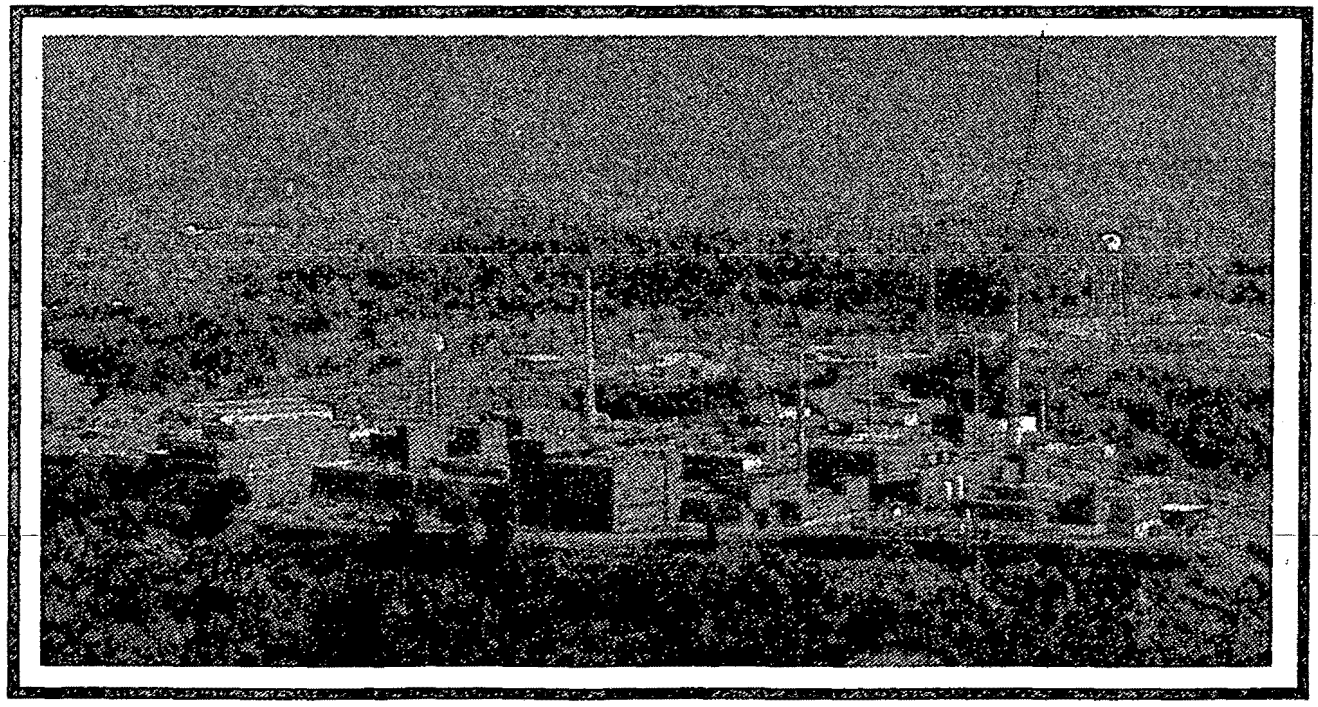
EG&G MOUND-30-03-04-02--9611270009

MOUND

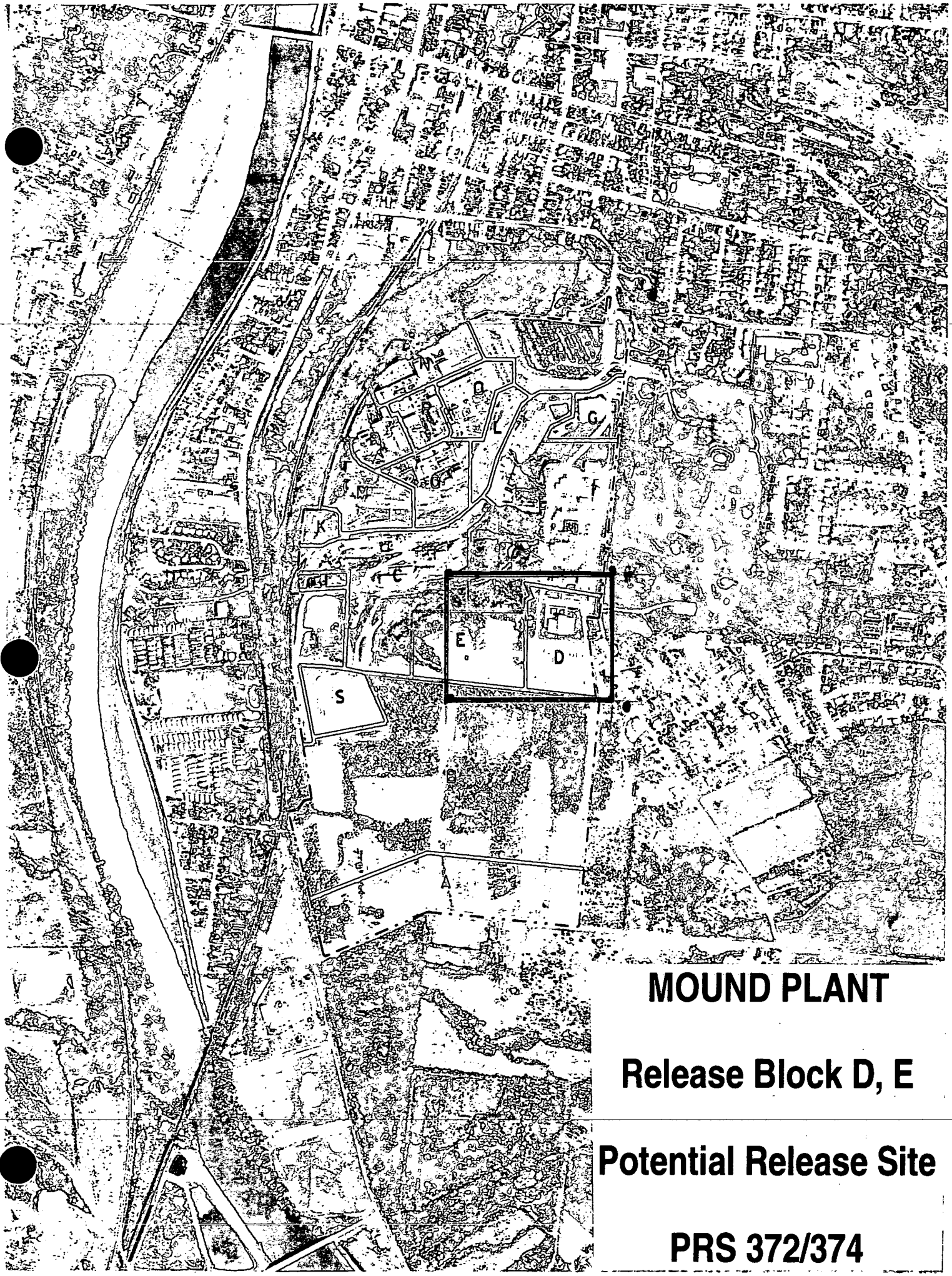
Environmental
Restoration
Program

MOUND PLANT
Potential Release Site Package
PRS # 372/374



PRS 372/374

REV	DESCRIPTION	DATE
PUBLIC RELEASE 0	Available for comments.	May 8, 1996
FINAL 1	Comment period expired. No comments. Recommendation page annotated.	Oct. 10, 1996
FINAL 2	Signature page changed to show correct review period.	Nov. 19, 1996

