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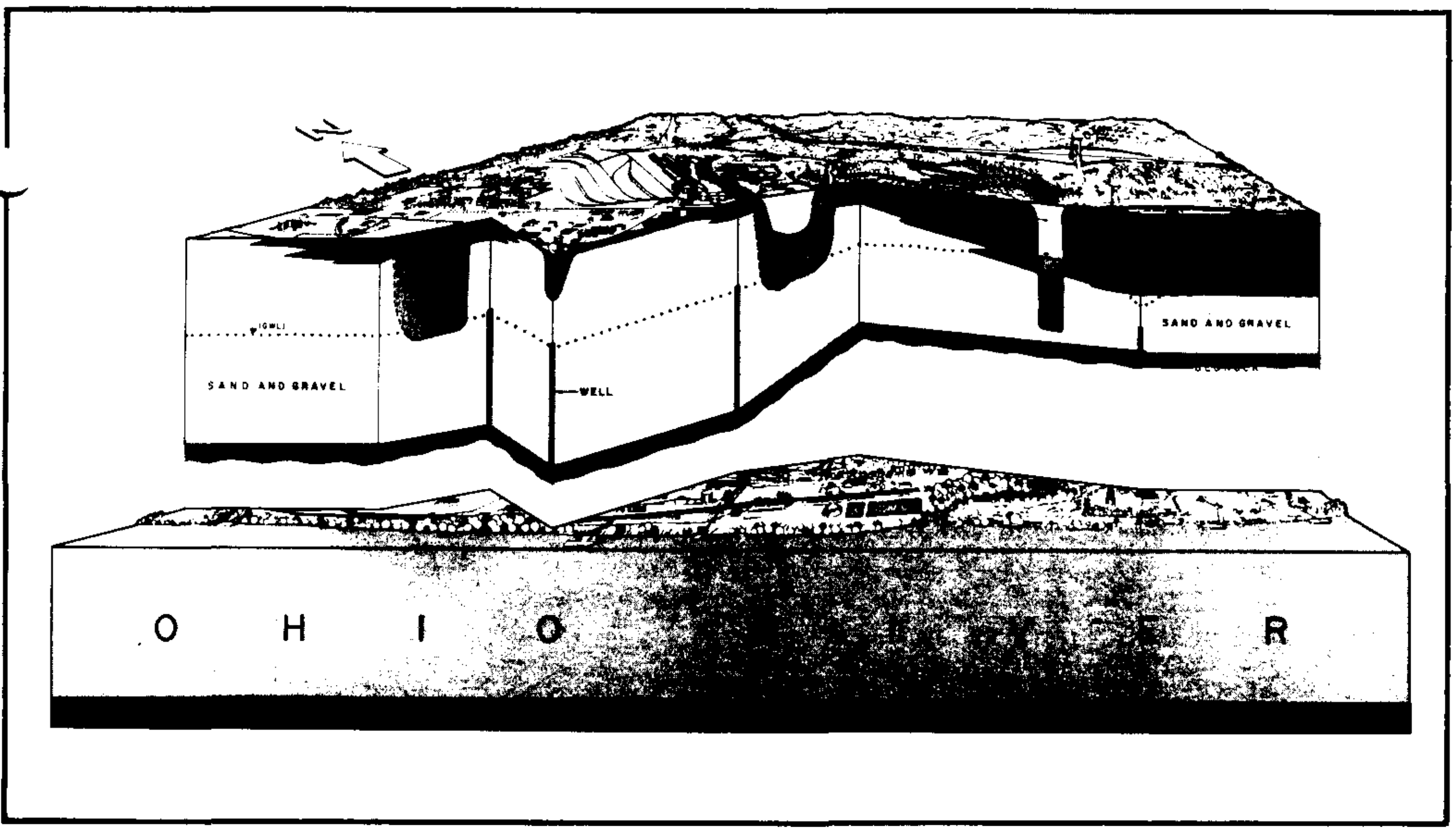
Volume II
Final Report

Remedial Investigation

Allied Chemical/
Ironton Coke Site
Ironton, Ohio

Allied - Signal Inc.
Morristown, New Jersey



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TECHNICAL MEMORANDUM
DEEP GEOTECHNICAL BORING PROGRAM

A total of six deep geotechnical borings were drilled at the Allied Chemical/Ironton Coke site in Ironton, Ohio in accordance with the Phase II work plan for the site Remedial Investigation/Feasibility Study (RI/FS). The purpose of the borings was to obtain information on the geotechnical properties of both the unconsolidated materials and bedrock which underlie the site. The locations of the completed borings are shown in Figure A-1. Two borings were drilled adjacent to the Goldcamp area and four borings were drilled around the periphery of the coke plant lagoon area. Borings initially scheduled to be drilled in the coke plant coal storage yard were deleted due to the quantity and quality of information regarding the coke plant production wells located in that area. This information was obtained after the work plan was developed.

