3001-0008140001

BWX Technologies, Inc.
a McDermott company

BWXT of Ohio, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

ESC-098/00
August 13, 2000

00-TC/08-13

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

ATTENTION: Dewain Eckman

SUBJECT: Contract No. DE-AC24-97OH20044
POTENTIAL RELEASE SITE (PRS) 66 DATA PACKAGE - FINAL

REFERENCE: Statement of Work Requirement C 7.1e -- Regulator Reports

Dear Mr. Provencher:

Attached is the Final Potential Release site (PRS) 66 Data Package. The release of this document to USEPA, OEPA, ODH, and the public reading room has been authorized by Art Kleinrath of MEMP.

If you or members of your staff have any questions regarding the document, or if additional support is needed, please contact Dave Rakel at extension 4203.

Sincerely,

J. S. Stapleton

Jeffrey S. Stapleton
Manager, Environmental Safeguards & Compliance

JSS/nmg

Enclosures as stated

cc: Tim Fischer, USEPA, (1) w/attachment
Brian Nickel, OEPA, (1) w/attachment
Ruth Vandegrift, ODH, (1) w/attachment
Art Kleinrath, MEMP, (2) w/attachment
Terrence Tracy, DOE/HQ, (1) w/attachment
Dann Bird, MMCIC, (2) w/attachment
John Price, BWXT of Ohio, (2) w/attachment
Floyd Hertwick, BWXT of Ohio, (1) w/attachment
Public Reading Room, (5) w/attachment
Administrative Record, (2) w/attachment
DCC

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MOUND

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Restoration
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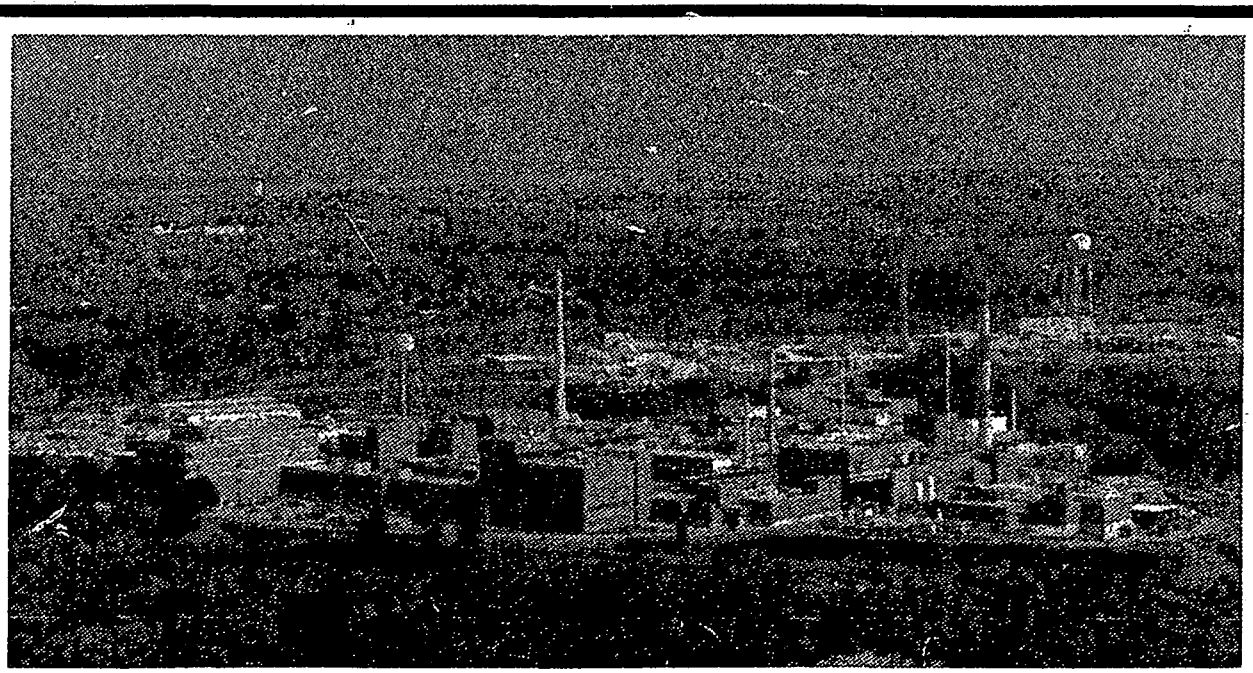
OhioEPA

MOUND PLANT

Potential Release Site Package

PRS # 66



PRS 66

REV	DESCRIPTION	DATE
WORKING DRAFT		
DRAFT	Binned FA, 8/20/96	**June 5, 1996**
DRAFT PROPOSED FINAL	Further Assessment sampling evaluations result in declaring that PRS 66 is a Removal Action. PRS 66 Removal Action recommendation inserted.	**February 28, 2000**
PUBLIC REVIEW DRAFT		**March 14, 2000**
FINAL	MMCIC comments received. Comments and Core Team responses inserted.	**July 3, 2000**

MOUND

Environmental Restoration Program

MOUND PLANT POTENTIAL RELEASE SITE PACKAGE

Notice of Public Review Period

The following Potential Release Site (PRS) Data Packages are available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio. Public comment on these documents will be accepted March 15, 2000 through April 15, 2000.

Potential Release Site 66: Area 7, Thorium and Polonium Wastes
Potential Release Site 420: Wetlands

Questions can be referred to Paul Lucas at (937) 865-4578.

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

Mr. Daniel Bird, AICP
Planning Manager
Miamisburg Mound Community Improvement Corporation
720 Mound Road
COS Bldg. 4221
Miamisburg, Ohio 45342-6714

Dear Mr. Bird:

The Core Team, consisting of the U.S. Department of Energy Miamisburg Environmental Management Project (DOE-MEMP), U.S. Environmental Protection Agency (USEPA), and the Ohio Environmental Protection Agency (OEPA), appreciates your comments on PRS 66 Data Package, Public Review Draft, March 14, 2000. Attached are our responses.

Should the responses to comments require additional detail, please contact Art Kleinrath at (937) 865-3597 and we will gladly arrange a meeting or telephone conference.

Sincerely,

DOE/MEMP: Art Kleinrath, Remedial Project Manager

USEPA: Timothy J. Fischer, Remedial Project Manager

OEPA: Brian K. Nickel, Project Manager

Substantive Comments

1. MMCIC is in agreement with the recommendation for removal action that is presented in this PRS 66 Data Package. This recommendation is based on the results of soil sampling that occurred in the PRS 66 area in the autumn of 1999. These results were referenced in a single paragraph on the recommendation page of this data package. MMCIC is perplexed as to why the basic supporting data from the 1999 sampling investigation were not included in the PRS 66 Data Package in the same manner as the supporting data were included for previous related investigations. It seems that, though it would not change the recommendation for PRS 66, it would be prudent to include the 1999 supporting data in the PRS 66 Data Package for an internally consistent document.

Response:

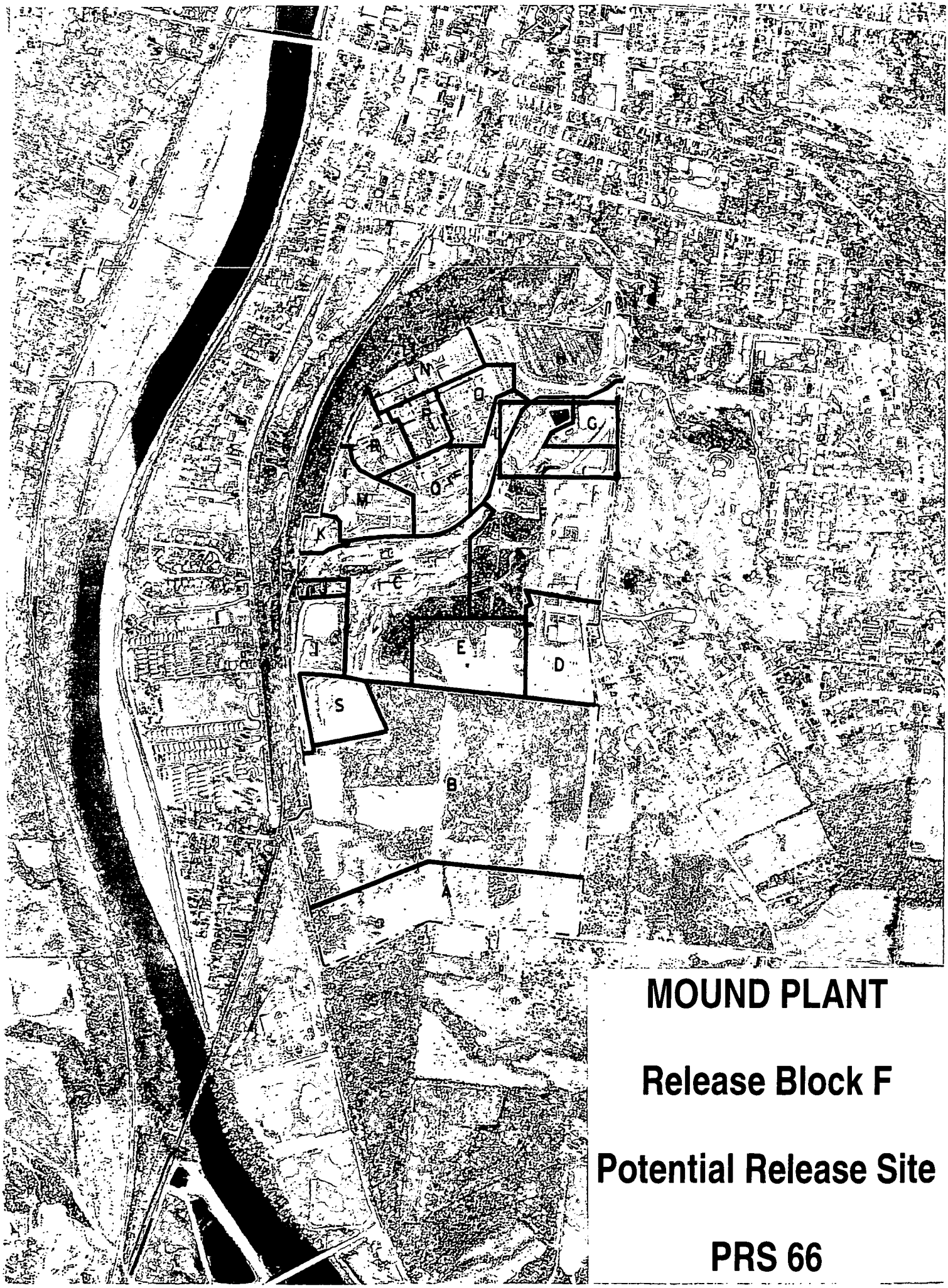
The Potential Release Site (PRS) 66 Data package was written in early calendar year 1996. It was binned as requiring Further Assessment (FA) on August 20, 1996. Analysis accomplished in decision if a Response Action (RA) would be more overall cost effective than the FA resulted in no change from the original binning decision. This additional FA decision occurred on July 10, 1997, and was based, in part, on uncertainty of what the ultimate PRS 66 remedial action would be as a function of planned further use. Further Assessment activities commenced in 1999. Evolving data collection and laboratory analysis indicated elevated levels of Plutonium-238, Thorium-232, Cesium-137, and Americium-241, warranting a Response (Removal) Action. No formal sampling and analysis report was written as of the date of the signed recommendation; and data collection and laboratory analysis continue as of the date of this comment response. Upon completion of this sampling and analysis and publishing of a consolidated and comprehensive results report(s), an Addendum referencing this report will be written and incorporated into the PRS 66 Data Package. Facilitation of baseline development activities associated with the new Response Action was a prime consideration in this strategy.

2. The language of the Recommendation Page of the PRS 66 Data Package currently simply states that a removal action is recommended for PRS 66. The current recommendation for removal action is focused on the primary plutonium and thorium hotspots identified in the 1999 sampling investigation. We suggest that this language be expanded to reflect the current understanding and efforts of the PRS 66 Stakeholder Focus Group, that, in addition to the hot spot removal action, the remainder of the PRS 66 project area will be more thoroughly investigated by

completing the PRS 66 Sampling and Analysis Plan that was reviewed and accepted with revisions by the Focus Group in autumn 1999. Then, with stakeholder input in conjunction with Core Team review, a determination will be made regarding the necessity for further remedial actions. This expanded recommendation would apply to all of the PRS 66 project area and not just the hot spot area.

Response:

The Core Team concurs that the PRS 66 Sampling and Analysis Plan is an appropriate document to outline the details and extent of the intended Response Action. The approved sampling plan will be completed for all areas not impacted by the removal. The recommendation, as written, does not constrain the limits of this action; but at the time of writing, identified the primary concerns that would precipitate the removal. The forthcoming PRS 66 Action Memorandum and EE/CA will undergo public review and allow the Focus Group to evaluate the adequacy of the remediation. It is expected that the Stakeholder Focus Group will continue it's involvement in designing the path forward to completion of PRS 66.

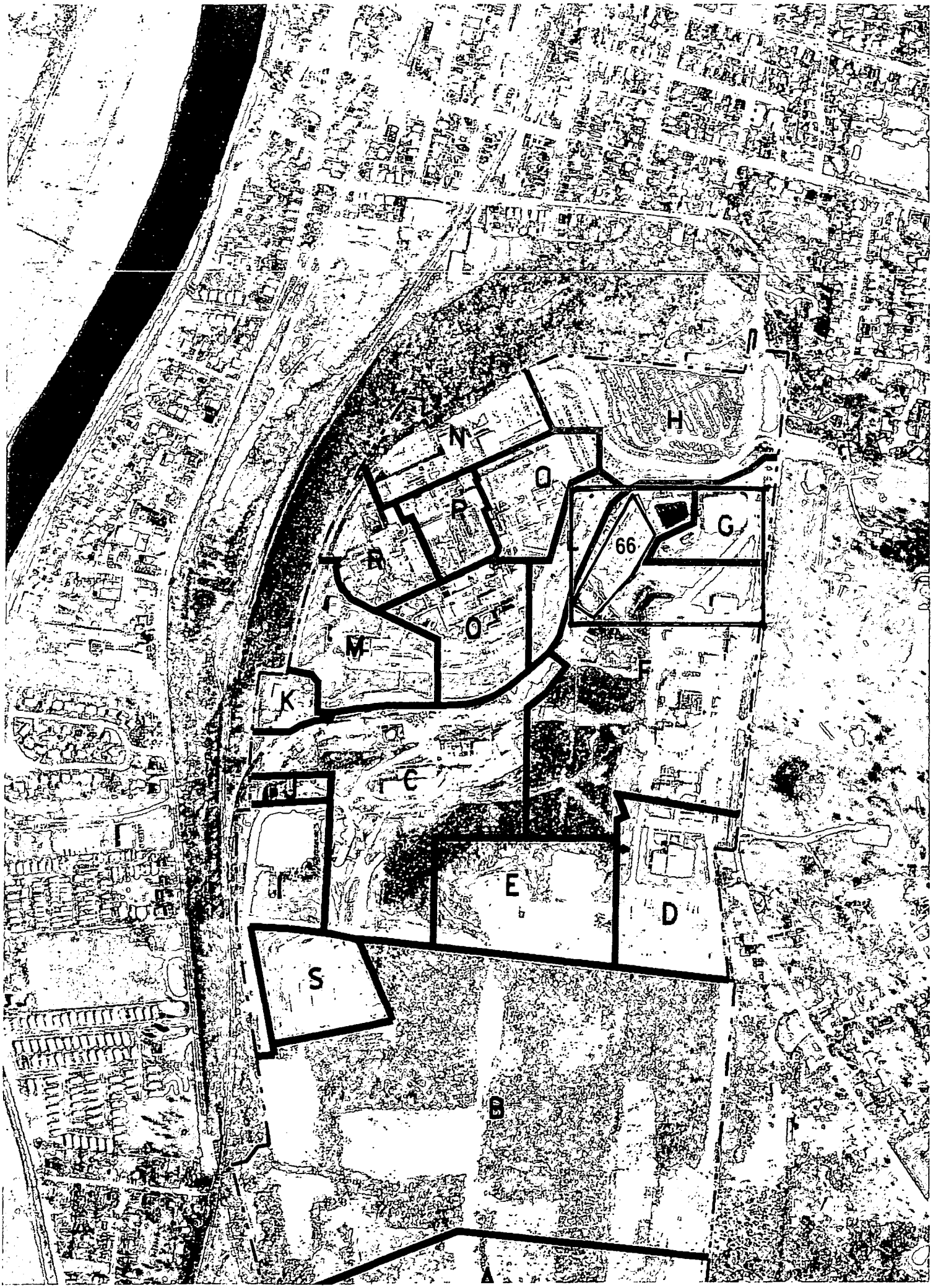


MOUND PLANT

Release Block F

Potential Release Site

PRS 66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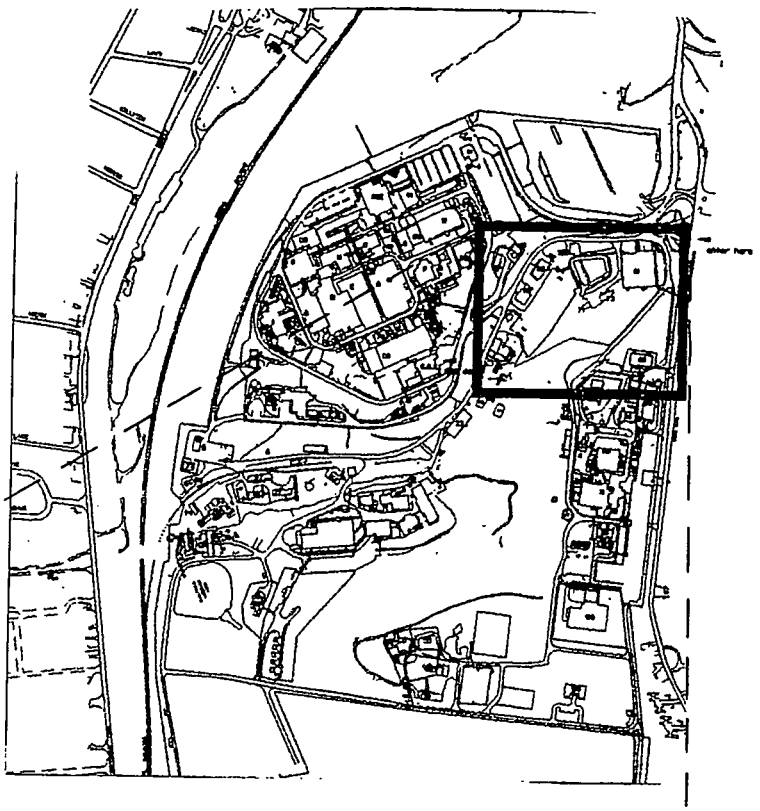
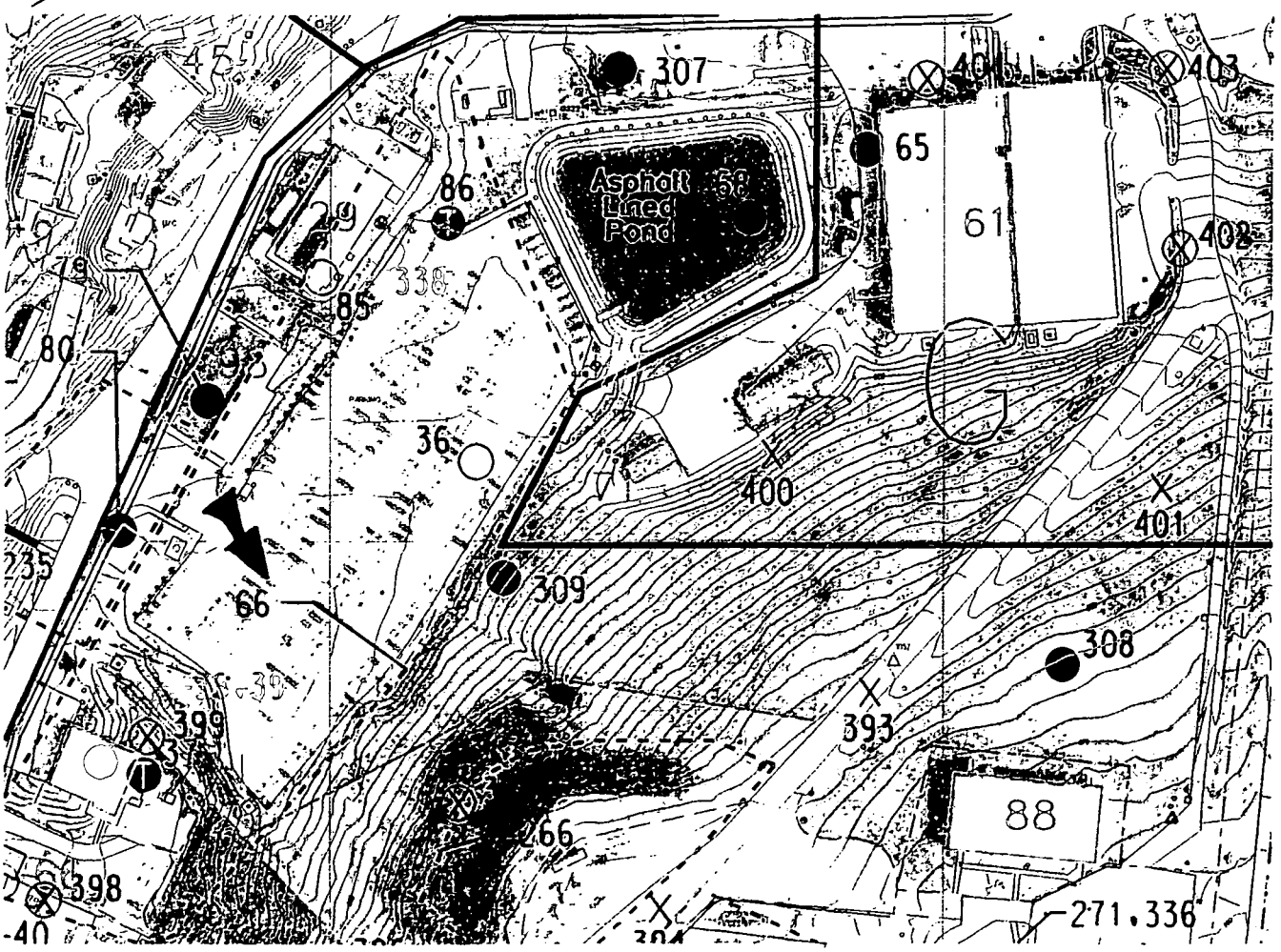
MOUND PLANT

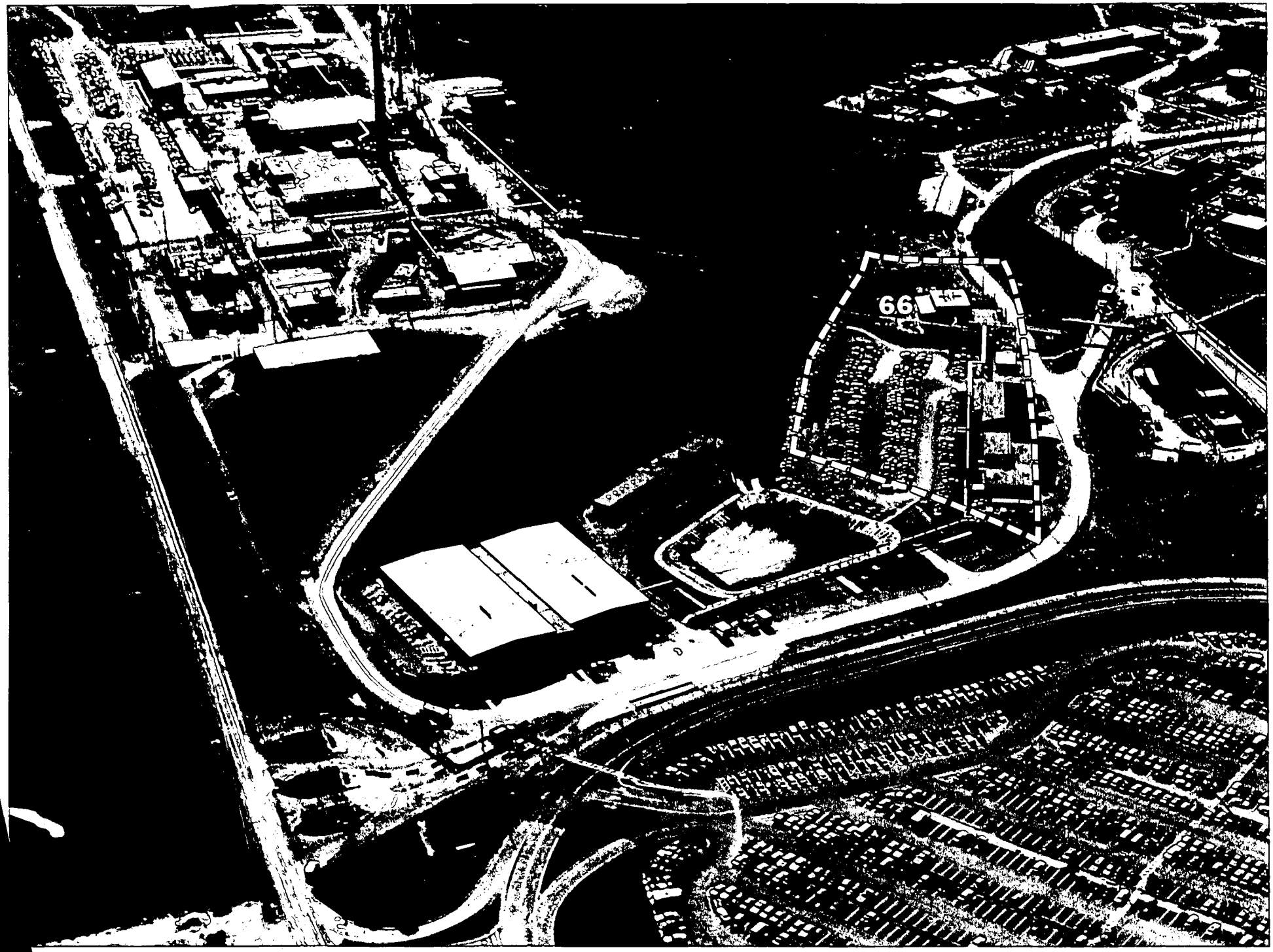
Release Block F

Potential Release Site

PRS 66






66

PRS 66

PRS HISTORY:

Potential Release Site (PRS) 66 refers to the disposal site for construction soils and debris located under the parking lot which is south of Buildings 29 and 98.[3] PRS 66 was originally identified as a larger site, Area 7, in the Site Scoping Report.[1] Additional PRS data packages will address the Area 7 locations which surround the parking lot.

The parking lot area was once a steep ravine and has a long history of debris disposal including: disposal of 10,000 to 15,000 empty drums that once contained thorium-232 (1955-1966), a polonium-210 contaminated washing machine (date unknown), and a thorium-232 contaminated flat bed truck (mid 1960s). Other materials contaminated with polonium-210 (mid 1960s), such as exhaust system ducts from the remodeling of T-building, may have been disposed of in the area.[4] Currently the area is an asphalt covered parking lot constructed in 1984. In 1990, a Magnetic survey was conducted at the parking lot in an attempt to locate buried ferrous materials (materials made of metal) beneath the parking lot. The results of this survey indicated that large ferrous objects are buried under the north-central portion of the parking lot. The buried items were interpreted to be the buried flatbed truck, empty thorium drums, and other ferrous debris.[9]

Remediation of a small section of the original AREA 7 disposal site, PRS 86, is in progress. PRS 86 is located north of the parking lot (PRS 66) and involves the removal of contaminated soil, gravel, and concrete from SW Building. The radiological contaminants include actinium-227, radium-226, and thorium-228.[4]

CONTAMINATION:

Soil samples were collected from surface and core boring locations during the Radiological Site Survey.[2] These samples were analyzed for radioactivity. Plutonium-238 (Pu-238) concentrations ranged from 0.01 to 7.40 picocuries per gram (pCi/g), which are below the Mound Plant As Low As Reasonably Achievable (ALARA) limit of 25 pCi/g. The thorium-232 (Th-232) levels ranged from less than 2.00 to 20.54 pCi/g. The regulatory limit for thorium contamination is 5 pCi/g in surface soils and 15 pCi/g in subsurface soils. Radium-226 (Ra-226), cobalt-60 (Co-60), cesium-137 (Cs-137), and tritium levels were below the PRS guideline criteria for contamination.

Additional soil sampling, the Operable Unit 5 (OU5) Area 7 investigation in 1994, detected Pu-238 and Th-232 concentrations which were less than the standards referenced above.[6]

Sampling for Volatile Organic Compounds (VOCs) in soil was performed as part of the Site Soil Gas Survey in 1992. VOCs detected were freon 11 ranging from 7 to 32 ppb, freon 113 ranging from 4 to 33 ppb, dichloroethene 1,2-cis (1,2-cis-DCE) ranging from 3 to 10 ppb, trichloroethane 1,1,1 (1,1,1 TCA) ranging from 2 to 22 ppb, tetrochloroethene (PCE) at 7 ppb, and toluene ranging from 3 to 825 ppb.[5] All soil gas concentration levels are below the contamination limits defined by Soil Screening Level calculations.[10]

VOCs, Semi-Volatile Organic Compounds (SVOCs), Pesticides/Polychlorinated Biphenyls (PCBs), Total Organic Carbon (TOC), Explosives, and Inorganics were sampled as part of the OU5 Area 7 Investigation in 1994. Results of VOCs detected were Acetone and Hexane, both below guideline values (GV). Twenty-four SVOCs were detected, all below GV. Nearly all of the maximum concentrations were found in the east central portion of the parking lot. Seventeen Pesticides/PCBs were detected, all below GV. TOCs were detected in all surface soil samples with a maximum concentration of 32,000 mg/kg. For all of the inorganics detected, none were above GV. No Explosives were detected in any of the soil samples.[6]

As part of the OU5 Non-Area of Concern (NON-AOC) investigation, soil gas sampling was also conducted using PETREX which resulted with relatively low detections of petroleum hydrocarbons and halogenated hydrocarbons. PETREX soil gas data only indicates the presence of a compound but does not give a definitive concentration.[7]

Groundwater sampling was conducted as part of the Operable Unit 5, Area 7 investigation in 1994. The maximum concentration of radionuclides detected were thorium-228 (1.24 pCi/L), thorium-232 (0.32 pCi/L), and tritium (2373.7 pCi/L). These concentrations are below GV. Two inorganics, bismuth and potassium, were detected at concentrations below GV.[6]

Groundwater investigation was also conducted as part of the Operable Unit 9, Hydrogeologic Investigation in the fall of 1994. Radionuclides, organics, and inorganics were analyzed. All results indicated no concentration levels above GV.[8]

A 1951 Mound construction map[11] contains the only recorded evidence of a septic tank located under the present day location of the lower parking lot and Building 98 (just within PRS 66).[11] An interview with a former Mound employee confirms that the tank did exist.[12] No evidence of the tank removal has been found.

