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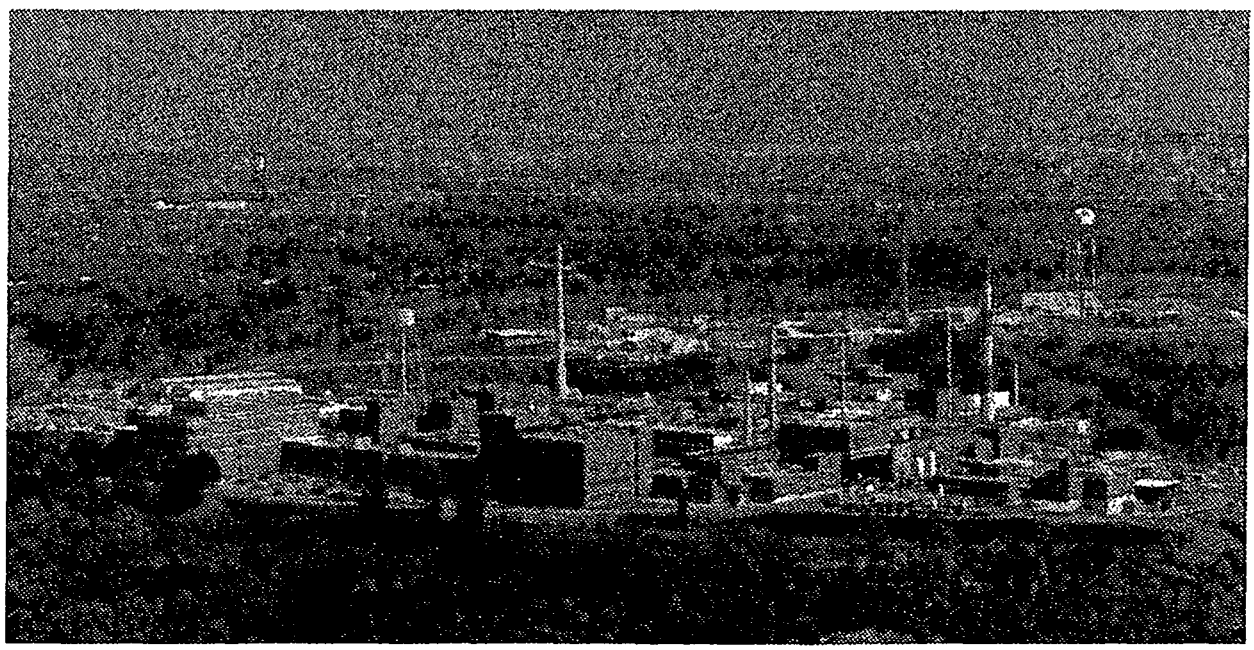
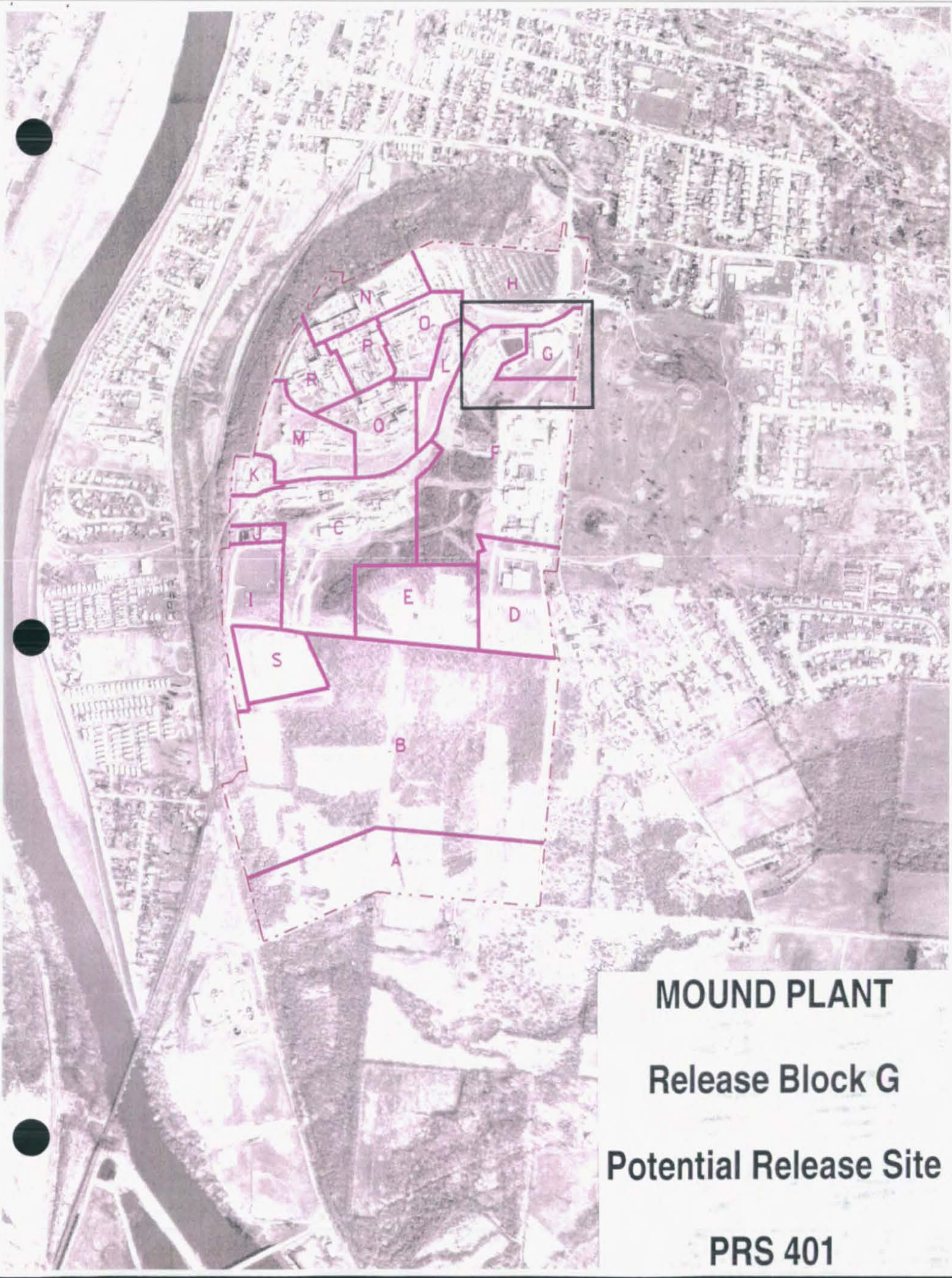
MOUND