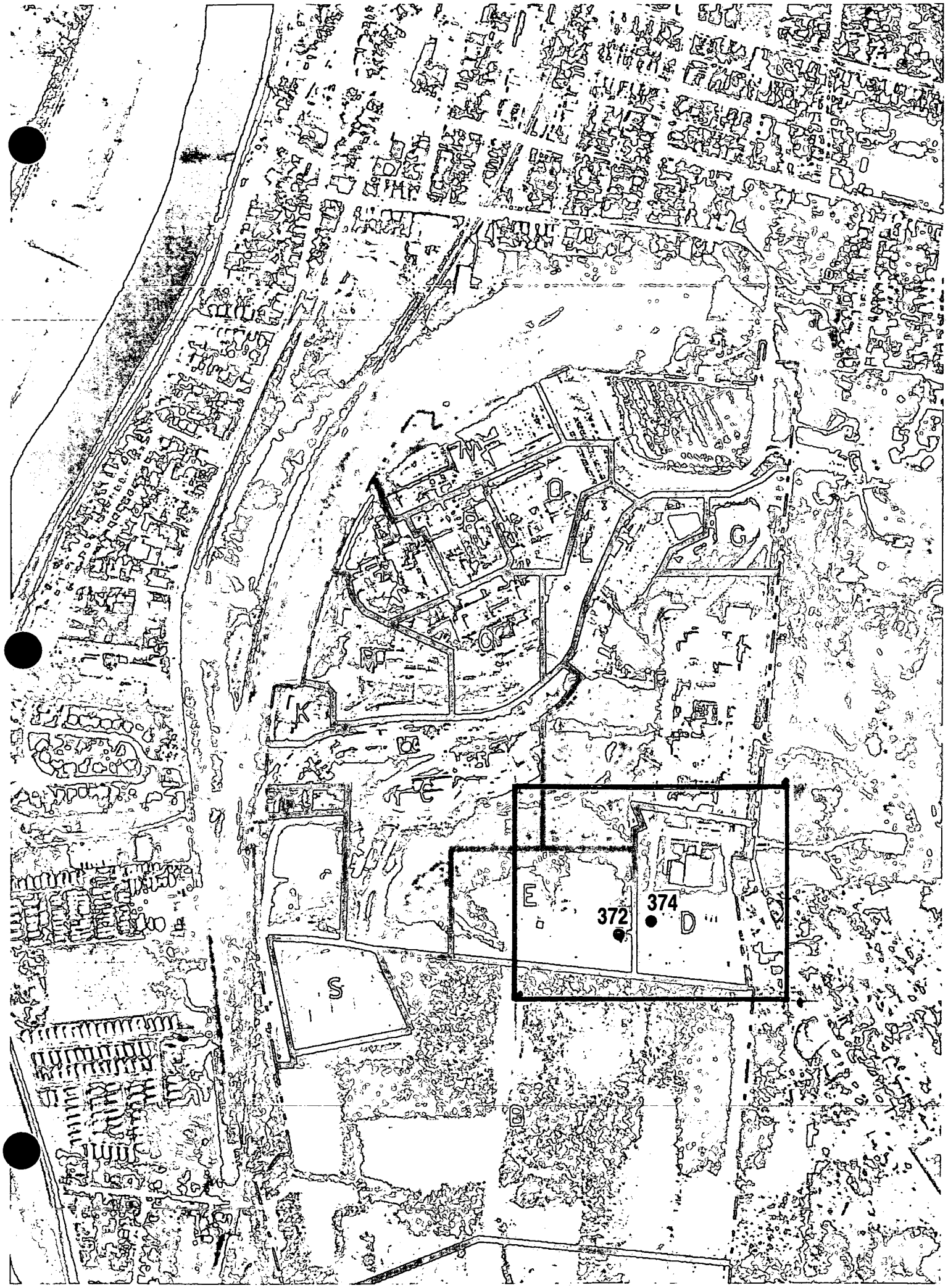


MOUND PLANT

Release Block D, E

Potential Release Site

PRS 372/374



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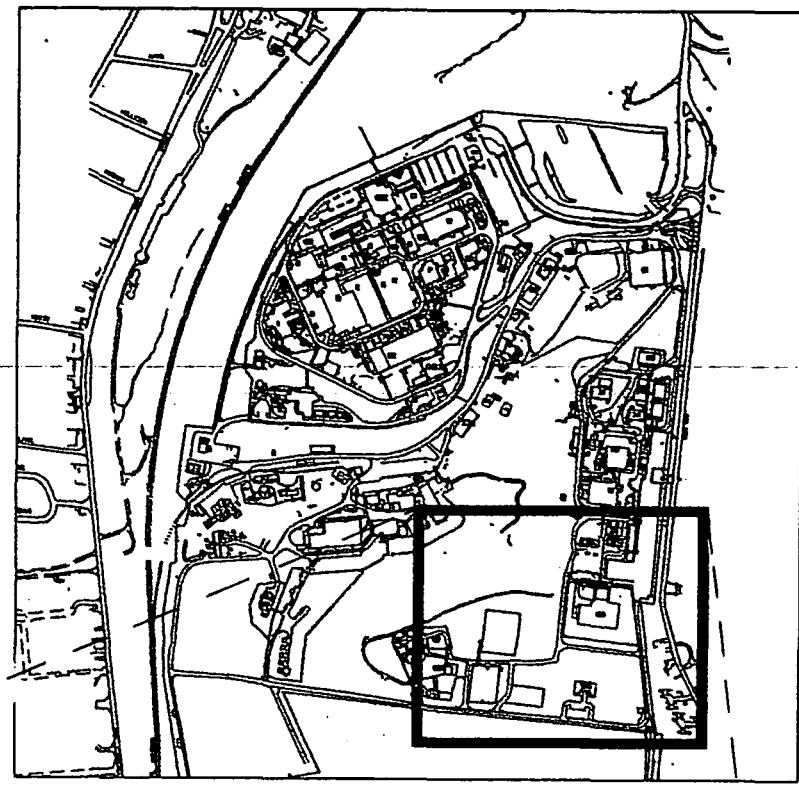
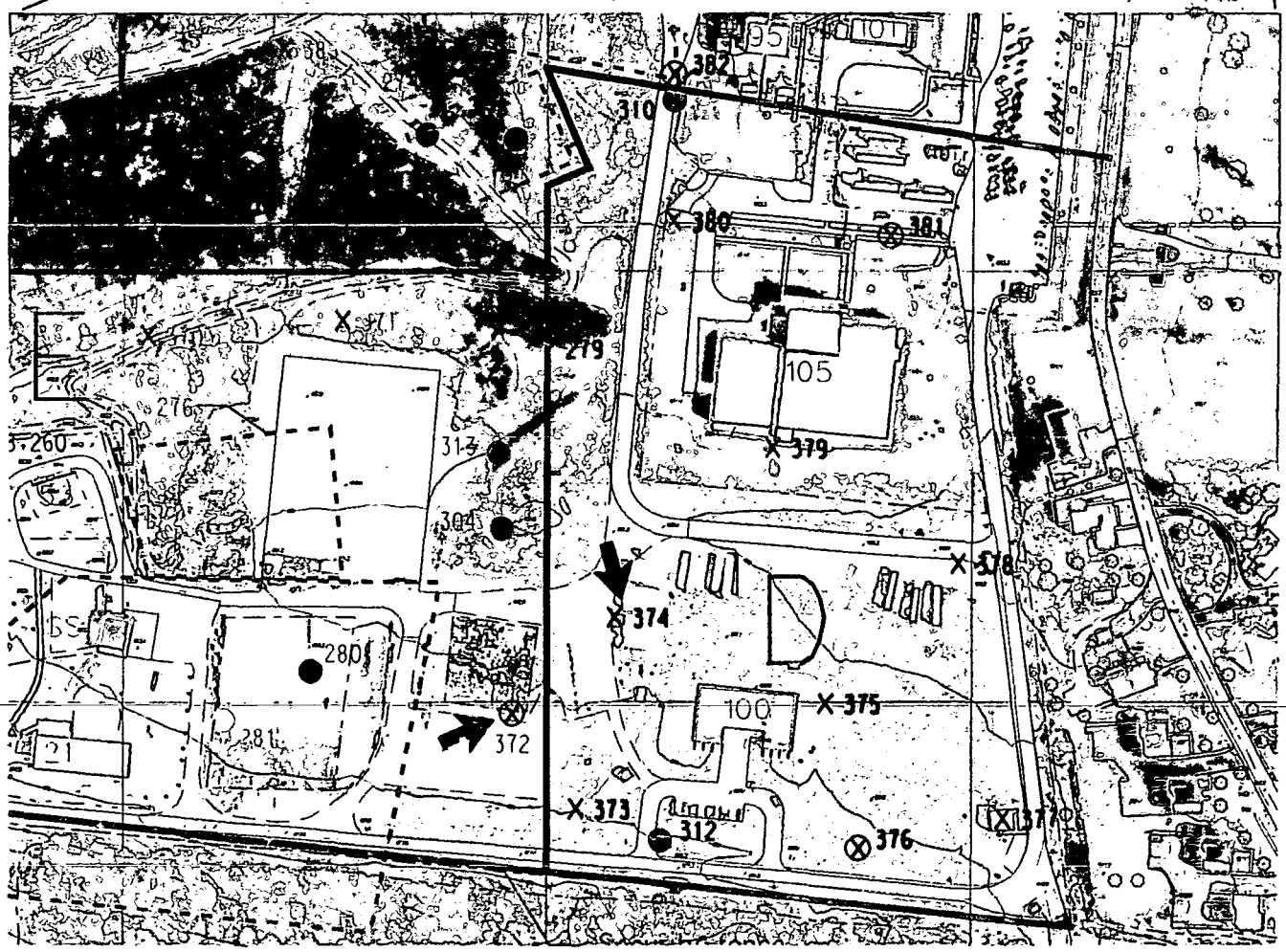
MOUND PLANT

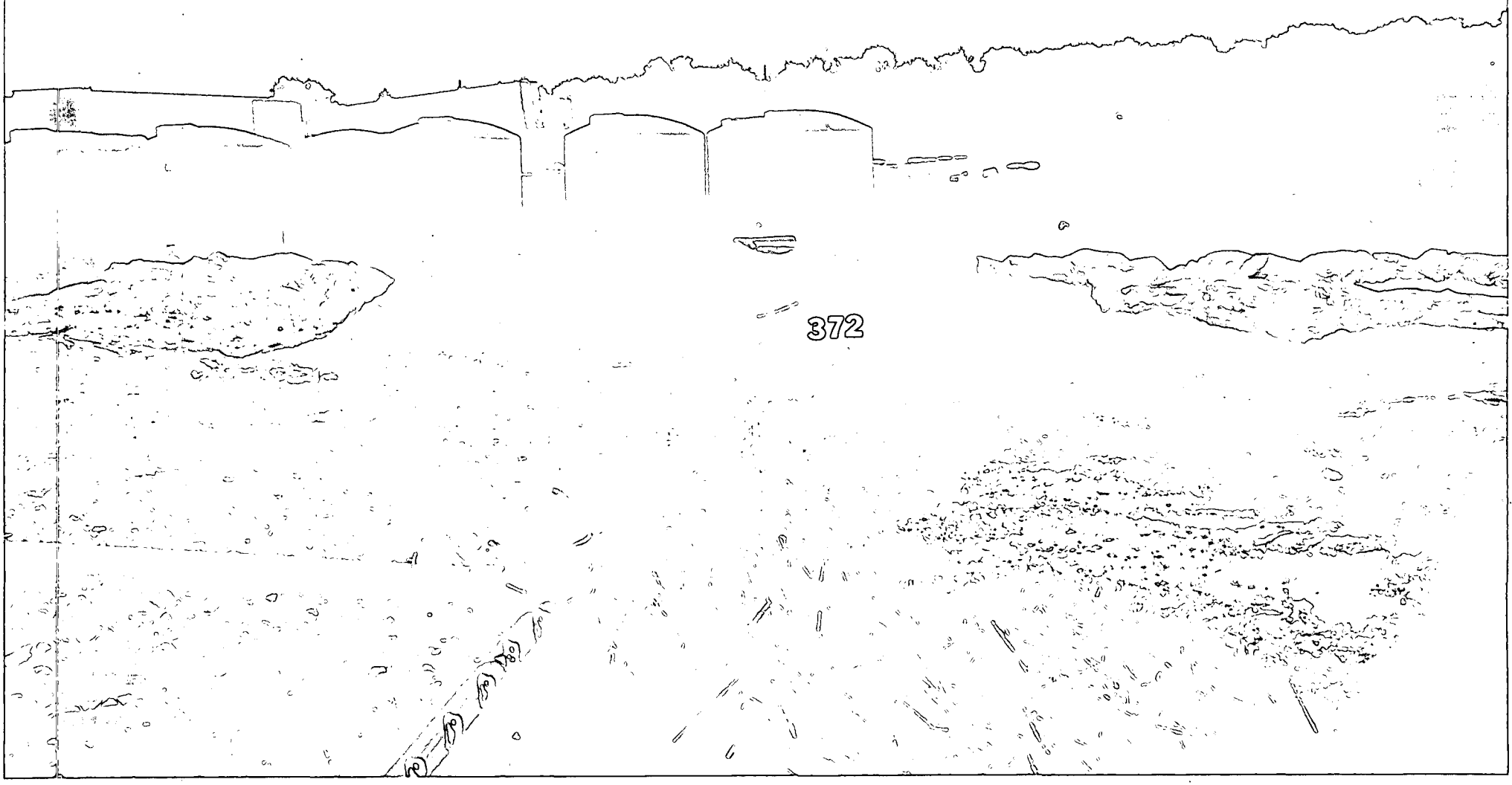
Release Block D, E

Potential Release Site

PRS 372/374






372

374

PRS 372/374

PRS HISTORY:

Areas of elevated soil gas readings identified during OU-5 Non-AOC Phase 1 [1] activities.

PROCESS DESCRIPTION:

No radioactive or hazardous waste generating processes are known to have occurred at these locations. Based on historical activities in nearby buildings, only isolated activity from plutonium and/or thorium may be expected.

CONTAMINATION:

No elevated soil screening or fidler results were noted at these locations.[1] The OU-5 Non-AOC Phase 1 soil gas results [1] indicate elevated readings (ION counts) at location 03N06 for total C5-C11 petroleum hydrocarbons (2476454) and total aromatic hydrocarbons (1135220). Location 03N07 had a total C5-C11 petroleum hydrocarbon reading of 1822856 and total semivolatile hydrocarbon of 8507. Location 2N 7W had a total semivolatile hydrocarbon reading of 71014. Samples were taken in 1994. (See attached map).

READING ROOM REFERENCES:

1) OU5 Operational Area Phase I Investigation, Non-AOC Field Report (Draft), March 1995. (pages 5-11)

PREPARED BY:

Richard Neff, DOE Technical Support Staff
Joseph C. Geneczko, Member of EG&G Technical Staff
George Liebson, Member of EG&G Technical Staff

SUPPLEMENTAL DATA
PRS 372/374

HISTORY:
THE PHASE I INVESTIGATION

As a result of the OU5, Operational Area Phase I Investigation [1] (also known as the 1994 PETREX Soil Gas Investigation). PRSs 372 and 374 were created based solely on moderate to high relative PETREX readings. The PETREX Soil Gas Investigation analyzed for aromatic, semivolatile, hydrocarbon and halogenated hydrocarbon compounds. Further assessment of the PETREX PRSs were deemed necessary to evaluate the potential for real contamination harmful to human health and the environment.

CONTAMINATION:
THE PHASE II INVESTIGATION

In February 1996, The Soil Gas Confirmation Investigation,[2, 4] sampled the 3 PETREX soil gas locations with the highest relative PETREX soil gas measurements in and around Release Block D. Four additional Release Block D PRSs with relatively non-elevated PETREX soil gas measurements were sampled at the request of Ohio EPA. All laboratory samples were collected over a depth of 1 to 3 feet and analyzed for volatiles, semivolatiles, PCBs, pesticides, metals, radionuclides, and explosives.

THE RESULTS

All seven of the Release Block D sample locations:

- Show concentrations of volatile and semivolatile compounds are at or below the 10^{-6} Risk Based Soil Guideline Values (one sample of benzo(a)pyrene was detected at 450 ug/kg compared to the 10^{-6} Risk Based Soil Guideline of 410 ug/kg.[2, 3]
- Show the level of contamination in the soil does not adversely affect the quality of groundwater at potential drinking water sources.[2, 5]

SUPPLEMENTAL REFERENCES:

2) Soil Gas Confirmation Sampling Results 3/6/96. (pages 13-25)
3) Risk-Based Soil Guidelines, Final, Revision 0, December 1995. (pages 26-30)
4) Soil Gas Confirmation Sampling Plan. (pages 31-34).
5) Soil Screening Level Calculations. (pages 35-42)

MOUND PLANT
PRS 372/374
SOIL CONTAMINATION

RECOMMENDATION:

Potential Release Sites (PRSs) 372/374 were created due to elevated soil gas measurements relative to surrounding soil areas. Subsequent quantitative sampling showed that all soil samples taken in Release Block D were at or below their respective 10^{-6} Risk Based Guideline Value. Hence:

1) The PETREX measurements, from which these PRSs were created, do not provide any evidence of soil contamination above the 10^{-6} Risk Based Guideline Values.
2) The Quantitative Soil Confirmation Sampling found no evidence of soil contamination above the 10^{-6} Guideline Values.
3) All Plutonium levels were at or below the 10^{-5} Risk Based Guideline Values. All Thorium levels were at or below the 10^{-5} Risk Based Guideline Values and below the regulatory standard of 5pCi/g.
4) There is no history of hazardous material activities or processes in the area.

