NA	6160	57800	27900	5670	5210	35600	21600	47900	4500
Manganese	1400	27,000	695	384	270	612	383	589	493	256	728
Mercury	ND	64			0.13						
Molybdenum	27	NA	0.43 B	1.2 B	0.77 B		1.7 B	1.5 B	0.63 B	1.4 B	1.8 B
Nickel	32	4,300	18.4	9.9	6.4 B	20.6	11.1	16.1	22.6	8.1 B	24.5
Potassium	1900	NA	1780	742 B	346 B	2080	574 B	744 B	1590	463 B	1420
Selenium	NA	NA									
Silver	1.7	1,100			0.24 B						
Sodium	240	NA	228 B	888 B	150 B	137 B	411 B	348 B	246 B	341 B	1010 B
Thallium	0.46	NA									
Tin	20	NA	1.1 B			1.4 B	1 B			4.5 B	1.5 B
Vanadium	25	1,500	14.9	8.3	4.7	16.3	23.1	18.9	14.2	7.4	42.7
Zinc	140	64,000	53.3	29.5		67	59	69.2	53.8	36.6	71.8
OTHER INORGANICS											
% Solids (%)	NA	NA	83.9	93.8	88.5	83.3	78.4	75	83.9	95	78.9
Nitrate/Nitrite (mg-N/kg)	NA	NA	2	1.8	1.2	2.1	7.2	4.8	1.6	26.5	2.2

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

Table A.4.
Detected Inorganics

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000010	SGC-NAC-000011	SGC-NAC-000012	SGC-NAC-000013	SGC-NAC-000014	SGC-NAC-000015	SGC-NAC-000016	SGC-NAC-000017
PETREX Sample Area			EAST	WEST	EAST	EAST	SOUTH	SOUTH	SOUTH	SOUTH
TAL INORGANICS (mg/kg)										
Aluminum	19000	NA	7300	10300	13100	8460	17700	7370	14100	20000
Antimony	NA	85	0.21 B	1.2 B						
Arsenic	8.6	64	7.2	2.2 B	1.9 BJ	1.2 BJ	2.7	3.6 J	3.4	2.4 B
Barium	180	15,000	64.7	13.5 B	78.4	53.4	110	51.3 B	68.7	119
Beryllium	1.3	1	0.34	0.36 B	0.44	0.2 B	0.68	0.24 B	0.46	0.96
Bismuth	NA	NA		0.99 B					0.62 B	1.2 B
Cadmium	2.1	210	0.62 B	5.2	6	4.6	7.7	3.7	5.7	8.6
Calcium	310000	NA	41500	90800	127000 J	222000 J	94200	342000	133690	23800
Chromium	20	110,000	12	11.9	17.3	10.8	22.3	9.1	17.7	24.5
Cobalt	19	NA	7.9 B	13.7	12.7 J	7.5 BJ	13.9	5.8 B	11.6 B	18.5
Copper	28	NA	17.4	16.6	21.3 J	13.5 J	22.4	12.2	19.3	26.9
Cyanide	ND	4,300					1.8		1	
Iron	35000	NA	17300	25600	27900	21100	36300	16600	26600	40000
Lead	48	NA	16.5	5.7	9.3 J	29.4 J	12.9	14.3	14.1	27.5
Lithium	26	NA	9.2 B	27.3	25.3	17.8 B	30.7	15 B	25.1	34.1
Magnesium	40000	NA	16700	12300	19900 J	7250 J	8190	4760	14600	6250
Manganese	1400	27,000	604	908	658	543	939	689	641	1360
Mercury	ND	64								0.07 B
Molybdenum	27	NA	2.3 B	0.58 B	1.3 B	0.81 B	1.3 B	0.51 B	1.3 B	0.76 B
Nickel	32	4,300	16.5	21.6	26.4	17.6	31.4	13.8	23.9	34.4
Potassium	1900	NA	794 B	2210 B	1630	1100 B	2250 B	1010 B	2090 B	3680
Selenium	NA	NA		0.31 B						
Silver	1.7	1,100								
Sodium	240	NA	82 B	288 B	2490 J	328 BJ	142 B	248 B	398 B	209 B
Thallium	0.46	NA								
Tin	20	NA			1.6 B	1.1 B	0.98 B		1.7 B	3.3 B
Vanadium	25	1,500	19.2	15.8	22.4	12.9	29.4	10.7	23.8	30.2
Zinc	140	64,000	299	59.9	68.5	44.9	92.5	67.7	70.5	103
OTHER INORGANICS										
% Solids (%)	NA	NA	83.9	90.1	84.7	81.7	80.9	74	85.3	72.8
Nitrate/Nitrite (mg-N/kg)	NA	NA	5.9	5.3	1.8	2.1	4.9	3	2.4	6.4