Environmental
Restoration
Program

MOUND PLANT
Potential Release Site Package
PRS # 401



REV	DESCRIPTION	DATE
PUBLIC RELEASE 0	Available for comment.	Dec. 17, 1996
FINAL 1		

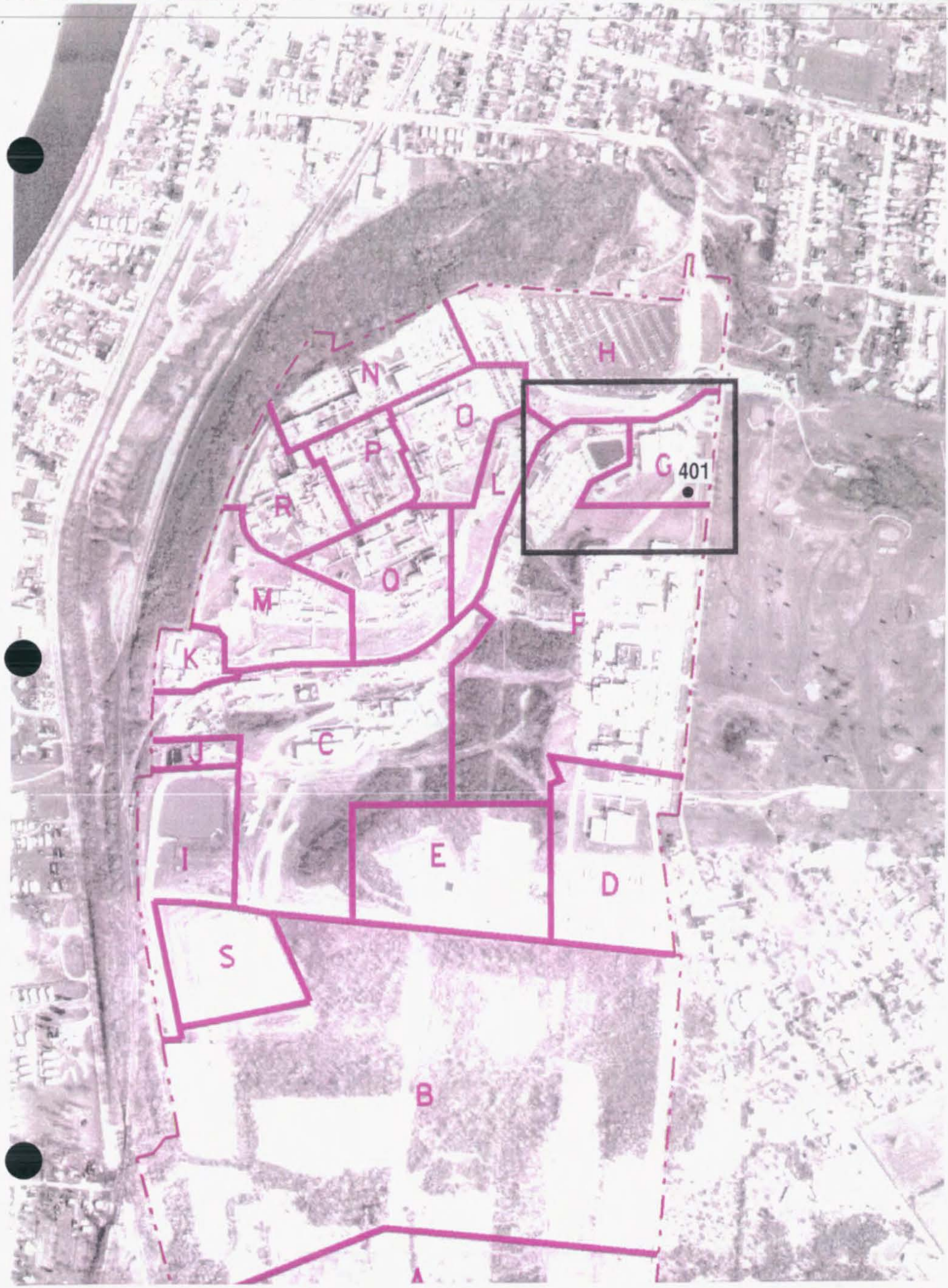


MOUND PLANT

Release Block G

Potential Release Site

PRS 401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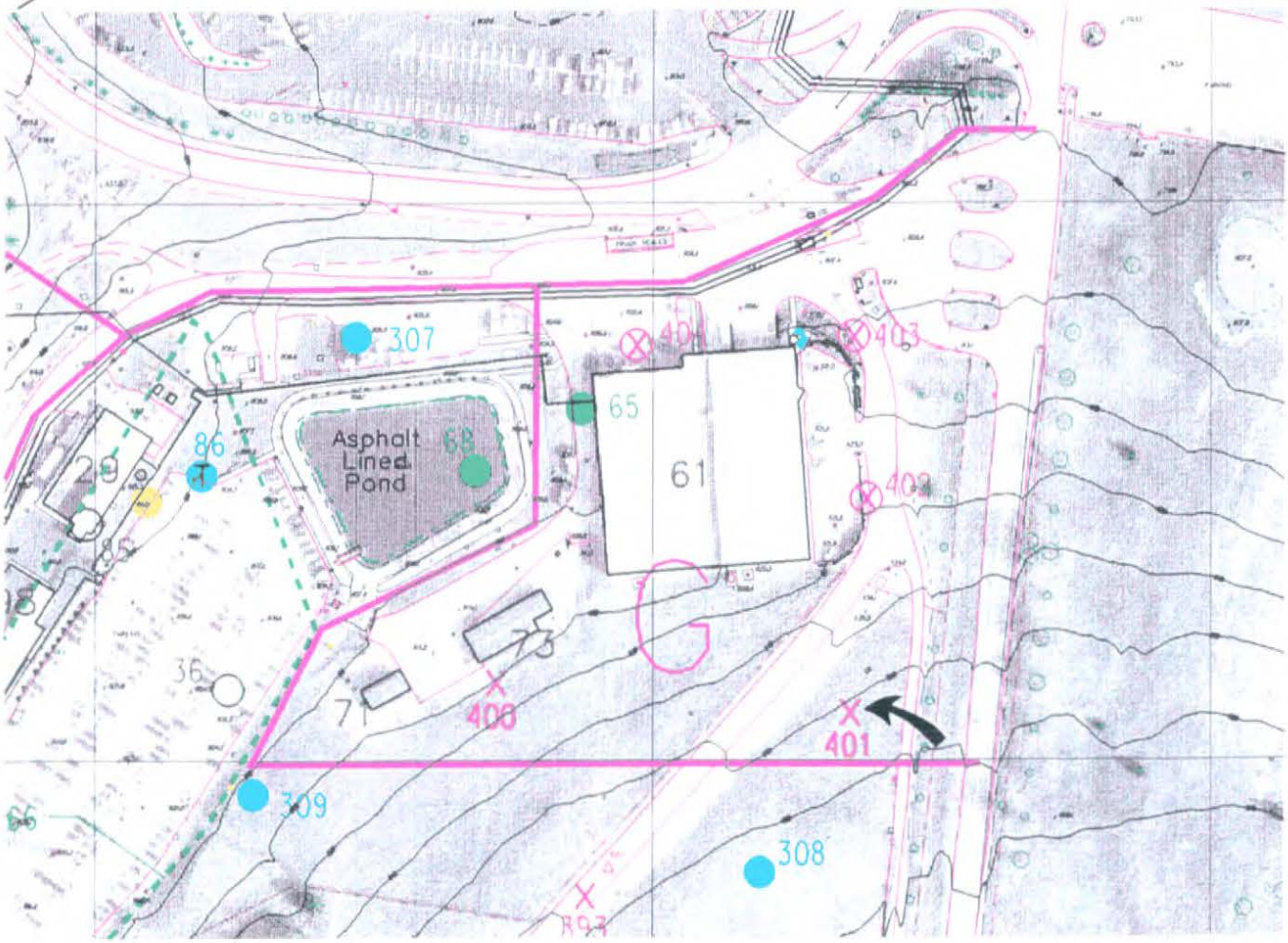
MOUND PLANT