Methods

The deep geotechnical borings were drilled using rotary drilling techniques and a casing advancer system to expedite the drilling process. Soil samples were obtained by driving a standard split-barrel sampler (split-spoon) at approximately five-foot intervals in order to determine:

- Density of unconsolidated materials
- Lithology of unconsolidated materials
- Depth to top of bedrock.

These samples were subsequently transferred to jars which were labeled and boxed for storage on site. Upon encountering bedrock, coring (NQ wireline casing) and pressure testing were conducted in Borings B-1, B-2, B-3, and B-6 to determine:

- Competence of bedrock
- Bedrock lithology
- Bedrock permeability.

Rock core was transferred to core boxes and photographed following preparation of the boring log. Soil samples and rock core were examined by an IT geologist/hydrogeologist. A visual descriptive log for each boring was prepared in the field to include the sample number and type, sample depths, sample descriptions, standard penetration resistance (density), sample recovery, USCS classification, and other pertinent information relative to the drilling procedure. Additionally, a rock fracture log was prepared for all rock which was cored. Boring logs are presented in Appendix H.

The bedrock sections of Borings B-1, B-3, and B-6 were pressure tested using a pneumatic double packer arrangement. This arrangement allows sequential testing of select intervals of a boring until the entire cored length has been tested. Boring B-2 was pressure tested by setting a single packer near the top of bedrock and testing a large interval in a single test. This single packer method provides a quick testing procedure where "no take" (impermeable bedrock) conditions are expected.

Following completion of packer testing, each boring was filled with a bentonite-cement grout which was placed by pumping through the drill rods from the bottom of the boring to seal the bedrock from the aquifer and to prevent caving of unconsolidated materials in the boring. All downhole equipment was thoroughly washed with a steam power sprayer between borings.

Results

The boring logs for the deep geotechnical borings (Appendix H) indicate a fairly uniform aquifer of loose to very dense fine to coarse sand with a trace to some fine gravel. Low-permeability materials were encountered in the coke plant lagoon area overlying the aquifer materials. These very soft to medium stiff silty clays and clayey silts are probably Ice Creek sediments deposited prior to lagoon construction. The logs for Borings B-3 and B-4 present a visual description of the materials encountered during drilling which comprise the outer lagoon dike. Borings B-5 and B-6 are presumably located on the old Ironton flood wall west of the coke plant lagoons (Figure A-1). Borings in the Goldcamp area (B-1 and B-2) did not encounter low-permeability layers in the alluvial deposits other than the clayey materials placed during closure of the Goldcamp dump. A gravel and cobble layer of variable thickness was found in Boring B-1 overlying the bedrock surface. This layer was encountered only near the Goldcamp area. In Boring B-2, a black, oily liquid was found just above bedrock in the sand and gravel. When this layer was encountered, drilling was suspended and a composite sample of the water column in the boring was collected for laboratory analysis. Additionally, a sample of the oily phase of the liquid was collected from the drilling water recirculation tank. Also in Boring B-2, an oily sheen was noted on samples from depths of 3.5 to 9.5 feet. An oily film was also noted in Boring B-5 on the sample from a depth of 38.0 to 39.5 feet. Laboratory analytical results from the samples of oily material collected in Boring B-2 are presented in Table A.1. No other signs of visual contamination were evident during the deep geotechnical boring program.

The field data collected during packer pressure testing (permeability testing) of bedrock indicate that the only zone which accepted significant quantities of water during testing was the weathered bedrock near the soil-bedrock interface at Boring B-6. The results of testing also suggest relatively low-permeability to impermeable bedrock below the weathered bedrock zone in the coke plant lagoon borings and the Goldcamp borings. Calculated permeability values for the bedrock are presented in Table A.2.