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 6-7)
2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 8-18)
3) OU9, Site Scoping Report: Volume 6 - Photo History Report, Final, February 1992. (pages 19-31)
4) OU9, Site Scoping Report: Volume 7 - Waste Management, February 1993. (pages 32-35)
5) Soil Gas Survey & Geophysical Investigations Main Hill and SM/PP Hill Areas Reconnaissance Sampling, February 1993. (pages 36-49)
6) OU5, Operational Area Phase I Investigation Area 7 Field Report, June 1995. (pages 50-71)
7) OU5, Operational Area Phase I Investigation Non-AOC Field Report, Volume II, June 1995. (pages 72-76)
8) OU9, Hydrogeologic Investigation: Groundwater Sweeps Report, Technical Memorandum, (Revision 1), April 1995. (pages 77-80)

OTHER REFERENCES:

9) Letter Report: Preliminary Results of Reconnaissance Magnetic Survey, Working Draft, November 1990. (pages 81-91)
10) Comparison of Actual Soil Gas Values with Calculated Acceptable Soil Gas Values, March 1996. (pages 92-94)
11) Lavoratory-Warehouse 15, Mound drawing number 4-2181, April 1951. (pages 95-97)
12) Phone conversation, Glenn Dixon (Barge Waggoner Sumner and Cannon) and former Mound Employees, April 1996. (pages 98-99)

PREPARED BY:

Gary L. Coons, Member of EG&G Technical Staff

MOUND PLANT RECOMMENDATION

PRS 66

Background:

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

Recommendation:

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

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

Concurrence:

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

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

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

REFERENCE MATERIAL
PRS 66

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

Table A.1. Comprehensive Tabulation of Potential Release Sites

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
63	Building 19 Soils	G-5	Grounds	Cobalt-60	10	Cobalt-60	S	10	1 14, 16	SGS[b] Table B.5 Location 5221 Table B.9 RSS[c] Locations C0099, C0100, S0530, S0532, S0533, S0534, S0535, S0538 (Appendix E in Ref. 6)	12 6
64	Building 19 Historic Gasoline Tank (Tank 238)	G-5	Historical	Gasoline	3	No information on when tanks were removed			No Data		
65	Building 61 Area, Former Heavy Equipment Area	E-10	Historical	Waste oil	1, 5, 7, 18	Suspected	S	7, 10	3, 4, 5, 6, 8 1 14	Tables B.6, B.7, B.8, and B.9 SGS[b], Table B.3 Locations 2216 and 2217 RSS[c] Locations S0233, S0234, S0235, S0236, S0237, S0240 (Appendix E in Ref. 6)	7 12 6
66	Area 7, Thorium and Polonium Wastes	E-8 E-9 F-8 F-9	Historical	Plutonium-238, Thorium-232 and -238, Polonium-210, Actinium-227, Radium-226, Cesium-137	1, 4, 5, 18	Suspected	S	4, 12, 18	14, 15, 16 1	Table B.1 (Table III.5 in Ref. 6) SGS[b] Table B.3	6 12

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

DEPARTMENT OF ENERGY
ALBUQUERQUE FIELD OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES

FINAL

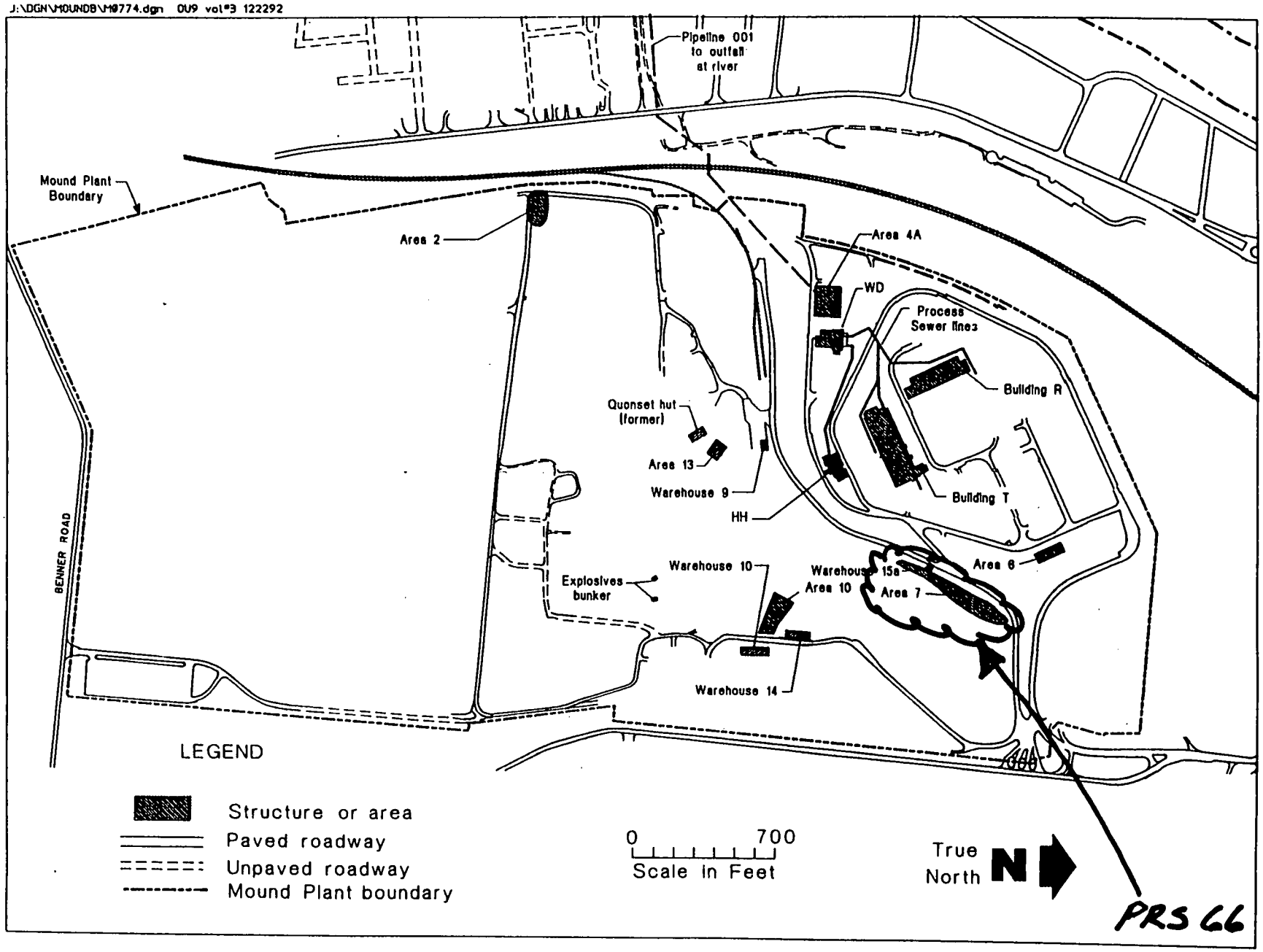


Figure 3.1. Polonium processing areas.

in a 100-ft by 40-ft trench. The trench may also contain a polonium-contaminated washing machine. Polonium has a half-life of 138.4 days, and is no longer present due to radioactive decay.

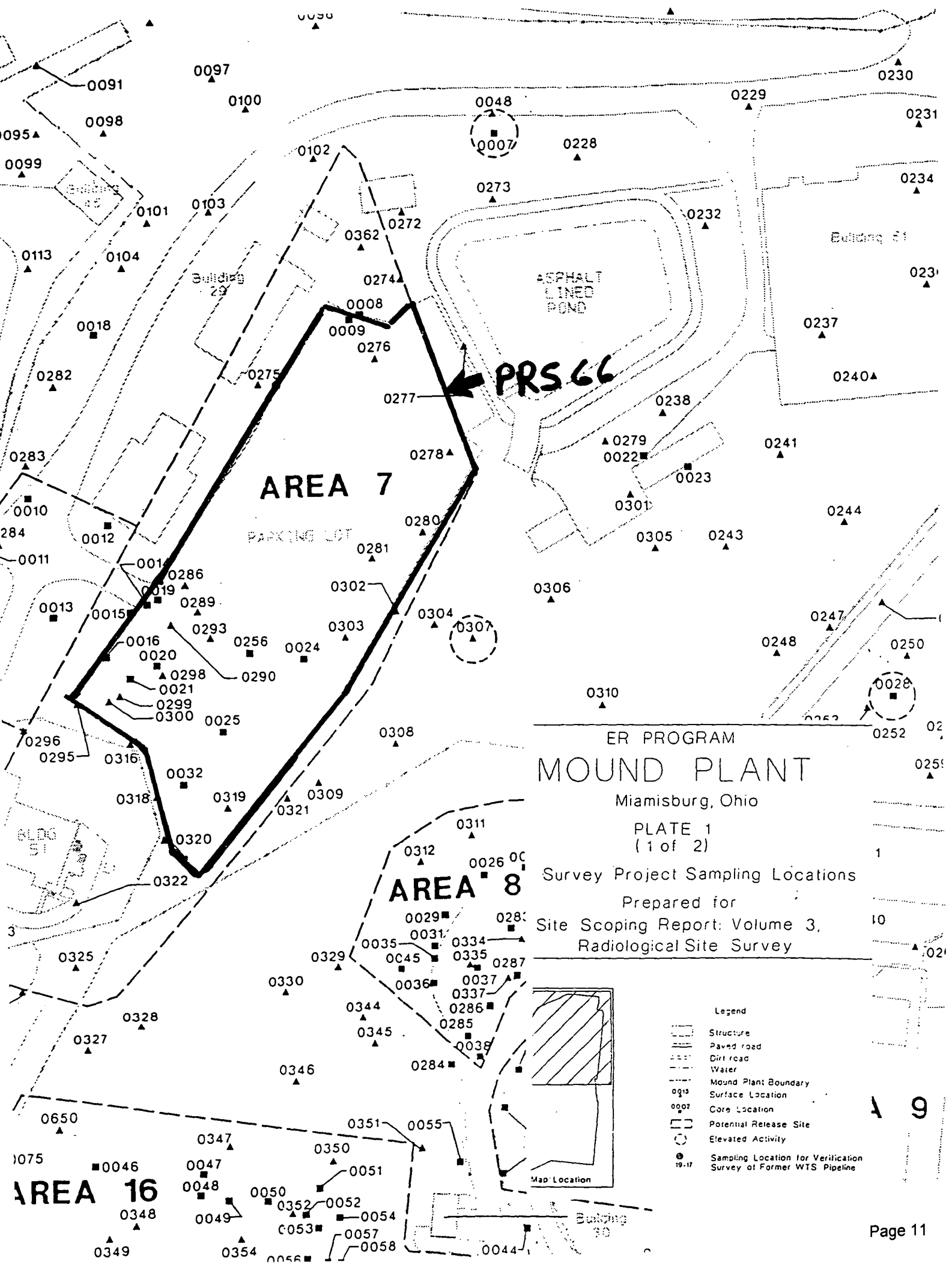
No surface soil samples were collected during the Site Survey Project, and only one core location was sampled in Area 6, location C0003 (Plate 1; Table III.4). No results were given for plutonium-238 or thorium for the samples collected from this core location. Gamma spectroscopy results were given, with radium-226 being the only radionuclide detected above the LDLs and with all measurements below 1 pCi/g.

Area 6 may have been covered with up to 30 ft of fill when the parking lot was built. The core location sampled during the Site Survey Project was only sampled to 180 inches, or 15 ft. Because the boring log for location 0003 is not available, it is not known if drilling was stopped because bedrock was reached or if any signs of the original trench were observed during the sampling. The location of the buried drums may be indicated by the magnetic anomaly depicted in the Preliminary Results of Reconnaissance Magnetic Survey (DOE 1990).

3.3.3. Area 7

Area 7 is a large area located in the upper valley at Mound Plant, in the area of Buildings 29, 51, 66, and 98 (Plate 1). This area was once a steep ravine (part of the plant drainage ditch) that has a long history of debris disposal and infilling, including the disposal of approximately 2,500 empty thorium drums (1955-1966) some of which may have been removed and placed in Area 2; a polonium-contaminated washing machine (date unknown); a thorium-contaminated flat bed truck (mid-1960s); and soil containing actinium-227, radium-226, and thorium-228 from the SW Building, which was placed in an old septic tank behind Building 29. When a parking lot was built in this area, up to 40 ft of fill was used to level the ravine, except where the septic tank was located. The extent of Area 7 shown on Plate 1 is based on an interpretation of the site survey data made in the preparation of this report, and is similar to the area depicted in the original Site Survey Project Report. In the mid-1960s, materials contaminated with polonium-210 were also buried on the side of the ravine. An exhaust system from the remodeling of T Building and a large stainless steel washing machine were among the items. Smaller items contaminated with polonium-210 may also have been buried (Garner 1991).

The samples from Area 7 were analyzed mainly for plutonium-238 and thorium. The maximum plutonium-238 concentration detected was 7.40 pCi/g in the surface sample from location S0286 (Table III.5). The maximum total thorium concentration detected, 20.52 pCi/g, was found in the surface sample collected from location S0298 (Table III.5). Other radionuclides detected in Area 7 included radium-226, cesium-137, and tritium. Maximum concentrations detected were 2 pCi/g, 1.2



ER PROGRAM

MOUND PLANT

Miamisburg, Ohio

PLATE 1
(1 of 2)

Survey Project Sampling Locations

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

Table III.5. (page 2 of 5)

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
C0014	2025	2300	1701	05-83	18	0.31	b					
			1702	05-83	36	0.02	2.07					
			1703	05-83	54	0.02	2.18					
			1704	05-83	72	0.03	b					
			1705	05-83	90	0.87	b					
			1706	05-83	108	0.27	b					
			1707	05-83	126	0.50	b					
			1708	05-83	144	0.76	b					
			1709	05-83	162	0.23	2.74					
			1710	05-83	180	0.18	b					
			1711	05-83	198	0.45	2.48					
			1712	05-83	216	0.29	b					
C0020	2075	2315	5980	07-84	0	3.10	2.55		LDL	LDL	0.8	LDL
			1713	05-83	18	0.08	b					
			1714	05-83	36	0.01	b					
			1715	05-83	54	0.06	b					
			1716	05-83	72	0.17	b					
			1717	05-83	108	0.29	b					
			1718	05-83	126	0.12	b					
			1719	05-83	144	0.08	b					
			1720	05-83	162	0.11	b					
			1721	05-83	180	0.37	b					
			1722	05-83	198	0.07	b					
			1723	05-83	216	0.10	b					
C0015	2025	2315	1833	05-38	18	0.11	3.53		LDL	LDL	0.8	LDL
			1834	05-83	36	0.11	b					
			1835	05-83	54	0.10	b					
			1836	05-83	72	0.22	b		LDL	LDL	0.8	LDL
			1837	05-83	90	0.10	b					
			1838	05-83	108	0.08	b					
			1839	05-83	126	0.09	b					
			1840	05-83	144	0.09	b					
			1841	05-83	162	0.07	b					
			1842	05-83	180	0.07	b					
			1843	05-83	198	0.19	2.41					
			1844	05-83	216	0.34	b					
			1845	05-83	234	0.37	4.84					
			1846	05-83	240	0.25	b					

MOUND SOIL SCREEN DATA

Table III.5. (page 3 of 5)

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
C0016	2050	2350	1750	05-83	81[c]	0.19	b					
			1751	05-83	36	0.02	b					
			1752	05-83	54	0.02	b					
			1753	05-83	72	0.01	b					
			1754	05-83	90	0.08	b					
			1755	05-83	108	0.11	b					
			1756	05-83	126	0.06	b					
			1757	05-83	144	0.06	2.05					
			1758	05-83	180	0.11	b					
			1759	05-83	216	0.03	b					
			1760	05-83	234	0.07	b					
C0019	2025	2290	1823	05-83	18	0.54	2.61					
			1824	05-83	36	0.29	b					
			1825	05-83	54	0.27	b					
			1826	05-83	90	0.52	b					
			1827	05-83	108	0.10	b					
			1828	05-83	126	0.06	b					
			1829	05-83	144	0.14	b					
			1830	05-83	162	0.16	b					
			1831	05-83	180	0.12	b					
			1832	05-85	216	0.10	b					
C0021	2075	2340	5982	07-84	0	1.52	b					
			1867	05-83	12	0.86	3.23					
			1868	05-83	24	1.00	3.80					
			1869	05-83	36	NR	18.00					
			1870	05-83	48	0.20	6.94					
			1871	05-83	60	0.08	b					
			1872	05-83	72	0.12	b					
			1873	05-83	84	0.03	b					
			1874	05-83	96	0.04	b					
			1875	05-83	108	0.02	b					
			1876	05-83	120	0.04	b					
			1877	05-83	132	0.11	b					
			1878	05-83	144	0.13	b					
			1879	05-83	156	0.18	b					
			1880	05-83	168	0.10	b					
			1881	05-83	180	0.21	3.82					
			1882	05-83	192	0.09	b					
			1883	05-83	204	0.21	b					
			1884	05-83	216	0.17	b					
			1885	05-83	228	0.24	b					
			1886	05-83	240	0.18	b					

Table III.5. (page 4 of 5)

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
C0024	2125	2200	1805	05-83	126	0.02	b					
			1806	05-83	144	0.01	b		LDL	LDL	0.8	LDL
			1807	05-83	156	0.02	b		LDL	LDL	0.9	LDL
C0025	2150	2290	1815	05-83	12	6.60	3.90					
			1816	05-83	36	0.30	4.02		LDL	LDL	1.0	LDL
			1817	05-83	72	0.09	b					
			1818	05-83	90	0.05	b					
			1819	05-83	144	0.05	2.43					
C0256	2100	2240	8385	11-84	18	0.03	2.79					
C0032	2175	2340	1808	05-83	18	0.64	3.14		LDL	LDL	1.0	LDL
			1809	05-83	36	2.19	b					
			1810	05-83	54	0.62	b					
			1811	05-83	90	0.08	b					
			1812	05-83	144	0.05	b					
			1813	05-83	162	0.08	b					
			1814	05-83	180	0.03	b					
S0274	1875	1985	5971	07-84	0	0.01	b					
S0275	1900	2135	5970	07-84	0	0.29	b					
S0276[d]	1925	2035	5973	07-84	0	1.27	b		LDL	LDL	1.5	LDL
S0278	2025	2010	5974	07-84	0	5.28	b		LDL	LDL	0.9	LDL
S0280	2075	2060	5975	07-84	0	0.56	b					
S0281	2075	2110	5976	07-84	0	0.83	4.03					
S0286	2025	2265	4091	10-83	0	7.40	b	5.23				
S0289	2050	2265	5983	07-84	0	0.64	b					
			5978	07-84	0	2.72	b					
S0290	2050	2290	6753	08-84	0	1.21	b					
S0293	2075	2265	5979	07-84	0	0.66	b					
S0295	2075	2390	4090	10-83	0	0.64	b					
S0298	2085	2315	6758	08-84	0	3.01	20.52					
S0299	2085	2355	6755	08-84	0	0.41	b		LDL	LDL	1.2	LDL

RADIOCHEMICAL ANALYSIS

Table III.5. (page 5 of 5)

Plate 1 Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
S0300	2085	2365	6757	08-84	0	0.38	4.48					
S0302	2125	2110	6512	08-84	0	4.13	b					
S0303	2125	2160	2818	10-83	0	0.75	b					
S0316	2125	2365	4100	10-83	0	0.98	b	0.69	LDL	LDL	0.8	LDL
S0318	2175	2365	5990	08-84	0	0.72	b					
S0319	2210	2315	6852	08-84	0	1.17	b					
S0320	2210	2375	6850	08-84	0	6.81	6.73					
S0321	2225	2265	4099	10-83	0	0.61	b					
~~S0322~~	~~2225~~	~~2465~~	~~5989~~	~~08-84~~	~~0~~	~~0.78~~	~~b~~					
~~S0323~~	~~2225~~	~~2540~~	~~5988~~	~~08-84~~	~~0~~	~~0.48~~	~~0.84~~					
~~S0325~~	~~2275~~	~~2490~~	~~6849~~	~~08-84~~	~~0~~	~~1.70~~	~~b~~					
~~S0362~~	~~1835~~	~~2005~~	~~6227~~	~~08-84~~	~~0~~	~~0.28~~	~~b~~					

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

pCi/g, and 5.23 nCi/l, respectively. Seven coreholes and four surface samples (C0008, C0009, C0020, C0015, C0024, C0025, C0032 and S0276, S0278, S0299 and S0316, respectively; Table III.5) were analyzed for cobalt-60. All analyses indicate that nothing above the LDL was encountered.

The core locations in Area 7 were drilled and sampled to maximum depths of 96 to 234 inches (8 to 19.5 ft). Mound Plant drawing #FSE16472, reproduced in the Site Scoping Report: Volume 2 Addendum (DOE 1992f) indicates the depth to bedrock in this area is 9 to 15 ft at the north end of the area, and to 65 ft at the southern end near Building 51. Because a boring log is available for only one of the Area 7 locations, it is not known if bedrock was encountered during the drilling; however, it appears that the majority of the core sampling did not penetrate fill and reach the original disposal area.

~~3.7. AREA 10~~

Area 10 is located on the slope of the SM/PP Hill, adjacent to Area 12 (Plate 1). Area 10 contains concrete and debris contaminated with polonium-210 from the 1949 and 1950 demolition of the old Dayton operations (DOE 1992g). The debris was covered over with a layer of dirt. With a half-life of 138.4 days, the polonium-210 is no longer present due to radioactive decay. The actual size of the area affected by the debris disposal is unknown so the area depicted on Plate 1 should be viewed as schematic.

One surface sample was collected in Area 10 during the Site Survey Project, sample S0604 (Plate 1; Table III.6). This sample contained 11.8 pCi/g of plutonium-238 and less than 2 pCi/g of thorium. It is not known where this sample was collected in relation to the debris. No analyses are known for gamma spectroscopy that would have detected cobalt-60 or perhaps bismuth-207.

Because of its location on the slope of the SM/PP Hill, Area 10 is in a position to receive surface water runoff from areas upgradient, such as the adjacent Area 12. Since there are no other known contaminants associated with the concrete, it is believed that the plutonium-238 detected in the surface sample is the result of deposition from surface water runoff. The original Site Survey Project Report notes that more recent D&D Program core sampling in Area 10 indicated one sample with a plutonium-238 concentration between 10 and 99 pCi/g.

3.8. AREA 13

Area 13 is located near Building 49 in the valley between the Main and SM/PP Hills at Mound Plant. In 1950, wood contaminated with polonium-210 from the demolition of the Dayton operations was stored in this area along with equipment stored in tents. The wood, tents and other debris was burned in Area 13 in 1955 (DOE 1992g). Metal and other residual materials that survived the fire were subsequently buried in the historic landfill (Area 2). With a half-life of 138.4 d

in the project report (Stought et al. 1988) is accurate. However, a more recent survey of the sanitary sewage drying beds in Area 3 indicate higher levels than reported by the Site Survey Project. Of 15 samples collected in the beds in 1988, the highest had a thorium-232 concentration of 63 pCi/g and a plutonium-238 concentration of 1235 pCi/g (Collins 1988). Additional discussion is provided in subsection 4.1.11.

The depth of the core samples collected in Area 3 during the Site Survey Project ranged from 18 inches to a maximum of 180 inches. Most core locations were only sampled to a depth of approximately 36 inches. The depth to bedrock in this area appears to range from 300 to 900 inches or about 25 to 75 ft (DOE 1992b). Boring logs are available for two Area 3 core locations, 0105 and 0113, and indicate that these locations were not sampled to bedrock (Appendix B).

5.5. AREA 7

Area 7 is a large area located in the upper valley at Mound Plant, behind or below Buildings 29, 51, 66, and 98 (Plate 1). This area was once a steep ravine that formed the upper reach of the plant drainage ditch. This area has a long history of debris disposal and infilling, including the disposal of approximately 10,000 empty thorium drums in the late 1950s to early 1960s, a polonium-contaminated washing machine (date unknown); a thorium-contaminated flat bed truck, and other equipment used in repackaging the thorium sludges. In the mid 1960s, materials contaminated with polonium-210 were also buried on the side of the ravine. An exhaust system from the remodeling of T Building and a large stainless steel washing machine were among the items. Smaller items contaminated with polonium-210, may also have been buried. The Site Scoping Report: Volume 6 - Photo History (DOE 1992b) documents several episodes of filling and construction. Plate 4 - Estimation of Fill Materials in Site Scoping Report: Volume 5 - Topographic Maps (DOE 1992a) indicates that over 30 feet of fill materials may exist in Area 7.

The current extent of Area 7 shown on Plate 1 is based on an interpretation of the site survey data made in the preparation of this report, and is similar to the area depicted in the original Site Survey Project Report (Stought et al. 1988). The area shown is actually larger than the estimate of the area used in the historic disposals. On the north end of Area 7 is an old buried septic tank that was first used during plant construction, and was the site of disposal of actinium- and radium-bearing soils excavated from the SW Building in 1955 (DOE 1992g), which is described in section 7 of this report.

The samples from the locations in Area 7 were analyzed mainly for plutonium-238 and thorium. The maximum plutonium-238 concentration detected was 7.40 pCi/g in the surface sample from location 0286 (S0286 on Table III.5). The maximum total thorium concentration detected, 20.52 pCi/g, was found in the surface sample collected from location S0298. Other radionuclides detected in Area 7

included radium-226, cesium-137, and tritium. Maximum concentrations detected were 2 pCi/g, 1.2 pCi/g, and 5.23 nCi/l, respectively.

The core locations in Area 7 were drilled and sampled to the maximum depths of 96 to 234 inches (8 to 19.5 ft). Mound Plant drawing #FSE16472 (DOE 1992f) indicates the depth to bedrock in this area is 9 to 15 ft at the north end of the area, and to 65 ft at the southern end near Building 51. Because a boring log is available for only one of the Area 7 locations, it is not known if bedrock was encountered during the drilling; however, it appears that the majority of the core sampling did not penetrate fill and reach the original disposal area. The area of thorium drum and other disposals of magnetic materials are depicted in the Preliminary Results of Reconnaissance Magnetic Survey (DOE 1990).

During the early 1970s, it is believed that some of the trash from the historic landfill was excavated and removed to the ravine (DOE 1991a). This fact was not substantiated during research for the scoping reports, but if true, it would suggest the possibility that some hazardous chemicals could have been relocated from the historic landfill to Area 7. Area 7 was one of the original areas identified in the early 1970s as a historic burial site for materials containing residual radionuclides. Some errors were apparent on the original map of Hot Waste Burial Sites compiled in the early 1970s and reproduced in the Site Scoping Report: Volume 7-Waste Management (DOE 1992g). For example, the thorium contamination was listed as thorium-228 when in fact thorium-232 was the dominant isotope in the Thorium Monex Process. Later versions of the map appeared in the Waste Management Site Plans of the mid 1970s with the correct thorium-232 isotope identified.

~~5.6. AREA 8~~

Area 8 is located on the SM/PP Hill in a low-lying area north of Building 31 (Plate 1). This area contains thorium-contaminated soils excavated from Areas 1 and 9 in 1966 and 1965, respectively. About 6 inches of topsoil was used as a cap. In 1984, a concrete pad was installed and some of the thorium contaminated soils were excavated. Soils with a contamination level greater than 15 pCi/g were boxed for offsite disposal and the remaining materials moved to the eastern, upper part of Area 12 (Draper 1985). The extent of Area 8 shown on Plate 1 is based on a review of Site Survey Project data conducted during the preparation this report, and is similar to the area described in the original report (Stought et al. 1988). The original report boundaries do not consider the isopleth contour shapes depicted on Plate 5.

In situ gamma spectroscopy for thorium-232 was performed at 14 core locations in Area 8. These analyses are identifiable in Table V.3 by a "None" given as the MRC ID. *In situ* analysis for thorium-232 was performed at core locations 0026, 0027, 0029, 0030, 00

Environmental Restoration Program

OPERABLE UNIT 9, SITE SCOPING REPORT VOLUME 6 - PHOTO HISTORY REPORT

MOUND PLANT
MIAMISBURG, OHIO

February 1992

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
Technical Support Office
Los Alamos National Laboratory

4. PHOTOINTERPRETATIVE DESCRIPTIONS OF WASTE DISPOSAL AREAS

For ease of description, the Northern and Southern Study Areas include the north parking lot and upper valley areas. The Southern Study Area includes the landfill and lower valley areas (Figure 4.1). The four areas of interest are described in the subsections that follow.

4.1. NORTH PARKING LOT AREA

The north parking lot area is located in the northeastern corner of the Mound Plant site. The north parking lot area is currently comprised of a small paved parking lot near the guard house and a large parking area north of the main entrance into the Mound Plant.

In the 1959 photos of this area (Figure 4.2), several small areas of disturbed soil bordering the northern and southeastern corners of the small parking lot are evident. The area east of the road leading to this small paved parking lot contains a large circular depression encircled by a dirt road. The western portion of this depression exhibits evidence of a foundation of a preexisting structure backed on the west by a steep excavation in the form of a retaining wall or berm. Trenching is evident to the southeast of this feature along both sides of the dirt road. To the immediate northeast of the depression is a disturbed area, roughly circular in outline. A trench bordered by excavation dirt is situated in the far northeastern portion of this area.

The small paved parking lot identified in the 1959 photograph was extended to the south in unpaved form by 1964, resulting in regrading of the hilltop surface and extensive areas of disturbance bordering the new lot (Figure 4.3). In the parking area to the east, this circular depression becomes a paved, three-tiered parking lot and access road. Areas of disturbance border the parking lot on the north and south. Leading from the southeast corner of the lowest tier of the parking lot is a linear trench oriented northeast to southwest. Areas of disturbance bordering the 1959 trench to the northeast are smaller but still evident in the 1964 photograph.

The small paved parking lot near the guard house (Figure 4.4) had been paved by 1968. The hillslopes east and south of this parking lot have been regraded. All previous evidence of surface disturbance have been obscured. This parking lot continues in use with no major changes in 1973, 1975, 1979, and 1981.

By 1968, the tiered parking lot is considerably expanded to the north and east extending to the limits shown on the base map. The area to the south of the access road shown in the 1964 photograph has been completely regraded (Figure 4.4). These activities obscure all previous evidence of surface disturbance. The expanded parking lot continues in use in 1973, 1975, 1979, and 1981.