Additionally, calculations show that all organic compounds detected in soil in Release Block D do not adversely affect the quality of groundwater at potential drinking water sources. Therefore, NO FURTHER ASSESSMENT is recommended.

CONCURRENCE:

DOE/MB: Arthur W. Kleinrath, Remedial Project Manager — 5/8/96 (date)

USEPA: Timothy J. Fischer, Remedial Project Manager — 5/8/96 (date)

OHIO EPA: Brian K. Nickel, Project Manager — 5/8/96 (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from 5/15/96 to ~~6/15/96~~ 6/17/96.

☒ No comments were received during the comment period.

☐ Comment responses can be found on page_____ of this package.

REFERENCE MATERIAL

FOR

PRS 372/374

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

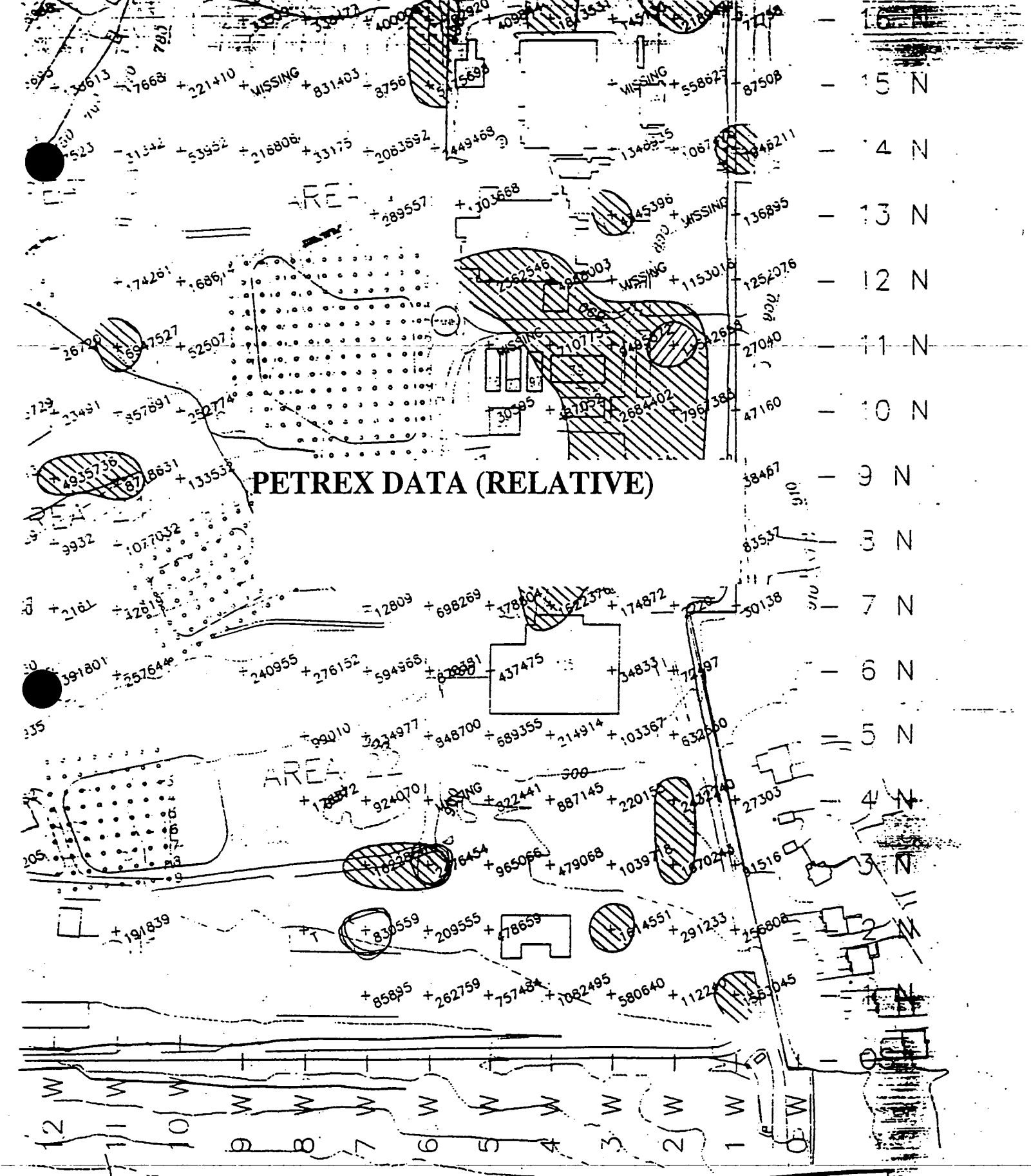
VOLUME II - APPENDICES A-G

March 1995

Draft

U.S. Department of Energy
Ohio Field Office

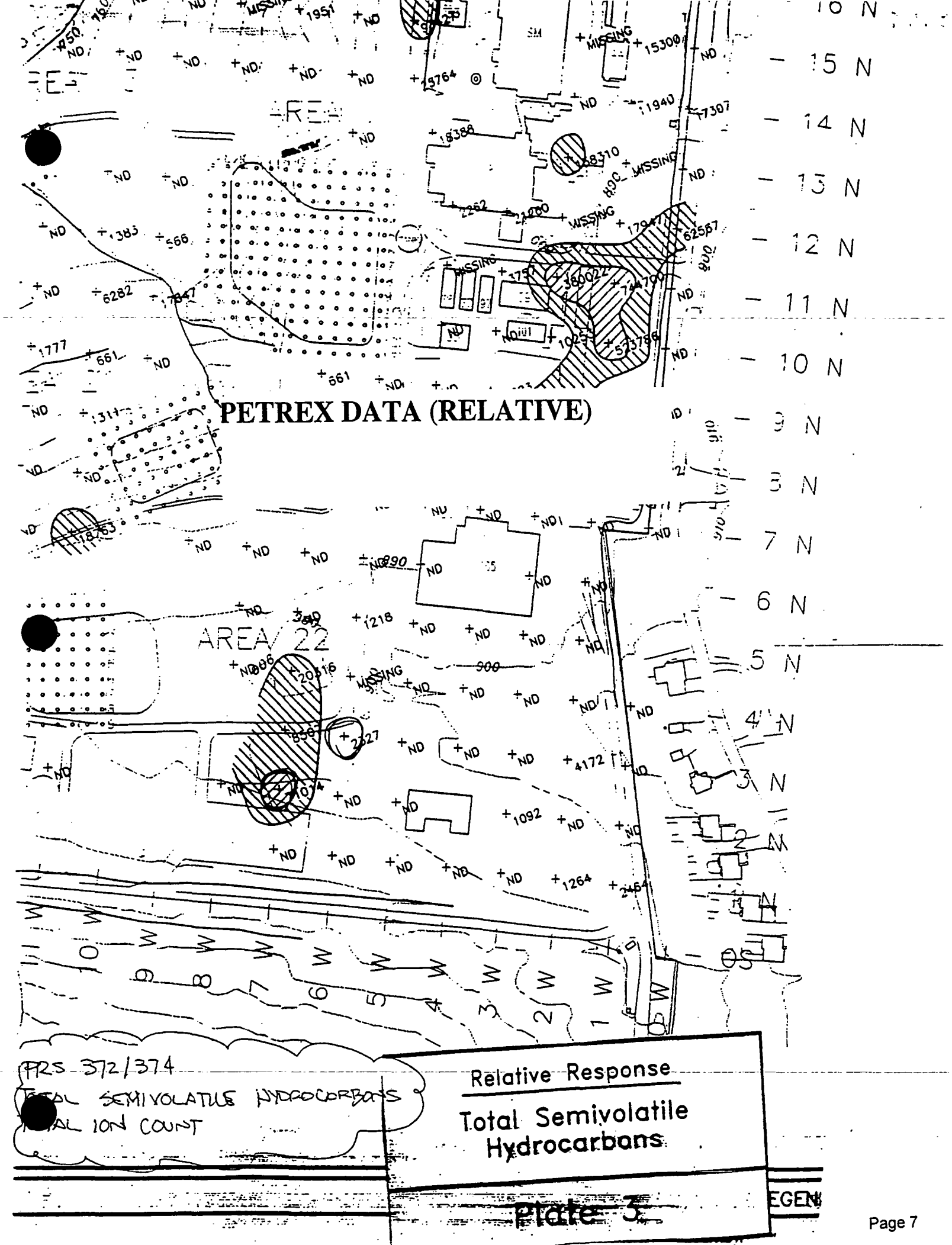
EG&G Mound Applied Technologies

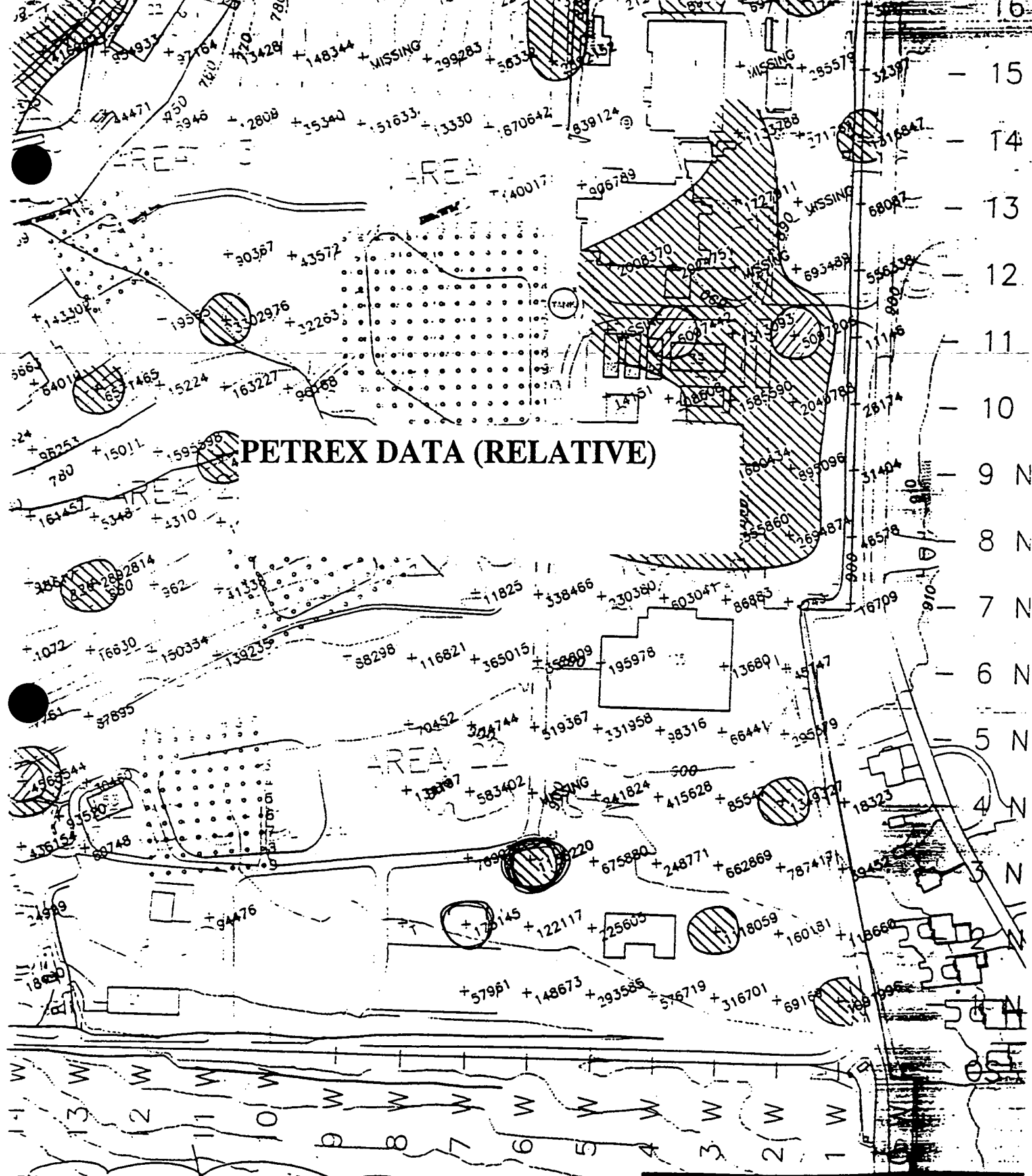


RS 372/374
TOTAL C5-C11
PETROLEUM HYDROCARBONS
TOTAL ION COUNT

Relative Response

Total C5-C11
Petroleum Hydrocarbons


PETREX DATA (RELATIVE)
AREA 22
PRS 372/374
TOTAL SEMIVOLATILE HYDROCARBONS
TOTAL ION COUNT
Relative Response
Total Semivolatile Hydrocarbons
Plate 5