TABLES

TABLE A.1

SUMMARY OF CHEMICAL ANALYSES
DEEP GEOTECHNICAL BORING PROGRAM

PARAMETER	CAS NUMBER[1]	SAMPLE IDENTIFICATION B-2H mg/ℓ[2]
VOLATILE PRIORITY POLLUTANTS:		
Acrolein	107-02-8	ND[3]
Acrylonitrile	107-13-1	ND
Benzene	71-43-2	0.068
Bromoform	75-25-2	ND
Carbon Tetrachloride	56-23-5	ND
Chlorobenzene	108-90-7	ND
Chlorodibromomethane	124-48-1	ND
Chloroethane	75-00-3	ND
2-Chloroethylvinyl ether	110-75-8	ND
Chloroform	67-66-3	<0.010[4]
Dichlorobromomethane	75-27-4	ND
Dichlorodifluoromethane	75-71-8	ND
1,1-Dichloroethane	75-34-3	ND
1,2-Dichloroethane	107-06-2	ND
1,1-Dichloroethylene	75-35-4	ND
1,2-Dichloropropane	78-87-5	ND
1,3-Dichloropropylene[5]	542-75-6	ND
Ethylbenzene	100-41-4	0.096
Methyl bromide	74-83-9	ND
Methyl chloride	74-87-3	ND
Methylene chloride	75-09-2	ND
1,1,2,2-Tetrachloroethane	79-34-5	ND
Tetrachloroethylene	127-18-4	ND
Toluene	108-88-3	0.16
trans-1,2-Dichloroethylene	156-60-5	ND
1,1,1-Trichloroethane	71-55-6	ND
1,1,2-Trichloroethane	79-00-5	ND
Trichloroethylene	79-01-6	ND
Trichlorofluoromethane	75-69-4	ND
Vinyl Chloride	75-01-4	ND
VOLATILE NONPRIORITY POLLUTANTS:		
2 Butanone	78-93-3	ND
Carbon disulfide	75-15-0	ND
2-Hexanone	591-78-6	ND
4-Methyl-2-pentanone	108-10-1	ND
Styrene	100-42-5	0.14
Vinyl acetate	108-05-4	ND
o-Xylene	95-47-6	0.21

See footnotes at end of table.

TABLE A.1
(Continued)

PARAMETER	CAS NUMBER[1]	SAMPLE IDENTIFICATION B-2H mg/ℓ[2]
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:		
Acenaphthene	83-32-9	10
Acenaphthylene	208-96-8	0.35
Anthracene	120-12-7	≤16[6]
Benzidine	92-87-5	ND
Benzo(a)anthracene	56-55-3	≤6.7
Benzo(a)pyrene	50-32-8	5.6
3,4-Benzofluoranthene	205-99-2	≤3.6
Benzo(g,h,i)perylene	191-24-2	0.74
Benzo(k)fluoranthene	207-08-9	≤3.6
Bis(2-chloroethoxy)methane	111-91-1	ND
Bis(2-chloroethyl)ether	111-44-4	ND
Bis(2-chloroisopropyl)ether	39638-32-9	ND
Bis(chloromethyl)ether[7]	542-88-1	ND
Bis(2-ethylhexyl)phthalate	117-81-7	ND
4-Bromophenyl phenyl ether	101-55-3	ND
Butyl benzyl phthalate	85-68-7	ND
2-Chloronaphthalene	91-58-7	ND
4-Chlorophenyl phenyl ether	7005-72-3	ND
Chrysene	218-01-9	≤6.7
Dibenzo(a,h)anthracene	53-70-3	0.22
1,2-Dichlorobenzene	95-50-1	ND
1,3-Dichlorobenzene	541-73-1	ND
1,4-Dichlorobenzene	106-46-7	ND
3,3'-Dichlorobenzidine	91-94-1	ND
Diethyl phthalate	84-66-2	ND
Dimethyl phthalate	131-11-3	ND
Di-n-butyl phthalate	84-74-2	0.10
2,4-Dinitrotoluene	121-14-2	ND
2,6-Dinitrotoluene	606-20-2	ND
Di-n-octyl phthalate	117-84-0	ND
1,2-Diphenylhydrazine (Azobenzene)[8]	122-66-7	ND
Fluoranthene	206-44-0	14
Fluorene	86-73-7	7.2
Hexachlorobenzene	118-71-1	ND
Hexachlorobutadiene	87-68-3	ND
Hexachlorocyclopentadiene	77-47-4	ND
Hexachloroethane	67-72-1	ND
Indeno(1,2,3-cd)pyrene	193-39-5	0.89
Isophorone	78-59-1	ND
Naphthalene	91-20-3	13
Nitrobenzene	98-95-3	ND
N-Nitrosodimethylamine	62-75-9	ND
N-Nitrosodi-n-propylamine	621-64-7	ND
N-Nitrosodiphenylamine (Diphenylamine)[8]	86-30-6	ND
Phenanthrene	85-01-8	≤16
Pyrene	129-00-0	9.8
1,2,4-Trichlorobenzene	120-82-1	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1764-01-6	ND

See footnotes at end of table.