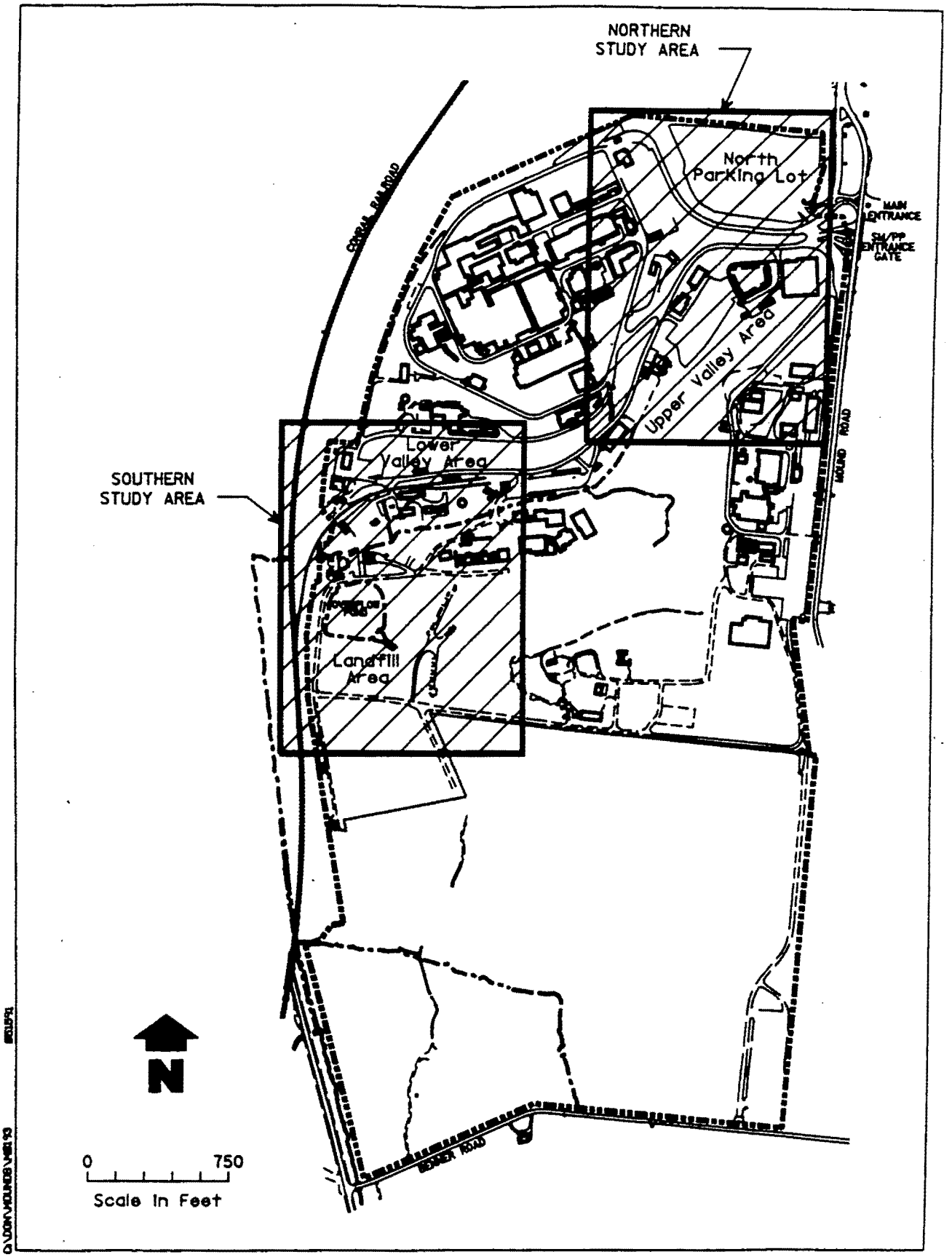


Figure 4.1. Locations of north parking lot and upper valley area in Northern Study Area, and lower valley and landfill areas in Southern Study Area.

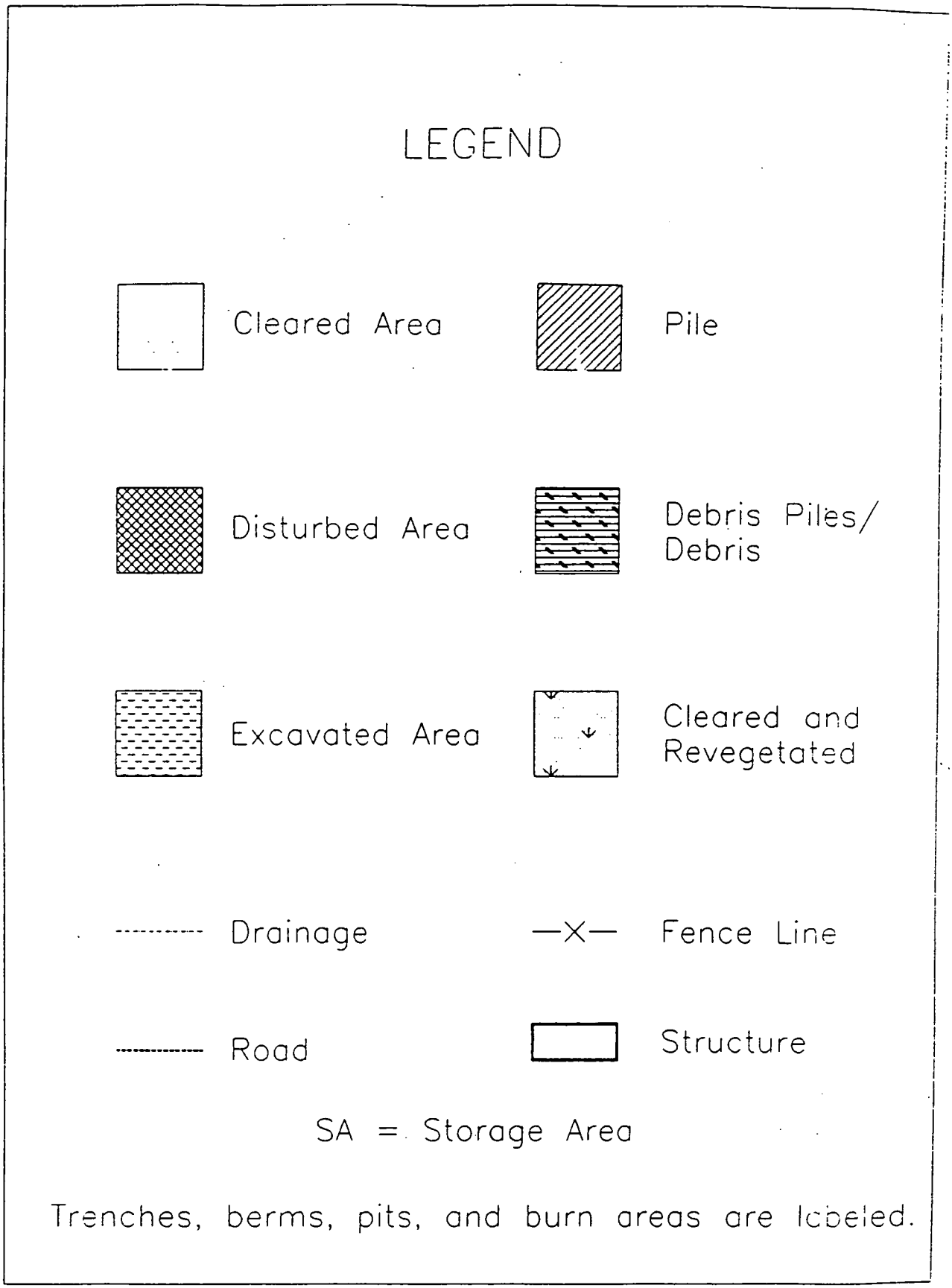


Figure 3.1. Legend of map units for aerial photograph interpretive mapping.

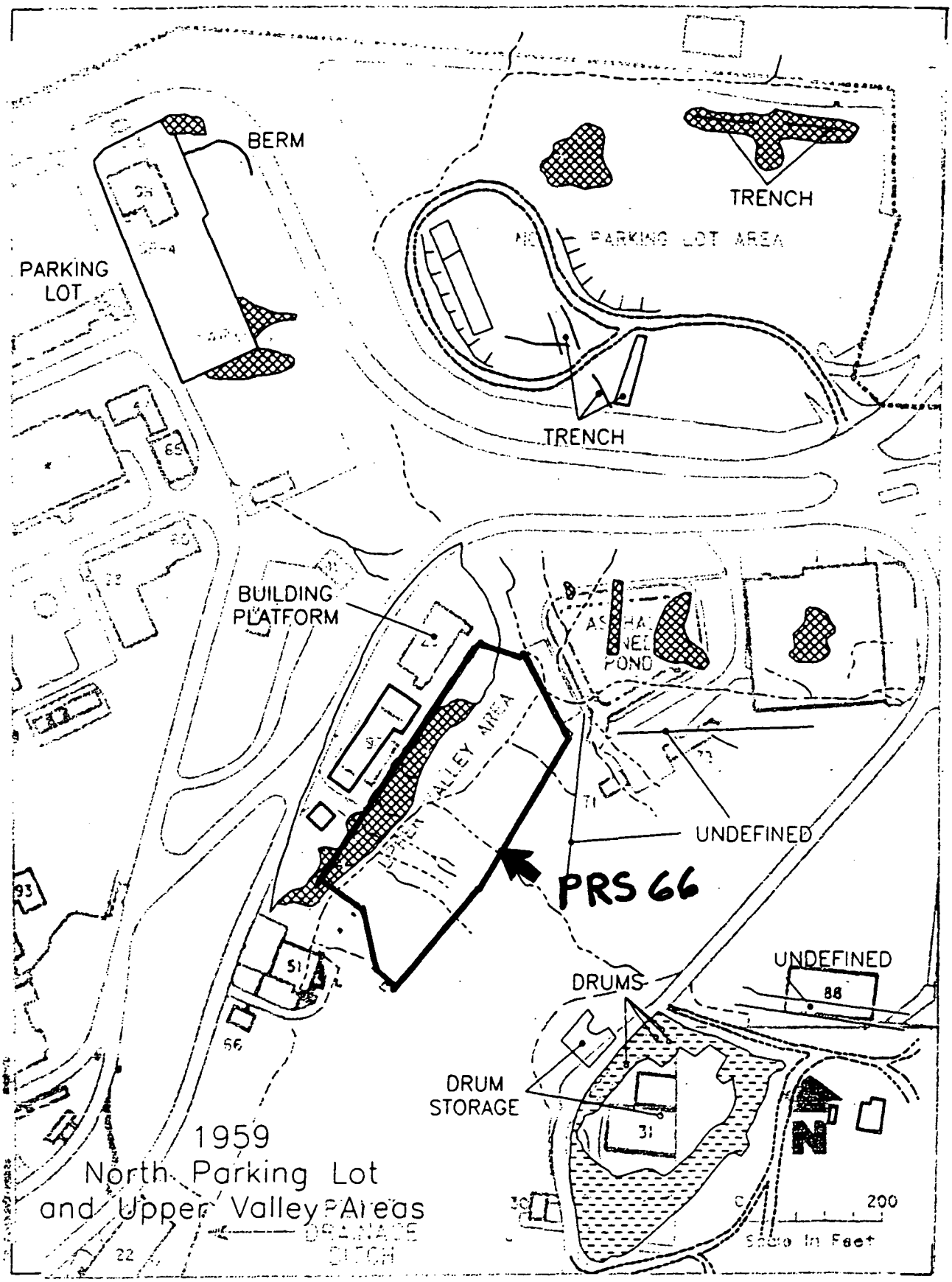


Figure 4.2. Interpretive map of Northern Study Area - 1959.

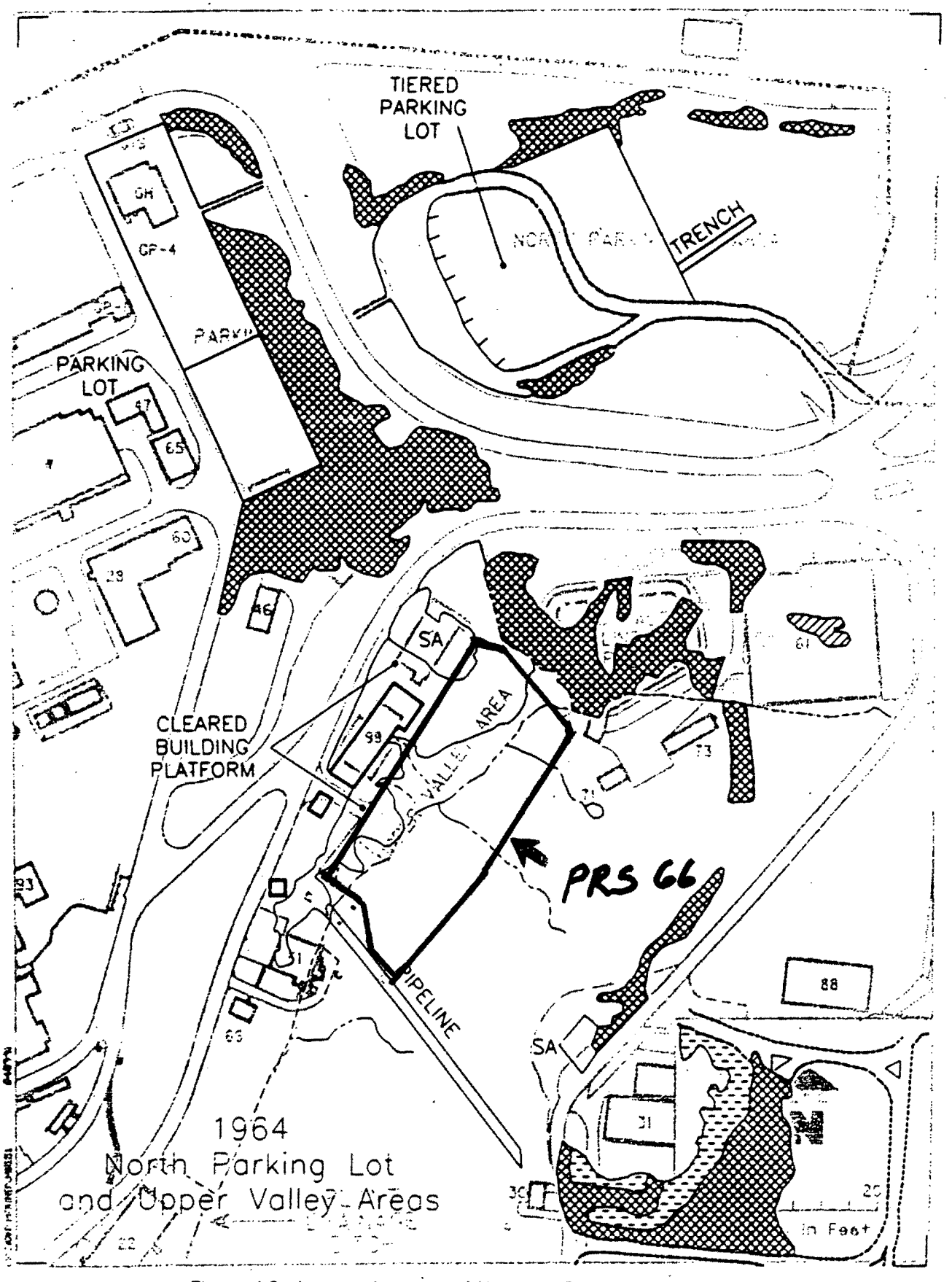


Figure 4.3. Interpretive map of Northern Study Area - 1964.

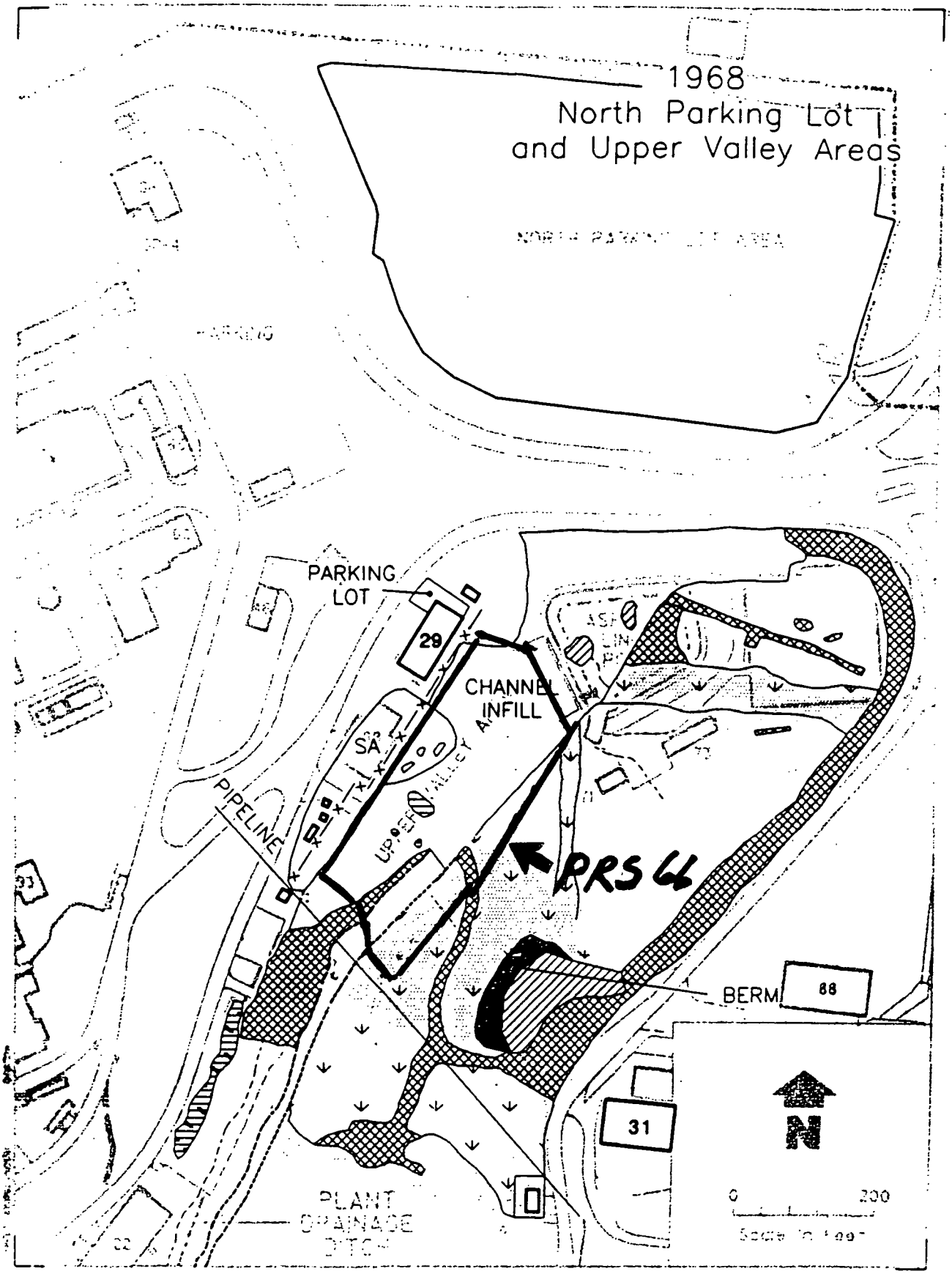


Figure 4.4. Interpretive map of Northern Study Area - 1968.

4.2. UPPER VALLEY AREA

The upper valley area is located in the northeastern portion of the Mound Plant site, south of the north parking lot area. Currently, the area of interest is largely comprised of a series of paved parking lots and an asphalt-lined pond built on fill materials. The integrity of the original drainage channel is maintained in 1959 (Figure 4.2). West- and southeast-trending tributaries meet to form the main southwest-flowing channel. Small disturbed areas lie to the north of the eastern tributary, and buildings are situated on a cleared platform to the west. Disturbed soils cut by drainages flowing east from the platform may indicate material dumping along this edge of the platform. There is clear evidence of a large number of drums stored on the upland in the southeast portion of the base map area. Lines of drums are also evident in a smaller area to the northeast of the large drum stack. In 1959, small dirt roads bordered all sides of the large drum storage area. Several undefined linearities, possibly abandoned roads, lie to the north.

The building platform extends to the southeast in the 1964 photograph with resultant in-filling to the drainage channel (Figure 4.3). However, most of the drainage remains intact. An extensive, irregular pattern of surface disturbance, including cleared and disturbed areas, occurs to the north of the drainage. A smaller linear pattern of disturbed soil also projects from here to the south. The surface of the large drum storage area visible in 1959 is completely cleared in the 1964 photograph. The cleared surface of the smaller drum storage area in the 1959 photograph is still evident in 1964. The road configuration around the location of the 1959 drum storage area has been slightly altered with the easternmost road extended to near the limits of the plant site. A northwest-southeast oriented pipeline crosses the southern end of the entire area and remains through 1981.

By 1968, channel in-filling has proceeded to the extent that an extensive building platform has been constructed to the west of the old drainage course, partially obscuring the drainage (Figure 4.4). The buildings on the 1964 platform have been replaced, with Building 29 situated farther to the north in an area identified as a storage area in 1964. Storage of materials is evident south of this building along the platform and some piles of material are present on the channel in-fill platform. An area of disturbed soil lies north of the remaining intact drainage, which is bordered on the west by an area of debris. The eastern portion of the North Valley Area is crossed by linear patterns of disturbed or cleared and re-vegetated areas. The site of the smaller drum storage area in 1959 has now been completely graded, resulting in a large pile of dirt lying just north of the road. Downslope from this feature and bordering it on the northeast is a C-shaped earthen berm the width of the dirt pile. Across the road, Building 31 has been constructed on a site that had been used for drum storage in 1959.

The 1973 photograph reveals continued channel in-filling to the south with the course of the original drainage completely obscured above Building 22 (Figure 4.5). Building 51 is constructed south of the

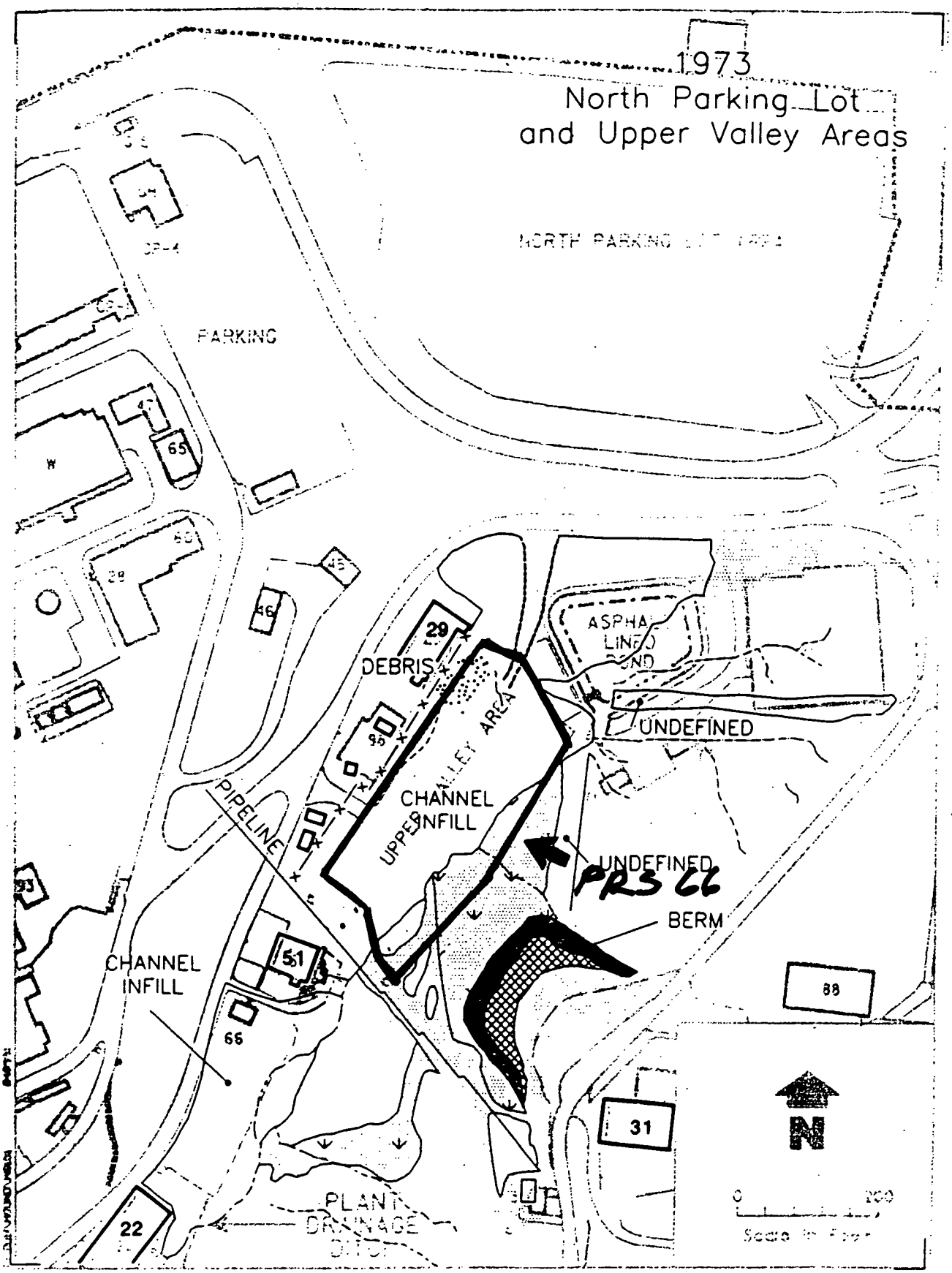


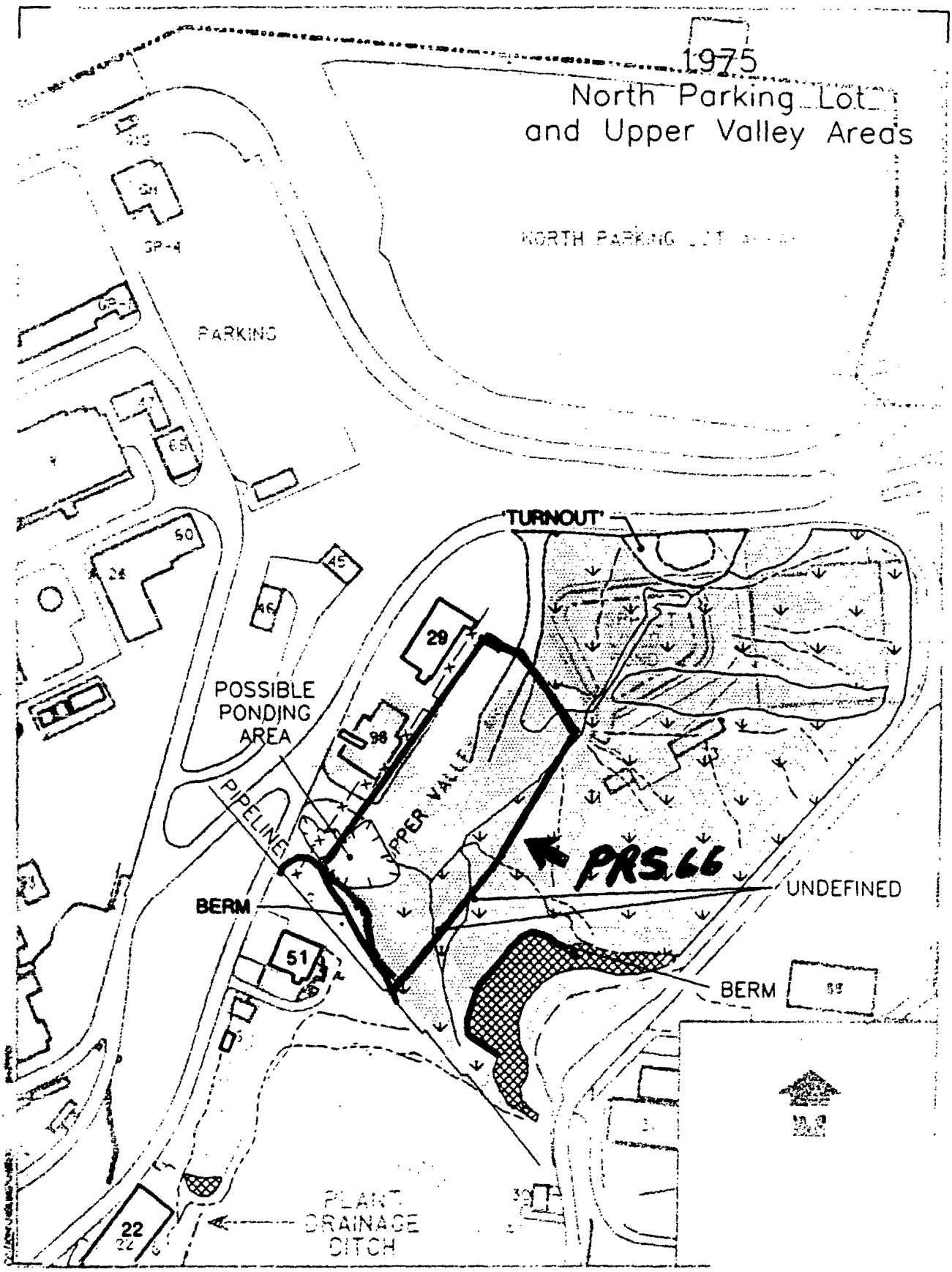
Figure 4.5. Interpretive map of Northern Study Area - 1973.

pipeline. Debris is evident on the channel in-fill surface behind the buildings and a new road enters the area on the north where none existed in 1968. The large dirt pile northeast of Building 31 in 1968 has been leveled resulting in a platform and disturbed slope which continue to be bordered by a large earthen berm. Re-vegetated and cleared linearities remain evident to the east of the old drainage course, and shallow drainages flow to the northwest and west down this slope.

Large portions of the platform formed by channel in-fill are re-vegetated by 1975 (Figure 4.6), but the central valley area behind the buildings still appears cleared. The drainage channel appears to have reestablished itself north of Building 22 and a berm now exists north of Building 51 that forms the southern edge of a drainage impoundment. In-filling continues near Building 22. A large cleared surface now exists between Buildings 51 and 22. Two large cleared areas are situated at the top and bottom of the eastern side of the North Valley Area. Numerous small drainages flow to the north and west down this slope. A new road "turnout" is in use along the main road at the northern end of the area. Two undefined channels are situated downslope from the berm on the east.

Construction of the asphalt-lined pond and surrounding utilities trenches is evident in 1979 (Figure 4.7). The installation of a sanitary sewerline is evident as four small pits are situated in the excavation area along with a larger U-shaped pit in the southwestern corner of this area. One linear and one L-shaped trench are also evident. Bordering the pits and trenches are ten piles of excavated fill and one linear debris pile along the southern edge of the road leading to Building 29. Lines of pipe, or the impressions left behind by these objects on the ground, occur on the eastern edge of the excavation area and on the northern edge of the bermed platform to the south. A large, semi-circular, excavated depression is evident that appears to be the origins of the asphalt-lined pond. Smaller disturbed areas lie to the east and one undefined linearity borders the area of main excavation activity on the southeast. Small west-flowing drainages cut the slope to the southeast of the excavation area. Much of the remaining in-fill platform has been heavily re-vegetated, although some cleared areas can be seen on the central and southern portions of the platform. The drainage impoundment and berm are still evident north of Building 51. Between Buildings 51 and 22, the in-fill platform is disturbed with a trench and associated dirt pile at its northern end. The re-established drainage cuts through this disturbed area and flows to the southwest. Several areas that have been cleared of heavy vegetation occur to the south and southeast of Building 51.