Release Block G

Potential Release Site

PRS 401



401

PRS 401

PRS HISTORY:

PRS 401 is a radiological soil area southeast of Building 61. This PRS was created due to results of the Operable Unit 5, Operational Area Phase I Investigation, NON-AOC Field Report which was performed in June of 1994, that reported the presence of Plutonium-238.[2]

The limited historical data suggests that no radioactive or hazardous waste generating processes are known to have occurred at this location.

CONTAMINATION:

In 1983 or 1984 the Radiological Site Survey Project investigated the soils on the Mound Plant Site for radionuclides by:

- screening using a sodium iodide detector (FIDLER) to identify areas of suspected radioactive contamination;
- sampling of surface and subsurface soil; and
- analysis of soil samples using one or more of the following methods: radiochemical analysis for plutonium-238 and thorium isotopes, gamma spectroscopy, and liquid scintillation for tritium.

This investigation took three surface samples in the vicinity of PRS 401.

Results found: [1]

Contaminant	Maximum Concentration	Guideline Value
Plutonium-238	3.92 pCi/g	25 pCi/g
Thorium	< 2 pCi/g	5 pCi/g
Cesium-137	1.4 pCi/g *	0.46 pCi/g

* : The other sample location in the area did not detect Cesium-137

The 1994 OU5 Operational Area Phase I Investigation NON-AOC investigated locations around the Mound Plant site where previous investigations showed the potential of contamination. Soil samples were taken and analyzed for radionuclides.

Results found: [2]

Contaminant	Maximum Concentration	Guideline Value
Plutonium-238	26 pCi/g *	25 pCi/g
Thorium	No Detection	5 pCi/g

* : 25 pCi/g is the Mound Soil Screening Facility Detection Limit for Plutonium-238

During the investigation Petrex: Relative Soil Gas data was taken at this location. Results indicated relatively low Hydrocarbon detections in the soil gas.

READING ROOM REFERENCES:

1) Operable Unit 9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 6-12)
2) Operable Unit 5, Operational Area Phase I Investigation Non-AOC Field Report, June 1995. (pages 13-22)

PREPARED BY:

Gary Coons, Member of EG&G Technical Staff
Jean Boling, Member of EG&G Technical Staff
Dennis Gault, Member of EG&G Technical Staff

MOUND PLANT
PRS 401
SOIL CONTAMINATION

RECOMMENDATION:

This soils location was identified as PRS 401 due to a single plutonium-238 detection found during the OU5, Operational Area Phase I Investigation.

In 1994, plutonium-238 was detected in a surface soil sample at 26 pCi/g. The 26 pCi/g detection is at the Mound ALARA (as low as reasonably achievable) concentration for plutonium.

A separate study detected the presence of cesium-137 at 1.4 pCi/g which is above the 0.46 pCi/g 10^{-6} Risk Based Guideline Value, but below the 10^{-5} Risk Based Guideline Value of 4.6 pCi/g. Since the cesium-137 was detected in only one sample, at a relatively low concentration, it is not considered a threat to humans or the environment. Other samples taken in the vicinity, of PRS 401, found no evidence of radioactive or hazardous contamination in the soil. No processes are known to have occurred at this PRS that would have contributed to any contamination.

Therefore, since (1) the plutonium detection establishing this location as a PRS is already at a level deemed "as low as reasonably achievable" and (2) the plutonium and cesium detections do not appear to be representative of contamination in the area (based on other sampling in the vicinity of PRS 401), PRS 401 is recommended for NO FURTHER ASSESSMENT.

CONCURRENCE:

DOE/MB: Arthur W. Kleinrath, Remedial Project Manager 12/17/96 (date)

USEPA: Timothy J. Fischer, Remedial Project Manager 12/17/96 (date)

OEPA: Brian K. Nickel, Project Manager 12/17/96 (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from _____ to _____

☐ No comments were received during the comment period.

☐ Comment responses can be found on page _____ of this package.