TABLE A.1
(Continued)

PARAMETER	CAS NUMBER(1)	SAMPLE IDENTIFICATION B-2H mg/ℓ(2)
ACID EXTRACTABLE PRIORITY POLLUTANTS:		
2-Chlorophenol	95-57-8	ND
2,4-Dichlorophenol	120-83-2	ND
2,4-Dimethylphenol	105-67-9	ND
4,6-Dinitro-o-cresol	534-52-1	ND
2,4-Dinitrophenol	51-28-5	ND
2-Nitrophenol	88-75-5	ND
4-Nitrophenol	100-02-7	ND
p-Chloro-m-cresol	59-50-7	ND
Pentachlorophenol	87-86-5	ND
Phenol	108-95-2	ND
2,4,6-Trichlorophenol	88-06-2	ND
ACID AND BASE-NEUTRAL EXTRACTABLE NONPRIORITY POLLUTANTS:		
Aniline	65-53-3	ND
Benzoic Acid	65-85-0	ND
Benzyl Alcohol	100-51-6	ND
4-Chloroaniline	106-47-8	ND
Dibenzofuran	132-64-9	5.7
2-Methylnaphthalene	91-57-6	5.8
2-Methylphenol	95-48-7	ND
4-Methylphenol	106-44-5	ND
2-Nitroaniline	88-74-4	0.26
3-Nitroaniline	99-09-2	0.22
4-Nitroaniline	100-01-6	ND
2,4,5-Trichlorophenol	95-95-4	ND

(1) The numbers presented in this column are the Chemical Abstracts Service (CAS) numbers used for cataloging the indicated compounds in the Chemical Abstracts Index.

(2) mg/ℓ = Milligrams per liter or parts per million.

(3) ND indicates none detected.

(4) The corresponding compound was detected at less than 10 micrograms per kilogram or parts per billion.

(5) The indicated compound is incorrectly identified in Part C of NPDES Form 2C as 1,2-Dichloropropylene. However, the sample was screened for the presence of both compounds.

(6) $\leq$ = Compound was found at a concentration equal to or less than the indicated value. Compounds are reported as "less than or equal to" the indicated concentration because some compounds exhibit the same mass spectra and retention times and therefore cannot be resolved.

(7) Decomposes rapidly in water.

(8) Detected as compound in parentheses.

TABLE A.2

RESULTS OF BEDROCK PACKER TESTING

BORING NO.[1]	DEPTH OF TEST ZONE (ft)	RANGE OF PERMEABILITY (cm/sec)
B-1	127.0 - 132.8	NT[2]
B-1	121.2 - 127.0	NT
B-1	115.4 - 121.2	NT
B-1	109.6 - 115.4	NT
B-1	103.8 - 109.6	NT
B-1	98.0 - 103.8	-[3]
B-1	92.2 - 98.0	NT
B-1	86.4 - 92.2	NT
B-1	83.5 - 89.3	NT
B-2	92.6 - 138.5[4]	1.6×10^{-5} - 1.7×10^{-5}
B-2	97.6 - 138.5	NT
B-2	95.1 - 138.5	NT
B-3	102.0 - 107.8	-
B-3	97.0 - 102.8	-
B-3	92.0 - 97.8	NT
B-3	87.0 - 92.8	NT
B-3	82.0 - 87.8	-
B-3	77.0 - 82.8	4.4×10^{-5} - 9.5×10^{-5}
B-3	76.0 - 81.8	6.1×10^{-5} - 7.7×10^{-5}
B-3	71.0 - 76.8	-
B-3	66.0 - 71.8	NT
B-3	61.0 - 66.8	NT
B-6	126.0 - 131.8	NT
B-6	121.0 - 126.8	NT
B-6	116.0 - 121.8	NT
B-6	111.0 - 116.8	-
B-6	106.0 - 111.8	-
B-6	101.0 - 106.8	-
B-6	96.0 - 101.8	-
B-6	91.0 - 96.8	-
B-6	90.0 - 95.8	-
B-6	89.5 - 95.3	-
B-6	84.0 - 89.8	2.8×10^{-3} - 2.9×10^{-3}

(1) Refer to Figure A-1 for location of borings.