By 1981, the asphalt-lined pond has been constructed within the former excavation area and a new building constructed to the east (Figure 4.8). Building 61 was subsequently enlarged to its present configuration in the mid-1980s. A disturbed area occurs to the southwest of the pond and is bisected by a narrow, undefined linear feature. Two other undefined linear features lie to the east, as does a larger, east-west oriented, linear-shaped feature. A formal parking lot is established south of Building 29 at the previous site of a cleared building platform in 1979. In all years after 1959, small structures were present in


1975
North Parking Lot
and Upper Valley Areas
NORTH PARKING LOT AREA
PARKING
'TURNOUT'
POSSIBLE
PONDING
AREA
PIPELINE
UPPER VALLEY
PRS.66
UNDEFINED
BERM
BERM
PLANT
DRAINAGE
DITCH
29
51
22
45
46
60
24
98

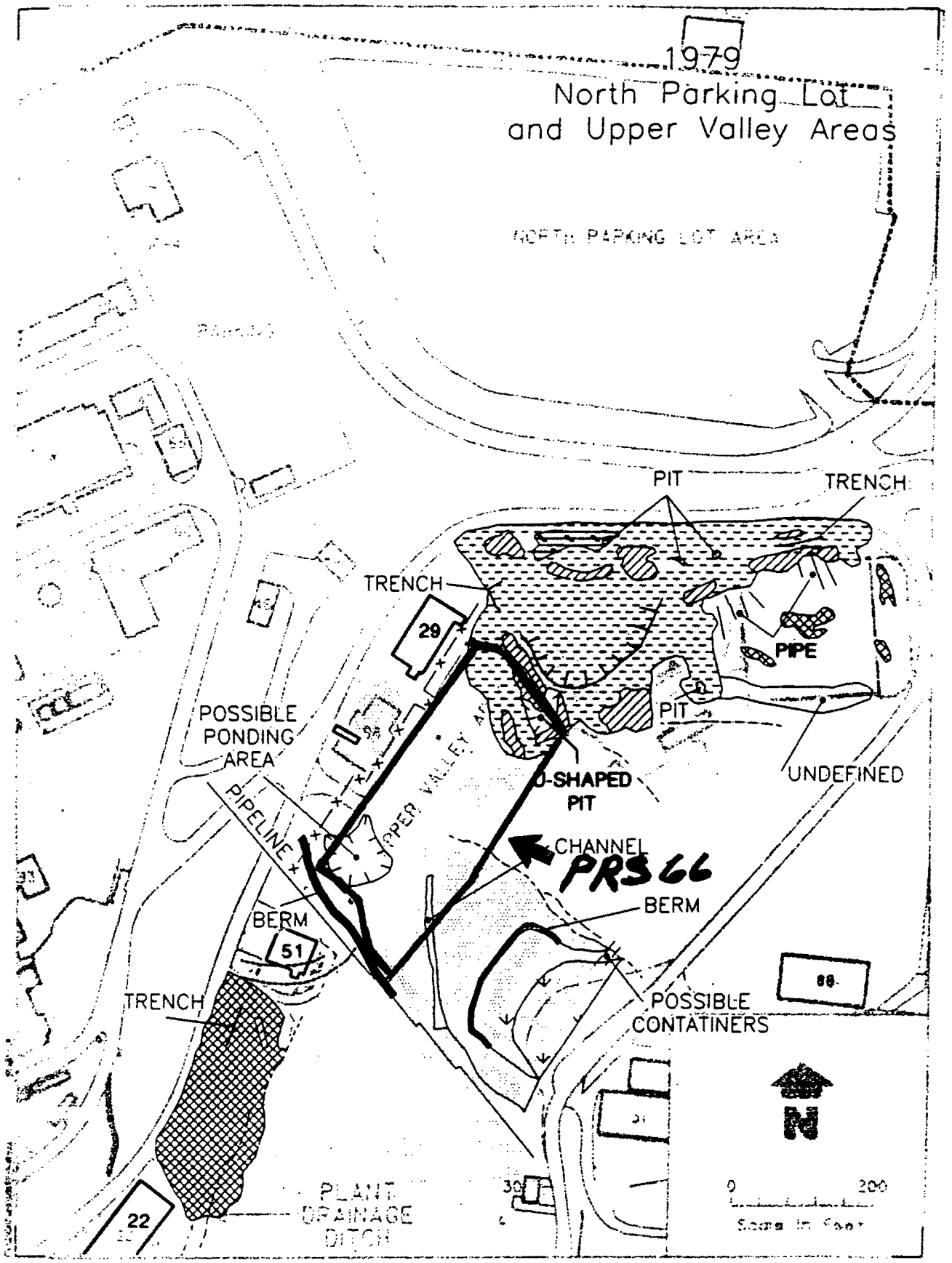


Figure 4.7. Interpretive map of Northern Study Area - 1979

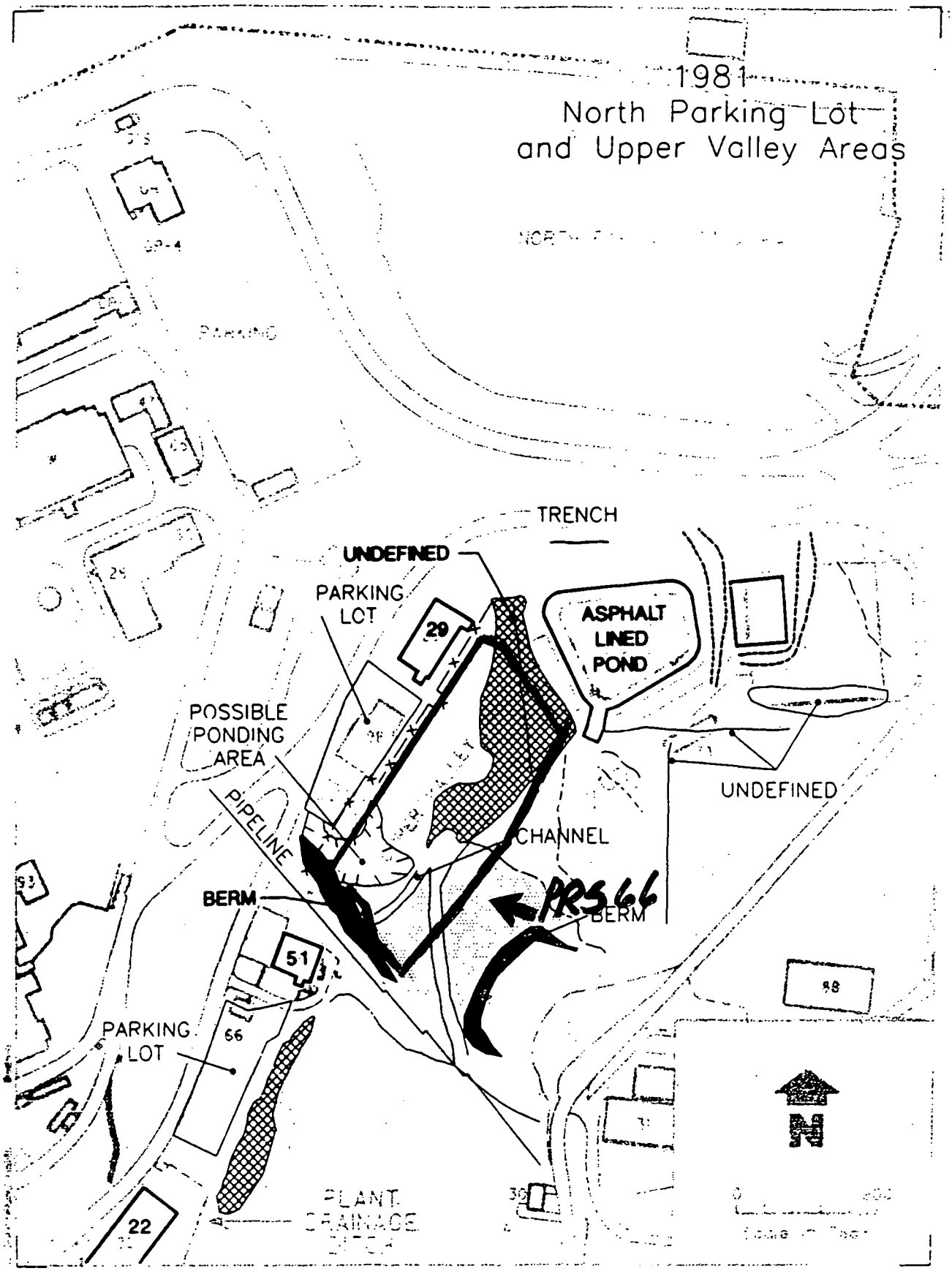


Figure 4.8. Interpretive map of Northern Study Area - 1981.

the continued replacement and repacking of the drums over the 10-year time span. The best current estimate is that the majority of these drums were placed in Area 7 (Meyer 1991; Garner 1991) and the remainder in Area 2. Also associated with the thorium project was a flatbed truck and a conveyor belt device used in the repackaging operations. This truck was previously reported to have been buried in the early 1950s and to have been contaminated with polonium-210 (DOE 1991c). It now appears likely that the dominant contaminant was thorium-232 from the repackaging operations and that the truck could not have been buried until that operation was completed in the mid-1960s (Garner 1991).

In either 1959 or 1960, concrete, soil, and gravel excavated from the west side of the SW Building were dumped in an old septic tank in the northern part of what is now included in Area 7 (DOE 1991c). The septic tank was installed for use during plant construction, but was abandoned during the 1950s. The contaminated materials contained radium-226, actinium-227, and thorium-228, which probably originated from a leaky sump (MCC 1953-1957) associated with the "old cave," now known as Area 15. The dirt and gravel were excavated in 1955 as part of the construction of the thorium refinery project (Meyer 1955c). The volume of material involved is estimated to have been about 100 to 150 ft^3 (Garner 1991). The septic tank appears to have been drilled, and core samples were collected during the Site Survey Project (DOE 1991c). Residual actinium-227 was detected at a concentration of 1,400 pCi/g at a depth of 144 inches (DOE 1991c).

In the mid-1960s, materials contaminated with polonium-210, including an exhaust system from the remodeling of T Building and a large stainless steel washing machine, were also buried on the side of the ravine. Smaller items contaminated with polonium-210 may also have been buried (Garner 1991).

During the research for this report, one unusual entry was noted in the logbooks maintained by decontamination workers. The log records that on April 29, 1965, seven 30-gallon drums [sic] of dirt were removed from road below Warehouse [sic] 15A (MRC 1961-1968). Warehouse 15A was used during this time period for a storage and shipping point for radioactive trash and wastes. No other information was obtained for this activity.

During the early 1970s, it was rumored that some of the trash from the historic landfill was excavated and removed to the ravine (DOE 1991a). This rumor has been difficult to substantiate; but, if true, it would suggest the possibility that some hazardous chemicals could have been relocated from the historic landfill to Area 7. Area 7 was identified as a historic burial site for materials containing residual radionuclides. The original map compiled during that early effort (Hebb 1972) is reproduced in Appendix A. Some errors were apparent on the original map. For example, the thorium contamination was listed as thorium-228 when in fact thorium-232 was the dominant isotope in the thorium sludges.

Document Control No. _____

Environmental Restoration Program

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

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

MOUND PLANT
MIAMISBURG, OHIO

February 1993

FINAL
(Revision 0)

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

also supported by the interpretation of historic aerial photographs, which indicate that the historic landfill may have occupied areas presently under the paved roads (DOE 1991f).

Area 2 was investigated for radiological contamination during the Site Survey Project (DOE 1991b). The maximum concentration of plutonium-238 was 17.1 pCi/g in a sample taken at a depth of 18 inches. The maximum thorium concentration detected was 3.31 pCi/g at a depth of 108 inches. Neither of the two boreholes in the area appear to have been located to exactly penetrate the thorium drums (DOE 1991b).

6.1.1.2. Area 6, Polonium-Contaminated Waste (Historical)

Area 6 is southeast of the GH Building on the Main Hill, in the northern portion of Mound (DOE 1991b) (Figure 6.1). The area is currently a parking lot and may overlap Area F, the chromium trench. In 1964, at least three 55-gallon drums of polonium-contaminated sand were placed in this area. The sand was contaminated during cleaning (sandblasting) of the metal framework of the WD Building sand filters. The sand was originally contained in drums that were placed in Area 6, in a 100-ft by 40-ft trench. The trench was covered with up to 30 ft of clean fill dirt before the parking lot was built. The trench may also contain a polonium-contaminated washing machine (Thomas 1991). Polonium has a half-life of 138.4 days and is no longer present due to radioactive decay. The 1982 to 1985 Radiological Site Survey (DOE 1991c) detected low levels of radium-226 (all below 1 pCi/g) in soil samples at various depths.

6.1.1.3. Area 7, Thorium, Polonium, and Actinium Wastes (Historical)

Area 7 is in the northeast portion of Mound, southwest of the asphalt-lined pond (Figure 6.1). The area encompasses about 140,000 ft^2 and is currently covered by a paved parking lot constructed in 1984. Buildings 51, 66, and 98 are also located over the area, which originally formed the upper reach of the plant drainage ditch. Many years of debris disposal and infilling have buried the original ravine (DOE 1992c).

Area 7 has been the site of extended disposal of residual materials including thorium, polonium-210, and some actinium-227. The thorium repackaging operations that extended from the mid-1950s to the mid-1960s generated between 15,000 and 20,000 steel drums. It is estimated that between 10,000 and 15,000 of these drums were crushed and buried along the western part of the original ravine. The remainder are probably buried in Area 2. This disposal tended to create usable land along this part of the ravine. In the Site Scoping Report: Volume 3 - Radiological Survey Report (DOE 1991c), it was reported that 2,500 drums were buried in Area 7, but that number fails to account for

Later versions of the map appeared in the waste management site plans of the mid-1970s (e.g., MRC 1974c) with the correct thorium-232 isotope identified.

The contamination levels within Area 7, reported as a result of the Site Survey Project investigation, are plutonium-238 and thorium concentrations of 7.40 and 20.52 pCi/g, respectively, in surface samples (DOE 1991c). Other radionuclides detected included radium-226 (2 pCi/g), cesium-137 (1.2 pCi/g), and tritium (5.23 nCi/L).

~~6.1.1.4. Area 8, Thorium-Contaminated Soils from Areas 1 and 9 (Historical)~~

Area 8 is northwest of Building 31, on the SM/PP Hill in the eastern portion of Mound (Figure 6.1), and encompasses approximately 25,000 ft^2 (MRC 1985a). Area 9 and Area 1 were contaminated by the repackaging of the thorium-232 sludges in 1965 and 1966. When these areas were scraped to remove the surficial contamination (in 1965), the soils were disposed of in Area 8 and Area 12. During the 1982 to 1985 Radiological Site Survey (DOE 1991c), plutonium-238 was detected at a maximum concentration of 24.4 pCi/g in a surface sample; all other surface samples were less than 10 pCi/g. The maximum thorium concentration was 254.3 pCi/g in a subsurface sample at a depth of 80 inches.

6.1.1.5. Area 10, Debris from Dayton Units (Historical)

Area 10 is west of Building 30, on the slope of the SM/PP Hill, in the east-central portion of Mound (Figure 6.1) (DOE 1991c). It was used for the disposal of concrete contaminated with polonium-210 from the Dayton operations. The concrete was deposited in 1950 and, because of the short half-life of polonium-210 (138.4 days), is no longer radioactive (DOE 1992g). One hundred and sixty truckloads of debris were brought to Mound from Dayton Unit IV (Halbach 1950), and 100 truckloads were brought from Unit III. It is unknown how much of this was stored in Warehouse 10, the tropical huts, or dumped in Area 10. Many of the temporary buildings at Unit III were also razed and brought to Mound when that facility was decommissioned. Some more recent concrete disposal may also have occurred, but nothing is known for certain. The area is estimated to be approximately 150 ft by 100 ft. The single surface soil sample collected from Area 10 during the 1982 to 1985 Radiological Site Survey had a plutonium-238 concentration of 11.8 pCi/g and a thorium concentration of less than 2 pCi/g (DOE 1991c).

6.1.1.6. Area 12, Thorium-Contaminated Soil from Area 1

Area 12 is west of Building 38, on the SM/PP Hill, in the eastern portion of Mound (Figure 6.1) (DOE 1991c). In 1965, soil contaminated with thorium-232 was transferred to

ENVIRONMENTAL RESTORATION PROGRAM

SOIL GAS SURVEY AND GEOPHYSICAL INVESTIGATIONS MAIN HILL AND SM/PP HILL AREAS RECONNAISSANCE SAMPLING

MOUND PLANT
MIAMISBURG, OHIO

February 1993

DEPARTMENT OF ENERGY
ALBUQUERQUE OFFICE

ENVIRONMENTAL RESTORATION PROGRAM
EG&G MOUND APPLIED TECHNOLOGIES

Table II.8 summarizes the positive detections from the Building 51 area sampling effort. Seven of the eight target compounds were detected in the soil vapor samples. These detections are shown on Figures 2.29 through 2.36. These figures also show Area 7 results. Toluene was the only VOC detected in either of the two water samples. Freon 11 was detected at two locations and three depths at concentrations ranging from 5 to 89 ppb (Figure 2.29). Freon 113 was detected in the 15- and 25-foot samples at one location at 8 and 18 ppb, respectively (Figure 2.30). Cis-12DCE was detected in the 15-foot samples from two locations at concentrations of 8 and 18 ppb (Figures 2.31). 111TCA was detected at two locations and three depths at concentrations ranging from 4 to 37 ppb (Figure 2.32). PCE was detected at three locations and four depths at concentrations ranging from 7 to 44 ppb (Figure 2.33). TCE was detected in the 15- and 25-foot samples at three locations at concentrations ranging from 9 to 207 ppb (Figure 2.34). Toluene was detected at four locations and six depths at concentrations ranging from 0.2 to 37 ppb, however, all but the water sample collected from the 25-foot depth at location 4160 showed associated blank detections (Figure 2.35). Figure 2.36 shows the total VOCs detected at each location near Building 51 (excluding samples with associated blank interferences).

Table II.9 summarizes the blank detections from the Building 51 sampling effort. Two soil gas ambient blanks and one water trip blank contained toluene from 0.1 to 5 ppb.

2.3.4. Area 7

A total of 53 investigative samples were collected from Area 7. All locations were sampled at a 5-foot depth except samples 2211 and 2212, which were contingency samples collected from a 15-foot depth. One of the 5-foot samples was a water sample (2036). Table II.10 summarizes the positive detections from the Area 7 sampling effort. Area 7 detection figures are repeats of the Building 51 figures. Six of the eight target compounds were detected at Area 7. Freon 11 was detected at three locations at concentrations ranging from 7 to 32 ppb (Figure 2.29). Freon 113 was detected at four locations ranging from 4 to 33 ppb (Figure 2.30). CIS-12DCE was detected at two locations ranging from 3 to 10 ppb (Figure 2.31). 111TCA was detected at five locations ranging from 2 to 22 ppb (Figure 2.32). PCE was detected at two locations at 6 and 7 ppb (Figure 2.33). Toluene was detected at 24 locations within Area 7. Eight of the 24 locations had associated blank detections of toluene. Sample 2036 was a water sample, which also showed toluene in its associated field blank. Figure 2.35 illustrates the Area 7 toluene detections that do not have these associated blank detections. Figure 2.36 shows the total VOCs detected at each of the Area 7 sample locations.

TABLE II.8. SUMMARY OF POSITIVE DETECTIONS – BUILDING 51
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN–12DCE	CIS–12DCE	111TCA	PCE	TCE	TOLUENE
MND–01–4157–0025w	28 AUG 92	---	---	---	---	---	---	---	0.2 *
MND–01–4160–0015	29 AUG 92	---	---	---	8	---	---	---	37 *
MND–01–4160–0025w	30 AUG 92	---	---	---	---	---	---	---	0.23
MND–01–4161–0015	29 AUG 92	---	---	---	---	---	---	9	8 *
MND–01–4161–1025	29 AUG 92	---	---	---	---	---	7	19	---
MND–01–4166–0015	31 AUG 92	5	9	---	---	---	44	75	---
MND–01–4166–0025	31 AUG 92	---	18	---	---	4	44	56	---
MND–01–4167–0015	31 AUG 92	89	---	---	18	37	44	207	8 *
MND–01–4167–0025	31 AUG 92	36	---	---	---	11	---	169	8 *

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.

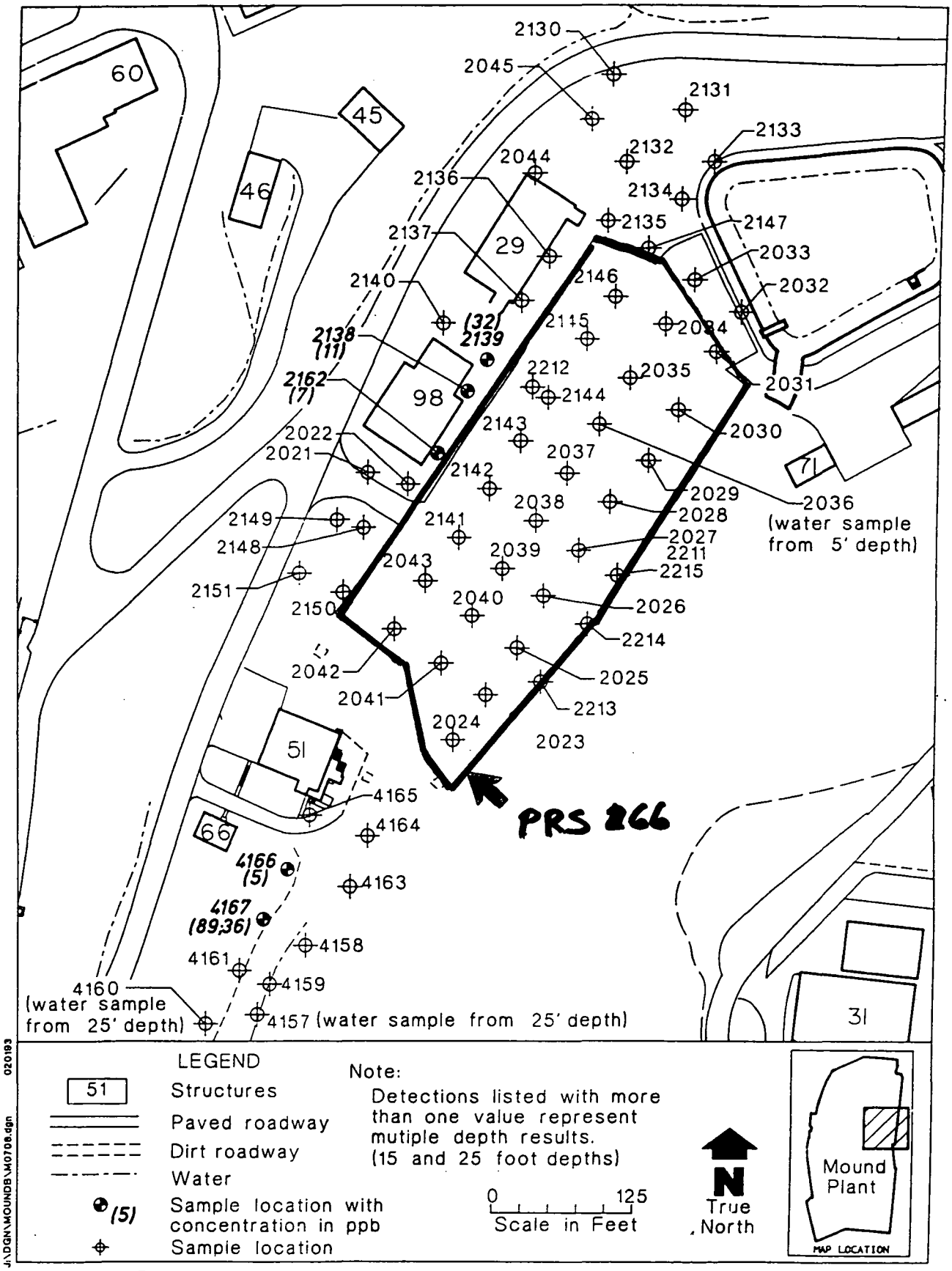


Figure 2.29. Freon II detection map for Area 7 and Building 51.

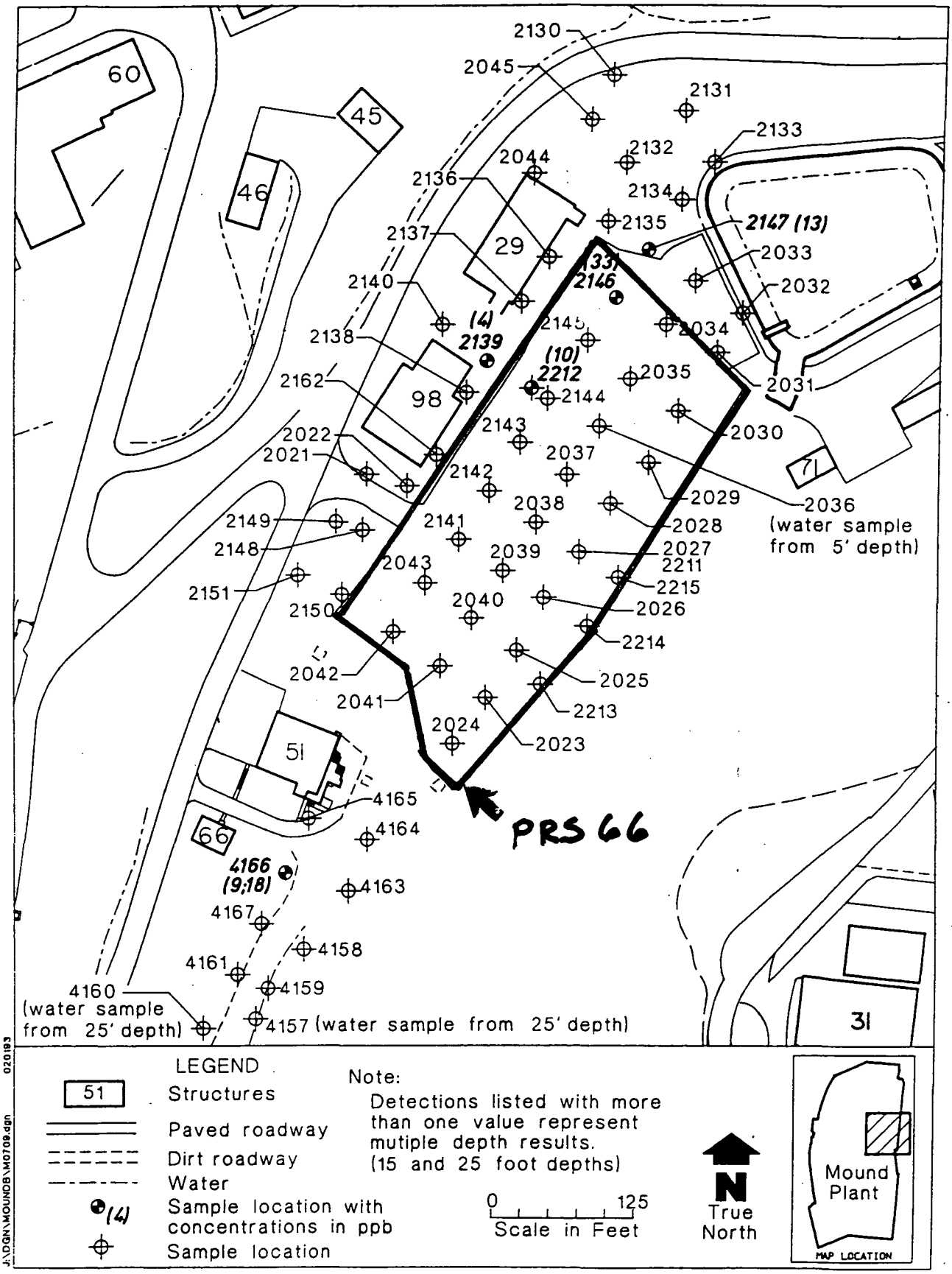


Figure 2.30. Freon 113 detection map Area 7 and Building 51.

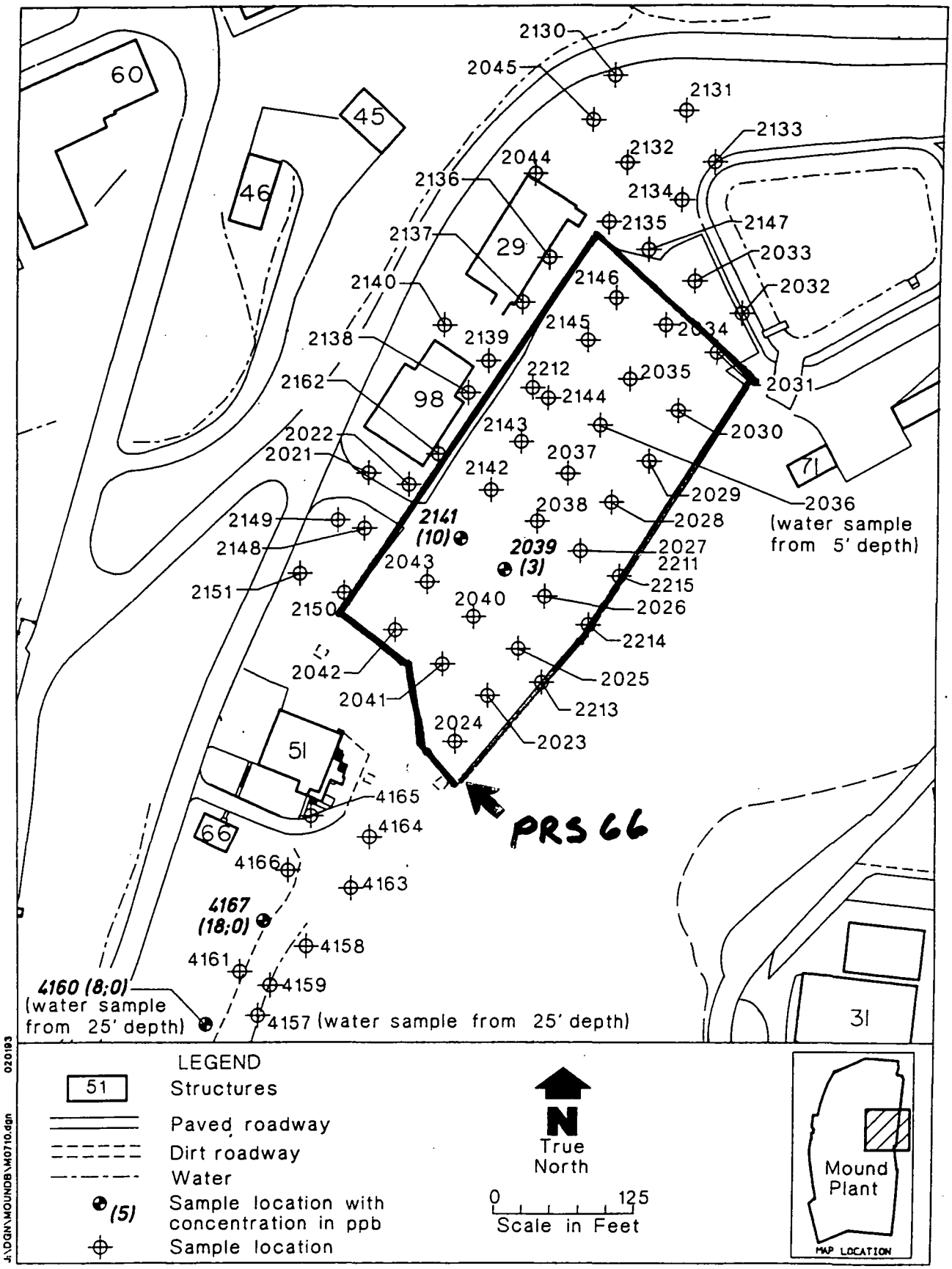


Figure 2.31. CIS-1,2-Dichloroethene detection map for Area 7 and Building 51.