REFERENCE MATERIAL
PRS 401

Document Control No. DGC
W.P. DAVIS

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

June 1993

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies

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

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

2.1.4. Sample Analyses

2.1.4.1. FIDLER Screening

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

2.1.4.2. Radiochemical Analysis for Plutonium-238

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

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

2.1.4.3. Radiochemical Analysis for Thorium

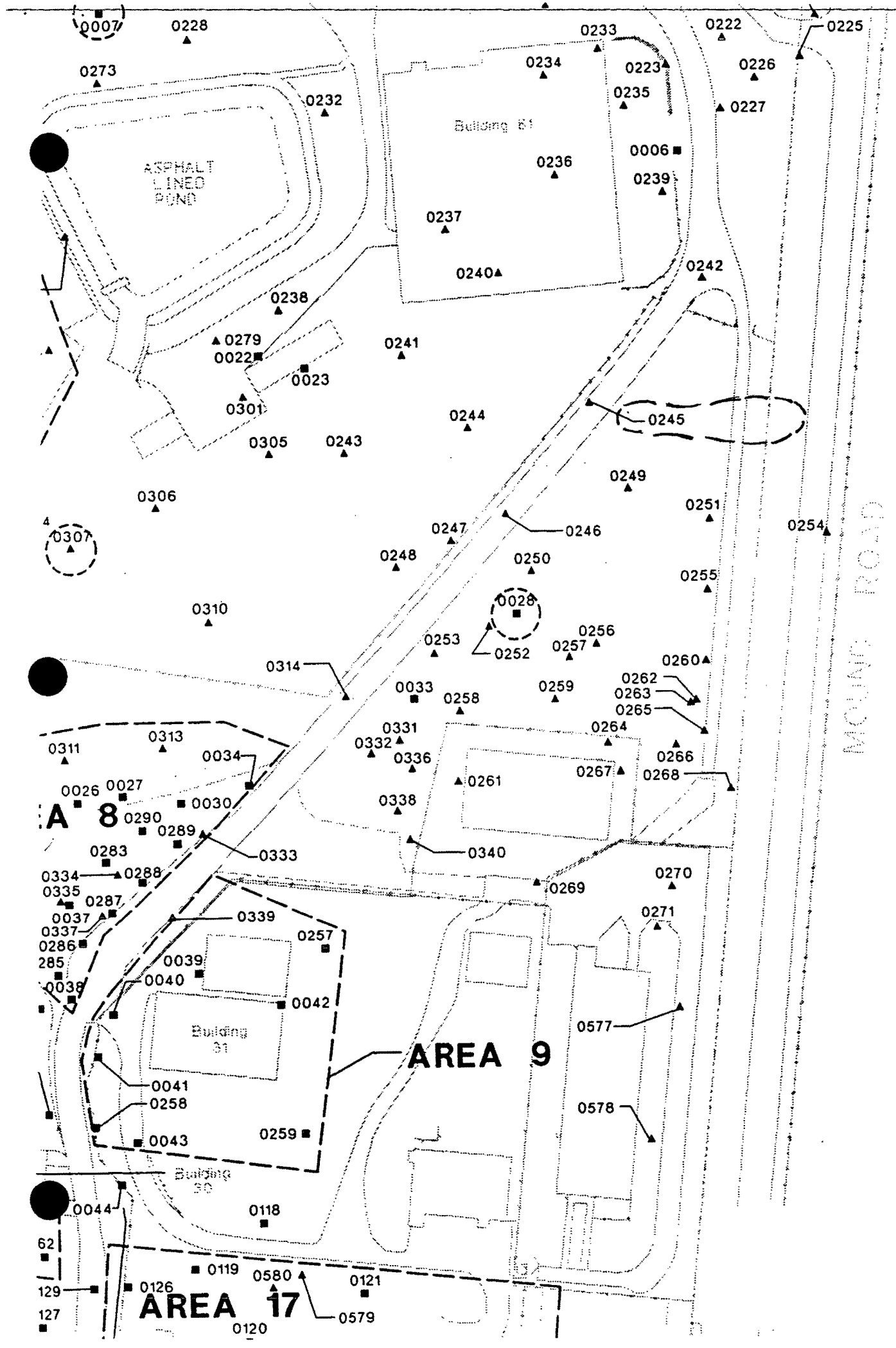
Samples with thorium concentrations in excess of 2 pCi/g by FIDLER screening were also radiochemically analyzed for thorium, resulting in the radiochemical analysis of about 12 percent of the samples. The LDLs for the thorium isotopes using radiochemical procedures were estimated to be

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

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

2.1.4.4. Gamma Spectroscopy

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

RADIOCHEMICAL ANALYSIS

GAMMA SPECTROSCOPY

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
S0235	2050	1505	6750	08-84	0	0.09	b					
S0236	2075	1580	2867	10-83	0	10.35[c]	b					
S0237	2075	1680	6751	08-84	0	0.02	b					
S0238	2075	1830	2864	10-83	0	0.09	b					
C0006	2100	1480	8354	11-84	54	0.03	3.24					
			8355	11-84	108	0.05	2.65					
S0239	2125	1505	2815	10-83	0	0.21	b					
S0240	2125	1655	6494	08-84	0	4.45	b					
S0241	2150	1755	2809	10-83	0	4.51	b					
S0242	2200	1505	2812	10-83	0	2.18	b	0.62				
S0243	2200	1830	6496	08-84	0	0.77	b					
S0244	2225	1730	6495	08-84	0	3.82	b		LDL	1.1	1.2	LDL
S0245	2250	1630	6498	08-84	0	0.46	b					
S0246	2300	1730	2811	10-83	0	0.92	b					
S0247	2300	1780	6499	08-84	0	3.82	b					
S0248	2300	1830	6497	08-84	0	9.00[c]	3.73[c]					
S0249	2325	1630	6502	08-84	0	3.92	b		LDL	1.4	1.2	LDL
S0250	2350	1730	6501	08-84	0	4.63	b					
S0251	2375	1580	2814	10-83	0	2.13	b					

Map Location[a]	Coordinates South	Coordinates West	MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
C0289	2422.7	2081.0	None[d]	07-84	0	NR	0.6					
			None[d]	07-84	12	NR	1.1					
			None[d]	07-84	24	NR	0.5					
			None[d]	07-84	36	NR	0.8					
			None[d]	07-84	48	NR	1.0					
			None[d]	07-84	60	NR	0.8					
C0290	2401.5	2102.1	None[d]	07-84	0	NR	0.7					
			None[d]	07-84	12	NR	0.8					
			None[d]	07-84	24	NR	0.8					
			None[d]	07-84	36	NR	0.8					
			None[d]	07-84	48	NR	0.6					
			None[d]	07-84	60	NR	0.9					
			None[d]	07-84	72	NR	0.8					
C0291	2915.3	2490.3	None[d]	07-84	0	NR	0.6					
			None[d]	07-84	12	NR	0.4					
			None[d]	07-84	24	NR	0.5					
			None[d]	07-84	36	NR	0.4					
			None[d]	07-84	48	NR	0.4					
			None[d]	07-84	60	NR	0.3					
			None[d]	07-84	72	NR	0.5					
			None[d]	07-84	84	NR	0.4					
			None[d]	07-84	96	NR	0.7					
			None[d]	07-84	108	NR	0.6					
			None[d]	07-84	120	NR	0.3					
			None[d]	07-84	132	NR	0.3					
91092	2185	3362	8413	12-84	f	0.31	323.5[g]					

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

[b]Thorium results of $\leq$ 2 pCi/g are listed as "b".