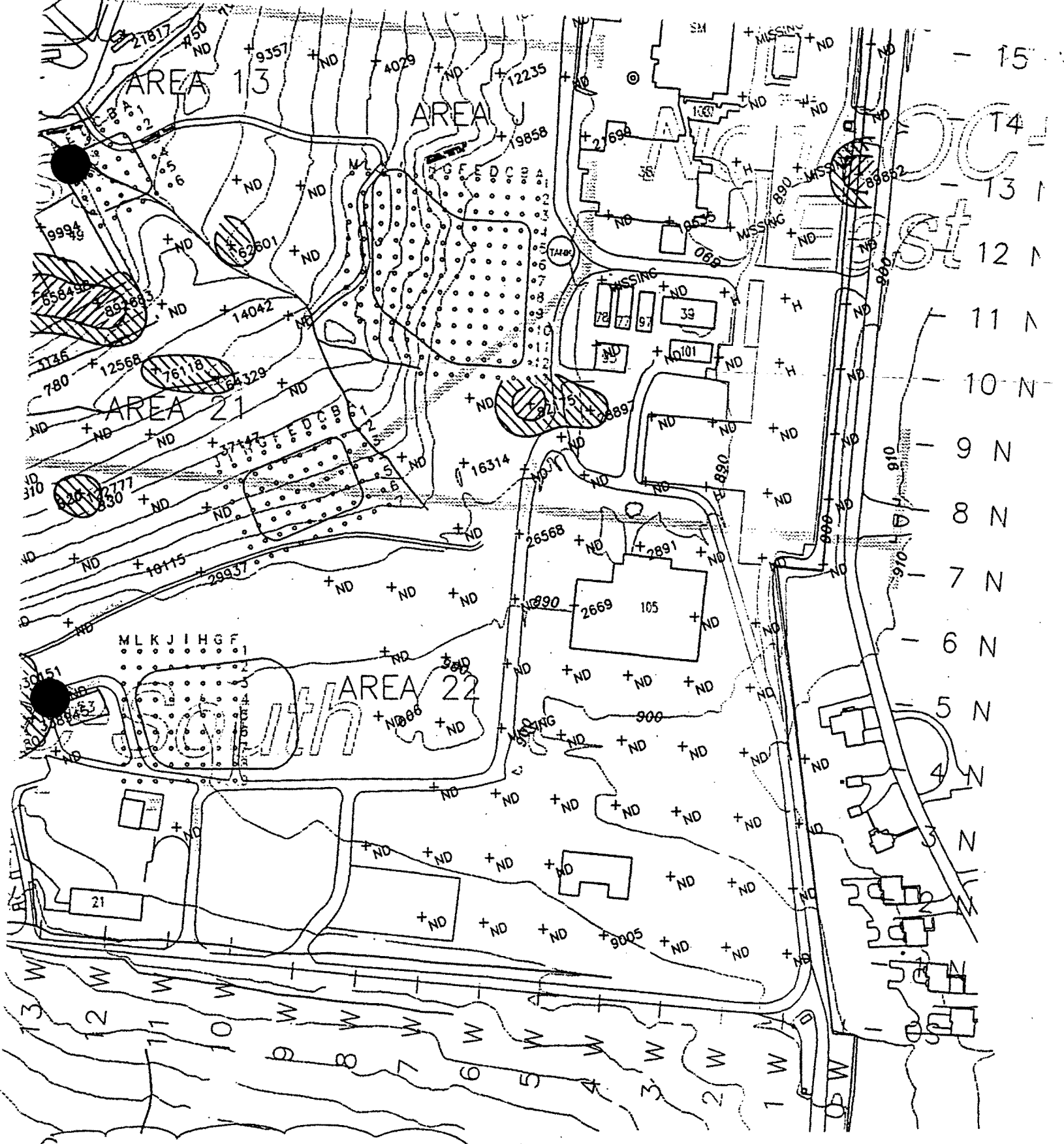


DRS 372/374
TOTAL AROMATIC HYDROCARBONS
TOTAL ION COUNT

Relative Response

Total Aromatic Hydrocarbons

Plate 2



PRS 372/374
TOTAL HALOGENATED HYDROCARBONS
TOTAL ION COUNT

PETREX DATA (RELATIVE)

5

ty

Relative Resp

NonAOC-South	NonAOC-West	Non/

APPENDIX D

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

	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
SMPID	Contamination Criteria CH1	FIDLER Readings CH1	Contamination Criteria CH2	FIDLER Readings CH2	FIDLER Readings Out Channel	Plutonium - 238		Thorium - 232	
	Units: CPM	Units: CPM	Units: KCPM	Units: KCPM	Units: KCPM	Units: pCi/g		Units: pCi/g	
	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	Note:	RESULTS	Note:
01N01	113	60	8.06	3.2	NC	3	a	1	a
01N02	113	130	8.06	8.01	NC	25	b	0.9	a
01N03	113	110	8.06	8.0	NC	60	b	1.1	a
01N04	113	75	8.06	7.0	NC	6	a	0.7	a
01N05	113	100	8.06	8.0	NC	15	a	1.3	a
01N06	113	90	8.06	7.5	NC	25	b	1.1	a
01N07	113	40	8.06	3.5	NC	10	a	0.3	a
01N14	113	120	8.06	9.0	NC	38	b	1.1	a
01N15	113	105	8.06	9.0	NC	34	b	1	a
01N16	210.6	130	12.22	9.0	NC	NR		NR	
01N17	210.6	135	12.22	9.0	NC	21	a	0.7	a
01N18	210.6	120	12.22	9.0	NC	24	a	0.6	a
01N19	210.6	135	12.22	9.0	NC	NR		NR	
01N21	170.3	110	9.72	7.5	NC	NR		NR	
01N22	210.6	135	12.22	7.0	NC	20	a	0.6	a
01N23	210.6	145	12.22	7.0	NC	17	a	0.9	a
02N01	98.8	70	6.76	4.4	NC	12	a	0.5	a
02N02	98.8	90	6.76	9.0	NC	25	b	1	a
02N03	98.8	90	6.76	8.5	NC	21	a	0.9	a
02N04	98.8	30	6.76	4.5	NC	NR		NR	
02N05	98.8	60	6.76	6.5	NC	19	a	0.8	a
02N06	98.8	60	6.76	6.0	NC	17	a	0.8	a
02N07	98.8	60	6.76	4.5	NC	1	a	0.4	a
02N08	98.8	100	6.76	6.5	NC	NR		NR	
02N11	157.3	55	8.45	3.5	NC	0	a	0.5	a
02N14	98.8	110	6.76	8.0	NC	6	a	0.5	a
02N15	179.4	120	10.92	9.0	NC	37	b	1	a
02N16	179.4	140	10.92	9.5	NC	28	b	1	a
02N17	179.4	130	10.92	6.0	NC	31	b	0.9	a

MOUND SOIL SCREEN DATA

APPENDIX D

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

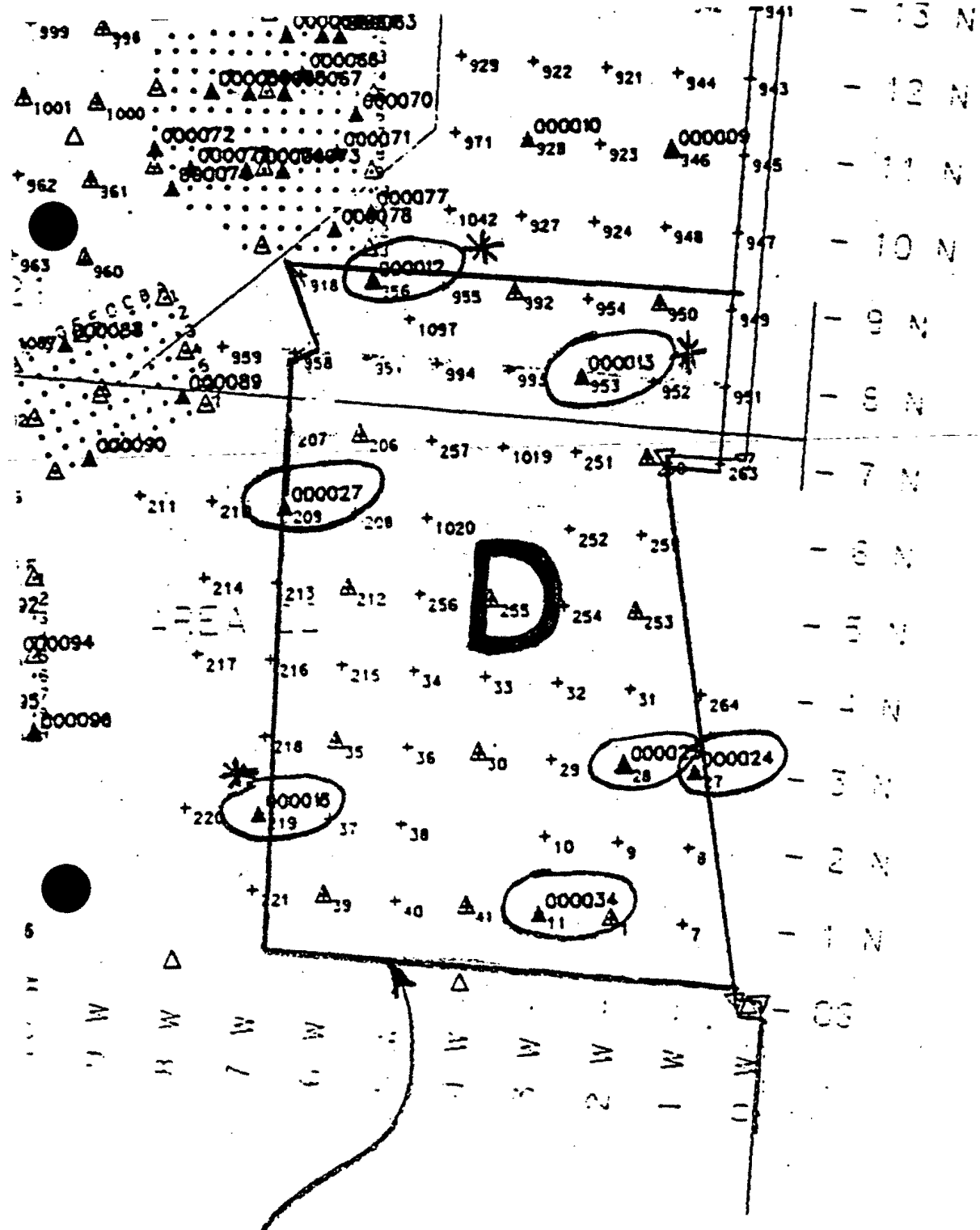
	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
SMPID	Contamination Criteria CH1	FIDLER Readings CH1	Contamination Criteria CH2	FIDLER Readings CH2	FIDLER Readings Out Channel	Plutonium - 238		Thorium - 232	
	Units: CPM	Units: CPM	Units: KCPM	Units: KCPM	Units: KCPM	Units: pCi/g		Units: pCi/g	
	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	Note:	RESULTS	Note:
02N18	179.4	170	10.92	9.5	NC	40	b	1	a
02N19	179.4	150	10.92	10.0	NC	20	a	1	a
02N20	130	85	6.5	6.5	NC	18	a	1.3	a
02N21	130	90	6.5	6.5	NC	NR		NR	
02N22	179.4	115	10.92	7.0	NC	21	a	0.8	a
02N23	179.4	80	10.92	6.5	NC	15	a	1	a
03N01	113	105	8.06	6.5	NC	38	b	0.7	a
03N02	152	145	8.45	8.5	NC	49	b	0.9	a
03N03	152	150	8.45	8.5	NC	25	b	1	a
03N04	152	150	8.45	9.0	NC	31	b	0.8	a
03N05	137.8	100	6.5	7.0	NC	9	a	0.9	a
03N06	137.8	100	6.5	6.0	NC	21	a	0.7	a
03N07	137.8	100	6.5	5.0	NC	13	a	0.8	a
03N13	170.3	90	9.72	6.0	NC	6	a	0.6	a
03N14	170.3	75	9.72	5.5	NC	9	a	0.5	a
03N15	210.6	150	12.22	9.5	NC	28	b	1.4	a
03N16	210.6	155	12.22	10.0	NC	36	b	0.8	a
03N17	210.6	150	12.22	10.5	NC	35	b	0.8	a
03N18	210.6	150	12.22	10.0	NC	46	b	0.7	a
03N19	179.4	160	10.92	9.0	NC	19	a	1.1	a
03N20	130	80	6.5	9.0	NC	24	a	1.6	a
03N21	130	100	6.5	8.0	NC	22	a	0.9	a
03N22	139	150	9.23	8.5	NC	1	a	1.1	a
03N23	139	100	9.23	6.5	NC	17	a	0.6	a
04N01	157.2	65	8.45	6.1	NC	0	a	0.8	a
04N02	98.8	70	6.72	4.5	NC	7	a	0.4	a
04N03	98.8	90	6.72	5.0	NC	25	b	0.8	a
04N04	137.8	120	6.5	7.0	NC	10	a	1.1	a
04N05	137.8	110	6.5	5.5	NC	20	a	1	a