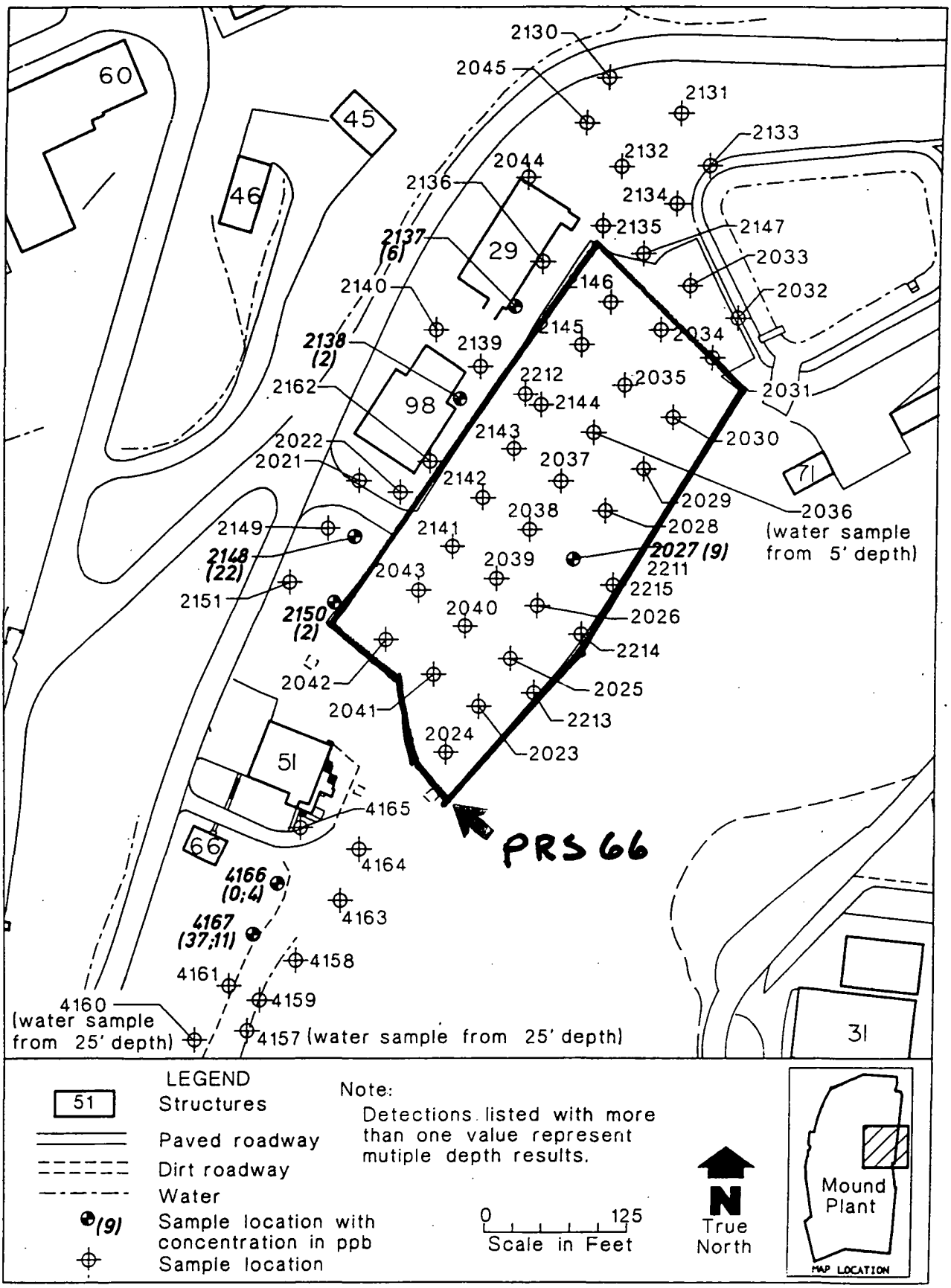


Figure 2.32. 1,1,1-Trichloroethane detection map for Area 7 and Building 51.

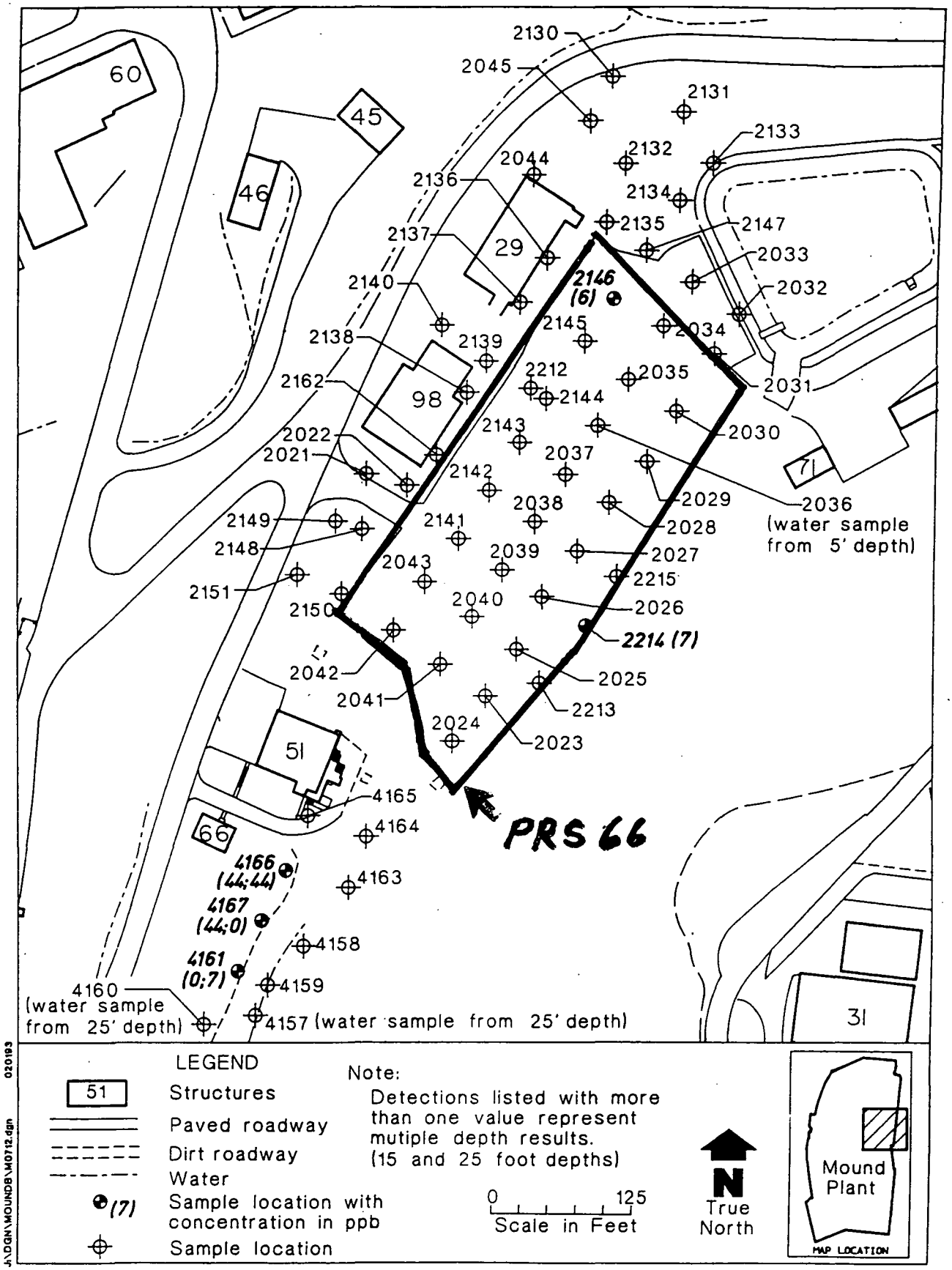


Figure 2.33. Tetrachloroethene detection map for Area 7 and Building 51.

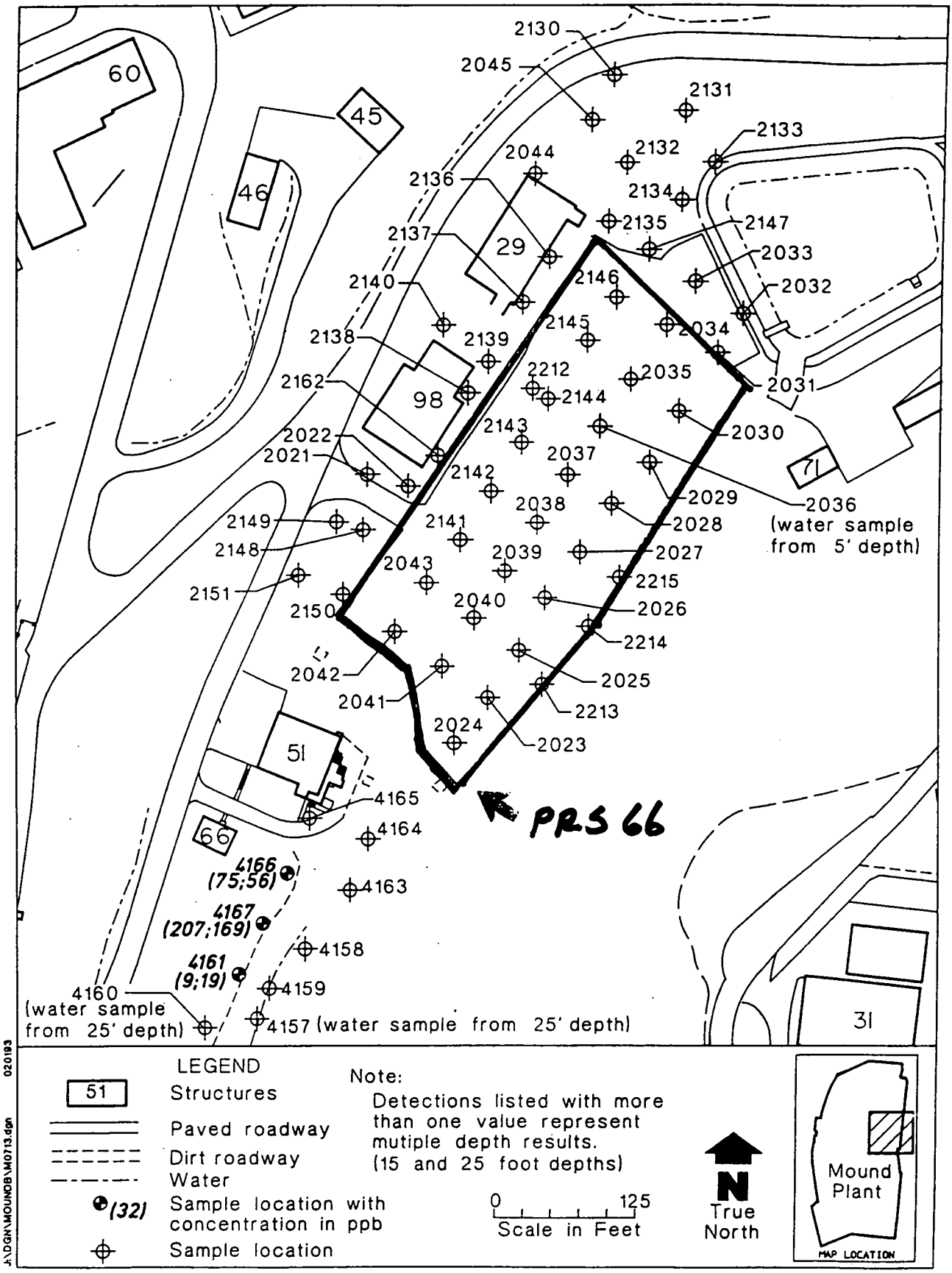


Figure 2.34. Trichloroethene detection map for Area 7 and Building 51.

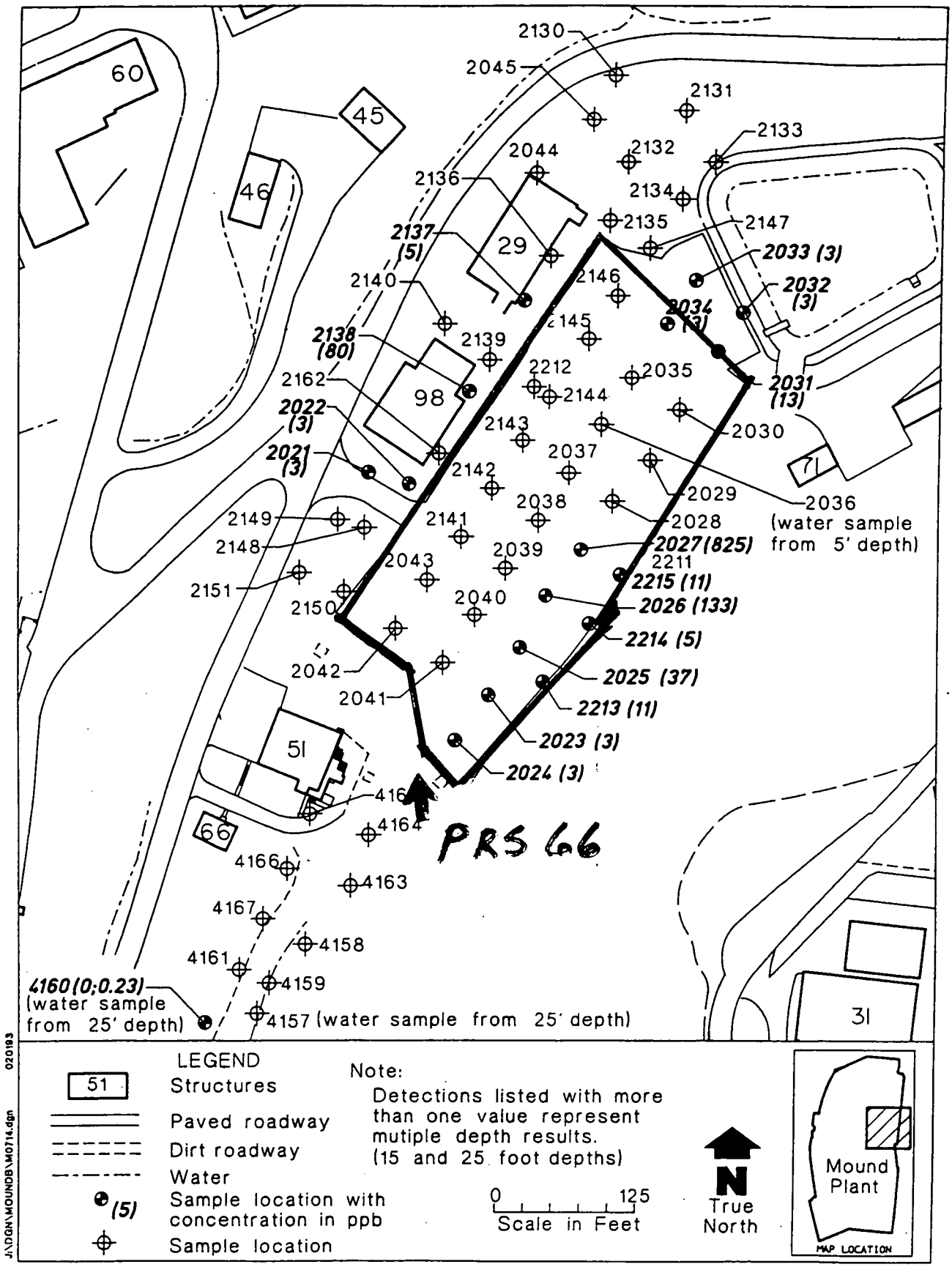


Figure 2.35. Toluene detection map for Area 7 and Building 51

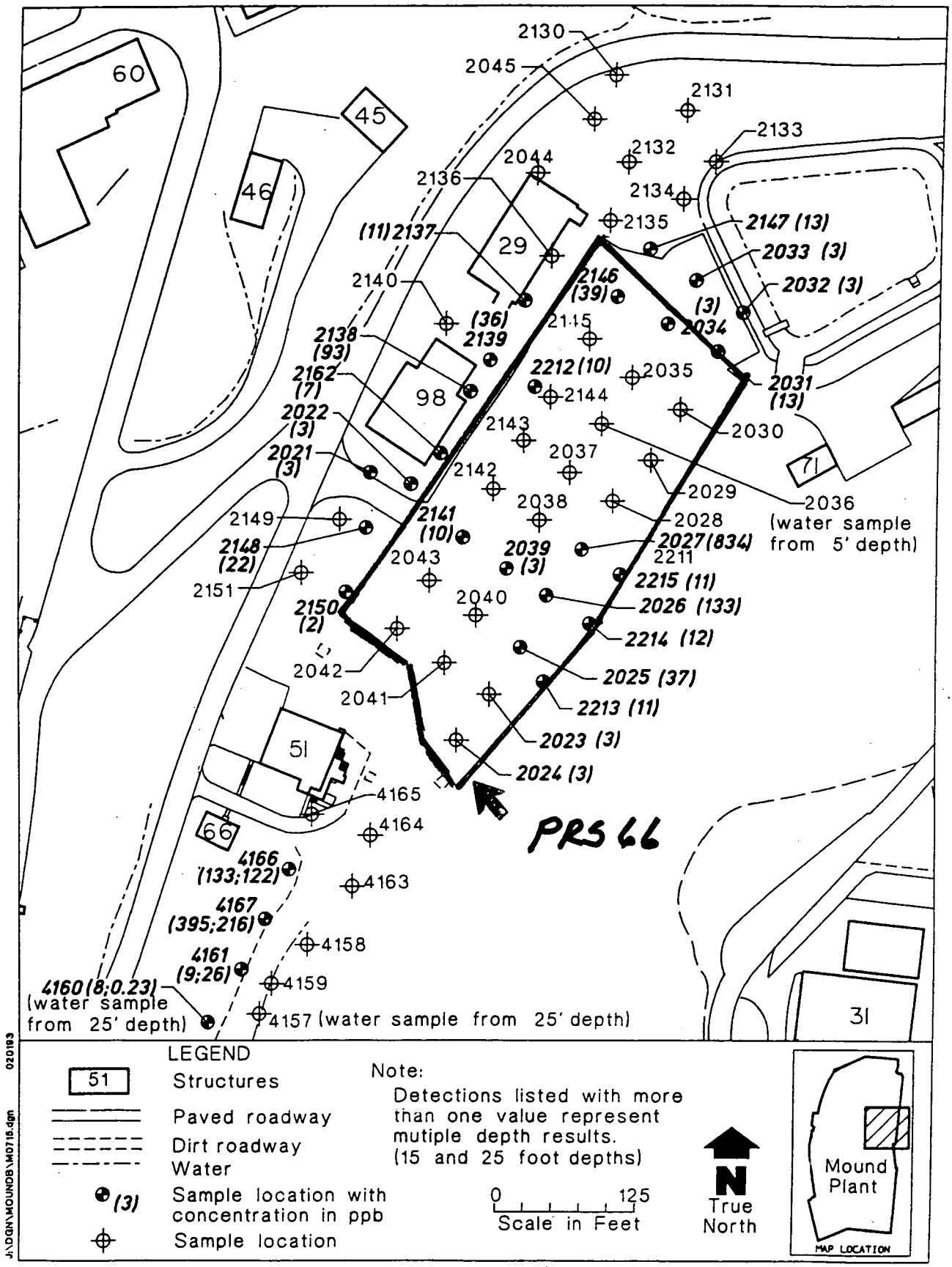


Figure 2.36. Total VOCs detection map for Area 7 and Building 51

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

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN–12DCE	CIS–12DCE	111TCA	PCE	TCE	TOLUENE
MND–01–2021–0005	1 AUG 92	---	---	---	---	---	---	---	3
MND–01–2022–0005	1 AUG 92	---	---	---	---	---	---	---	3
MND–01–2023–0005	1 AUG 92	---	---	---	---	---	---	---	3
MND–01–2024–0005	1 AUG 92	---	---	---	---	---	---	---	3
MND–01–2025–0005	1 AUG 92	---	---	---	---	---	---	---	37
MND–01–2026–0005	1 AUG 92	---	---	---	---	---	---	---	133
MND–01–2027–0005	1 AUG 92	---	---	---	---	9	---	---	825
MND–01–2031–0005	1 AUG 92	---	---	---	---	---	---	---	13
MND–01–2032–0005	2 AUG 92	---	---	---	---	---	---	---	3
MND–01–2033–0005	2 AUG 92	---	---	---	---	---	---	---	3
MND–01–2034–0005	2 AUG 92	---	---	---	---	---	---	---	3
MND–01–2034–1005	2 AUG 92	---	---	---	---	---	---	---	3
MND–01–2036–0005w	3 AUG 92	---	---	---	---	---	---	---	242 *
MND–01–2036–1005w	3 AUG 92	---	---	---	---	---	---	---	218 *
MND–01–2039–0005	2 AUG 92	---	---	---	3	---	---	---	---
MND–01–2044–0005	3 AUG 92	---	---	---	---	---	---	---	13 *
MND–01–2137–1005	24 AUG 92	---	---	---	---	6	---	---	5
MND–01–2138–0005	24 AUG 92	11	---	---	---	2	---	---	80
MND–01–2139–0005	25 AUG 92	32	4	---	---	---	---	---	3 *
MND–01–2141–0005	25 AUG 92	---	---	---	10	---	---	---	5 *
MND–01–2142–0005	25 AUG 92	---	---	---	---	---	---	---	11*
MND–01–2142–1005	25 AUG 92	---	---	---	---	---	---	---	11*
MND–01–2145–0005	25 AUG 92	---	---	---	---	---	---	---	5 *
MND–01–2146–0005	25 AUG 92	---	33	---	---	---	6	---	---
MND–01–2147–0005	25 AUG 92	---	13	---	---	---	---	---	---
MND–01–2148–0005	26 AUG 92	---	---	---	---	22	---	---	---
MND–01–2149–0005	26 AUG 92	---	---	---	---	---	---	---	5 *
MND–01–2149–1005	26 AUG 92	---	---	---	---	---	---	---	5 *
MND–01–2150–0005	26 AUG 92	---	---	---	---	2	---	---	5 *
MND–01–2162–0005	30 AUG 92	7	---	---	---	---	---	---	---
MND–01–2212–0015	26 SEP 92	---	10	---	---	---	---	---	---
MND–01–2213–0005	26 SEP 92	---	---	---	---	---	---	---	11
MND–01–2214–0005	26 SEP 92	---	---	---	---	---	7	---	5
MND–01–2215–0005	26 SEP 92	---	---	---	---	---	---	---	11

Notes:

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

SOIL GAS DATA (ABSOLUTE)

Table II.11 summarizes the Area 7 blank samples which contained VOC concentrations. Toluene was detected in various trip, ambient, and field blank samples associated with the Area 7 sampling effort at concentrations ranging from 3 to 186 ppb.

2.3.5. Main Parking Lot and Southwest of Main Hill

The contingency sampling effort conducted during the final week of the soil gas survey included the collection of five Main Parking Lot soil gas samples and six soil gas samples southwest of the Main Hill. All were collected from a depth of 5 feet. Table II.12 summarizes the detections from the Main Parking Lot and southwest of Main Hill sampling efforts.

At the Main Parking Lot only toluene was detected. Samples 2216 and 2219 contained toluene at 104 and 11 ppb, respectively (Figure 2.37). Toluene was detected in an ambient blank sample at location 2220 at a concentration of 8 ppb, but this sample was collected one day after the detections described above. No other blanks contained measurable concentrations of target compounds.

Southwest of the Main Hill four of the target compounds were detected. Most of these occurred in sample 5221, which was collected adjacent to Building 19. Freon 11, Freon 113, and TCE were detected in sample 5221 at concentrations of 21, 131, and 66 ppb, respectively. Figures 2.38 through 2.40 illustrate these detections. Toluene was detected at four locations southwest of the Main Hill, at concentrations ranging from 11 to 82 ppb (Figure 2.41); however, all of these samples had an associated ambient blank sample containing 8 ppb toluene (Table II.13). Figure 2.42 shows the sum of total VOCs detected at sample location 5221.

2.4. SUMMARY AND CONCLUSIONS

2.4.1. Summary of Results

Table II.14 summarizes the range of detections from each study area for the eight target compounds. As shown, peak Main Hill detections for the eight target compounds ranged from 247 to 131,000 ppb, with the highest being Freon 113. Peak Area J detections ranged from 11 to 46 ppb, with the highest being Freon 11. Peak Building 51 detections ranged from 18 to 89 ppb, with the highest being Freon 11. Peak Area 7 detections ranged from 7 to 825 ppb, with the highest being Toluene. Peak detections from the Main Parking Lot and southwest of Main Hill ranged from 21 to 131 ppb, with the highest being Freon 113.

Table II.11. SUMMARY OF POSITIVE BLANK DETECTIONS–AREA 7
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN–12DCE	CIS–12DCE	111TCA	PCE	TCE	TOLUENE
MND–01–2021–3002	2 AUG 92	---	---	---	---	---	---	---	3
MND–01–2036–5000w	3 AUG 92	---	---	---	---	---	---	---	59
MND–01–2036–2000	3 AUG 92	---	---	---	---	---	---	---	186
MND–01–2130–5000	19 AUG 92	---	---	---	---	---	---	---	3
MND–01–2147–3002	25 AUG 92	---	---	---	---	---	---	---	8
MND–01–2151–3002	26 AUG 92	---	---	---	---	---	---	---	11

Notes: Only QA/QC sample locations having positive detections are shown.
w: Indicates water sample.

SOIL GAS DATA (ABSOLUTE)

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

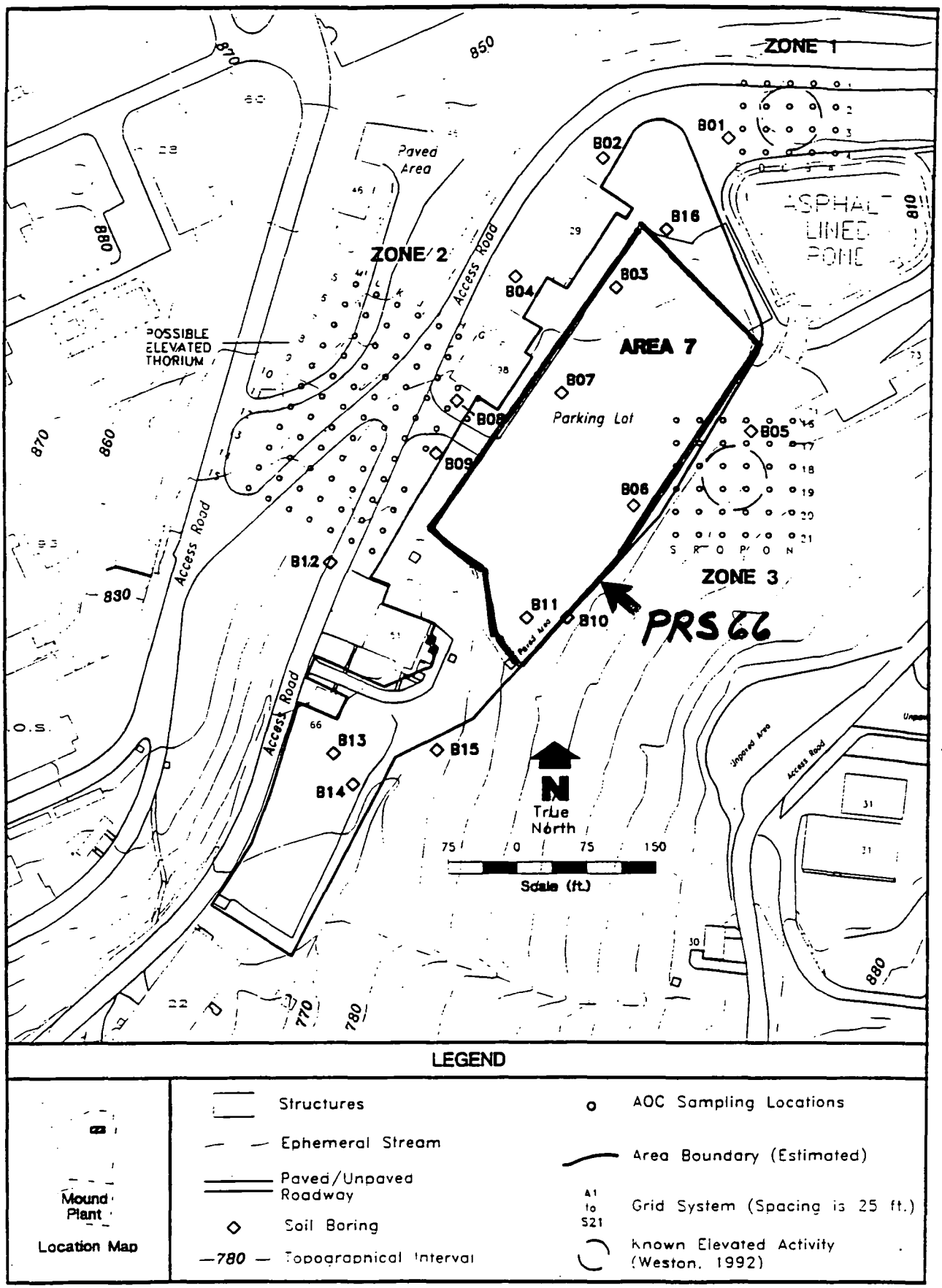


Figure 2.1. Data Collection Points for Area 7 Phase 1 and Phase 2 Investigations

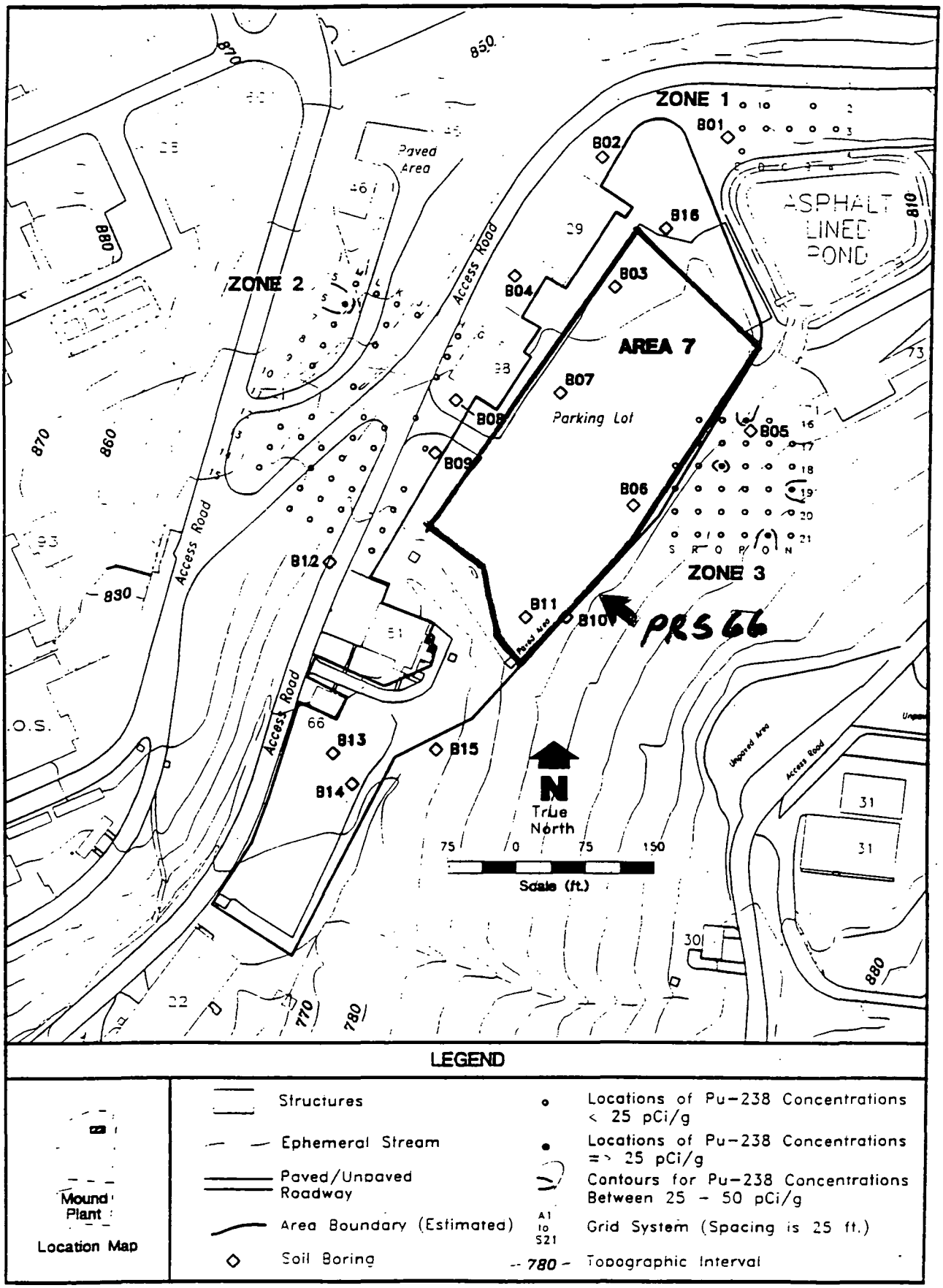


Figure 2.3. Areas of Elevated Surface Pu-238 Activity

Table II.4. Area 7 Samples Collected
Page 1 of 2

Soil Boring	Sample Type and Depth			
	Surface Soil	Subsurface Soil	Geotechnical	Groundwater
B01	B01001 (0-2 ft)	B01002 (5-7 ft) B01003 (10-12 ft) B01004 (15-17 ft) B01005 (20-22 ft) B01006 (25-27 ft) B01007 (30-32 ft)	B01021 (7-9 ft)[T] B01022 (17-19 ft)[T] B01023 (22-24 ft)[T]	
B02	B02001 (0-2 ft)	B02002 (5-7 ft)		
B03	B03001 (0-2 ft)	B03002 (5-7 ft) B03003 (10-13 ft) B03004 (15-19 ft) B03005 (25-28 ft) B03006 (34-36 ft)[V] B03007 (38-40 ft)[V]		W03001 (17.3-20.4 ft)
B04	B04001 (0-2 ft)	B04002 (5-9 ft) B04102 (5-9 ft)[D]	B04021 (0-2 ft)[T,B] B01021 (0-2 ft)[B]	
B05	B05001 (0-2 ft)	B05002 (5-7 ft)	B01021 (0-2 ft)[B]	
B06	B06001 (0-2 ft)	B06002 (5-10 ft) B06003 (10-16 ft)		
B07	B07001 (0-2 ft) BO7101 (0-2 ft)[D]	B07002 (5-9 ft) B07003 (10-15 ft) B07004 (15-17 ft)		
B08	B08001 (0-2 ft)	B08002 (5-10 ft) B08003 (10-22 ft)		
B09	B09001 (0-2 ft)	B09002 (5-12 ft) B09102 (5-12 ft)[D] B09003 (12-20 ft) B09004 (20-25 ft) B09005 (25-32 ft)		
B10	B10001 (0-2 ft)	B10002 (5-10 ft) B10003 (10-13.5 ft)		
B11	B11001 (0-2 ft)	B11002 (4-10 ft) B11102 (4-10 ft)[D] B11003 (10-15 ft) B11004 (15-20.5 ft)		W11001 (12.5-20.5 ft)
B12	B12001 (0-2 ft)	B12002 (6-10 ft) B12003 (12-23.5 ft)		