[c]Verification sample analyzed for QA/QC.

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

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

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

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

LDL - The sample result was below the Lower Detection Limit, which was estimated to be 0.5 pCi/g for cesium-137, cobalt-60, and americium-241. The LDL for radium-226 or actinium-227 was estimated to be 1 pCi/g.

NR - No result provided. (Note: no samples were taken for plutonium-238 when *in situ* gamma spectrometry was performed.)

Document Control No.

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

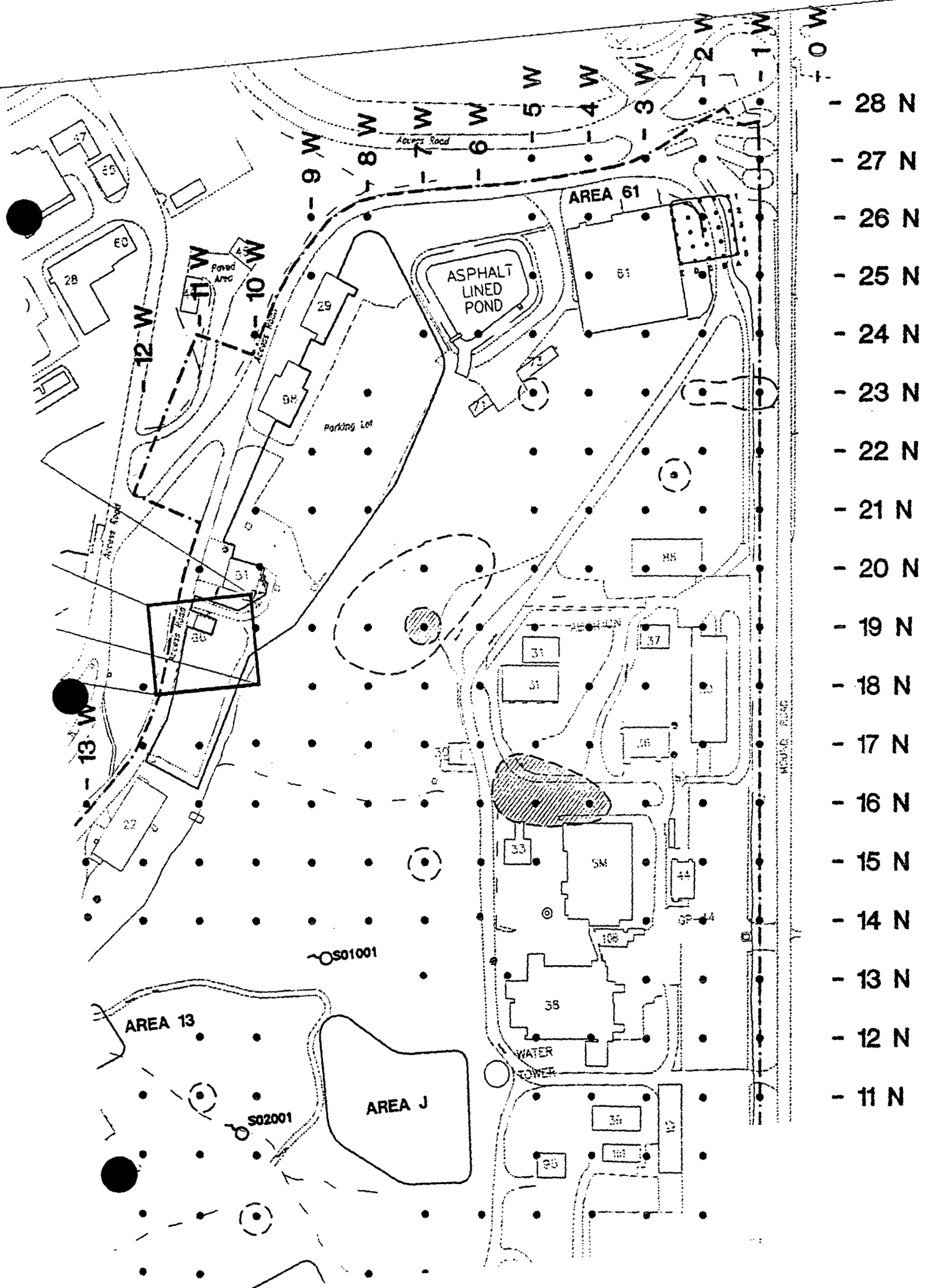
VOLUME I - TEXT

June 1995

Final (Revision 0)

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies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Paved Area
Parking Lot
AREA 13
AREA J
S01001
S02001
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Table II.2. Summary of Elevated Surface Radiological Activity in Non-AOC (FIDLER Survey)
Page 5 of 5

Location	Channel 1 (cpm)		Channel 2 (kcpm)		Out Channel (kcpm)
	CC	RDG	CC	RDG	RDG
15N11	165.3	--	7.6	8.5	a
16N1	236.8	--	9.9	10.5	a
16N4	130	150	5.2	9.0	a
17N8	165.3	--	7.6	8.0	a
18N6	130	--	5.2	6.5	a
18N6.5	165.3	460	7.6	46	40
18N8		170	7.6	11.0	a
18N9		--		10.5	a
19N7	170.9	325	7.1	20.0	45.0
19N9		--		9.5	a
20N2	130	--	5.2	6.5	a
20N3		--		6.5	a
20N4	170.9	--	7.1	7.5	a
20N6		375		22.0	30.0
20N7		325		22.5	45.0
21N3		--	7.1	8.0	a
21N5	149.4	--	6.7	10.0	a
22N4		--		9.5	a
22N5		--		8.0	a
23N1	236.8	--	9.9	10.5	a
23N5	149.4	--	6.7	7.0	a
24N4	170.9	--	7.1	7.5	a

CC contamination criteria
cpm counts per minute
kcpm counts per minute times 1000
RDG FIDLER reading
a Out Channel readings were not measured at individual grid locations
-- Reading taken did not exceed CC

FIDLER DATA

completed at background stations, provided a statistical basis to determine if survey locations were contaminated. Background station locations were selected based on the terrain to be surveyed and were assumed not to be contaminated based on knowledge of previous site activities. At each background station, Channel 1 readings were taken and recorded in counts per minute (cpm). Channel 2 readings were taken and recorded in counts per minute x 1000 (kcpm). The standard deviations and the contamination criteria (CC) were calculated for Channels 1 and 2 (see Appendix A.1).

Table II.1 presents the background station information for the Non-AOC survey. The background station (not shown in Table II.1) for the Building 61 survey was established using FIDLER #2 (Instrument #3400, Probe #3611) at grid location A1 in Area 61.