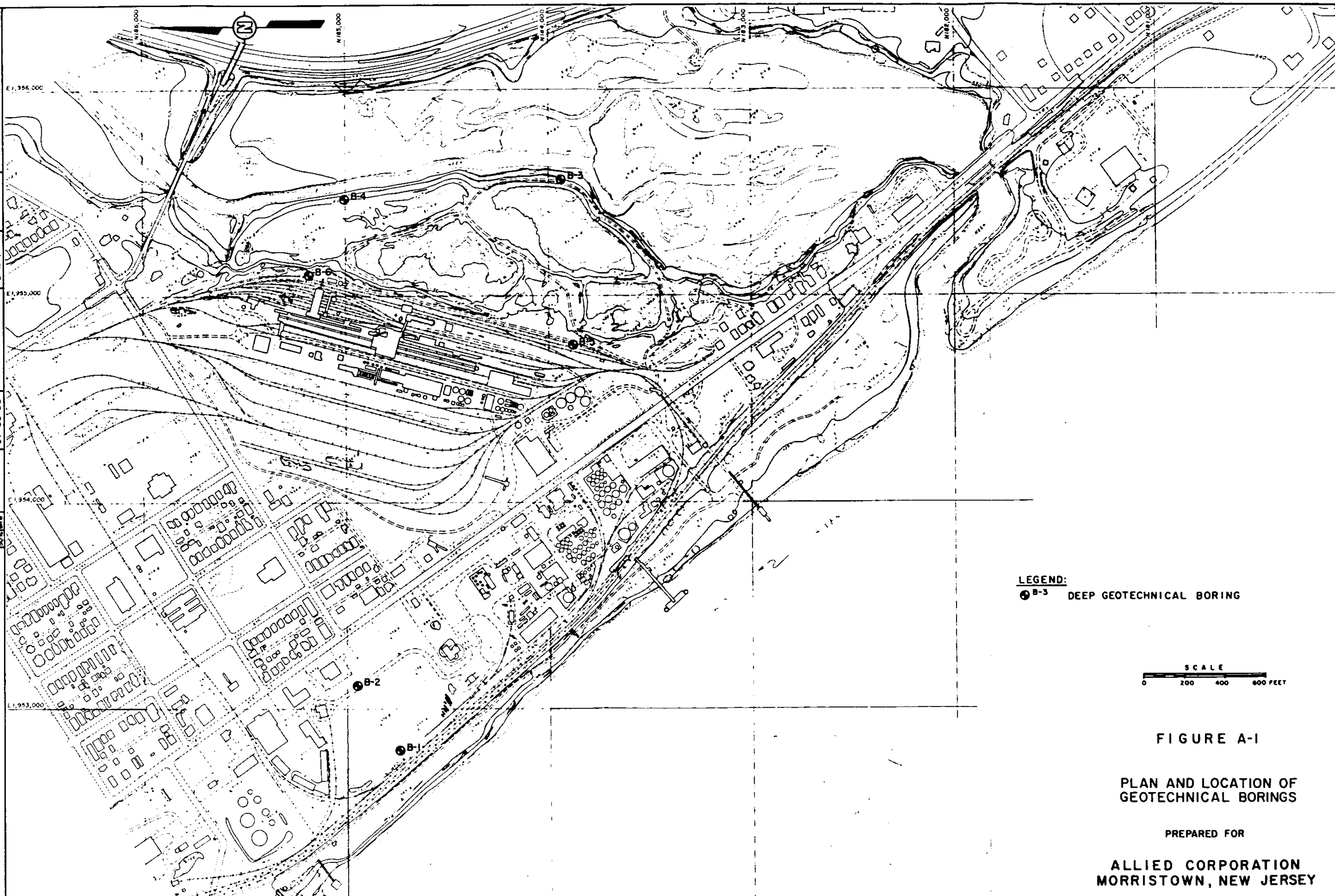
(2) "NT" means No Take. Packer testing in the specified test zone resulted in no flow of water and indicates extremely low permeability.

(3) The flow measured for the indicated test zone was below the normal operating range of the test equipment. The permeability of these zones is correspondingly low.

(4) Bottom depth of Boring B-2.

FIGURE

DRAWN BY c/b/ 01-03-85 | CHECKED BY RJK 1-25-85 | APPROVED BY JLH 1-25-85 | DRAWING NUMBER 83-1625-E71



REFERENCES

1 TOPOGRAPHIC MAP PREPARED BY EASTERN MAPPING CO., PITTSBURGH, PENNSYLVANIA DATED DECEMBER, 1983 - SCALE 1" = 200'

2 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF IRONTON, OHIO-KY AND ASHLAND, KY-OHIO QUADRANGLES - DATED 1972 AND 1968 (PHOTOREVISED 1975) - SCALE 1" = 2000'

FIGURE A-1

PLAN AND LOCATION OF GEOTECHNICAL BORINGS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

APPENDIX
B

APPENDIX B

TECHNICAL MEMORANDUM
SOILS PROGRAM

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TECHNICAL MEMORANDUM
SOILS PROGRAM

As part of the Phase II work plan of the remedial investigation at the Allied Chemical/Ironton Coke site, an investigation of near-surface soils was conducted from June 25 to 30, 1984 and from July 18 to 20, 1984. The objectives of the program were as follows:

- Locate and characterize site soil contamination and identify contaminant sources
- Locate potential sources of ground water contamination within the approximate contaminant source areas as identified in the Phase I Remedial Investigation report
- Investigate and characterize other potential ground water contaminant source areas.