Table III.1. Maximum Concentrations by Borehole of Radionuclides Detected in Surface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration		Number of Samples with Detects
	Value (pCi/g)	Borehole	
Plutonium-238	1.36	B07	11
Plutonium-239/240	0.12	B07	1
Potassium-40	23.72J	B06	11
Radium-226	0.83	B16	12
Thorium-228	1.53J	B07	10
Thorium-230	1.31J	B01	12
Thorium-232	1.02J	B05	14
Tritium	9.50	B09	4
Uranium-234	1.19	B05	13
Uranium-235	0.23	B05	8
Uranium-238	1.23	B05	18

pCi/g - picocuries per gram
J - estimated value

RADIOCHEMICAL ANALYSIS

detected in 14 of the samples. Most of the maximum concentrations came from B05 and B07 which are on opposite sides of the parking lot and located toward the northern end of Area 7.

3.3.1.2. Surface Soil Organic Data

Seventeen surface soil samples were collected and analyzed for organic contaminants. The following subsections discuss the general classes of organic compounds.

Volatile Organic Compounds

Only two VOCs, acetone and hexane, were detected in surface soil samples. Acetone was detected in six of the 17 surface samples collected with the maximum concentration of 140 parts per billion (ppb) from B07. Hexane was detected in two of 17 of surface samples collected with the maximum concentration of 4J (J indicates an estimated value) ppb from B03.

~~Semi-Volatile Organic Compounds~~

Seventeen surface soil samples were collected and analyzed for semi-volatile organic compounds (SVOCs). Twenty-four SVOCs were detected in surface soil samples from Area 7 borings. Table III.2 shows maximum concentrations and associated boreholes, and the total number of samples in which the contaminant was detected. Nearly all the maximum concentrations were from B09, which is located in the east-central portion of Area 7.

Pesticides/Polychlorinated Biphenyls

Seventeen surface soil samples were collected and analyzed for pesticides/polychlorinated biphenyls (PCBs). Seventeen pesticides/PCBs were detected in surface soil samples from Area 7 soil borings. Table III.3 shows maximum concentrations and associated boreholes, and the total number of samples in which the analyte was detected. Maximum pesticide/PCB concentrations in surface soil samples are widely dispersed throughout the Area 7 soil borings.

Table III.3. Maximum Concentrations by Borehole of Pesticides/PCBs Detected in Surface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration		Number of Samples with Detects
	Value (ppb)	Borehole	
4,4'-DDE	0.39J	B05	3
4,4'-DDT	0.42J	B02	3
Aldrin	0.91J	B08	4
Alpha-Chlordane	15.00J	P07	9
Aroclor-1248	210.00	B13	2
Aroclor-1254	38.00J	B05	2
delta-BHC	0.19J	B10	2
Dieldrin	1.00J	B07	5
Endosulfane Sulfate	1.40J	B14	5
Endrin	1.60J	B14	4
Endrin Aldehyde	3.60J	B08	2
Endrin Ketone	2.00J	B03	3
Heptachlor	0.41J	B04	3
Heptachlor Epoxide	0.56J	B01	4
gamma-BHC (Lindane)	0.22J	B13	1
gamma-Chlordane	11.00J	B07	10
p,p'-Methoxychlor	7.00J	B14	4

ppb - parts per billion
J - estimated value

General Chemistry

Total Organic Carbon

Total organic carbon (TOC) was detected in all surface soil samples with a maximum concentration of 102,000 ppm from B03.

Explosives

No explosives were detected in surface soil samples collected from Area 7 soil borings.

3.3.1.3. Surface Soil Inorganic Data

Seventeen surface soil samples were collected and analyzed for inorganic contaminants. The following subsections discuss the general classes of inorganic compounds.

Anions

Four anions were detected in surface soil samples from Phase 2 soil borings. Fluoride and sulfate were the only anions detected in all 17 surface soil samples. The maximum fluoride concentration was 38.8J ppm and the maximum sulfate concentration was 764 ppm, both from B07. Chloride and nitrate/nitrite were detected in 16 and 12 samples, respectively. The maximum chloride concentration was 382J ppm from B12 and the maximum nitrate/nitrite concentration was 3.86 ppm from B08.

Metals

Seventeen surface soil samples were collected and analyzed for metals. Eleven metals were detected in all of the surface soil samples. Table III.4 summarizes maximum concentrations and associated boreholes.

Lanthanides

Seventeen surface soil samples were collected and analyzed for lanthanides. Twelve lanthanides were detected in surface soil samples from Area 7 borings. Table III.5 summarizes maximum concentrations and associated boreholes, and the number of samples in which the analyte was detected. Half of the maximum concentrations detected were from B07. The remaining maximum concentrations detected were

from B05, B06, B08, and B15. With the exception of B15, all of these soil borings are located in the central portion of Area 7.

Table III.4. Metals Detected in All Surface Soil Samples from Area 7

Analyte	Maximum Concentration	
	Value (ppm)	Borehole
Aluminum	67,000	B14
Arsenic	11.5J	B04
Barium	82.1J	B05
Beryllium	0.8	B05
Calcium	245,000	B08
Iron	23,400	B05
Lead	23.6	B15
Magnesium	89,900	B02
Manganese	756.J	B05
Potassium	4990J	B10
Zinc	56	B15

ppm - parts per million J - estimated value

3.3.1.4. Subsurface Soil Radiological Data

Fifty subsurface soil samples were collected and analyzed for radionuclides. Thirteen radionuclides were detected in subsurface soil samples from Area 7 soil borings. Table III.6 shows maximum concentrations, associated boreholes and depths, and the total number of samples in which the contaminant was detected. Boreholes with the maximum concentrations of these radionuclides include B01, B02, B06, B07, B09, B14, and B16, indicating that subsurface radiological contamination is fairly dispersed throughout Area 7. Potassium-40 (K-40), Ra-226, Th-232, and U-238 were the most commonly detected radionuclides.

Table III.5. Maximum Concentrations by Borehole of Lanthanides Detected in Surface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration		Number of Samples with Detects
	Value (ppm)	Borehole	
Cerium	44.70	B06	7
Dysprosium	4.50	B05	4
Erbium	8.40J	B07	4
Europium	1.60	B05	6
Gadolinium	106.00	B15	4
Holmium	2.00	B07	1
Lanthanum	15.70	B05	5
Neodymium	32.00	B08	14
Praseodymium	51.80	B07	4
Samarium	18.60	B07	3
Terbium	13.60	B07	3
Ytterbium	3.40	B07	3

ppm - parts per million J - estimated value

General Chemistry

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
Cesiu	RADIOCHEMICAL ANALYSIS			1
Potass				45
Plutoni				13
Plutoniun				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.

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

Parameter	Maximum Concentration			Number of Samples with Detects
	Value (ppb)	Borehole	Depth (ft BGS)	
1,2-Diethylbenzene	13.00	B14	22-24	1
2-Butanone	110.00	B16	26-30	1
Acetone	78.00J	B09	20-25	26
Acetonitrile	120.00J	B09	12-20	2
Hexane	42.00	B14	25-30	4
Methylene Chloride	150.00	B03	15-19	1
PCE	1.00J	B11	4-10	1
Toluene	4.00J	B11	4-10	5

ppb - parts per billion
ft BGS - feet below ground surface
J - estimated value

General Chemistry

Semi-Volatile Organic Compounds

Forty-five subsurface soil samples were collected and analyzed for SVOCs. Twenty-three SVOCs were detected in subsurface soil samples from Area 7 soil borings. Table III.8 shows maximum concentrations, associated boreholes and depths, and the total number of samples in which the contaminant was detected. Most of the SVOC maximum contaminant concentration values are from B13 at a depth of 5-10 feet BGS. None of the SVOCs were detected in all the subsurface soil samples and only five of them were found in more than a third of the samples.

Pesticides/Polychlorinated Biphenyls

Forty-five subsurface soil samples were collected and analyzed for pesticides/PCBs. Eighteen pesticides/PCBs were detected in subsurface soil samples from Area 7 soil borings. Table III.9 shows maximum concentrations, associated boreholes and depths, and the total number of samples in which the contaminant was detected. Maximum contaminant concentration values of pesticides/PCBs were found in the subsurface in six soil borings - (B01, B03, B07, B13, B14, and B15). The first three borings (B01,

Table III.8. Maximum Concentrations by Borehole of SVOCs Detected in Subsurface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration			Number of Samples with Detects
	Value (ppb)	Borehole	Depth (ft BGS)	
2-Methylnaphthalene	190.00J	B09	5-12	2
Acenaphthene	180.00J	B13	5-10	5
Acenaphthylene	60.00J	B09	5-12	1
Anthracene	380.00J	B13	5-10	9
Benzo(a)anthracene	1100.00	B13	5-10	12
Benzo(a)pyrene	890.00	B13	5-10	10
Benzo(b)fluoranthene	1500.00	B13	5-10	15
Benzo(g,h,i,)perylene	370.00J	B13	5-10	5
Benzo(k)fluoranthene	2800.00	B13	5-10	16
Benzoic acid	92.00J	B13	20-25	4
Bis(2-ethylhexyl)phthalate	780.00	B14	25-30	17
Carbozle	260.00J	B13	5-10	6
Chrysene	1100.00	B13	5-10	13
Di-n-butylphthalate	130.00J	B03	5-7	14
Dibenzo(a,h)anthracene	160.00J	B13	5-10	3
Dibenzofuran	220.00J	B09	5-12	5
Fluoranthene	2100.00	B13	5-10	16
Fluorene	270.00J	B09	5-12	6
Indeno(1,2,3-cd)pyrene	520.00	B13	5-10	8
Naphthalene	430.00J	B09	5-12	4
Phenanthrene	2100.00	B13	5-10	14
Phenol	42.00J	B07	5-9	1
Pyrene	2600.00	B13	5-10	16

ppb - parts per billion
ft BGS - feet below ground surface
J - estimated value

Table III.9. Maximum Concentrations by Borehole of Pesticides/PCBs Detected in Subsurface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration			Number of Samples with Detects
	Value (ppb)	Borehole	Depth (ft BGS)	
4,4'-DDD	0.20J	B07	5-9	2
4,4'-DDE	3.50J	B03	5-7	6
4,4'-DDT	0.97J	B07	15-17	2
Aldrin	0.22J	B01	25-27	3
alpha-Chlordane	4.50J	B07	5-9	5
Aroclor-1248	540.00	B14	25-30	5
Aroclor-1254	270.00	B14	25-30	3
delta-BHC	0.20J	B13	5-10	1
Dieldrin	4.50J	B03	5-7	2
Endosulfan II	0.15J	B01	5-7	1
Endosulfane Sulfate	0.73J	B15	6-10	3
Endrin	1.30J	B15	2-6	2
Endrin Aldehyde	0.84J	B01	5-7	3
Endrin Ketone	0.21J	B13	5-10	2
gamma-BHC (Lindane)	0.86	B14	25-30	1
gamma-Chlordane	3.70J	B07	5-9	7
Heptachlor	0.09J	B01	10-12	1
Heptachlor Epoxide	0.23J	B03	15-19	2

ppb - parts per billion
ft BGS - feet below ground surface
J - estimated value

B03, and B07) are located in the northern portion of Area 7 and borings B13, B14, and B15 are located in the southern portion of Area 7. The occurrence of pesticides/PCBs is relatively uncommon in Area 7 subsurface soil samples, as shown by the relatively few samples with detected quantities.

Explosives

2,4-Dinitrotoluene, HMX, and RDX were the only explosives detected in the forty-five subsurface soil samples collected from Area 7 soil borings. 2,4-Dinitrotoluene was detected in two samples; maximum concentration was 0.85 ppm from B12 at a depth of 6-10 feet BGS. HMX was detected in four samples; maximum concentration was 0.72J ppm from B13 at a depth of 10-16 feet BGS. RDX was detected in two samples; maximum concentration was 0.77J ppm from B13 at a depth of 10-16 feet BGS. B12 is located in the west-central portion of Area 7 and B13 is located in the southern portion of Area 7.

Organic Carbon

TOC was found in all 45 subsurface soil samples collected from Area 7 soil borings. The maximum concentration was 32,000 ppm from B07 at a depth of 5-9 feet BGS.

3.3.1.6. Subsurface Soil Inorganic Data

~~Anions~~

Chloride, fluoride, sulfate, and nitrate/nitrite anions were detected in the 45 subsurface soil samples collected from Area 7 soil borings. Chloride was detected in 38 samples with a maximum concentration of 214J ppm from B13 at a depth of 20-25 feet BGS. Fluoride was detected in 43 samples with a maximum concentration of 19.9J ppm from B15 at a depth of 10-16 BGS. Sulfate was detected in all of the samples with a maximum concentration of 621J ppm from B04 at a depth of 5-9 feet BGS. Nitrate/nitrite was detected in 33 samples with a maximum concentration of 44.7J ppm from B01 at a depth of 10-12 feet BGS.

~~Metals~~

Twenty-five metals were detected in the 45 subsurface soil samples collected from Area 7 soil borings. Table III.10 shows maximum concentrations, associated boreholes and depths, and the total number of samples in which the contaminant was detected. Eleven of the metals (44%) were found in all of the subsurface soil samples. B14 showed most of the maximum concentrations (11 parameters), all from a depth of 25-30 feet BGS. B15 had seven of the maximum concentrations at depths of 6-10 and 10-16 feet BGS. Both of these soil borings are located in the southern portion of Area 7.

Lanthanides

Forty-five subsurface soil samples were collected and analyzed for lanthanides. Thirteen lanthanides were detected in subsurface soil samples from Area 7 soil borings. Table III.11 shows maximum concentrations, associated boreholes and depths, and the total number of samples in which the contaminant was detected. Maximum concentrations of lanthanides were found in subsurface soil samples from B03, B05, B07, B13, B14, and B15. Only europium and neodymium were detected in more than half of the subsurface soil samples collected.

3.3.1.7. Groundwater Data

One groundwater sample was collected from each of the borings B03, B11, B13, B14, and B16. A duplicate sample was also collected from B13. The samples from B03, B11, B13, and B14 were analyzed for chemical and radiological parameters. The sample from B16 was analyzed only for radiological parameters.

Groundwater Radiological Data

Eleven radionuclides were detected in groundwater samples from Area 7 soil borings. Table III.12 shows maximum concentrations and associated boreholes and depths, and the total number of samples in which the radionuclide was detected. Tritium, uranium-234 (U-234), U-238, and Ra-226 were detected in all five samples. Th-228 was detected in all of the samples except B11.

Table III.10. Maximum Concentrations by Borehole of Metals Detected in Subsurface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration			Number of Samples with Detects
	Value (ppm)	Borehole	Depth (ft BGS)	
Aluminum	303,000.00	B14	25-30	45
Antimony	4.10J	B14	25-30	22
Arsenic	26.60	B04	5-9	45
Barium	229.00J	B14	25-30	45
Beryllium	1.10J	B15	10-16	45
Bismuth	74.80	B15	10-16	24
Cadmium	1.40J	B14	25-30	12
Calcium	174,000.00J	B15	6-10	45
Chromium	29.70J	B14	25-30	39
Cobalt	13.90J	B02	5-7	39
Copper	430.00J	B14	25-30	40
Iron	42,400J	B15	10-16	45
Lead	87.00J	B14	25-30	45
Lithium	15.20J	B07	5-9	2
Magnesium	75,800.00J	B15	6-10	45
Manganese	1460.00J	B13	25-28	45
Mercury	2.00J	B14	25-30	9
Nickel	34.00J	B15	6-10	40
Potassium	6020.00	B15	6-10	45
Selenium	0.93	B07	5-9	1
Silver	7.90J	B14	25-30	10
Sodium	815.00	B11	15-20.5	39
Tin	6.10	B09	12-20	12
Vanadium	25.20J	B14	25-30	39
Zinc	371.00J	B14	25-30	45

ppm - parts per million
ft BGS - feet below ground surface
J - estimated value

Table III.11. Maximum Concentrations by Borehole of Lanthanides Detected in Subsurface Soil Samples from Area 7 Soil Borings

Parameter	Maximum Concentration			Number of Samples with Detects
	Value (ppm)	Borehole	Depth (ft BGS)	
Cerium	75.00	B15	10-16	21
Dysprosium	5.90	B13	25-28	17
Erbium	8.00J	B03	5-7	10
Europium	2.00	B05	5-7	23
Gadolinium	90.70J	B07	10-15	10
Holmium	2.40	B07	15-17	6
Lanthanum	29.60	B07	15-17	12
Lutetium	0.99	B03	10-13	9
Neodymium	46.10	B15	10-16	38
Praseodymium	121.00	B15	2-6	14
Samarium	20.40	B13	20-25	9
Terbium	14.90	B13	20-25	5
Ytterbium	3.90	B14	25-30	9

ppm - parts per million
ft BGS - feet below ground surface
J - estimated value

Table III.12. Maximum Concentrations by Borehole of Radionuclides Detected in Groundwater Samples from Area 7 Soil Borings

Parameter	Maximum Concentration			Number of Samples with Detects
	Value (pCi/L)	Borehole	Depth (ft BGS)	
Americium-241	0.73J	B13	34.0	1
Plutonium-238	2.29J	B14	21.5	1
Potassium-40	199.90	B13	34.0	1
Radium-226	0.81J	B13	34.0	5
Thorium-228	1.24	B03	17.4	4
Thorium-230	0.58J	B13	34.0	3
Thorium-232	0.32J	B03	17.4	3
Tritium	2373.70	B11	12.5	5
Uranium-234	2.94J	B16	17.0	5
Uranium-235	0.39	B16	17.0	3
Uranium-238	3.49	B16	17.0	5

pCi/L - picocuries per liter
J - estimated value
ft BGS - feet below ground surface

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Groundwater Organic Data

VOCs detected in groundwater samples include chloroform, TCE, cis-1,2-dichloroethene (cis-1,2-DCE), and trans-1,2-dichloroethene (trans-1,2-DCE). Only one contaminant was detected at each of the following locations: 1.00J micrograms per liter (µg/L) chloroform from B03, 5.00 µg/L TCE from B11, 0.27J µg/L cis-1,2-DCE from B14, and 0.03J µg/L trans-1,2-DCE from B14.

SVOCs detected in groundwater samples include benzoic acid, bis(2-ethylhexyl)phthalate, and phenol. Benzoic acid was detected in B13 and B14; maximum concentration was 6.00 µg/L from B13. Bis(2-ethylhexyl)phthalate was detected in B11 and B14; maximum concentration was 8.00J ug/L from B14. Phenol was detected only in B14 at a concentration of 3.00J µg/L.

The only pesticide/PCB detected in groundwater samples was aroclor-1254 which was found in B14 at a concentration of 0.38J µg/L.

Explosives detected in groundwater samples include 1,3,5-trinitrobenzene; 1,3-dinitrobenzene; 2-amino-4,6-dinitrotoluene; and RDX. 1,3,5-Trinitrobenzene was detected in B11 and B13; maximum concentration was 1.10J µg/L from B11. 1,3-Dinitrobenzene was detected only in B14 at a concentration of 0.19J µg/L. 2-Amino-4,6-dinitrotoluene was detected only in B13 at a concentration of 2.20J µg/L. RDX was detected only in B11 at a concentration of 0.90 µg/L.

Groundwater Inorganic Data

Anions detected in groundwater samples include chloride, fluoride, sulfate, and nitrate/nitrite. They were each detected in all four of the samples analyzed for chemical parameters. Maximum concentrations were 866.00 milligrams per liter (mg/L) chloride and 0.58 mg/L fluoride from B03, 75.20J mg/L sulfate from B13, and 1.22J mg/L nitrate/nitrite from B03.

Groundwater samples were collected from B03, B11, B13, and B14 and sent to the laboratory for metals analyses. However, analysis of the sample from B03 is incomplete at this time (except for bismuth), and so no B03 groundwater metals data is presented or discussed (except for bismuth).

Nineteen metals were detected in Area 7 groundwater samples. Table III.13 shows metals detected, maximum concentrations and associated boreholes, and the total number of samples in which the metal was detected. Thirteen of the metals were detected in all three groundwater samples analyzed. Arsenic, lead, and chromium were detected only in B13 and B14, antimony and silver were detected only in B14, and thallium was detected only in B11.

About half of the maximum concentrations were found in B14 and about a third of the maximum concentrations were found in B13. Both of these boreho.es are in the southern portion of Area 7.

Lanthanides detected in groundwater samples include europium, gadolinium, holmium, and samarium. Europium was detected only in B03 at a concentration of 4.00 µg/L. Gadolinium was detected in B03 and B13; maximum concentration was 181.00J µg/L from B13. Holmium was detected only in B03 at a concentration of 10.00 µg/L. Samarium was detected only in B03 at a concentration of 82.00 µg/L. B03 is located in the northern portion of Area 7 and B13 is located to the south.

~~3.3.2 Summary of Physical Properties Data~~

~~These data have been previously summarized and are presented in Section 2.3.4.2.~~

Table III.13. Maximum Concentrations by Borehole of Metals Detected in Groundwater Samples from Area 7 Soil Borings

Analyte	Maximum Concentration		Number of Samples with Detects
	Value (µg/L)	Borehole	
Aluminum	13,000.00J	B14	3
Antimony	2.60	B14	1
Arsenic	10.60	B13	2
Barium	165.00	B14	3
Bismuth	268.00	B03	3
Calcium	249,000.00	B13	3
Chromium	47.20	B14	2
Cobalt	7.70	B13	3
Copper	106.00	B14	3
Iron	22,100.00J	B13	3
Lead	27.40	B14	2
Magnesium	69,800.00	B13	3
Manganese	1690.00	B13	3
Potassium	10,700.00	B11	3
Silver	9.30	B14	1
Sodium	285,000.00	B14	3
Thallium	3.60	B11	1
Vanadium	21.20	B14	3
Zinc	195.00	B14	3