Table II.1. FIDLER and Background Station Information for the Non-AOC

Date	FIDLER #	Instrument #	Probe #	Background Station
6/20/94	#1 #2	#3712 #3400	#3713 #3611	SAIC Trailer Stake 3N4
6/21/94	#1 #1 #2 #2	#3712 #3712 #3400 #3400	#3713 #3713 #3611 #3611	Stake 3N4 Stake 1N16 Stake 3N4 Stake 1N16
6/22/94	#2	#3400	#3611	Stake 8N1
6/23/94	#2 #2	#3400 #3400	#3611 #3611	Stake 8N2 Stake 4N23
6/27/94	#2 #2	#3400 #3400	#3611 #3611	Stake 20N6 Stake 26N5
6/28/94	#2	#3400	#3611	Stake 8N2
6/29/94	#2	#3400	#3611	Stake 12N27
6/30/94	#2	#3400	#3611	Stake 3N13
7/6/94	#2	#3400	#3611	Stake 8N22
7/7/94	#2	#3400	#3611	Stake 11N22
7/21/94	#2	#3400	#3611	Stake 11N16

FIDLER SURVEY

PROJECT NAME: EG&G MOUND OU5 OPERATIONAL AREA, PHASE 1 PROJECT NO.: 34896

LOCATION GRID ID	DATE OF SURVEY	CONTAM. CRIT CH1	CONTAM. CRIT CH2	FIDLER READING (CPM) CH1	FIDLER READING (CPM) CH2 x (1000)	FIDLER NUMBER	COMMENTS
Ø2W22	6/27/94	176.8	8.97	135	5.5	2	
Ø3W22	6/27/94	176.8	8.97	115	6.0	2	
Ø4W22	6/27/94	152.1	8.45	100	9.5	2	
Ø5W22	6/27/94	152.1	8.45	105	8.0	2	
Ø6W22							AOC AREA 7
Ø7W22							AOC AREA 7
Ø8W22	6/27/94	176.8	8.97	115	4.5	2	
Ø9W22	6/27/94	176.8	8.97	95	6.0	2	
1ØW22							AOC AREA 7
11W22							AOC AREA 7
12W22							AOC AREA 7
	gpH 11/2/94						
Ø1W23	6/22/94	253.5	12.48	170	10.5	2	
Ø2W23	6/27/94	176.8	8.97	160	5.0	2	
Ø3W23	6/27/94	152.1	8.45	115	5.5	2	
Ø4W23	6/27/94	152.1	8.45	95	6.0	2	
Ø5W23	6/27/94	152.1	8.45	100	7.0	2	
Ø6W23							AOC AREA 7
Ø7W23							AOC AREA 7

FIDLER DATA

MOUND SOIL SCREEN DAT

Table II.3. Summary of Elevated Surface Soil Radiological Activity
Page 2 of 2

Grid Location[a]	Mound Soil Screening Facility Data	
	Plutonium-238 (pCi/g)	Thorium-232 (pCi/g)
6N9	33	ND
6N14	30	ND
6N16	29	ND
6N17	25	ND
6N19	39	ND
7N14	27	ND
7N18	26	ND
7N23	25	1
9N10	25	ND
11N11	25	ND
12N15	85	ND
15N7	30	ND
16N4	78	ND
16N5	243	ND
19N7	56	15.9
19N8	25 39	2.4 ND
20N6	27	2.6
20N7	37	14.7
22N4	ND	2.0
23N1	25	ND
23N2	26	1
23N5	25	ND
B18001 (Building 24)	38	6.7
21.5N2.5	25	ND

[a] See Plate 1 for grid location

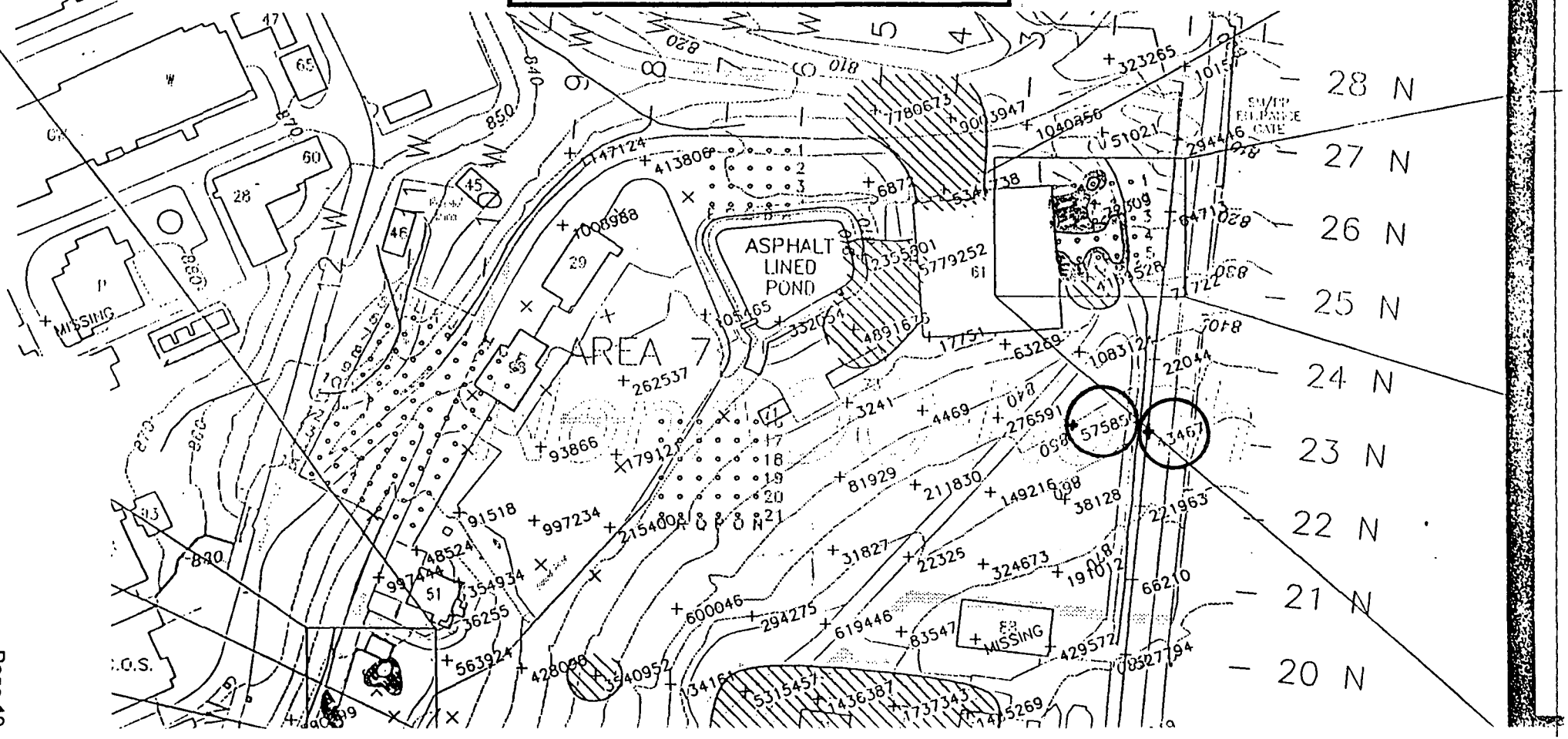
ND Radiological contamination not detected above the Mound Plant Soil Screening Facility detection limits of 25 pCi/g for Pu-238 and 2 pCi/g for Th-232