MOUND SOIL SCREEN DATA

SUPPLEMENTAL REFERENCES
PRS 372/374

SOIL GAS CONFIRMATION INVESTIGATION

SAMPLING RESULTS 3/96



▲ *SOIL GAS CONFIRMATION* SAMPLE LOCATIONS

* THESE *SOIL GAS CONFIRMATION* SAMPLE LOCATIONS HAD THE HIGHEST RELATIVE MEASUREMENTS FROM THE *PHASE I PETREX SOIL GAS SURVEY*

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000012	SGC NAC 000013	SGC NAC 000014	SGC NAC 000015	SGC NAC 000016	SGC NAC 000017	Background	10^{-6} Construction Worker Guidelines
GENERAL ANALYTES								
% Solids	84.7	81.7	80.9	74.0	85.3	72.8	---	---
Nitrate-Nitrite (mg-N/kg)	1.8	2.1	4.9	3.0	2.4	6.4	26	NA
VOLATILES (µg/kg)								
1,2-Dichloroethene (total)				96			NA	NA
2-Butanone	8 J	10 J					NA	46,500,000
Benzene				2 J			NA	32,000
Carbon Disulfide		4 J					NA	1,400,000
Ethylbenzene				1 J			NA	2,400
Toluene				28			NA	1,250,000
Trichloroethene				3 J			NA	125,000
Xylene (total)			1 J	4 J			---	

J - Numerical value is an estimated quantity

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000023	SGC NAC 000024	SGC NAC 000025	SGC NAC 000026	SGC NAC 000027	SGC NAC 000028	Background	10^{-6} Construction Worker Guidelines
GENERAL ANALYTES								
% Solids	77.5	89.5	89.3	85.7	85.3	82.0	---	---
Nitrate-Nitrite (mg-N/kg)	11.6	2.2	2	3.4	2.6	3.6	26	NA
VOLATILES (µg/kg)								
1,2-Dichloroethene (total)							NA	NA
2-Butanone							NA	46,500,000
Benzene							NA	32,000
Carbon Disulfide							NA	1,400,000
Ethylbenzene							NA	2,400
Toluene	4 J		2 J				NA	1,250,000
Trichloroethene							NA	125,000
Xylene (total)							---	2,100,000,000

J - Numerical value is an estimated quantity
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000029	SGC NAC 000033	SGC NAC 000034	SGC NAC 000035	SGC A21 000089	SGC A21 000090	Background	10^{-6} Construction Worker Guidelines
GENERAL ANALYTES								
% Solids	84.8	84.4	88.1	84.6	83.2	78.5	---	---
Nitrate-Nitrite (mg-N/kg)	3.5	1.1	3.7	3.5	1.9	5.2	26	NA
VOLATILES (µg/kg)								
1,2-Dichloroethene (total)							NA	NA
2-Butanone							NA	46,500,000
Benzene							NA	32,000
Carbon Disulfide							NA	1,400,000
Ethylbenzene							NA	2,400
Toluene			2 J				NA	1,250,000
Trichloroethene							NA	125,000
Xylene (total)							---	2,100,000,000

J - Numerical value is an estimated quantity
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000012	SGC NAC 000013	SGC NAC 000014	SGC NAC 000015	SGC NAC 000016	SGC NAC 000017	Background	10^{-6} Construction Worker Guidelines
SEMI-VOLATILES (µg/kg)								
Acenaphthene							NA	NA
Anthracene							NA	320,000,000
Benzo(a)anthracene	18 J				47 J		NA	4,100
Benzo(a)pyrene	21 J				42 J		NA	410
Benzo(b)fluoranthene	22 J				39 J		NA	4,100
Benzo(g,h,i)perylene					33 J		NA	NA
Benzo(k)fluoranthene	17 J				46 J		NA	41,000
Bis(2-ethylhexyl)phthalate	35 J				100 J		NA	215,000
Carbazole							NA	NA
Chrysene	22 J				51 J		NA	410,000
Di-n-butyl phthalate							NA	105,000,000
Di-n-octyl phthalate							NA	21,500,000
Dibenz(a,h)anthracene							NA	410
Dibenzofuran							NA	NA
Diethyl phthalate							NA	NA
Fluoranthene	38 J				100 J	28 J	NA	42,500,000
Fluorene							NA	NA
Indeno(1,2,3-cd)pyrene					27 J		NA	4,100
Naphthalene				61 J			NA	NA
Phenanthrene					63 J		NA	NA
Pyrene	37 J				87 J	26 J	NA	32,000,000

J - Numerical value is an estimated quantity
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000023	SGC NAC 000024	SGC NAC 000025	SGC NAC 000026	SGC NAC 000027	SGC NAC 000028	Background	10^{-6} Construction Worker Guidelines
SEMI-VOLATILES (µg/kg)								
Acenaphthene							NA	NA
Anthracene							NA	320,000,000
Benzo(a)anthracene							NA	4,100
Benzo(a)pyrene							NA	410
Benzo(b)fluoranthene							NA	4,100
Benzo(g,h,i)perylene							NA	NA
Benzo(k)fluoranthene							NA	41,000
Bis(2-ethylhexyl)phthalate		26 J			24 J	26 J	NA	215,000
Carbazole							NA	NA
Chrysene							NA	410,000
Di-n-butyl phthalate							NA	105,000,000
Di-n-octyl phthalate		89 J					NA	21,500,000
Dibenz(a,h)anthracene							NA	410
Dibenzofuran							NA	NA
Diethyl phthalate							NA	NA
Fluoranthene							NA	42,500,000
Fluorene							NA	NA
Indeno(1,2,3-cd)pyrene							NA	4,100
Naphthalene							NA	NA
Phenanthrene							NA	NA
Pyrene							NA	32,000,000

J - Numerical value is an estimated quantity
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000029	SGC NAC 000033	SGC NAC 000034	SGC NAC 000035	SGC A21 000089	SGC A21 000090	Background	10^{-6} Construction Worker Guidelines
SEMI-VOLATILES (µg/kg)								
Acenaphthene			130 J				NA	NA
Anthracene			360 J				NA	320,000,000
Benzo(a)anthracene			500				NA	4,100
Benzo(a)pyrene			450 J				NA	410
Benzo(b)fluoranthene			360 J				NA	4,100
Benzo(g,h,i)perylene			220 J				NA	NA
Benzo(k)fluoranthene			380 J				NA	41,000
Bis(2-ethylhexyl)phthalate	25 J	27 J	19 J				NA	215,000
Carbazole			160 J				NA	NA
Chrysene			500				NA	410,000
Di-n-butyl phthalate							NA	105,000,000
Di-n-octyl phthalate							NA	21,500,000
Dibenz(a,h)anthracene			68 J				NA	410
Dibenzofuran			95 J				NA	NA
Diethyl phthalate							NA	NA
Fluoranthene			1300				NA	42,500,000
Fluorene			160 J				NA	NA
Indeno(1,2,3-cd)pyrene			210 J				NA	4,100
Naphthalene			28 J				NA	NA
Phenanthrene			1200				NA	NA
Pyrene			1000				NA	32,000,000

J - Numerical value is an estimated quantity.
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000012	SGC NAC 000013	SGC NAC 000014	SGC NAC 000015	SGC NAC 000016	SGC NAC 000017	Background	10^{-6} Construction Worker Guidelines
INORGANICS (mg/kg)								
Aluminum	13100	8460	17700	7370	14100	20000	19000	NA
Antimony							NA	425
Arsenic	1.9 BJ	1.2 BJ	2.7	3.6 J	3.4	2.4 B	8.6	320
Barium	78.4	53.4	110	51.3 B	68.7	119	180	75,000
Beryllium	0.44	0.20 B	0.68	0.24 B	0.46	0.96	1.3	1
Bismuth					0.82 B	1.2 B	NA	NA
Cadmium	6.0	4.6	7.7	3.7	5.7	8.6	2.1	1,050
Calcium	127000 J	222000 J	94200	342000	133690	23800	310000	NA
Chromium	17.3	10.8	22.3	9.1	17.7	24.5	20	1,050,000
Cobalt	12.7 J	7.5 BJ	13.9	5.8 B	11.6 B	18.5	19	NA
Copper	21.3 J	13.5 J	22.4	12.2	19.3	26.9	26	NA
Cyanide			1.8		1.0		ND	21,500
Iron	27900	21100	36300	16600	26600	40000	35000	NA
Lead	9.3 J	29.4 J	12.9	14.3	14.1	27.5	48	NA
Lithium	25.3	17.8 B	30.7	15.0 B	25.1	34.1	26	NA
Magnesium	19900 J	7250 J	8190	4760	14600	6250	40000	NA
Manganese	658	543	939	689	641	1360	1400	135,000
Mercury						0.07 B	NC	320
Molybdenum	1.3 B	0.81 B	1.3 B	0.51 B	1.3 B	0.76 B	27	NA
Nickel	26.4	17.6	31.4	13.8	23.9	34.4	32	21,500
Potassium	1630	1100 B	2250 B	1010 B	2090 B	3680	1900	NA
Sodium	2490 J	328 BJ	142 B	248 B	398 B	209 B	240	NA
Tin	1.6 B	1.1 B	0.98 B		1.7 B	3.3 B	20	NA
Vanadium	22.4	12.9	29.4	10.7	23.8	30.2	25	7,500
Zinc	68.5	44.9	92.5	67.7	70.5	103	140	320,000