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Table A.4.
Detected Inorganics

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000018	SGC-NAC-000019	SGC-NAC-000020	SGC-NAC-000021	SGC-NAC-000022	SGC-NAC-000023	SGC-NAC-000024	SGC-NAC-000025
PETREX Sample Area			WEST	WEST	WEST	WEST	WEST	SOUTH	SOUTH	SOUTH
TAL INORGANICS (mg/kg)										
Aluminum	19000	NA	5130	7820	13400	7720	8030	12200	5410	6830
Antimony	NA	85					0.66 B			
Arsenic	8.6	64	4.1	6.8	3	4.3	13.3	2 BJ	0.83 BJ	1.9 BJ
Barium	180	15,000	21.4 B	56.1	17.9 B	24.2 B	65.8 J	90.3	28.4 B	49.2
Beryllium	1.3	1	0.28	0.22 B	0.77	0.19 B	0.49	0.91	0.29	0.4
Bismuth	NA	NA								
Cadmium	2.1	210		3.4						
Calcium	310000	NA	157000	76400	64400	58300	42200	35400 J	210000 J	162000 J
Chromium	20	110,000	9.3	8.9	18.6	13.9	14.4 J	16.2	7.9	18.1
Cobalt	19	NA	5.5 B	8.4 B	12.9	10.3 B	11.5 B	13.1	5.9 B	8.7 B
Copper	26	NA	11.6	14.2	17.3	26.5	26.3 J	18.9	8.2	30.5
Cyanide	ND	4,300				0.65 B				
Iron	35000	NA	13600	16000	25500	20600	22300 J	29300	14600	24200
Lead	48	NA	8.2	14.2	5.3	14	14.9 J	16.4 J	5.2 J	6.9 J
Lithium	26	NA	18.1 B	9.7 B	39.5	25.8	15.3 B	18.8 B	12.8 B	16.3 B
Magnesium	40000	NA	47700	29800	16300	15800	22000 J	4640	15700	14900
Manganese	1400	27,000	381	539	505	577	522 J	1030 J	393 J	429 J
Mercury	ND	64						0.07 BJ		
Molybdenum	27	NA	0.82 B	2.2 B		0.53 B	5.7	0.87 B	0.63 B	2.3 B
Nickel	32	4,300	13.5	13.3	27.3	21.3	27.4	42.3	12.3	22.2
Potassium	1900	NA	1040 B	1090 B	3590	1300	641 B	1760	874 B	443 B
Selenium	NA	NA								
Silver	1.7	1,100	0.41 B			0.33 B				
Sodium	240	NA	398 B	155 B	383 B	357 B	101 BJ	174 BJ	172 BJ	157 BJ
Thallium	0.46	NA								
Tin	20	NA		1.3 B	1.6 B	1.7 B	1 B	0.97 B		0.89 B
Vanadium	25	1,500	10.3	17.5	17.7	12.6 B	22.4 J	18	7.3	10.5
Zinc	140	64,000	41.2	56.1	84.9	68.9	72.5 J	66.6	28.9	64.6
OTHER INORGANICS										
% Solids (%)	NA	NA	84.2	85.3	87.6	77.4	78.3	77.5	89.5	89.3
Nitrate/Nitrite (mg-N/kg)	NA	NA	13.7	6.5	2.1	6.1	2.2	11.6	2.2	2

No entry - not detected
mg/kg - milligrams/kilogram
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ND - No detections in background samples
mg-N/kg - milligrams per kilogram, reported as nitrogen
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B - Analyte detected in blanks associated with this sample
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Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.5.