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

Relative Response

Total Aromatic Hydrocarbons

Plate 2

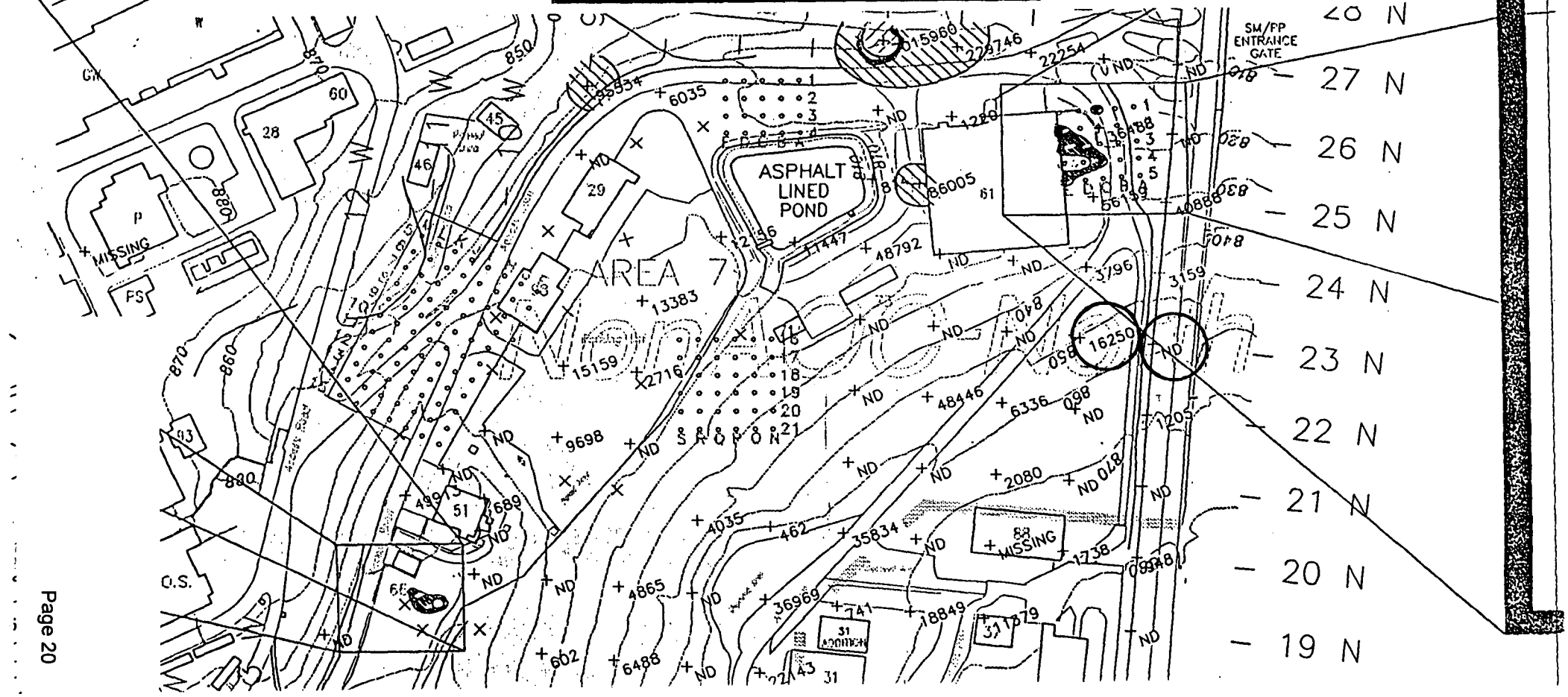


LEGEND				
Relative Response Values (in ion counts):				
NonAOC–South	NonAOC–West	NonAOC–East	NonAOC–North	Area 61
≥ 70,000	≥ 1,000,000	≥ 300,000	≥ 800,000	≥ 1,400,000
70,000–89,999	100,000–999,999	30,000–299,999	80,000–799,999	100,000–1,399,999