Test pit locations were selected by OEPA, U.S. EPA, and Allied during a site visit on June 6, 1984. Additional test pits were located south of coke plant Lagoon No. 1 and near the tar plant anthracene production unit.

Methods

A John Deere backhoe was used to excavate test pits to depths ranging from approximately 8.0 to 13.5 feet. The depth of each test pit was determined on the basis of the materials encountered in the pit and on the purpose of the excavation. An IT geologist was present to observe each test pit, prepare a log describing materials and conditions encountered (Appendix H), and collect samples as appropriate. Samples were collected for chemical analysis based on the following criteria:

- Changes in the stratigraphy of the soil
- Changes in the color of the materials encountered
- Visible contamination of soil

- High concentrations of volatile organics as indicated by an organic vapor analyzer
- Presence of free liquids.

Each sample was collected in one 500-milliliter amber glass jar and two 40-milliliter VOA vials. Samples were kept cool during subsequent storage and chain-of-custody forms accompanied samples during shipment to the IT Environmental Laboratory in Pittsburgh, Pennsylvania.

Generally, each test pit was excavated at least several feet into visibly clean, natural soil to determine changes with depth in contaminant concentrations, depth and type of fill materials, the nature of the soil underlying the fill material, and the presence of any buried utilities. Each test pit was backfilled and compacted upon completion and the backhoe was thoroughly washed before moving to the next test pit location.

The samples taken near the phenolics loading area at the coke plant from TP-21 were retrieved using a hand auger due to the presence of a nearby tank containing an explosive atmosphere. Samples TP-22G-S through TP-27G-S were collected by Allied personnel from the trench excavated during replacement of the carbolate transfer pipeline around the old coke plant administrative building. The samples were retrieved from depths ranging from 6 to 10 feet.

Table B.1 provides a summary of sample designations in each test pit, the approximate sampling depths, and the total depth of each test pit. The locations of test pits and Samples TP-22G-S through TP-27G-S are shown in Figure B-1.

Results of Investigation

At Test Pit TP-18, a black oily liquid with a naphthalene/creosote odor seeped into the test pit from a slag layer encountered between a depth of 2.0 and 2.8 feet. A 5.2-foot-thick layer of silty clay was encountered below the slag layer. The sand layer below 8.0 feet contained a relatively clear liquid with a naphthalene/creosote odor. At Test Pit TP-20, a coarse gravel drain was encountered and the test pit filled with water during excavation. A sample of the water was collected for chemical analysis (Sample No. TP-20G-W). Test Pit TP-20A was excavated approximately 5 feet to the north of Test Pit TP-20 to determine the stratigraphy near the drain. A small seep from a sand layer was observed at a depth of approximately 8 feet in Test Pit TP-19. The seep may be derived from the saturated gravel drain encountered in Test Pit TP-20. Allied Chemical personnel who observed the seep in Test Pit TP-19 indicated that the solvent furfural had once been used in this area of the plant. Based on this information, furfural was added to the list of analytical parameters for three soil samples from Test Pits TP-19 and two soil samples from Test Pit TP-20. The results of these analyses, shown in Table B.2, indicate that furfural was detected only in amounts slightly greater than the detection limit.

At TP-21, a 3.0-foot silty clay layer was present below 1.5 feet of fill. A layer of fine to medium sand was encountered beneath the silty clay. The sand was moist in the upper portion but became unexpectedly wet below 6.5 feet. The sample collected from 7.0 to 8.0 feet (TP-21G-S) exhibited an unidentifiable chemical odor. Several of the samples collected by Allied Chemical personnel from the pipeline trench (TP-22G-S through TP-27G-S) had a phenol odor. These samples were primarily silty clay which was probably placed as backfill around the old transfer pipeline.

The test pit classification logs contained in Appendix H provide a visual description of materials encountered in each pit, the depth of the pit, and other relevant notes. Because Samples TP-22G-S through TP-27G-S were collected by Allied personnel from a pipeline trench, classification logs are not available for these sample locations. The results of the chemical analyses of the selected soil samples is presented in Table B.3.