Detected Radionuclides (pCi/g)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000006	SGC-NAC-000007	SGC-NAC-000008	SGC-NAC-000009	SGC-NAC-000010
PETREX Sample Area			EAST	WEST	WEST	EAST	EAST
Americium-241	ND	4.95					
Bismuth-207	ND	0.18					
Bismuth-210	ND	NA					
Cesium-137	0.42	0.46	0.861				
Cobalt-60	NC	0.10					
Plutonium-238	0.13	5.5	4.32	0.537	0.0826	0.0233	0.107
Plutonium-239/240	0.18	5.5					
Potassium-40	37	NA	14.3	10.8	7.72	12.9	15
Radium-226+D	2	0.14	0.87	0.537	0.571	0.764	0.917
Thorium-228+D	1.5	0.85	1.06	0.431	0.678	0.779	0.914
Thorium-230	1.9	44	1.18	0.582	0.541	1.09	1.27
Thorium-232	1.4	50	1.18	0.328	0.554	0.838	0.708
Uranium-234	1.1	38	0.761	0.551	0.361	0.712	0.897
Uranium-235+D	0.11	3.4					0.0459
Uranium-238+D	1.2	11.0	0.815	0.574	0.414	0.774	1.06

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

Table A.5.

Detected Radionuclides (pCi/g)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000011	SGC-NAC-000012	SGC-NAC-000013	SGC-NAC-000014	SGC-NAC-000015
PETREX Sample Area			WEST	EAST	EAST	SOUTH	SOUTH
Americium-241	ND	4.95					
Bismuth-207	ND	0.18					
Bismuth-210	ND	NA					
Cesium-137	0.42	0.46				0.826	
Cobalt-60	NC	0.10					
Plutonium-238	0.13	5.5	0.0718	0.101	0.0107	0.671	0.0118
Plutonium-239/240	0.18	5.5		0.00154		0.0206	
Potassium-40	37	NA	17.8	15.5	4.65	22.5	19.2
Radium-226+D	2	0.14	0.778	0.592	0.263	1.1	1.4
Thorium-228+D	1.5	0.85	0.913	0.697	0.247	1.18	1.37
Thorium-230	1.9	44	0.902	0.803	0.359	1.09	1.48
Thorium-232	1.4	50	0.83	0.769	0.21	1.08	1.43
Uranium-234	1.1	38	0.882	0.693	0.378	0.866	1.01
Uranium-235+D	0.11	3.4		0.0231	0.0183	0.0548	0.0927
Uranium-238+D	1.2	11.0	0.871	0.681	0.424	1.01	0.955

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

Table A.5.

Detected Radionuclides (pCi/g)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000016	SGC-NAC-000017	SGC-NAC-000018	SGC-NAC-000019	SGC-NAC-000020
PETREX Sample Area			SOUTH	SOUTH	WEST	WEST	WEST
Americium-241	ND	4.95					
Bismuth-207	ND	0.18					
Bismuth-210	ND	NA					
Cesium-137	0.42	0.46		0.582			
Cobalt-60	NC	0.10					
Plutonium-238	0.13	5.5	0.253	0.2	0.684	0.121	0.721
Plutonium-239/240	0.18	5.5	0.00413	0.0166	0.00487		
Potassium-40	37	NA	15.2	29.1	10.1	7.9	24.7
Radium-226+D	2	0.14	0.934	0.96	0.677	0.528	0.841
Thorium-228+D	1.5	0.85	1.04	1.1	0.465	0.378	0.892
Thorium-230	1.9	44	1.36	1.01	0.582	0.749	1.08
Thorium-232	1.4	50	0.894	1.26	0.508	0.375	0.843
Uranium-234	1.1	38	0.765	0.698	0.523	0.44	0.751
Uranium-235+D	0.11	3.4	0.0394	0.0403			0.0362
Uranium-238+D	1.2	11.0	0.993	0.852	0.496	0.691	0.825

No entry - not detected
ND -No detections in background samples
NA - Data not available
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Magenta = above Background and Below GC
Blue = above Background (no GC)