µg/L - micrograms per liter
J - estimated value

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

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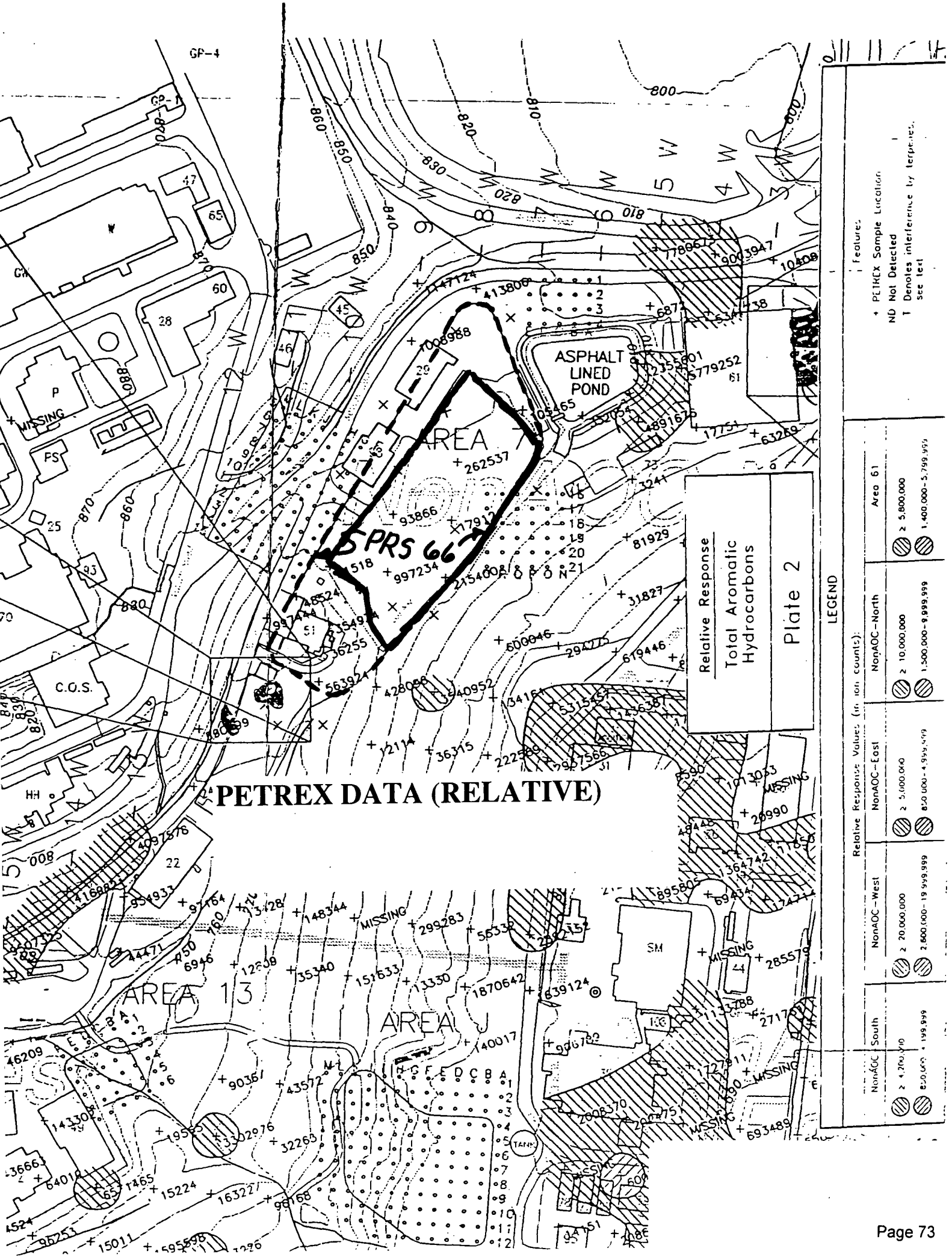
U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies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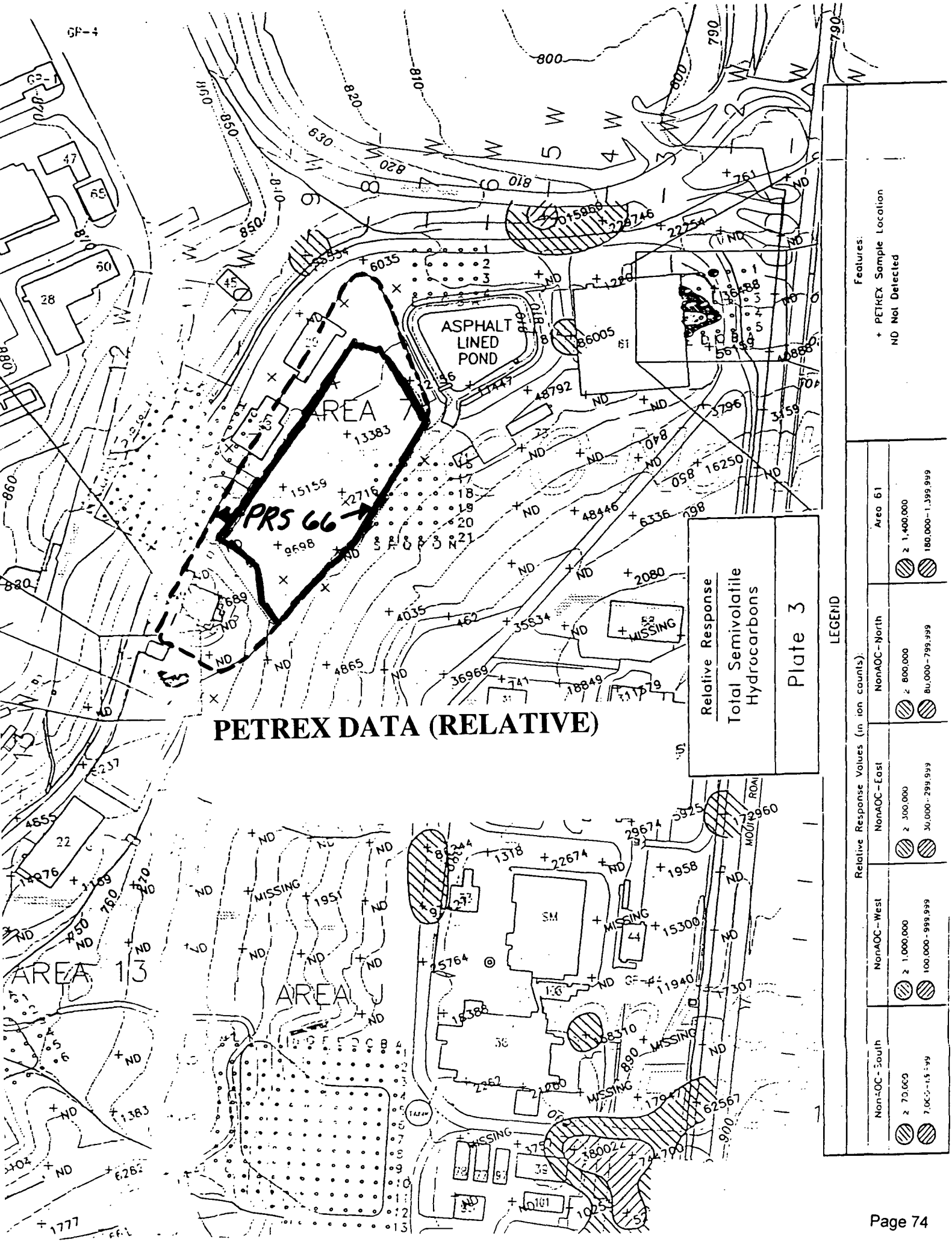
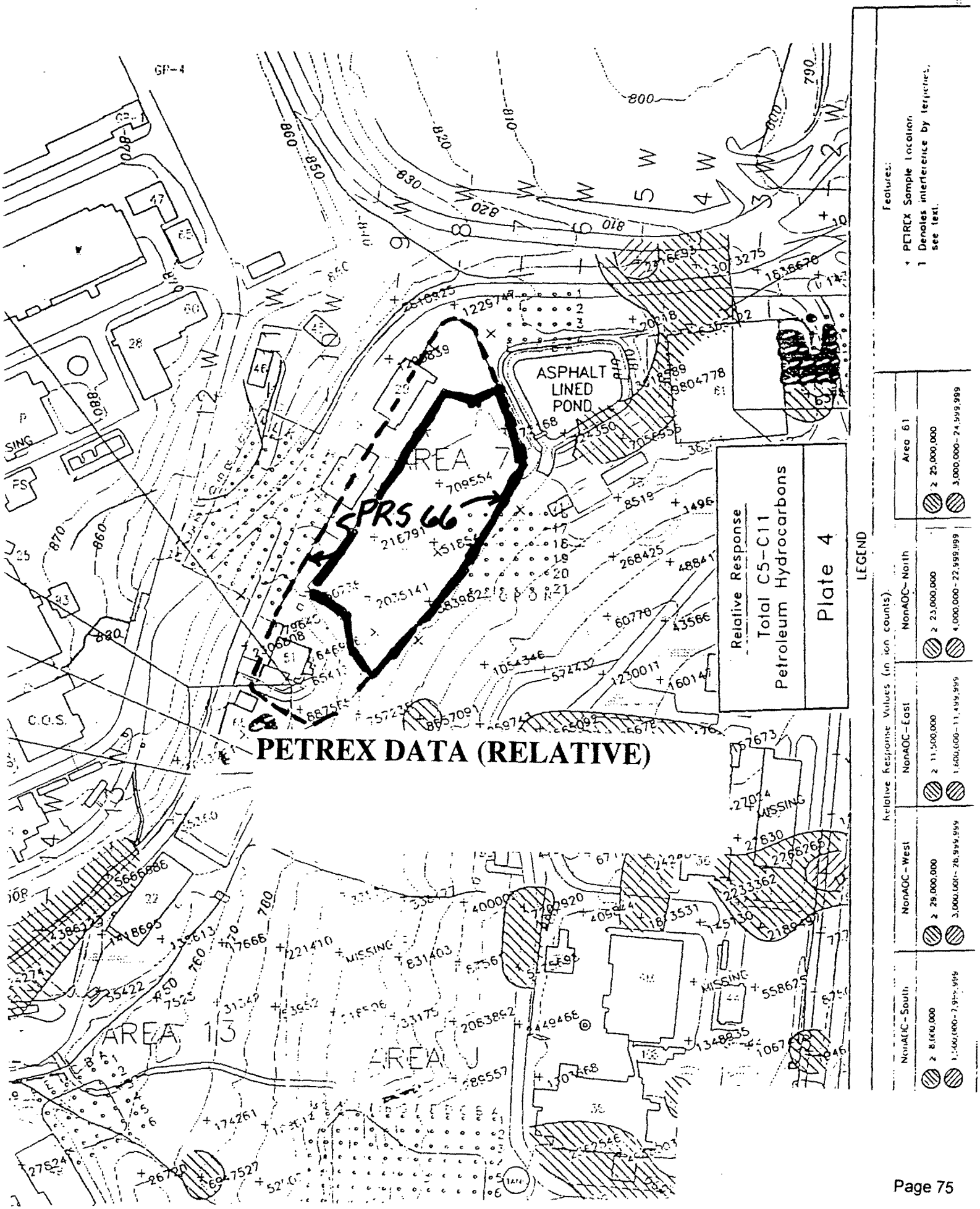
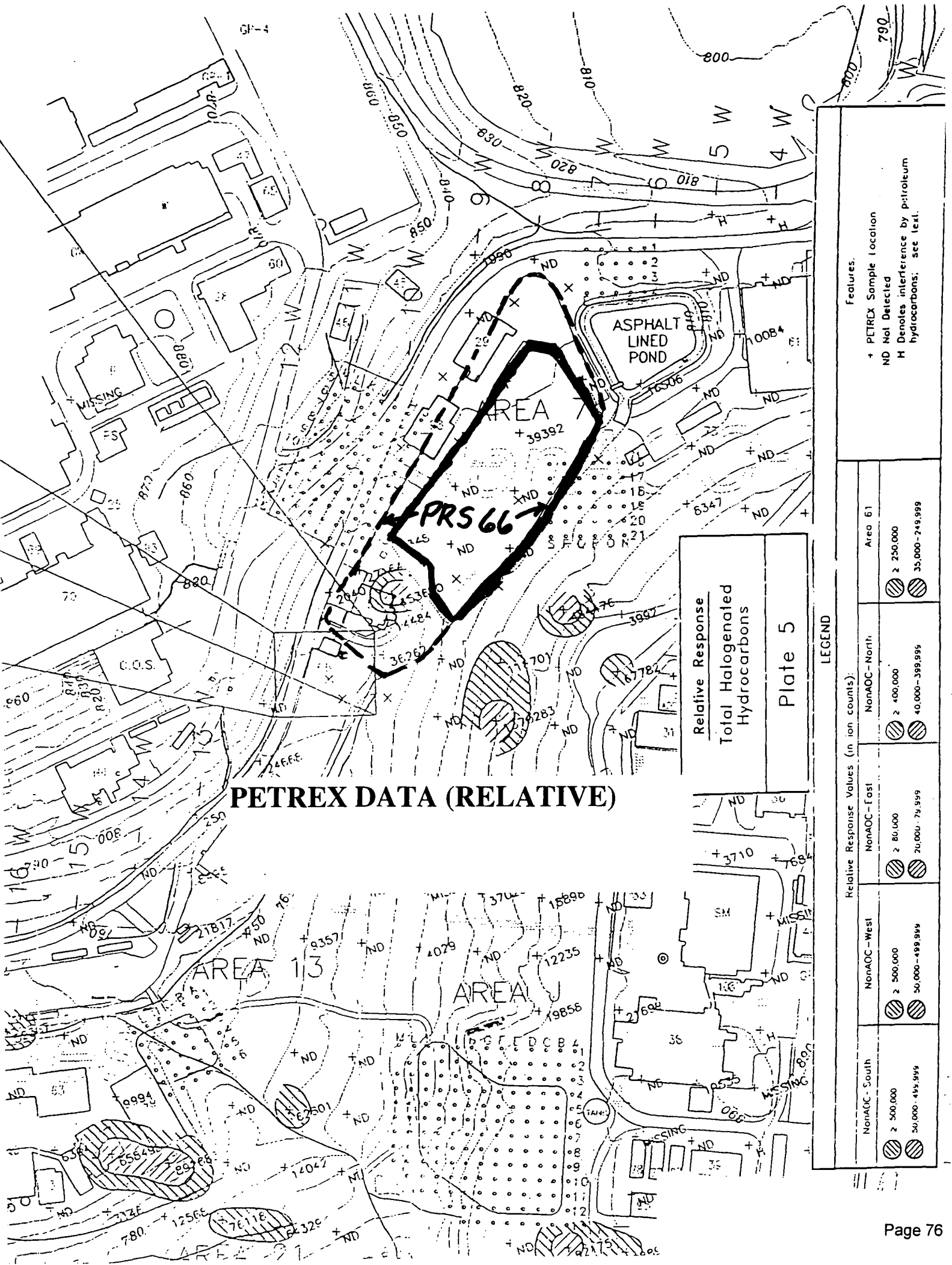
Relative Response
Total Aromatic Hydrocarbons
Plate 2
LEGEND
Features
PETREX Sample Location
ND Not Detected
T Denotes interference by terpenes, see text
Relative Response Values (in ion counts):
NonAOC-South
NonAOC-West
NonAOC-East
NonAOC-North
Area 61
≥ 4,200,000
≥ 20,000,000
≥ 5,000,000
≥ 10,000,000
≥ 5,800,000
ASPHALT LINED POND
AREA 7
AREA 13
AREA 1
SPRS 66
C.O.S.
SM
TANK
MISSING


PETREX DATA (RELATIVE)
Relative Response
Total Semivolatile Hydrocarbons
Plate 3
LEGEND
Features:
+ PETREX Sample Location
ND Not Detected
Relative Response Values (in ion counts):
NonAOC-South
≥ 70,000
70,000-99,999
NonAOC-West
≥ 1,000,000
100,000-999,999
NonAOC-East
≥ 300,000
30,000-299,999
NonAOC-North
≥ 800,000
80,000-799,999
Area 61
≥ 1,400,000
180,000-1,399,999
ASPHALT LINED POND
AREA 7
PRS 66
AREA 13
AREA 1
SM
MISSING
ND



PETREX DATA (RELATIVE)


PETREX DATA (RELATIVE)
Relative Response
Total Halogenated Hydrocarbons
Plate 5
LEGEND
Features.
+ PETREX Sample Location
ND Not Detected
H Denotes interference by petroleum hydrocarbons; see text.
Relative Response Values (in ion counts):
Area 61
≥ 250,000
35,000-249,999
NonAOC-North
≥ 400,000
40,000-399,999
NonAOC-East
≥ 80,000
70,000-79,999
NonAOC-West
≥ 500,000
50,000-499,999
NonAOC-South
≥ 500,000
50,000-499,999
ASPHALT LINED POND
AREA 7
PRS 66
AREA 13
AREA J
AREA 21
C.O.S.
SECTION 21
MISSING
TANK

Document Control No. _____

Environmental Restoration Program

Operable Unit 9 Hydrogeologic Investigation: Groundwater Sweeps Report

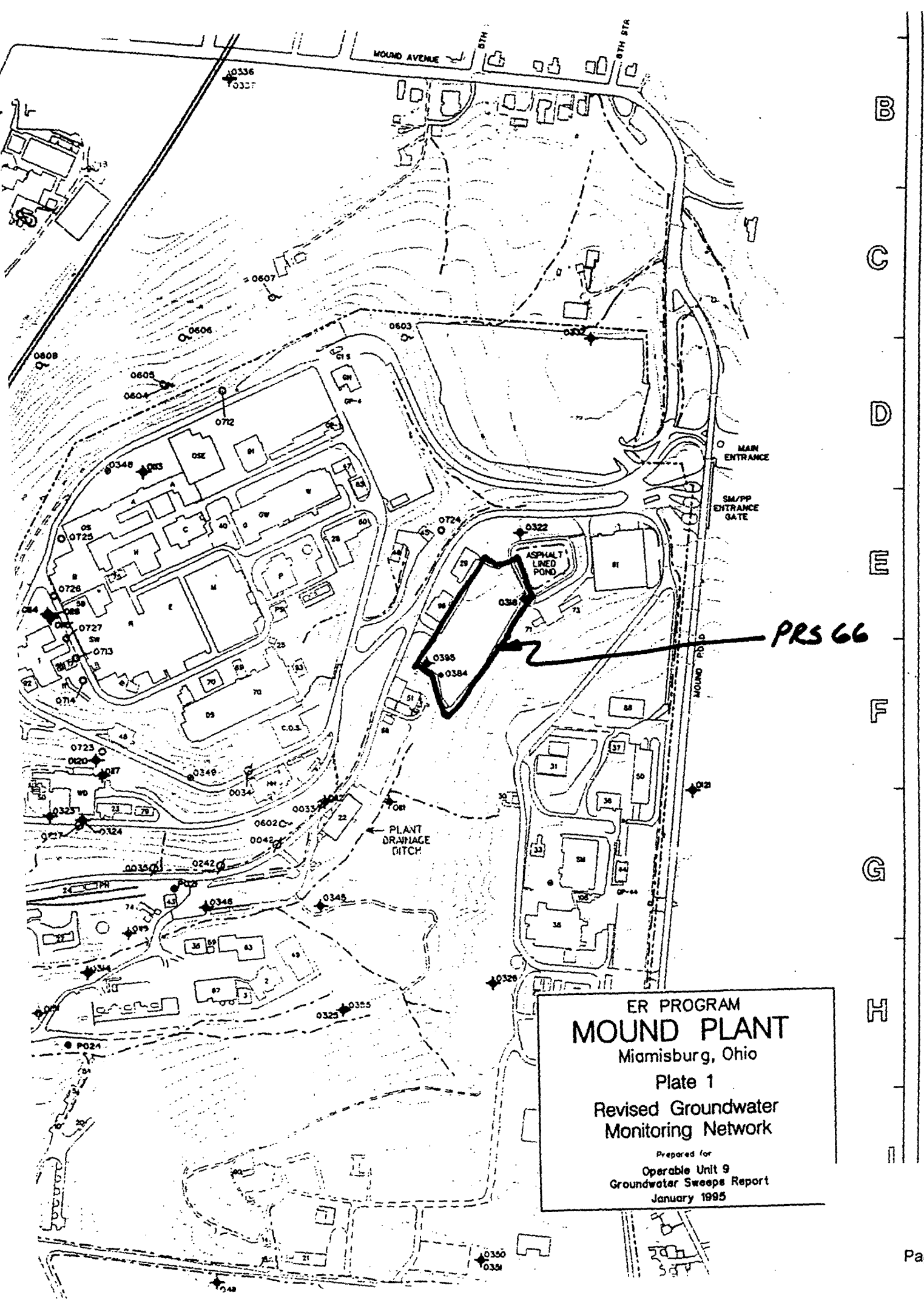
MOUND PLANT
MIAMISBURG, OHIO

April 1995

Technical Memorandum
(Revision 1)

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies



ER PROGRAM

MOUND PLANT

Miamisburg, Ohio

Plate 1

Revised Groundwater Monitoring Network

Prepared for

Operable Unit 9
Groundwater Sweeps Report
January 1995

GROUNDWATER QUALITY DATA BY LOCATION
SITE: SWP98 GROUNDWATER SWEEPS
LOCATION: 0318
NORTH COORDINATE: 598644.24 FT
EAST COORDINATE: 1497216.04 FT
09/10/93 TO 10/15/93
REPORT DATE: 04/03/95

FORMATION OF COMPLETION: SHALE (SH)
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT (D)

PARAMETER NAME	LOG DATE	SAMPLE ID	UNITS OF MEASURE	PVI	LAB VALUE	PVI	VALIDATED VALUE	RUN TYPE
AMMONIA	09/12/93	0001	MG/L		0.35		0.35	I
ANTIMONY, SOLUBLE	09/12/93	0001	UG/L	B	4.1	J	4.1	I
BARIUM, SOLUBLE	09/12/93	0001	UG/L	B	95.1		95.1	I
BARIUM, TOTAL	09/12/93	0001	UG/L	B	105.		105.	I
CALCIUM, SOLUBLE	09/12/93	0001	UG/L		90900.	J	90900.	I
CALCIUM, TOTAL	09/12/93	0001	UG/L		99600.	J	99600.	I
CHLORIDE	09/12/93	0001	MG/L		127.	J	127.	I
COPPER, SOLUBLE	09/12/93	0001	UG/L	B	2.5		2.5	I
FLUORIDE	09/12/93	0001	MG/L		0.45		0.45	I
IRON, SOLUBLE	09/12/93	0001	UG/L		455.	J	455.	I
IRON, TOTAL	09/12/93	0001	UG/L		1390.	J	1390.	I
LITHIUM, SOLUBLE	09/12/93	0001	UG/L	B	24.3		24.3	I
LITHIUM, TOTAL	09/12/93	0001	UG/L	B	27.8		27.8	I
MAGNESIUM, SOLUBLE	09/12/93	0001	UG/L		35700.		35700.	I
MAGNESIUM, TOTAL	09/12/93	0001	UG/L		39000.		39000.	I
MANGANESE, SOLUBLE	09/12/93	0001	UG/L		33.0		33.0	I
MANGANESE, TOTAL	09/12/93	0001	UG/L		34.2		34.2	I
PLUTONIUM-239/240	09/12/93	0001	PCI/L		.236		REJECT	I
POTASSIUM, SOLUBLE	09/12/93	0001	UG/L	B	3640.		3640.	I
POTASSIUM, TOTAL	09/12/93	0001	UG/L	B	3940.		3940.	I
SODIUM, SOLUBLE	09/12/93	0001	UG/L		35200.		35200.	I
SODIUM, TOTAL	09/12/93	0001	UG/L		38100.		38100.	I
SULFATE	09/12/93	0001	MG/L		70.8		70.8	I
THORIUM-228	09/12/93	0001	PCI/L		.92		REJECT	I
THORIUM-230	09/12/93	0001	PCI/L		.894		REJECT	I
TOTAL DISSOLVED SOLIDS	09/12/93	0001	MG/L		614.	J	614.	I
TOTAL KJELDAHL NITROGEN	09/12/93	0001	MG/L		0.34		0.34	I
TOTAL ORGANIC CARBON	09/12/93	0001	MG/L		1.1		1.1	I
TOTAL PHOSPHATE	09/12/93	0001	MG/L		0.092		0.092	I

PARAMETER VALUE INDICATOR (PVI): U - LESS THAN DETECTION LIMIT

GROUNDWATER QUALITY DATA BY LOCATION
SITE: SWP98 GROUNDWATER SWEEPS
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NORTH COORDINATE: 598644.24 FT
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09/10/93 TO 10/15/93
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FORMATION OF COMPLETION: SHALE (SH)
HYDRAULIC FLOW RELATIONSHIP: DOWN GRADIENT (D)

PARAMETER NAME	LOG DATE	SAMPLE ID	UNITS OF MEASURE	PVI	LAB VALUE	PVI	VALIDATED VALUE	RUN TYPE
TOTAL SUSPENDED SOLIDS	09/12/93	0001	MG/L		5.0	J	5.0	I
TRITIUM	09/12/93	0001	PCI/L		2850.		2850.	I
VANADIUM, SOLUBLE	09/12/93	0001	UG/L		14.8		14.8	I
VANADIUM, TOTAL	09/12/93	0001	UG/L		15.3		15.3	I

PARAMETER VALUE INDICATOR (PVI): U - LESS THAN DETECTION LIMIT

ENVIRONMENTAL RESTORATION PROGRAM

LETTER REPORT: PRELIMINARY RESULTS OF RECONNAISSANCE MAGNETIC SURVEY

MOUND PLANT
AREAS 2, 6, 7, AND C

November 1990

DEPARTMENT OF ENERGY

ALBUQUERQUE OPERATIONS OFFICE

ENVIRONMENTAL RESTORATION PROGRAM

TECHNICAL SUPPORT OFFICE

LOS ALAMOS NATIONAL LABORATORY

WORKING DRAFT

Figure 8 is a color postings plot derived from the magnetic vertical gradient measurements in Area 2, with an overlay of cultural features. The background range selected for this data set is -75 to +75 nanoteslas per meter (nT/m). This figure defines several small anomalous zones that were not identified by the residual magnetic field data. In addition, a linear anomaly related to the overhead power lines is evident in this figure.

Figure 9 is an interpretive map of magnetic anomalies in Area 6. A relatively large anomaly exists between approximately 490 and 525 east and between 480 and 525 north. This anomaly is interpreted to be related to buried ferrous materials beneath the parking lot. Eight additional small anomalies are present throughout the area that are interpreted to represent buried ferrous objects. The interpretive map does not include anomalies that are related to surface cultural features identified in the field. The locations of the centers of the eight areas and the approximate areal coverage of the anomalous zones are listed in Table 1.

4.3. RESULTS IN AREA 7

Figure 10 is a color postings plot derived from residual magnetic field data in Area 7, including a cultural map overlay. The objective of the magnetic survey in this area was to locate a buried flatbed truck; 2,500 crushed, empty thorium drums; and other ferrous debris. The data ranges for the color plot were set to optimize resolution of the large anomaly in the north-central portion of the parking lot. This anomaly is related to a large amount of buried ferrous metal and is interpreted to define the location of the buried truck, thorium drums, and other ferrous debris. The buried debris is identified by positive anomalous readings to the south of the target and directly over it and negative anomalous readings on the north side of the target. This is the typical signature of a randomly oriented collection of ferrous metal objects in the presence of the earth's (ambient) magnetic field. In addition to this large anomaly, the survey also identified a linear anomaly that intersects a manhole cover in the parking lot. This feature is related to a storm drain that was identified on site utility maps (see overlay).

Figure 11 is a color postings plot that was derived from magnetic vertical gradient readings in Area 7, including a cultural map overlay. A pattern similar to the one present in the residual field data set is evident in the north-central portion of the parking lot, with positive anomalous readings to the south and negative anomalous readings to the north of the target. The anomaly related to the buried debris is not as areally extensive as the anomaly on the residual magnetic field plot because of the higher resolution of magnetic vertical gradient readings. In addition, the drain pipe running beneath the parking lot is more clearly identified on the magnetic vertical gradient plot.

Figure 12 and 13 are profiles of residual magnetic field readings and magnetic vertical gradient readings, respectively, for measurements along line 470 east in Area 7. Both profiles show the drain pipe at

approximately 550 north. However, the anomaly related to the drain pipe is narrower and more distinct on the magnetic vertical gradient profile. Both plots also show the large zone of anomalous readings related to the buried truck, drums, and debris. Again, this anomaly is narrower and more distinct on the magnetic vertical gradient plot. The residual magnetic field curve is smoother than the magnetic vertical gradient curve, also indicating the higher resolution of magnetic vertical gradient measurements for discrete objects. The negative readings at the extreme northern end of the profiles are related to ferrous metal objects on the surface in this area.

Figure 14 is an interpretive map of magnetic anomalies in Area 7. The linear feature running southwest-northeast is a storm drain that was identified on site utilities maps. The large anomalous zone in the north-central portion of the figure is interpreted to be related to the buried flatbed truck, thorium drums, and other ferrous debris. The burial site has approximate dimensions of 35 ft by 80 ft for areal coverage of 2800 sq ft. No other anomalies were identified in Area 7 that were not related to surface cultural features.

~~4.4. RESULTS IN AREA C~~

Figure 15 is a color plot derived from residual magnetic field data in Area C, including an overlay map of cultural features. The objective of the survey in this area was to identify any buried ferrous targets and relate them to point reflectors identified by the GPR surveys in 1987 and 1988. With the exception of the northwest corner of this area, there was little cultural interference. For this reason, the range of background values, -100 to 100 nT, is narrower than the background range for Area 6.

An anomaly is present in the southern portion of the figure at approximately 210 east, 120 north. The anomaly is characterized by a cluster of six readings greater than 300 nT, with a cluster of readings less than -300 nT to the northwest. The fact that the negative region of the anomaly is not directly north of the positive region may indicate influence of remanent magnetization of the buried ferrous object. Based on this information, it appears that this anomaly is related to a discrete, relatively large object, as opposed to a cluster of randomly oriented ferrous debris.

Aside from identifying this anomaly, the residual magnetic field plot identifies a few small anomalies that do not appear to be related to surface cultural features. The plot also shows a general trend, with anomalous negative readings on the western perimeter of the area, related to site cultural features. Information on the total number of magnetic anomalies, their location, and their size is presented in the discussion of the vertical gradient measurements.

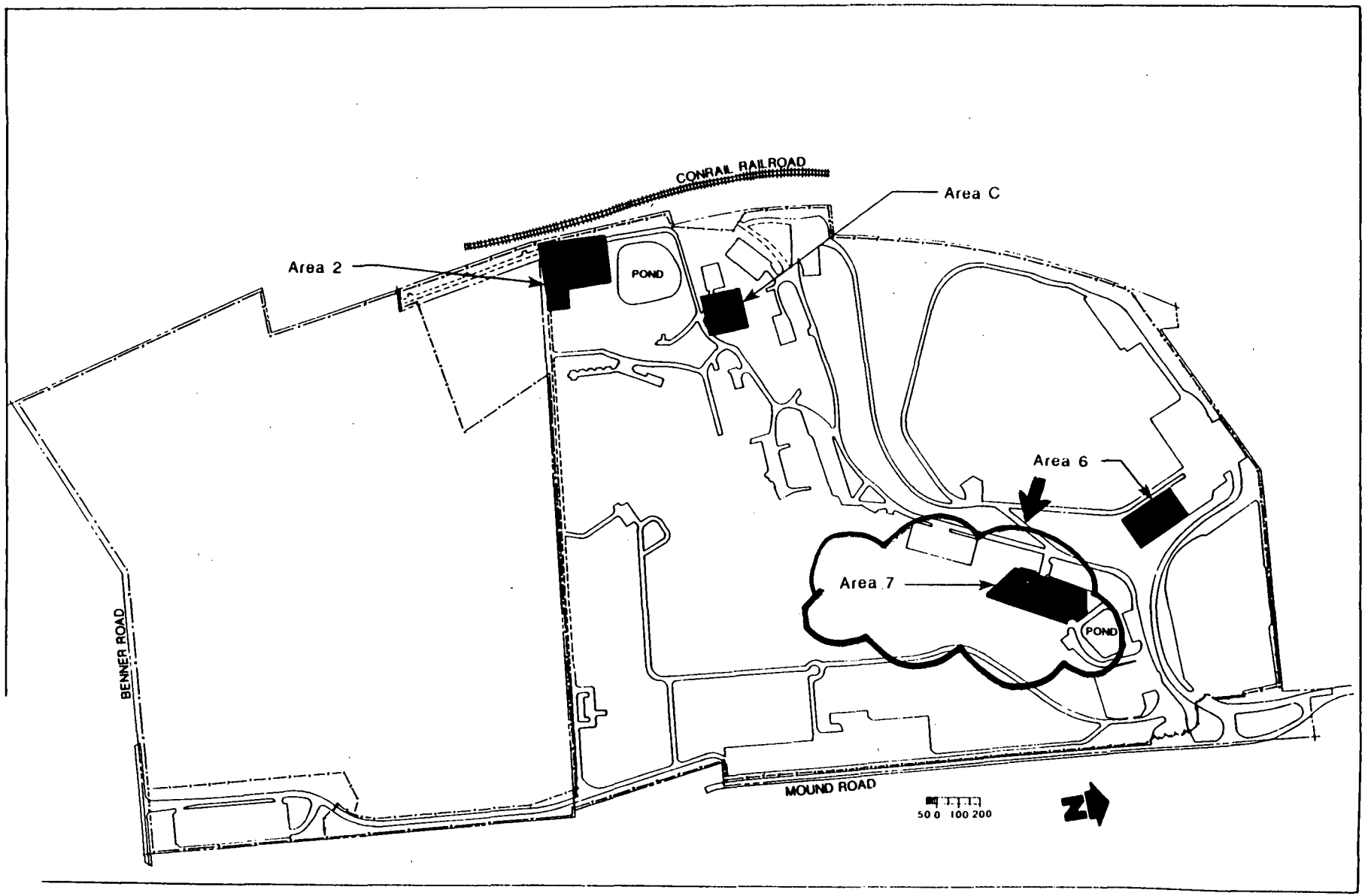


Figure 1 Location of survey areas.

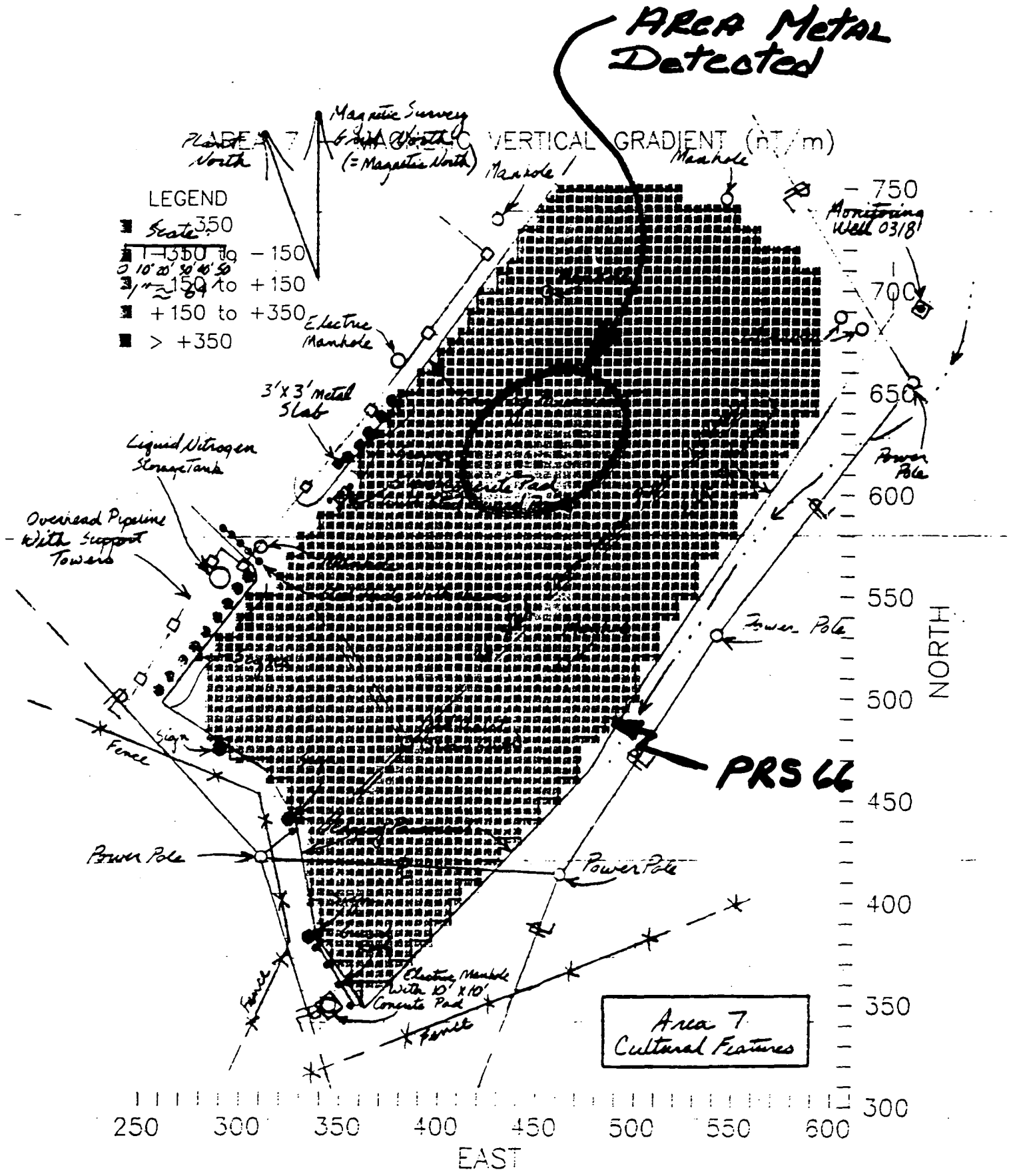


Figure 11. Color postings plot of magnetic vertical gradient in Area 7.