TABLES

TABLE B.1

SUMMARY OF TEST PIT DATA
SOILS PROGRAM

TEST PIT NO.(1)	TEST PIT DEPTH (ft)	SAMPLE NO.	APPROXIMATE SAMPLE DEPTH (ft)
TP-1	12.0	TP-1I-S	0.0 - 2.0
		TP-1H-S	4.0 - 6.5
		TP-1G-S	11.0 - 12.0
TP-2	7.7	TP-2I-S	0.0 - 1.5
		TP-2H-S	1.5 - 2.8
		TP-2G-S	7.0 - 7.7
TP-3	8.0	TP-3I-S	0.0 - 1.5
		TP-3H-S	1.5 - 3.0
		TP-3G-S	6.5 - 8.0
TP-4	9.0	TP-4I-S	1.0 - 2.0
		TP-4H-S	3.0 - 4.0
		TP-4G-S	8.0 - 9.0
TP-5	8.0	TP-5I-S	0.0 - 1.2
		TP-5H-S	2.0 - 3.0
		TP-5G-S	7.0 - 8.0
TP-6	8.7	TP-6I-S	0.0 - 1.5
		TP-6H-S	2.0 - 3.0
		TP-6G-S	8.0 - 8.7
TP-7	9.0	TP-7I-S	0.0 - 1.5
		TP-7H-S	2.5 - 3.5
		TP-7G-S	8.0 - 9.0
TP-8	9.0	TP-8I-S	0.0 - 1.0
		TP-8H-S	3.0 - 4.0
		TP-8G-S	8.0 - 9.0
TP-9	11.0	TP-9I-S	0.0 - 1.0
		TP-9H-S	3.5 - 5.0
		TP-9G-S	10.0 - 11.0
TP-10	11.0	TP-10H-S	3.0 - 4.0
		TP-10G-S	9.5 - 11.0

See footnotes at end of table.

TABLE B.1
(Continued)

TEST PIT NO.[1]	TEST PIT DEPTH (ft)	SAMPLE NO.	APPROXIMATE SAMPLE DEPTH (ft)
TP-11	12.0	TP-11I-S	0.0 - 1.0
		TP-11H-S	7.0 - 8.0
		TP-11G-S	11.0 - 12.0
TP-12	12.0	TP-12G-S	11.0 - 12.0
TP-13	13.5	TP-13G-S	10.5 - 12.5
TP-14	8.0	TP-14H-S	7.0 - 8.0
		TP-14G-S	2.3 - 3.0
TP-15	9.0	TP-15H-S	3.5 - 4.0
		TP-15G-S	8.0 - 9.0
TP-16	9.5	TP-16H-S	3.3 - 4.3
		TP-16G-S	8.5 - 9.5
TP-17	10.5	TP-17I-S	4.5 - 5.0
		TP-17H-S	5.5 - 6.5
		TP-17G-S	9.5 - 10.5
TP-18	10.0	TP-18I-S	2.5 - 2.8
		TP-18H-S	3.5 - 4.5
		TP-18G-S	8.0 - 10.0
TP-19	10.0	TP-19I-S	0.0 - 2.8
		TP-19H-S	3.8 - 4.8
		TP-19G-S	8.0 - 9.0
TP-20	4.0	TP-20G-W	0.0 - 4.0
TP-20A	10.5	TP-20H-S	3.0 - 4.0
		TP-20G-S	9.5 - 10.5
TP-21[2]	8.0	TP-21I-S	0.0 - 1.5
		TP-21H-S	4.5 - 5.0
		TP-21G-S	7.0 - 8.0
NA[3]	NA[3]	TP-22G-S	10.0

See footnotes at end of table.

TABLE B.1
(Continued)

TEST PIT NO.[1]	TEST PIT DEPTH (ft)	SAMPLE NO.	APPROXIMATE SAMPLE DEPTH (ft)
NA	NA	TP-23G-S	10.0
NA	NA	TP-24G-S	7.0
NA	NA	TP-25G-S	7.0
NA	NA	TP-26G-S	6.0
NA	NA	TP-27G-S	6.0

(1) See Figure B-1 for location of test pits and samples.

(2) Hand auger boring at phenolics loading area.

(3) Samples collected by Allied personnel from trench excavated during replacement of carbolate pipeline.

TABLE B.2

RESULTS OF FURFURAL ANALYSIS
SOILS PROGRAM

SAMPLE IDENTIFICATION	PARAMETER FURFURAL mg/kg[1]
TP-19G-S	ND[2]
TP-19H-S	0.15
TP-19I-S	ND
TP-20G-W	IS[3]
TP-20G-S	ND
TP-20H-S	0.11

[1] mg/kg = milligrams per kilogram or parts per million.

[2] ND indicates that the compound was not detected with a detection limit of <0.10 mg/kg.

[3] IS indicates that there was insufficient sample for analysis.