J - Numerical value is an estimated quantity
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000023	SGC NAC 000024	SGC NAC 000025	SGC NAC 000026	SGC NAC 000027	SGC NAC 000028	Background	10^{-6} Construction Worker Guidelines
INORGANICS (mg/kg)								
Aluminum	12200	5410	6830	7120	11500	15300	19000	NA
Antimony							NA	425
Arsenic	2.0 BJ	0.83 BJ	1.9 BJ	0.61 BJ	3.6 J	2.0 BJ	8.6	320
Barium	90.3	28.4 B	49.2	34.1 B	87.6	111	180	75,000
Beryllium	0.91	0.29	0.40	0.11 B	0.81	0.96	1.3	1
Bismuth							NA	NA
Cadmium				2.9			2.1	1,050
Calcium	35400 J	210000 J	162000 J	315000	68800 J	48400 J	310000	NA
Chromium	16.2	7.9	18.1	8.1	16.2	20.6	20	1,050,000
Cobalt	13.1	5.9 B	8.7 B	5.4 B	11.6 B	11.8 B	19	NA
Copper	18.9	8.2	30.5	8.7	19.2	16.1	26	NA
Cyanide							ND	21,500
Iron	29300	14600	24200	16300	30800	35200	35000	NA
Lead	16.4 J	5.2 J	6.9 J	4.9	14.3 J	5.6 J	48	NA
Lithium	18.8 B	12.8 B	16.3 B	16.7 B	17.0 B	21.4 B	26	NA
Magnesium	4640	15700	14900	4380	9760	5190	40000	NA
Manganese	1030 J	393 J	429 J	417	659 J	593 J	1400	135,000
Mercury	0.07 BJ				0.13 J		NC	320
Molybdenum	0.87 B	0.63 B	2.3 B	0.88 B	1.9 B	0.80 B	27	NA
Nickel	42.3	12.3	22.2	12.2	25.9	28.2	32	21,500
Potassium	1760	874 B	443 B	1200	757 B	1400	1900	NA
Sodium	174 BJ	172 BJ	157 BJ	228 B	126 BJ	119 BJ	240	NA
Tin	0.97 B		0.89 B	1.3 B	1.1 B	0.67 B	20	NA
Vanadium	18.0	7.3	10.5	8.1	21.3	22.4	25	7,500
Zinc	66.6	28.9	64.6	32.7	109	80.8	140	320,000

J - Numerical value is an estimated quantity.
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000029	000033 NAC 000033	000034 NAC 000034	000035 NAC 000035	000089 A21 000089	000090 A21 000090	Background	10^{-6} Construction Worker Guidelines
INORGANICS (mg/kg)								
Aluminum	10700	5720	6450	12400	14800	16500	19000	NA
Antimony	0.61 B						NA	425
Arsenic	1.8 BJ	1.3 BJ	4.9 J	2.1 B	3.4	3.5	8.6	320
Barium	59.1	29.3 B	51.0	58.1	77.3	128	180	75,000
Beryllium	0.64	0.44	0.43	0.37	0.42	0.88	1.3	1
Bismuth						1.0 B	NA	NA
Cadmium				4.2	6.1	7.1	2.1	1,050
Calcium	87300 J	164000 J	106000 J	73500	92800	7820	310000	NA
Chromium	14.8	7.4	11.6	14.4	17.8	20.6	20	1,050,000
Cobalt	12.0	6.5 B	7.7 B	9.8 B	12.0 B	13.4	19	NA
Copper	15.3	7.3	13.0	14.0	16.7	21.7	26	NA
Cyanide							ND	21,500
Iron	25400	12600	16100	23800	29300	33200	35000	NA
Lead	6.2 J	3.5 J	14.9 J	12.8	16.9	35.4	48	NA
Lithium	22.5 B	13.6 B	9.6 B	18.9 B	15.4 B	18.5 B	26	NA
Magnesium	5910	8520	25000	3930	3530	3830	40000	NA
Manganese	637 J	359 J	513 J	553	649	982	1400	135,000
Mercury			0.10 BJ		0.07 B	0.10 B	NC	320
Molybdenum	0.77 B	0.34 B	1.6 B	1.1 B	1.9 B	1.4 B	27	NA
Nickel	24.6	12.5	15.5	18.9	20.4	28.5	32	21,500
Potassium	800 B	396 B	851 B	1390	1170 B	2420 B	1900	NA
Sodium	125 BJ	197 BJ	245 BJ	97.7 B	121 B	95.4 B	240	NA
Tin		1.4 B	1.2 B	1.2 B	2.0 B	2.4 B	20	NA
Vanadium	15.4	7.7	14.9	19.4	29.3	32.0	25	7,500
Zinc	58.4	29.3	50.3	52.2	75.4	101	140	320,000

J - Numerical value is an estimated quantity
NA - Background value not available

NOTE: No entry equates to a non-detect.

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000012	SGC NAC 000013	SGC NAC 000016	SGC NAC 000024	SGC NAC 000025	SGC NAC 000027	Background	10^{-6} Construction Worker Guidelines
RADIONUCLIDES (pCi/g)								
Americium-241 (AM-241)	0.3033	0.211	1.16	0.273	0.6393	0.384	ND	5.0
Bismuth-207 (BI-207)	0.093	0.06274	0.116	0.1	0.124	0.101	ND	0.18
Bismuth-210 (BI-210M)	0.135	0.0902	0.1614	0.1055	0.1519	0.141	ND	NA
Cesium-137 (CE-137DA)	0.117	0.0946	0.199	0.383	0.185	0.169	0.42	0.46
Cobalt-60 (CO-60)	0.128	0.1158	0.149	0.1488	0.192	0.182	NC	0.10
Plutonium-238 (PU-238)	0.101	0.0107	0.253	0.523	0.288	0.259	0.13	5.5
Plutonium-239/240 (PU-239/4(	0.00154	0.00304	0.00413	0.0141	0.00665	0.00381	0.18	5.5
Potassium-40 (K-40)	15.5	4.65	15.2	12	18.1	21.7	37	NA
Radium-226 (RA-226DA)	0.592	0.289	0.934	0.714	1.22	1.5	2	0.14
Thorium-228 (TH-228)	0.697	0.247	1.04	0.775	1.16	0.986	1.5	0.85
Thorium-230 (TH-230)	0.803	0.359	1.36	0.988	1.49	1.57	1.9	44
Thorium-232 (TH-232)	0.769	0.21	0.893	0.938	1	0.915	1.4	50
Uranium-234 (U-234)	0.693	0.378	0.765	0.718	1.07	1.07	1.1	38
Uranium-235 (U-235)	0.0231	0.0188	0.0394	0.0276	0.0467	0.0592	0.11	3.4
Uranium-238 (U-238)	0.681	0.424	0.993	0.839	1.14	0.869	1.2	11

NA - Background value not available
ND - No detections in background samples
NC - Background value not computed

Mound Environmental Restoration Program
Soil Gas Confirmation Sampling Results - Block D

Chemical Detections

ANALYTE	SGC NAC 000034	Background	10^{-6} Construction Worker Guidelines
RADIONUCLIDES (pCi/g)			
Americium-241 (AM-241)	0.399	ND	4.95
Bismuth-207 (BI-207)	0.114	ND	0.175
Bismuth-210 (BI-210M)	0.117	ND	NA
Cesium-137 (CE-137DA)	0.1622	0.42	0.46
Cobalt-60 (CO-60)	0.1098	NC	0.1
Plutonium-238 (PU-238)	0.574	0.13	5.5
Plutonium-239/240 (PU-239/4(	0.00369	0.18	5.5
Potassium-40 (K-40)	16.5	37	NA
Radium-226 (RA-226DA)	0.872	2	0.14
Thorium-228 (TH-228)	0.884	1.5	0.85
Thorium-230 (TH-230)	1.34	1.9	44
Thorium-232 (TH-232)	0.963	1.4	50
Uranium-234 (U-234)	0.977	1.1	37.5
Uranium-235 (U-235)	0.0563	0.11	3.35
Uranium-238 (U-238)	0.978	1.2	11

ND - No detections in background samples
NA - Data not available
NC - Background value not computed

RISK-BASED GUIDELINE VALUES

MOUND PLANT
MIAMISBURG, OHIO

December 1995

Submitted to the
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Environmental Restoration
and the
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U.S. DEPARTMENT OF ENERGY

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U.S. DEPARTMENT OF ENERGY
under contract DE-AC05-84OR21400

FINAL
(REVISION 0)

TABLE 4A

Construction/Mound Employee - Soil/Sediment Guideline Values: Chemicals (Units = mg/kg)

CHEMICAL	Ingestion				Inhalation				Ingestion + Inhalation			
	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1
Cyanide				2.15e+04								
Iron												
Lead												
Lithium												
Manganese (Diet)				1.50e+05				1.55e+06				1.35e+05
Mercury				3.20e+02				9.50e+06				3.20e+02
Nickel				2.15e+04								
Silver				5.50e+03								
Thallium												
Vanadium				7.50e+03								
Zinc				3.20e+05								
Organics												
1,1,1-Trichloroethane												
1,1-Dichloroethane				1.05e+05				3.90e+01				3.90e+01
1,2-Dichloroethane	3.30e+03	3.30e+02	3.30e+01		1.70e+03	1.70e+02	1.70e+01		1.10e+03	1.10e+02	1.10e+01	

TABLE 4A

Construction/Mound Employee - Soil/Sediment Guideline Values: Chemicals (Units = mg/kg)

CHEMICAL	Ingestion				Inhalation				Ingestion + Inhalation			
	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1
1,2-trans-Dichloroethylene				2.15e+04								
2-Butanone				6.50e+05				4.65e+04				4.65e+04
2-Hexanone												
2-Methylnaphthalene												
4-Methyl-2-Pentanone				8.50e+04				3.50e+03				3.50e+03
4-Methylphenol				5.50e+03								
Acetone				1.05e+05								
Benzene	1.05e+04	1.05e+03	1.05e+02		2.45e+03	4.65e+02	4.65e+01		2.45e+03	3.20e+02	3.20e+01	
Benzoic Acid				4.25e+06								
Bromodichloromethane	4.80e+03	4.80e+02	4.80e+01	2.15e+04								
Butyl benzyl phthalate				2.15e+05								
Carbon Disulfide				1.05e+05				1.45e+03				1.40e+03
Carbon Tetrachloride	2.30e+03	2.30e+02	2.30e+01	7.50e+02	2.55e+03	2.55e+02	2.55e+01		1.20e+03	1.20e+02	1.20e+01	
Chloroethane								8.00e+02				
Chrysene	4.10e+04	4.10e+03	4.10e+02									

TABLE 4A

Construction/Mound Employee - Soil/Sediment Guideline Values: Chemicals (Units = mg/kg)

CHEMICAL	Ingestion				Inhalation				Ingestion + Inhalation			
	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1
Cresols												
Di-n-butylphthalate				1.05e+05								
Di-n-octylphthalate				2.15e+04								
Dibromochloromethane	3.55e+03	3.55e+02	3.55e+01	2.15e+04								
Dichloromethane	3.95e+04	3.95e+03	3.95e+02	6.50e+04				5.00e+03				5.00e+03
Diethyl benzene, 1,4-												
Ethyl benzene				1.05e+05				2.40e+00				2.40e+00
Hexane				6.50e+04				4.55e+02				4.55e+02
Isophorone	3.15e+05	3.15e+04	3.15e+03	2.15e+05								
Methyl Iodide												
N-nitroso-diphenylamine	6.00e+04	6.00e+03	6.00e+02									
Pentachlorophenol	2.50e+03	2.50e+02	2.50e+01	3.20e+04								
Phenol				6.50e+05								
Tetrachloroethene				1.05e+04								
Toluene				2.15e+05				1.25e+03				1.25e+03

TABLE 4A

Construction/Mound Employee - Soil/Sediment Guideline Values: Chemicals (Units = mg/kg)

CHEMICAL	Ingestion				Inhalation				Ingestion + Inhalation			
	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1	GV for TR=10^{-4}	GV for TR=10^{-5}	GV for TR=10^{-6}	GV for HI=1
Tribromomethane	3.75e+04	3.75e+03	3.75e+02	2.15e+04	8.00e+09	8.00e+08	8.00e+07		3.75e+04	3.75e+03	3.75e+02	
Trichloroethylene	2.70e+04	2.70e+03	2.70e+02		2.20e+03	2.20e+03	2.25e+02		2.20e+03	1.25e+03	1.25e+02	
Trichlorofluoromethane				3.20e+05				3.65e+03				3.65e+03
Trichloromethane	4.90e+04	4.90e+03	4.90e+02	1.05e+04	1.55e+03	1.55e+02	1.55e+01		1.55e+03	1.55e+02	1.55e+01	
Xylene				2.15e+06								
bis(2-Ethylhexyl)phthalate	2.15e+04	2.15e+03	2.15e+02	2.15e+04								
PAHs												
Acenaphthylene												
Anthracene				3.20e+05								
Benzo(a)anthracene	4.10e+02	4.10e+01	4.10e+00									
Benzo(a)pyrene	4.10e+01	4.10e+00	4.10e-01									
Benzo(b)fluoranthene	4.10e+02	4.10e+01	4.10e+00									
Benzo(g,h,i)perylene												
Benzo(k)fluoranthene	4.10e+03	4.10e+02	4.10e+01									
Dibenz(a,h)anthracene	4.10e+01	4.10e+00	4.10e-01									

SOIL GAS CONFIRMATION SAMPLING PLAN

Attachment 1 - Soil Gas Confirmation Sampling Plan

Background Information

As part of the OU5 New Property and Operational Area investigations, samples were collected for soil gas and Mound soil screening analysis. FIDLER measurements were also made. The OU5 investigation identified approximately 80 sites with elevated levels of aromatic, semivolatile, petrochemical, or halogenated hydrocarbons. This soil gas data provides only a relative indication of chemical concentration. This investigation will collect soil samples from the sites of elevated organic concentration, perform chemical analysis for a broad range of constituents. Additional samples for soil screening will be analyzed and these results will be compared to the corresponding radiochemical results. Data from the original OU5 investigation is available for Health and Safety Planning.