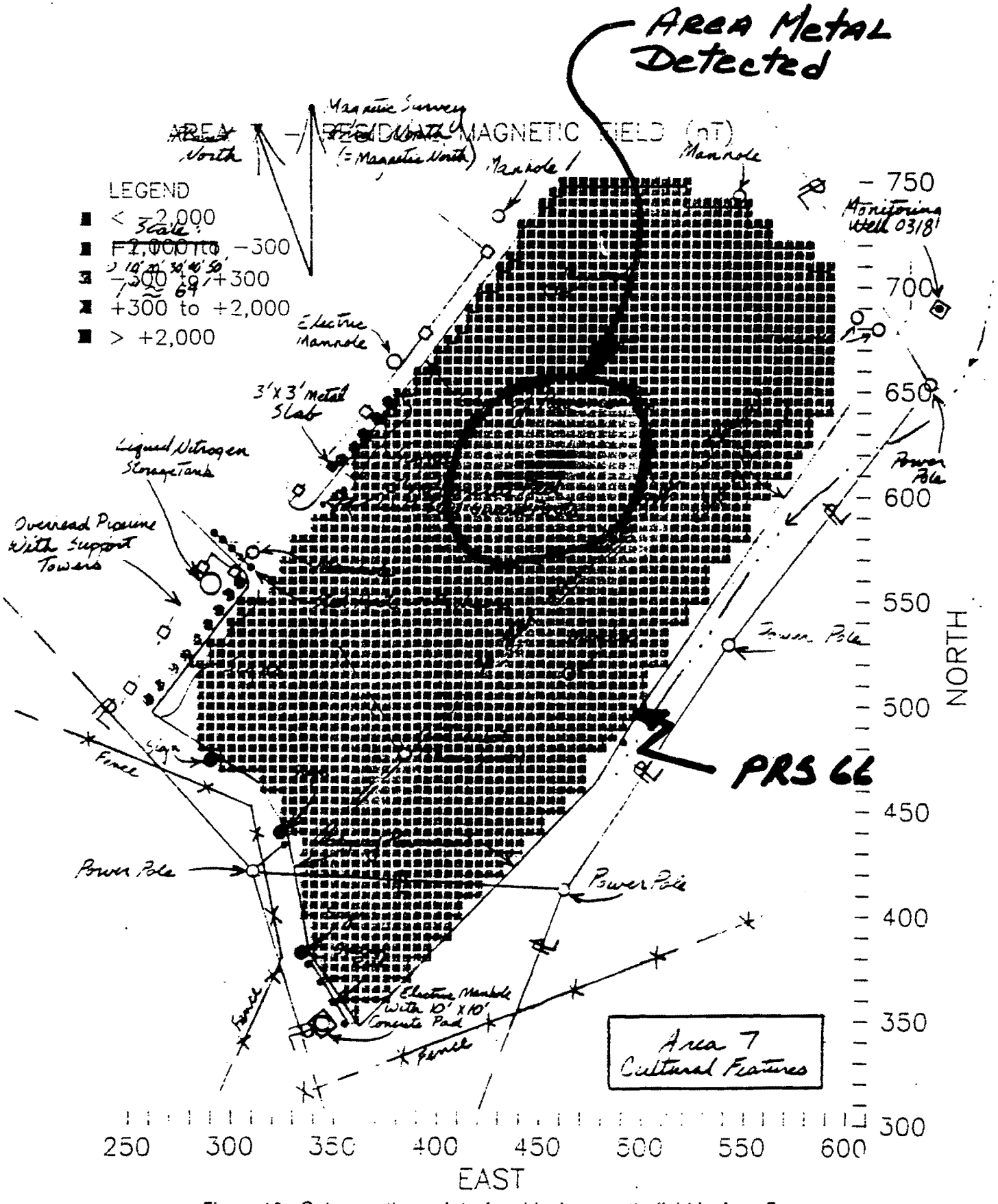


Figure 10: Color postings plot of residual magnetic field in Area 7.

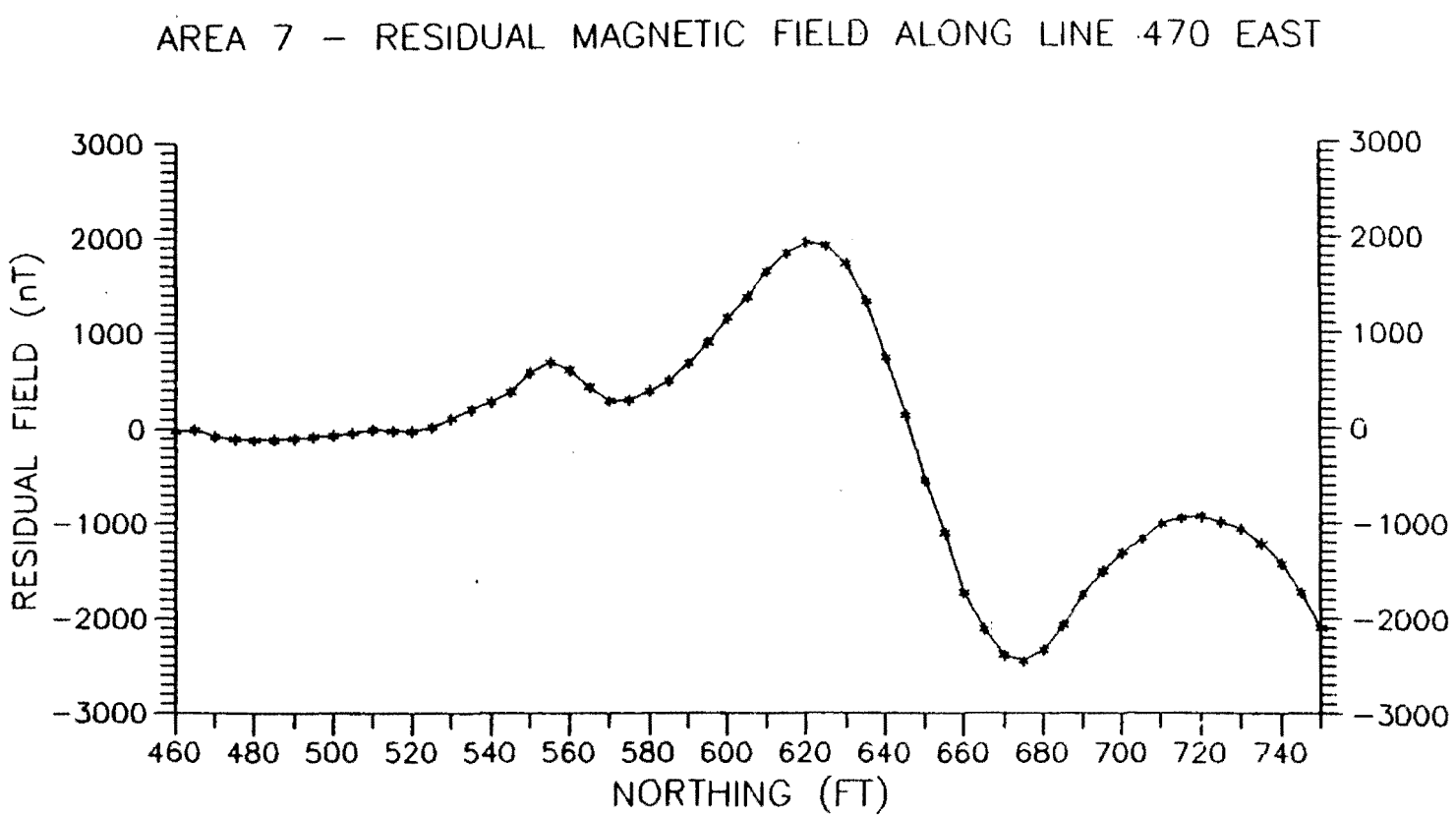


Figure 12. Profile of residual magnetic field values in Area 7 along line 470 E.

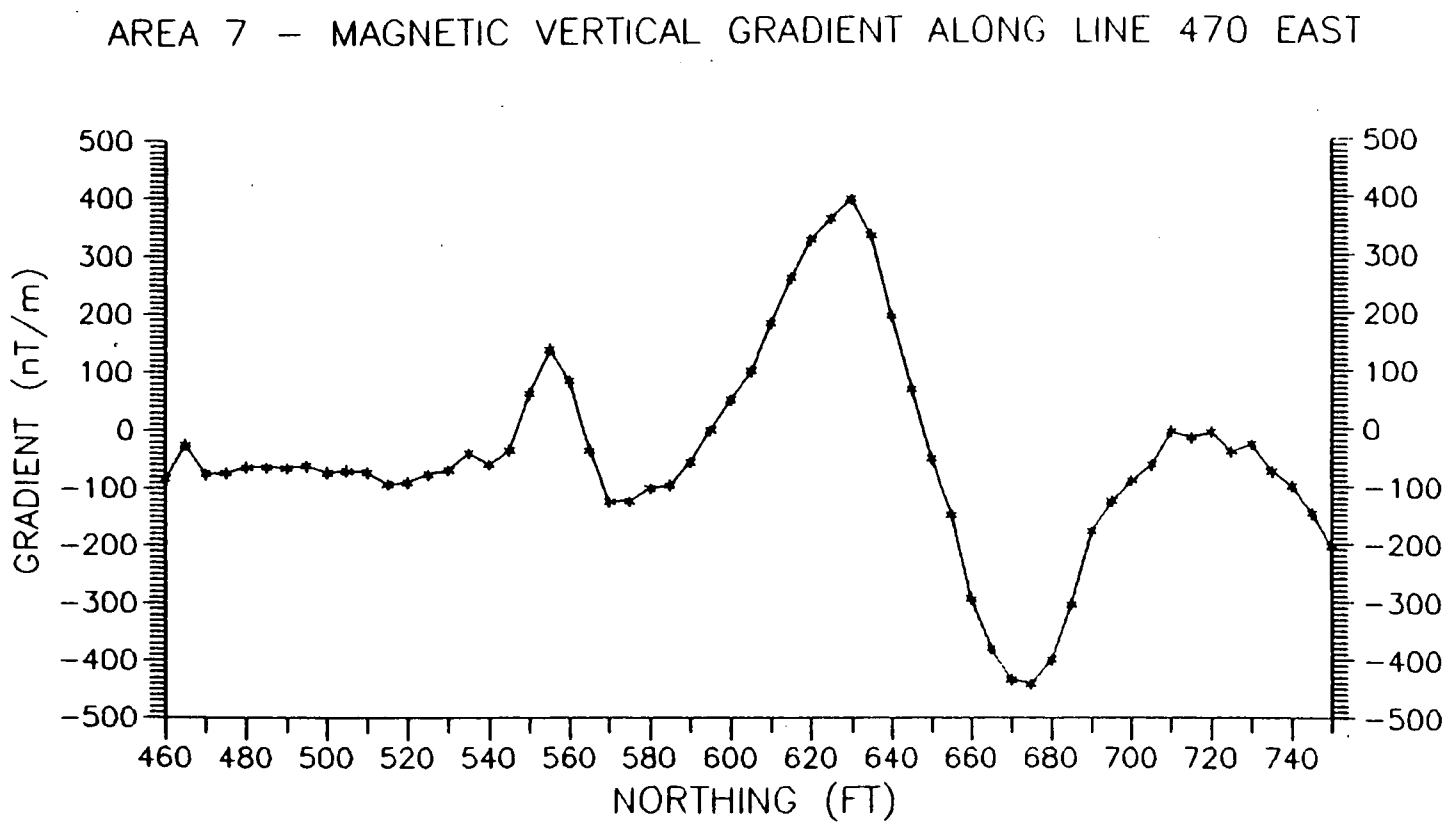


Figure 13. Profile of magnetic vertical gradient values in Area 7 along line 470 E.

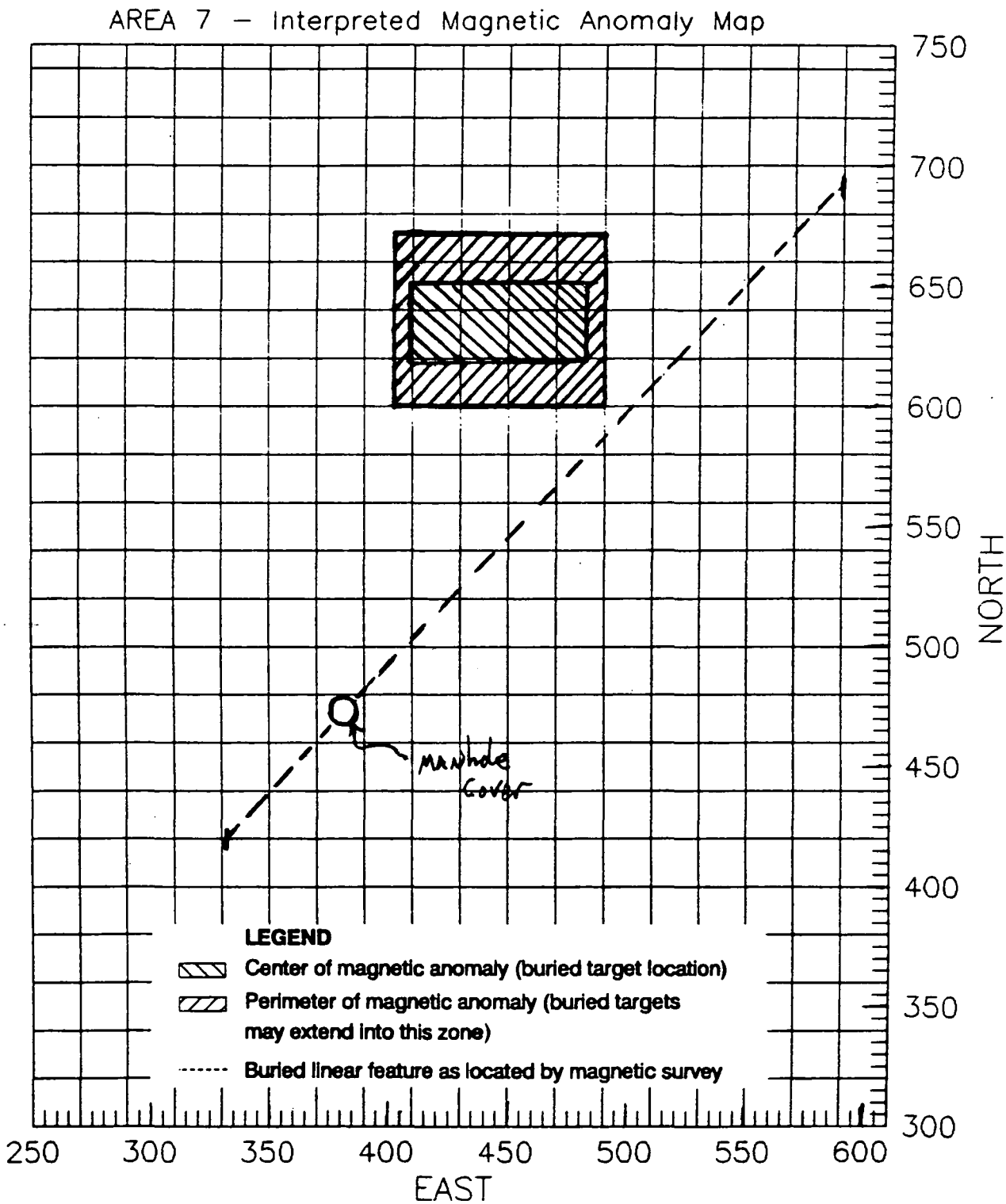


Figure 14. Interpretive map of magnetic anomalies in Area 7.

Area 7 – Contour Plot – Residual Magnetic Field

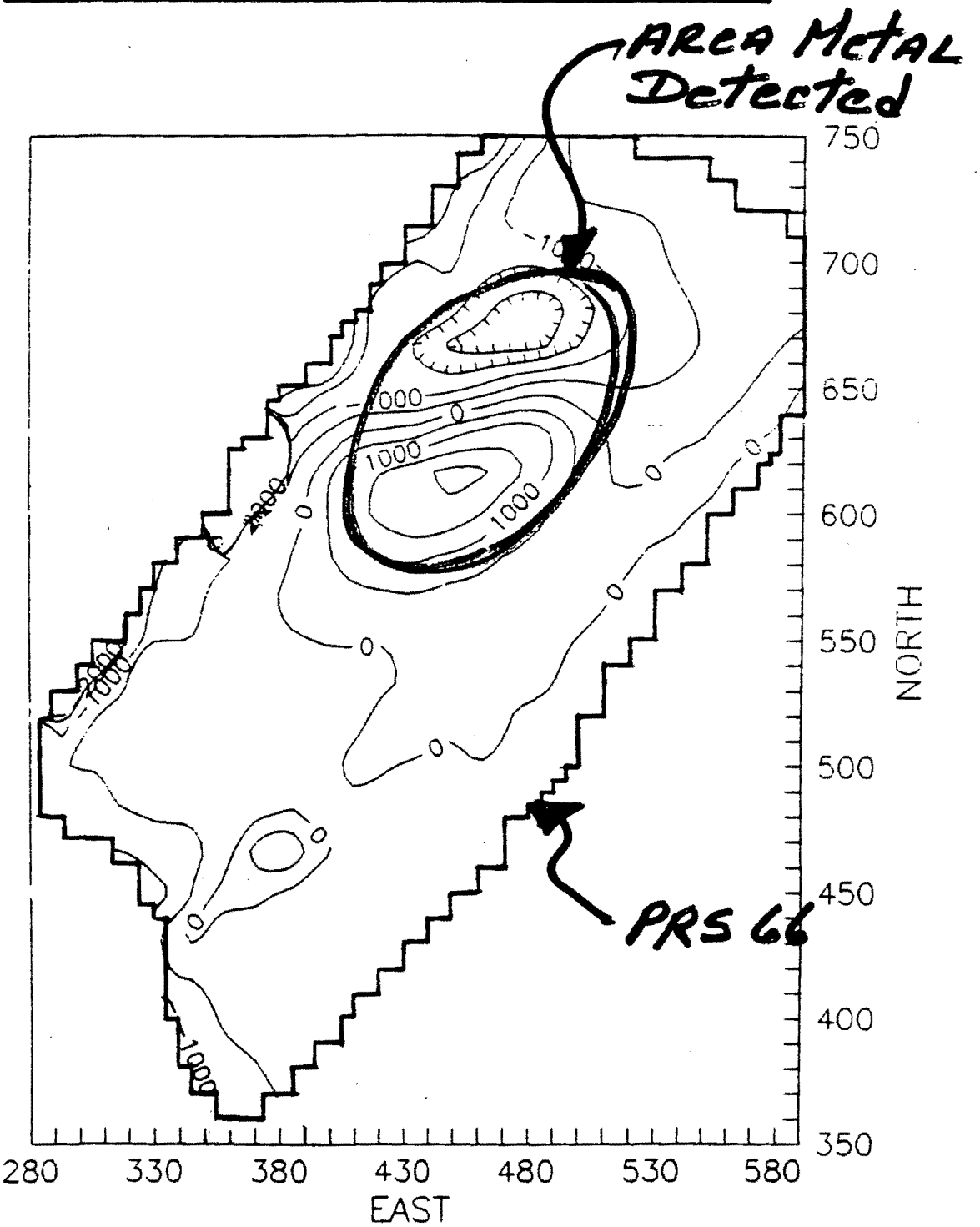


Figure A5.

AREA 7 – Contour Plot – Magnetic Vertical Gradient

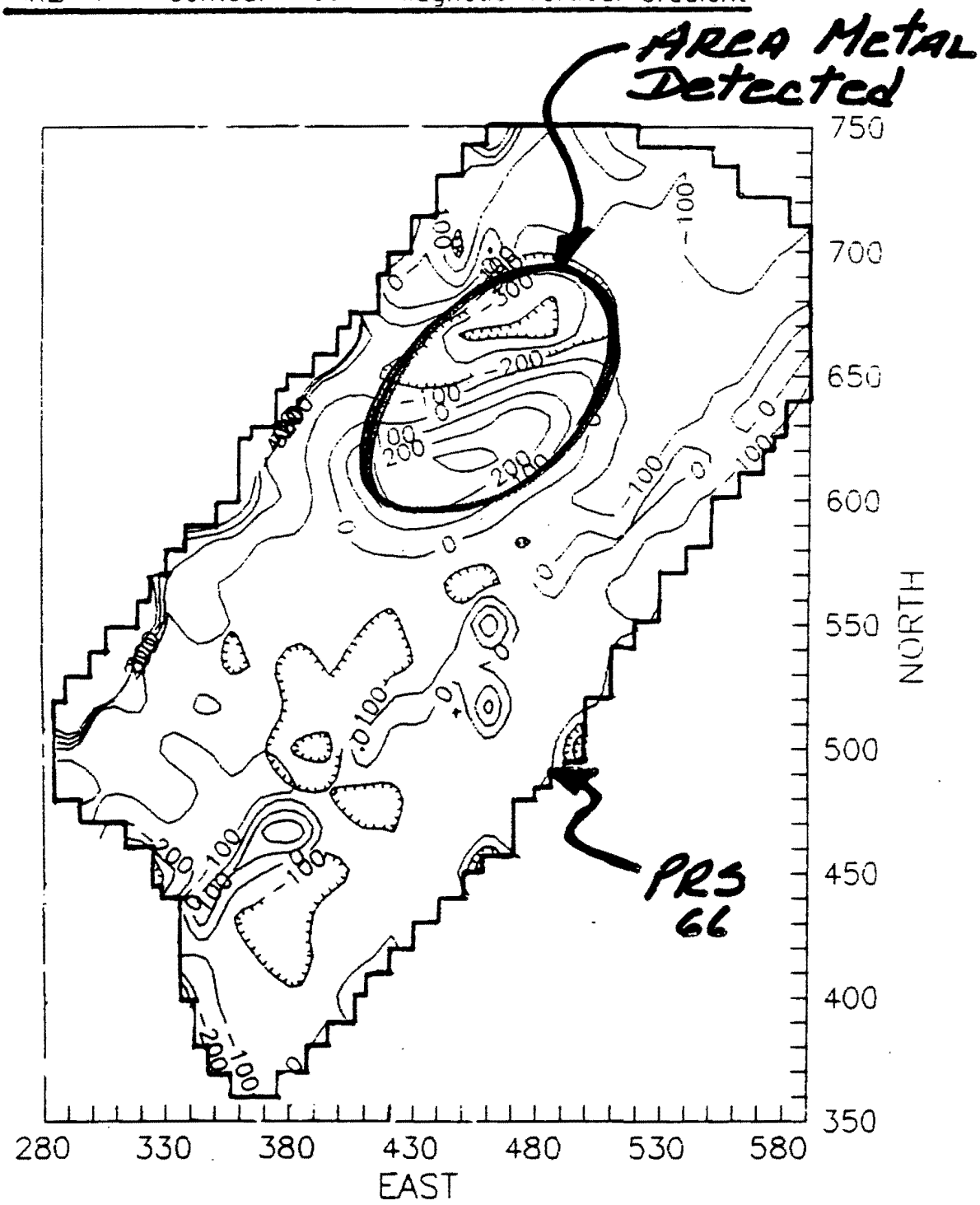


Figure A6.

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:

$$Ct = (Cg/Pb)*[[Pb * Kd / H] + [pw / H] + [pt -pw]]$$

where

Cg	concentration of volatile chemical concentrations as soil vapor in ng/ml
Pb	Bulk density of the soil in g/ml
Kd	soil/water partition coefficient in ml/g
H	Dimensionless Henry's Law Constant
pw	water filled porosity
pt	total porosity
Ct	target soil concentration in ng/g or ug/kg (ppb)

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

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

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

$$Cg = (Pb*Ct)/[[Pb*Kd/H] + [pw/H] + [pt-pw]]$$

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

Pb	1.6	Bulk density of the soil in g/ml
pw	0.15	water filled porosity
pt	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	Kd	Calculated Acceptable Soil Screening Level Value	Calculated Acceptable Soil Gas Reading	Calculated Acceptable Soil Gas Reading
		ml/g	mg/kg (ppm)	ng/ml	ppb
Toluene	2.52E-01	3.42	22.06	1.56E+03	414600
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

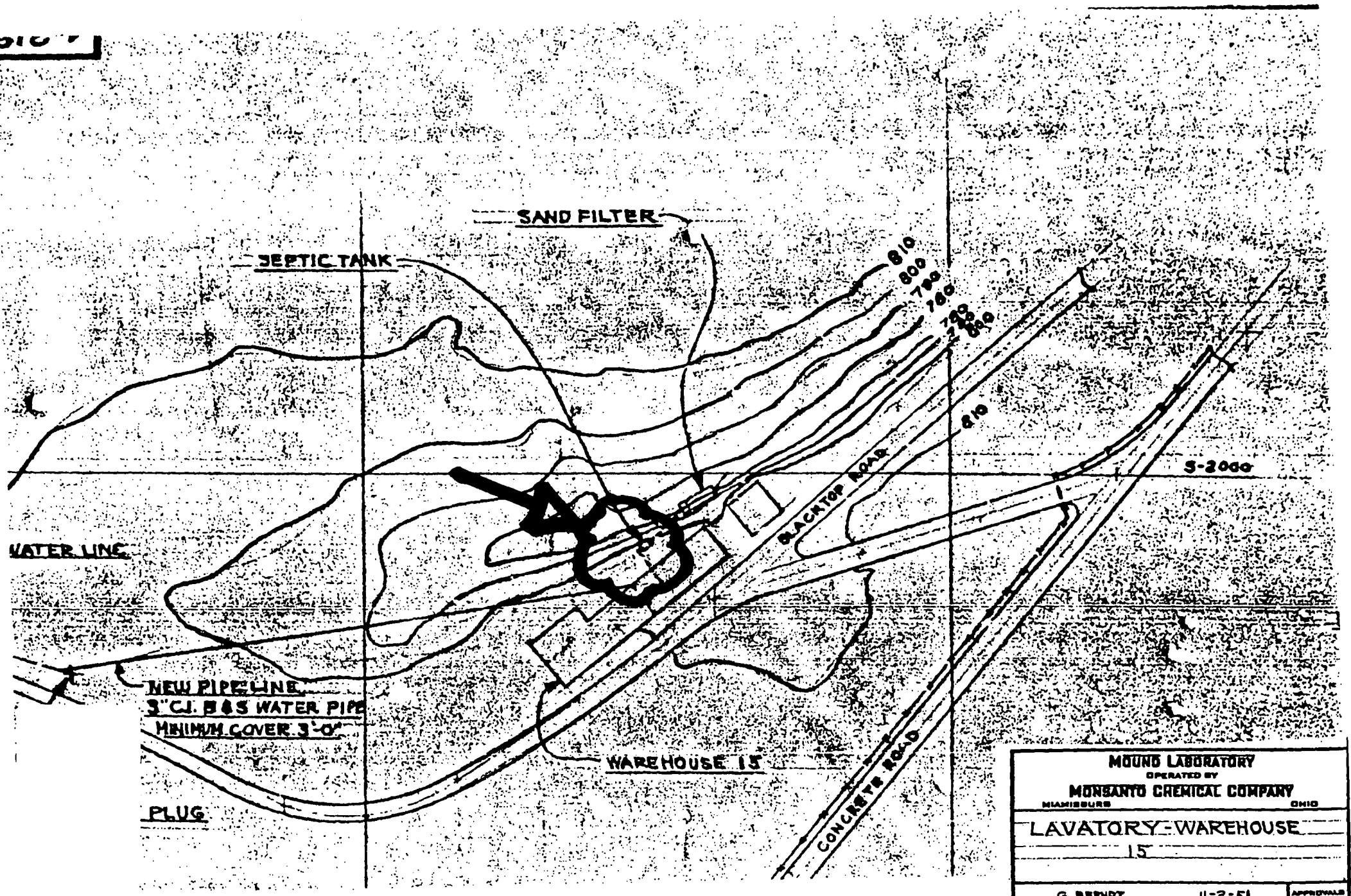
na not available

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.

Lavoratory - Warehouse 15

Drawing Number 4-2181


SAND FILTER
SEPTIC TANK
810
800
790
780
790
780
800
810
BLACKTOP ROAD
S-2000
WATER LINE
NEW PIPELINE
3" C.I. B&S WATER PIPE
MINIMUM COVER 3'-0"
WAREHOUSE 15
PLUG
CONCRETE ROAD
MOUND LABORATORY
OPERATED BY
MONSANTO CHEMICAL COMPANY
MIAMISBURG OHIO
LAVATORY-WAREHOUSE
15
DRAWN G. BERNDT DATE 11-2-51
CHECKED DATE
APPROVED DATE
JOB NO. 714
SCALE 1/8"=1'-0" & NOTED
DWG. NO. 4-2181
APPROVALS
1
2
3
4
NO. DATE REVISION BY CHK'D APPROVED

29
PARKING
PRESENT DAY LOCATION
OF 1951 SEPTIC TANK

Phone Interviews on Septic Tank Existence

M o u n d **Electronic Message/AOS**

From :Glenn F. Dixon
DIXON
Dept. :
Tel. No :513/438-0378
Date :01-May-1996 02:27pm EST
Subject :Possible Septic Tank in Vicinity of New Central Fire Stati

TO :Joseph Geneczko (GENEJC)

CC :Glenn F. Dixon (DIXON)

In response to your inquiry concerning a septic tank and/or a sand filter possibly located near the present Central Fire Station (bldg 98), I contacted two retired long-time Mound employees, Mr. Joseph Garner and Mr. Frank Thomas.

Mr. Garner had no recall of either item.

Mr. Thomas remembered that the old construction warehouse 15 had an offset in it, and that there was a septic tank in the area outside the offset. I relayed this information to Mr. Kip Weaver of EG & G; he said that it agreed with information he had found.

I would expect that there are record drawings of warehouse 15 at Mound, and that the location of the sepic tank could be approximated using this information. Of course, it may have been removed in conjunction with construction in that area.

If I can be of further assistance in this or other matters, please contact me.

Page Redacted

Contains Proprietary Information