Relative Response

Total Semivolatile Hydrocarbons

Plate 3

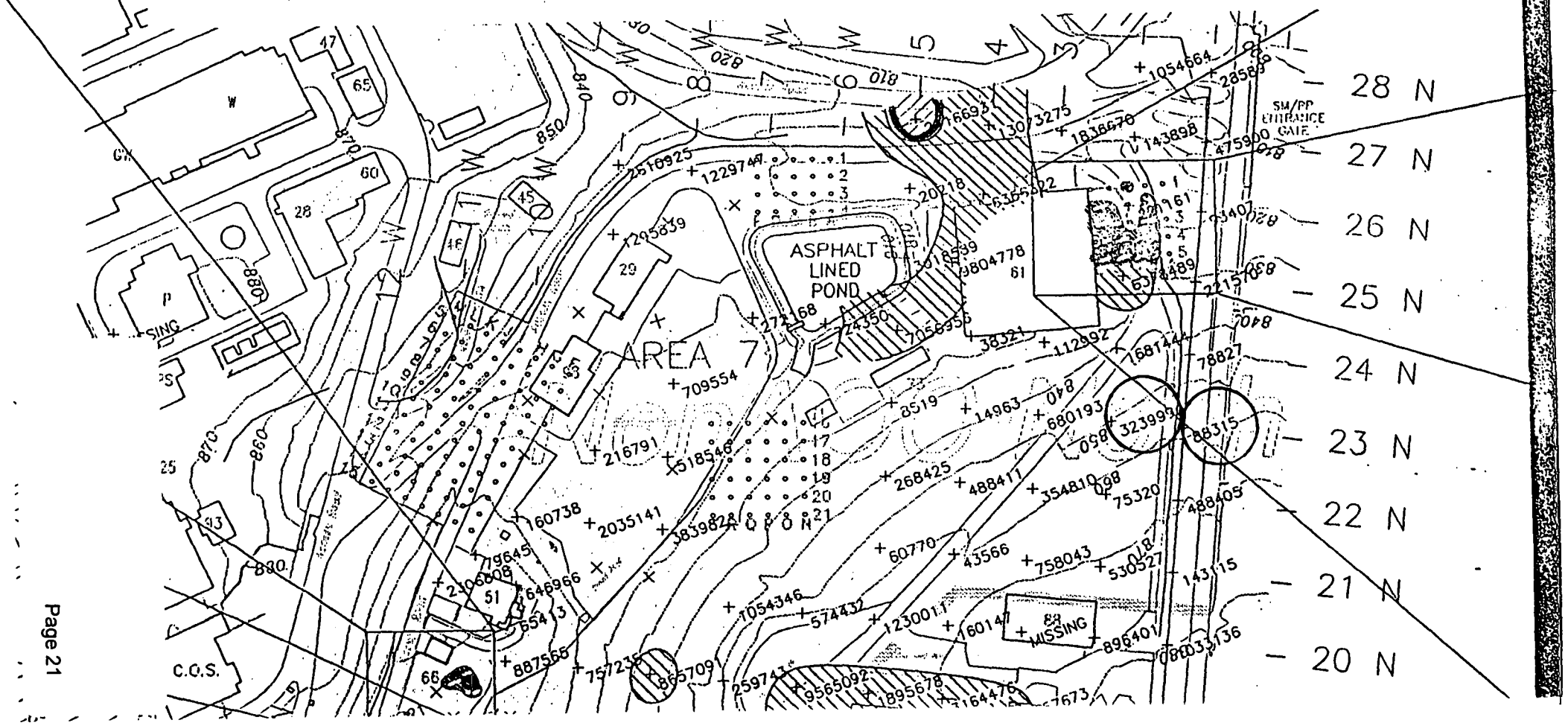


LEGEND				
Relative Response Values (in ion counts):				
NonAOC-South	NonAOC-West	NonAOC-East	NonAOC-North	Area 61
≥ 8,000,000	≥ 29,000,000	≥ 11,500,000	≥ 23,000,000	≥ 25,000,000
5,500,000–7,999,999	3,000,000–28,999,999	1,000,000–11,499,999	4,000,000–22,999,999	3,000,000–24,999,999

Relative Response

Total C5–C11 Petroleum Hydrocarbons

Plate 4



LEGEND				
Relative Response Values (in ion counts):				
NonAOC–South	NonAOC–West	NonAOC–East	NonAOC–North	Area 61
≥ 500,000	≥ 500,000	≥ 80,000	≥ 400,000	≥ 250,000
80,000–499,999	80,000–499,999	30,000–79,999	40,000–399,999	30,000–249,999

Relative Response

Total Halogenated Hydrocarbons

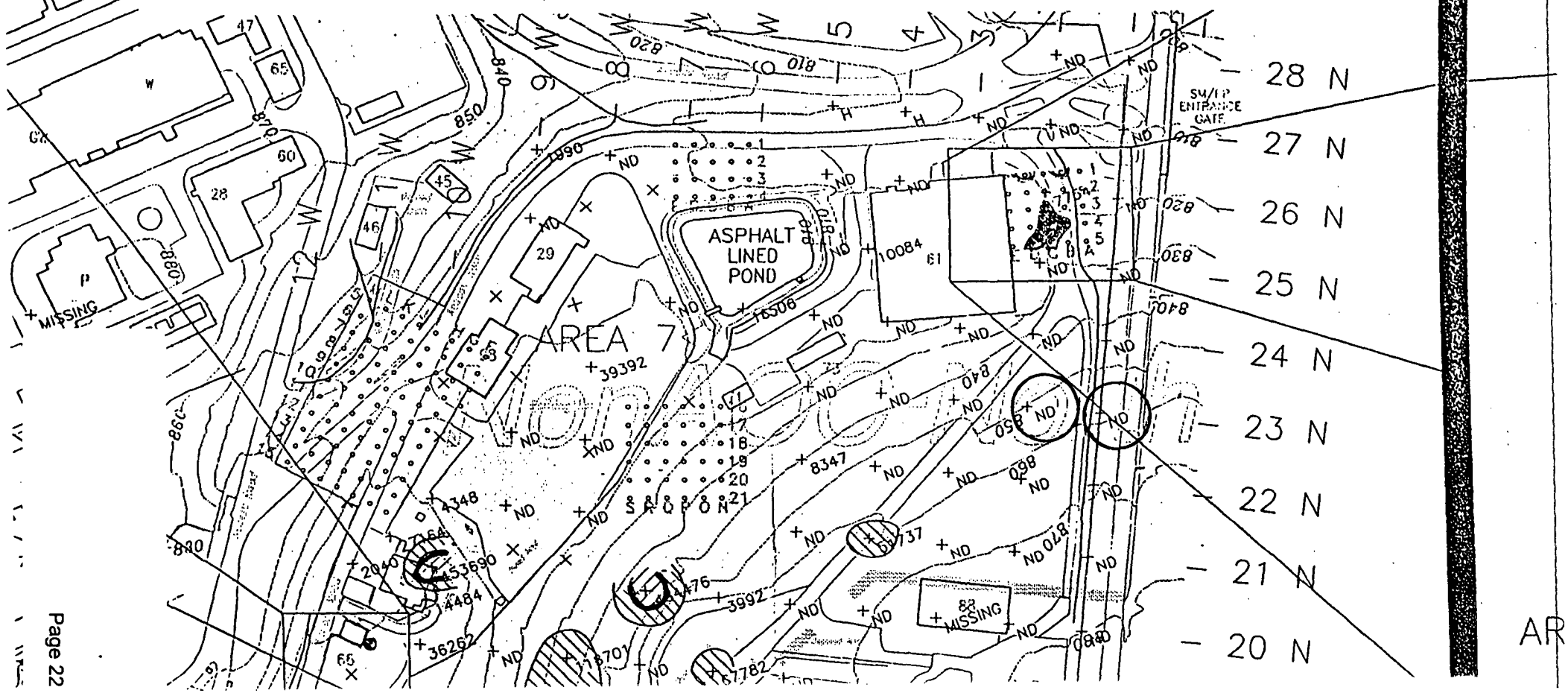



Plate 5