In addition, 22 locations are identified where samples will be collected on behalf of Ohio EPA. DOE will split samples with Ohio EPA and replicate all analyses as a quality assurance check on Ohio EPA's laboratory.

Sampling Objectives

1. Using survey coordinates from the OU5 investigation, locate the original soil gas sampling site +/- 2 ft. Obtain a near surface soil sample for chemical and radiochemical analysis. The core team will compare the data to background values and risk-based guideline values to determine if no action, further assessment, or remediation is required.
2. Develop a set of VOC and SVOC results for comparison to soil gas concentrations. This may provide a general relationship between soil gas ion count measurements and actual soil concentrations.
3. Collect 22 samples for Ohio EPA. Soil screening results will be compared with OEPA and DOE radiochemical results. Remaining data will be tabulated for comparision to OEPA results.

Sample Locations And Frequency

The attached maps show the sample locations. Survey coordinates and sample numbers will be provided by EG&G prior to start of work. At DOE locations there is one soil screening sample and one sample for laboratory analysis per location. At each OEPA location there is one soil screening sample, one sample for DOE laboratory analysis, and one sample for OEPA laboratory analysis. Note that one OEPA locations coincides with one DOE location. Only one soil screening and one DOE laboratory sample need be obtained.

The laboratory turnaround time will be 2 weeks for <u>all analyses</u> for samples at locations 7W2N, 3W8N, 6W9N. Laboratory turnaround times for <u>VOC and SVOC analyses</u> will be 2 weeks for locations 14W4N, 18W2N, 13W7N; Area 21: B6 and H7; Area 22: F9, G5, J3, J8, L4, and M2; and associated QC samples. In addition, these locations will be sampled before areas where expedited analysis is not required. EG&G shall be notified upon receipt of these results from the laboratory.

Sampling Specifications

<u>Environmental Samples</u>

Near Surface soil samples

Number: 79 DOE and 22 OEPA

Depth: 1 to 3 ft

Analytical parameters: All samples will be analyzed for all parameters in the analytical list.

<u>Quality Control Samples</u>

Field Duplicates

Number: 1 for every 10 samples collected

Analytical parameters: All samples will be analyzed for all parameters in the analytical list.

Trip Blanks

Number: 1 per cooler containing VOC samples

Analytical parameters: TCL VOCs

Matrix Spike/Matrix Spike Duplicate

-SOP 1.5, Guide to the Handling, Packaging, and Shipping of Samples;
-SOP 1.6, General Equipment Decontamination;
-SOP 1.8, Personnel Decontamination--Level D Protection;
-SOP 5.3, Subsurface Solid Sampling with Hand Auger and Thin-Wall Sampler; and
-SOP 5.8, Soil Sampling with a Stainless Steel Surface Soil Sampler (revision 0).

Survey coordinates of the original soil gas sampling locations are specified herein. The original grids were established by locating a starting point via survey and measuring grid distances with a tape measure. The coordinates for the surveyed points were loaded into CAD software and the coordinates for other grid points were established by drawing the grid and allowing the CAD software to produce the easting and northing. In this investigation a professional surveyor shall use the coordinates from CAD software to locate the sampling location to within 6 inches of survey coordinates specified. Every attempt will be made to sample at the survey coordinates specified. Sampling locations may be relocated with approval of the EG&G Program Manager. If a sampling location is relocated it shall be staked and resurveyed to +/- 6 inches.

During sample collection, care will be taken to exclude vegetation and organic debris. Geochemical samples will be collected with a stainless steel spade and placed in appropriate containers. Samples collected for VOC analyses will be placed directly into the appropriate laboratory containers, without homogenization, to minimize volatilization. Soils collected for other requested analyses will be homogenized in a stainless steel pan and then placed in the appropriate containers. Samples will be collected at the prescribed subsurface intervals at each location for the analytical parameters as shown above. In the event that addition sample volume is required additional soil may be taken from the same interval at a second hole within 6 inches of the first.

Collect soil for radiochemical analyses just below the ground surface. Remove organic material and homogenize sufficient soil to fill a Mound Sodium Iodide soil screening dish. Submit the soil screening dish for analysis by EG&G at the soil screening facility. At Ohio EPA locations transfer 1/2 of the soil in the dish to a labeled bottle for analysis at the DOE laboratory and transfer the remaining half of the sample into an Ohio EPA bottle for analysis at their laboratory. Take precautions so as not to cross-contaminate samples from different locations. Keep the work area, hands, and equipment clean. In the field log book, record the soil screening results and the OEPA and DOE sample numbers as completed on the laboratory chain of custody forms.

Sample Handling And Analysis
Preservative and container requirements of the surface and subsurface soil samples are outlined in Table I.5. When a sample is collected, a chain-of-custody record will be started for that sample following the procedures in Mound Plant ER Program SOP 1.3, Sample Control and Documentation (revision 0) (DOE 1991a). A custody seal will be placed on each sample container, and the samples will be packed on ice. When the samples are packaged for shipment, enough ice will be used so that they will be maintained at a temperature of 4°C during shipment. Samples will be shipped by Federal Express* overnight service. Packaging and shipment will follow Mound Plant ER Program SOP 1.5, Guide to Handling, Packaging, and Shipping of Samples.

The samples collected as part of this investigation will be analyzed for the analytical parameters shown above. The laboratory will follow approved method guidelines for requested parameter analyses, as specified in the Operable Unit 9 QAPP.

Data Validation
90/10 data validation shall be performed per section 9 of the OU9 QAPP.

Data Reduction
- VOC and SVOC concentations will be compared to Ion Counts from the corresponding OU5 Petrex Soil Gas analyses.
- Mound Soil Screening results will be compared to the corresponding Plutonium-238 and Thorium-232 results.
- Chemical concentrations from other locations will be tabulated by location sampled.
- All data collected will be entered into the Mound Environmental Information Management System.

Number: 1 for every 20 samples collected
Analytical parameters: All samples will be analyzed for all parameters in the analytical list. (Double volume for most parameters, triple volume for VOCs)

Equipment Rinsate Blanks
Number: 1 for every 10 samples collected
Analytical parameters: All samples will be analyzed for all parameters in the analytical list.

Field Ambient Blanks
Number: 1 for every 10 samples collected
Analytical parameters: TCL VOCs

Analytical List
VOCs (excluding OU9 additional analytes)
Semi-VOCs (excluding OU9 additional analytes)
TCL pesticides/PCBs
TAL inorganics (including OU9 additional analytes)
USATHAMA explosives
Gamma spectrometry
Nitrate/Nitrite
Isotopic Plutonium (238, 239/240)
Isotopic Thorium (228, 230, 232)
Isotopic Uranium (234/235, 238)
Mound Soil Screening (Pu-238, Th-232)

PCBs = polychlorinated biphenyls USATHAMA = U.S. Army Toxic and Hazardous Materials Agency
TAL = Target Analyte ListVOC = volatile organic compound
TCL = Target Compound List

Sample Designation
Samples shall be identified by a xxx-AAA-###### (3 x 3 x 6) sample id number where
xxx= SGC (Soil Gas Confirmation)
AAA = A03 for Area 3
AAA = A07 for Area 7
AAA = A13 for Area 13
AAA = A21 for Area 21
AAA = A22 for Area 22
AAA = SDB for Area SDB
AAA = A0J for Area J
AAA = NAC for Non-AOC areas
is a 6 digit sequential number beginning at 000001. The 6 digit sequential number shall be provided to the laboratory on the chain of custody form.

Sampling Equipment And Procedures
Soil sampling will be performed according to Mound Plant ER Program SOP 5.3, Subsurface Solid Sampling with Hand Auger and Thin-Wall Sampler. In addition the sampling team may use a gas powered auger or geoprobe to assist in achieving the desired sampling depth. All soil samples will be collected according to the procedures identified in the ER Program SOPs described in the Operable Unit 9 QAPP.

The SOPs specific to this study include
-SOP 1.1, General Instructions for Field Personnel;
-SOP 1.3, Sample Control and Documentation;
-SOP 1.4, Sample Containers and Preservation;

SOIL SCREENING LEVEL CALCULATIONS

SOIL SCREENING LEVEL CALCULATIONS

Soil concentrations that pose no calculated threat to groundwater

REFERENCES

Schairbaum, J.R. and Frost, J.P. 1988. "The Hydrology of Sicamore Farm - A Preliminary Report." Center for Ground water Management, Wright State University. September 20, 1988.

DOE. 1994. "Operable Unit 9, Hydrogeologic Investigation: Bedrock Report." U.S. Department of Energy, Albuquerque Field Office, Albuquerque, New Mexico. January, 1994.

USEPA. 1994. "Technical Background Document for soil Screening Guidance - Review Draft." U.S. Environmental Protection Agency, Office of Emergency and Remedial Response. EPA/540/R-94/106 December, 1994

Soil Screening Level (10m source, 0.01 hydraulic gradient, 500m from receptor)

A Soil Screening Level (SSL) is the level of contamination that can exist in soil that does not adversely affect the quality of groundwater at a potential drinking water source such as the Buried Valley Aquifer (BVA).

Soil Screening Calculations are used to determine if a PRS may adversely affect ground water quality due to leaching of organic soil contaminants. These equations conservatively calculate the effects of soil leaching and ground water mixing at a particular PRS. The input parameters represent conditions at the PRS. MCLs are assumed to be protective of ground water that will be used as a drinking water source. Note that the distance a PRS lies from a potential drinking water receptor (BVA) generally controls the amount of ground water mixing.

NOTE: Once the equation calculates a mixing zone depth (d) that is equal to the aquifer thickness (da), no additional mixing or dilution takes place. This is the maximum attentuation that the Soil Screening Level Equation calculates. All distances to a potential receptor greater than the distance that first causes the mixing zone depth to equal the aquifer thickness creates no additional attenuation. For this reason, the tables are only reproduced until (d) is equal to the aquifer thickness, which in the case of the Mound Plant Bedrock is 15 m.

Parameters for soil leaching calculation:			
Definition	**Parameter**	**Main Hilltop soil**	**Units**
source length parallel to ground water flow	**L**	**10**	**m**
aquifer thickness (DOE 1994)	da	15	m
hydraulic conductivity (DOE 1994)	K	52	m/y
hydraulic gradient at the source	**i**	**0.01**	**m/m**
horizontal distance to receptor	**xr**	**500**	**m**
infiltration rate (Schairbaum & Frost 1988)	in	0.15	m/y
soil-water partition coefficient (Koc * foc for organic chemicals)	Kd	chemical specific	L/kg
saturated porosity	Ow	0.15	
air filled porosity	Oa	0.28	
Henry's Law constant * 41 (0 for metals and radionuclides)	H	chemical specific	
dry soil bulk density	B	1.6	kg/L
soil organic carbon/water partition coefficient	Koc	chemical specific	L/kg
fraction organic carbon in soil (DOE Mound Plant Data Base)	foc	0.02	
mixing zone depth	d	15	m
dilution factor (used to multiply the target concentration)	df=	6.20	

Mixing Zone Depth Calculation

MIXING ZONE DEPTH (d)

$d = (0.0112(L+xr)^2)^{0.5} + da\{1 - \exp[(\ln(L+xr))/Kida)]\}$ (Equation 3)

DILUTION FACTOR (df) (Equation 4)

$df = 1 + Kid/inL$

SOIL SCREENING LEVEL CALCULATION

$SSL = Cw\{Kd + (Ow + (OaH))/B\}$ (Equation 1)

$Kd = Koc * foc$ (Equation 2)

INPUT PARAMETER DEFINITION

MCL	mg/L	
Cw	mg/L	target soil leachate. Acceptable water conc. * df
Kd	L/kg	soil-water partition coefficient
Ow		saturated porosity
Oa		air filled porosity
H		Henry's Law constant * 41 to make dimensionless
B	kg/L	dry soil bulk density
Koc	L/kg	soil organic carbon/water partition coefficient
foc	g/g	fraction organic carbon in soil

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-5 GV	Acceptable	Cw	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
Acenapthene	7.54E-03	5846	0.02	116.92			0	0.00	—
Acetone	1.18E-03	0.46	0.02	0.0092		3.6	3.6	22.32	2.30
Aldrin	4.22E-03	94623	0.02	1892.46			0	0.00	—
Anthracene	4.55E-03	18162	0.02	363.24	0.007		0.007	0.04	15.77
Arochlor 1016		147410	0.02	2948.2			0	0.00	—
Arochlor 1254		892520	0.02	17850.4		0.00073	0.00073	0.00	80.79
Arochlor 1260		4425557	0.02	88511.14		0.000011	0.000011	0.00	6.04
Benzene	2.24E-01	66	0.02	1.32	0.005		0.005	0.03	0.05
Benzo(a)anthracene	1.48E-04	272847	0.02	5456.94	0.007		0.007	0.04	236.84
Benzo(b)flouranthene	2.53E-04	882588	0.02	17651.76	0.007		0.007	0.04	766.09
Benzoic Acid	1.37E-05		0.02			140	140	868.00	81.38
Benzo(a)pyrene	3.43E-05	749569	0.02	14991.38	0.0002		0.0002	0.00	18.59
Bis(2-chlorethyl)ether	8.77E-04	76	0.02	1.52			0	0.00	—
Bis(2-ethylhexyl)phthalate	3.43E-04	94361	0.02	1887.22			0	0.00	—
Bomodichloromethane	1.30E-01	54	0.02	1.08	0.08		0.08	0.50	0.59
Bromoform	2.52E-02	97	0.02	1.94	0.08		0.08	0.50	1.01
Butanol	3.50E-04	5	0.02	0.1			0	0.00	—
Butyl benzyl phthalate	7.83E-05	15975	0.02	319.5		7.3	7.3	45.26	14464.81
Carbazole	8.12E-05	2441	0.02	48.82			0	0.00	—
Carbon disulfide	5.21E-01	52	0.02	1.04		0.033	0.033	0.20	0.25
Carbon tetrachloride	1.18E+00	187	0.02	3.74	0.005		0.005	0.03	0.13
Chlordane	2.73E-03	61155	0.02	1223.1	0.002		0.002	0.01	15.17
p-Chloroaniline	4.80E-05	41	0.02	0.82			0	0.00	—
Chlorobenzene	1.79E-01	213	0.02	4.26			0	0.00	—
Chlorodibromomethane	1.02E-01	72	0.02	1.44	0.08		0.08	0.50	0.77
Chloroform	1.65E-01	47	0.02	0.94	0.08		0.08	0.50	0.53
2-Chlorphenol	6.81E-04		0.02				0	0.00	—
Chyrsene	4.96E-05	312425	0.02	6248.5		0.0046	0.0046	0.03	178.21
DDD	2.03E-04	84937	0.02	1698.74			0	0.00	—
DDE	5.08E-03	108469	0.02	2169.38		0.00017	0.00017	0.00	2.29
DDT	2.20E-03	77577	0.02	1551.54		0.001	0.001	0.01	9.62
Dibenzo(a,h)anthracene	4.59E-07	1914389	0.02	38287.78			0	0.00	—
Di-n-butyl phthalate	5.86E-05	16851	0.02	337.02		3	3	18.60	6270.32
1,2-Dichlorobenzene (o)	8.61E-02	693	0.02	13.86	0.6		0.6	3.72	51.96
1,2-Dichlorobenzene (p)	1.15E-01	653	0.02	13.06	0.075		0.075	0.47	6.13

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-6 GV	Acceptable	CW	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
3,3-Dichlorobenzidene	8.53E-07	2441	0.02	48.82			0	0.00	—
1,1-Dichloroethane	2.36E-01	35	0.02	0.7		1.1	1.1	6.82	5.70
1,2-Dichloroethane	5.25E-02	20	0.02	0.4	0.005		0.005	0.03	0.02
1,1-Dichloroethylene	1.04E+01	64	0.02	1.28	0.007		0.007	0.04	0.14
cis-1,2 Dichloroethylene	1.85E-01	29	0.02	0.58	0.07		0.07	0.43	0.31
trans-1,2-Dichloroethylene	2.29E-01	50	0.02	1	0.1		0.1	0.62	0.70
1,2-Dichloropropane	1.15E-01	59	0.02	1.18	0.005		0.005	0.03	0.04
1,3-Dichloropropene	1.21E-01	33	0.02	0.66			0	0.00	—
2.4-Dichlorophenol	9.76E-06		0.02				0	0.00	—
Dieldrin	1.09E-04	18388	0.02	367.76		0.0018	0.0018	0.01	4.11
Diethyl phthalate	2.24E-05	152	0.02	3.04			0	0.00	—
2,4-Dimethylphenol	1.33E-04		0.02				0	0.00	—
Dimethyl phthalate	2.37E-05	32	0.02	0.64			0	0.00	—
2,4-Dinitrophenol	1.98E-07		0.02				0	0.00	—
2,4-Dinotrotolulene	6.03E-06	51	0.02	1.02			0	0.00	—
2,6-Dinotrotolulene	5.33E-06	42	0.02	0.84			0	0.00	—
Di-n-octyl phthalate	3.14E-05	9.8E+08	0.02	19601631		0.73	0.73	4.53	88716980.61
Endosulfan	9.47E-04	738	0.02	14.76			0	0.00	—
Endrin	4.88E-05	9335	0.02	186.7	0.002		0.002	0.01	2.32
Ethylbenzene	3.18E-01	388	0.02	7.76	0.7		0.7	4.34	34.33
Fluoranthene	3.83E-04	72025	0.02	1440.5		0.87	0.87	5.39	7770.56
Fluorene	2.99E-03	9226	0.02	184.52			0	0.00	—
Heptachlor	2.41E-02	11651	0.02	233.02	0.0004		0.0004	0.00	0.58
Heptachlor epoxide	3.40E-04	7236	0.02	144.72	0.0002		0.0002	0.00	0.18
Hexachlorobenzene	2.19E-02	27996	0.02	559.92	0.001		0.001	0.01	3.47
Hexachloro-1,3-butadiene	9.80E-01	6992	0.02	139.84			0	0.00	—
alpha-HCH (alpha-BHC)	2.78E-04	1310	0.02	26.2			0	0.00	—
beta-HCH (beta-BHC)	1.42E-05	1392	0.02	27.84		0.000047	0.000047	0.00	0.01
gamma-HCH (lindane)	1.39E-04	1085	0.02	21.7	0.0002		0.0002	0.00	0.03
Hexachlorocyclopentadien	7.05E-01	9589	0.02	191.78	0.05		0.05	0.31	59.52
Hexachloroethane	1.48E-01	1829	0.02	36.58			0	0.00	—
Indeno(1,2,3-c,d)pyrene	1.99E-07	4364700	0.02	87294		0.000026	0.000026	0.00	14.07
Isophorone	2.54E-04	30	0.02	0.6		7.2	7.2	44.64	30.97
Mercury	4.67E-01		0.02		0.002		0.002	0.01	0.00

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-6 GV	Acceptable	Cw	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
Methoxychlor	2.60E-04	77936	0.02	1558.72	0.04		0.04	0.25	386.59
Methyl bromide	5.82E-01	11	0.02	0.22			0	0.00	—
Methyl chloride	1.85E+00	7	0.02	0.14			0	0.00	—
Methylene chloride	9.72E-02	13	0.02	0.26			0	0.00	—
2-Methylphenol	6.72E-05		0.02				0	0.00	—
Napthalene	1.98E-02	1549	0.02	30.98			0	0.00	—
Nitrobenzene	8.45E-04		0.02				0	0.00	—
N-Nitrosodiphenylamine	2.86E-02	327	0.02	6.54			0	0.00	—
N-Nitrosodi-n-proplyamine	1.70E-03	17	0.02	0.34			0	0.00	—
Pentachlorobenzene		13274	0.02	265.48			0	0.00	—
Pentachlorophenol	5.82E-04		0.02		0.001		0.001	0.01	0.00
Phenol	2.44E-05		0.02			22	22	136.40	12.79
Pyrene	3.39E-04	59865	0.02	1197.3		0.68	0.68	4.22	5048.21
Styrene	1.37E-01	573	0.02	11.46	0.1		0.1	0.62	7.18
1;1,2,2-Tetrachloroethane	1.53E-02	104	0.02	2.08			0	0.00	—
Tetrachloroethylene	7.09E-01	139	0.02	2.78	0.005		0.005	0.03	0.09
Toluene	2.52E-01	171	0.02	3.42	1		1	6.20	22.06
Toxaphene	1.38E-04	501	0.02	10.02	0.003		0.003	0.02	0.19
1,2,4-Trichlorobenzene	1.07E-01	1840	0.02	36.8	0.07		0.07	0.43	16.02
1,1,1-Trichloroethane	7.63E-01	110	0.02	2.2	0.2		0.2	1.24	3.01
1,1,2-Trichloroethane	4.10E-02	61	0.02	1.22	0.005		0.005	0.03	0.04
Trichloroethylene	4.35E-01	112	0.02	2.24	0.005		0.005	0.03	0.07
2,4,5-Trichlorophenol	1.80E-04		0.02				0	0.00	—
2,4,6-Trichlorophenol	1.66E-04		0.02				0	0.00	—
Vinyl acetate	2.26E-02	5	0.02	0.1			0	0.00	—
Vinyl chloride	3.45E+00	11	0.02	0.22	0.002		0.002	0.01	0.01
Xylenes (total)	2.48E-01	381	0.02	7.62	10		10	62.00	480.94
Inorganics									
Antimony			0.02		0.006		0.006	0.04	0.00
Arsenic			0.02	29	0.05		0.05	0.31	9.02
Barium			0.02	1.4	2		2	12.40	18.52
Beryllium			0.02	4600	0.004		0.004	0.02	114.08
Bromate			0.02		0.01		0.01	0.06	0.01
Cadmium			0.02	120	0.005		0.005	0.03	3.72
Chloramine			0.02		4		4	24.80	2.33

CHEMICAL NAME	H	Koc	foc	Kd	MCL	10-5 GV	Acceptable	Cw	SSL
		L/kg		L/kg	mg/L	mg/L	Concentration	mg/L	mg/kg
Chlorine			0.02		4		4	24.80	2.33
Chlorine Dioxide			0.02		0.8		0.8	4.96	0.47
Chromium (total)			0.02	19	0.1		0.1	0.62	11.84
Copper			0.02	10000					
Cyanide			0.02		0.2		0.2	1.24	0.12
Fluoride			0.02		4		4	24.80	2.33
Mercury			0.02	145	0.002		0.002	0.01	1.80
Nickel			0.02	21	0.1		0.1	0.62	13.08
Nitrate			0.02		10		10	62.00	5.81
Nitrite			0.02		1		1	6.20	0.58
Selenium			0.02	5	0.05		0.05	0.31	1.58
Sulfate			0.02		500		500	3100.00	290.63
Zinc			0.02	420					
Thallium			0.02	71	0.002		0.002	0.01	0.88
Radionuclides					pCi/L	pCi/L	pCi/L		
Radium 226					20		20	124.00	11.63
Radon					300		300	1860.00	174.38
Tritium				1	20,000		20000	124000.00	135625.00
Actinium 227						0.076	0.076	0.47	0.04
Americium 241						0.15	0.15	0.93	0.09
Bismuth 207						9.4	9.4	58.28	5.46
Cesium 137						1.5	1.5	9.30	0.87
Cobalt 60						2.5	2.5	15.50	1.45
Plutonium 238				100000		0.16	0.16	0.99	99200.09
Plutonium 239				100000		0.15	0.15	0.93	93000.09
Plutonium 240				100000		0.15	0.15	0.93	93000.09
Strontium 90						0.85	0.85	5.27	0.49
Thorium 228						0.21	0.21	1.30	0.12
Thorium 230						1.3	1.3	8.06	0.76
Thorium 232						1.5	1.5	9.30	0.87