TABLE B.3

RESULTS OF CHEMICAL ANALYSES
SOILS PROGRAM

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	CYANIDE (Total) mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4^-	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
TP-1G-S	29	5.6	56	ND[2]	45	ND/ND	<1.0/<1.0[3,4]
TP-1H-S	37	20	9.6	0.8	340	ND/ND	45
TP-1I-S	150/140	34	2.6	2.2	68	ND/ND	65
TP-2G-S	4.0	45	8.1	0.9	90/79	ND	1.2
TP-2H-S	28	67	0.63	0.9	110/90/120	ND	3.6/2.4
TP-2I-S	65	39	19	55/62	45	1.1	2600
TP-3G-S	190	11	0.60	2.4	1700	ND	<1.0
TP-3H-S	310/330	45	2.5	0.8	5000	ND	<1.0
TP-3I-S	280	47/45	47	3.9	7300	ND	23
TP-4G-S	21	34	ND/0.62	0.9	22	ND	2.2
TP-4H-S	7.8	22	1.2	0.7	110	ND	<1.0
TP-4I-S	11	5.6	1.2	1.6	45	ND	7.1/7.3
TP-5G-S	48	11	1.2	1.5	34	ND/ND	<1.0
TP-5H-S	390	56	ND	0.3	560	ND	<1.0
TP-5I-S	85	61	17	4.3	45	ND	1070

See footnotes at end of table.

TABLE B.3
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	CYANIDE (Total) mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4^-	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
TP-6G-S	24	61	ND/ND	1.1	22	ND	2.1/2.6
TP-6H-S	34	34	ND	4.4	ND	ND	<1.0
TP-6I-S	31	17	4.4	9.8	34	0.21	3090
TP-7G-S	7.0/6.0	22	ND	1.0	68	ND	<1.0
TP-7H-S	14	67	ND	3.1	170/110	ND	<1.0
TP-7I-S	8.0	22	6.3	3.2	140	ND	39
TP-8G-S	4.0	22	ND	1.8	68	ND	<1.0
TP-8H-S	6.7	14	22	2.3	79	ND	<1.0/<1.0
TP-8I-S	18	11	7.3	2.8	45	ND	25
TP-9G-S	17	51	ND	1.3	22	0.025	<1.0
TP-9H-S	53	90	29/24	5.9	56	0.019	1500/1500
TP-9I-S	19	22	5.0	2.5	45	ND	14/16
TP-10G-S	4.9	28/22	ND	3.6	45/45	ND	<1.0
TP-10H-S	13	9.9	37/27	0.7	90	ND	375/430

See footnotes at end of table.

APPENDIX
C

APPENDIX C

TECHNICAL MEMORANDUM
WASTE CHARACTERIZATION
IRONTON COKE PLANT LAGOONS

APPENDIX C

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TECHNICAL MEMORANDUM
WASTE CHARACTERIZATION
IRONTON COKE PLANT LAGOONS

A detailed investigation of the Ironton coke plant lagoons was undertaken by IT Corporation (IT) between July 16 and 26, 1984. The investigation consisted of drilling numerous borings in the coke plant lagoon area; collecting waste, soil, and ground water samples for chemical analysis; conducting in situ borehole tests; and collecting air samples in the Lagoon No. 5 tar pit. The objectives of the investigation include:

- Confirm the Phase I estimates of waste volume contained in each lagoon (i.e., depth of waste material)
- Chemically characterize underlying natural materials
- Characterize inner lagoon dike construction materials
- Characterize outer lagoon dike construction materials
- Characterize old Ironton flood wall construction materials west of the coke plant lagoon area
- Collect and analyze waste/dike samples for Phase II Table A parameters
- Collect and analyze ground water samples from within the lagoon waste materials
- Conduct in situ tests to determine waste consistency, stratification, and stabilization characteristics and permeability of waste materials
- Evaluate potential release of airborne volatile organics during remedial action operations.

Borings penetrating the outer lagoon dike (Borings B-3 and B-4) and the old Ironton flood wall (Boring B-6) were drilled as part of the deep geotechnical boring program. The descriptive boring logs for these borings are contained in Appendix H.

Methods

Several drilling techniques were used to advance borings during the lagoon investigation, including:

- Continuous sample tube system with hollow stem augers
- Hand-pushed polyvinyl chloride (PVC) pipe with fitted plunger
- Standard two-inch-diameter split-barrel sampler with hollow stem augers.

At each boring, continuous sampling was conducted to obtain a complete core of waste material for visual examination. Boring logs containing detailed descriptions of materials encountered were prepared by an IT geologist and are presented in Appendix H. The locations of the lagoon borings and the deep geotechnical borings are shown in Figure C-1. Samples representative of the materials encountered at each boring location were selected and retained for chemical analysis. Additionally, ground water samples from within the waste material were bailed from Borings LB-4, LB-10, LB-11, and LB-12 for chemical analysis. All samples collected for chemical analysis were appropriately preserved and chain-of-custody records accompanied the samples to the IT laboratory.

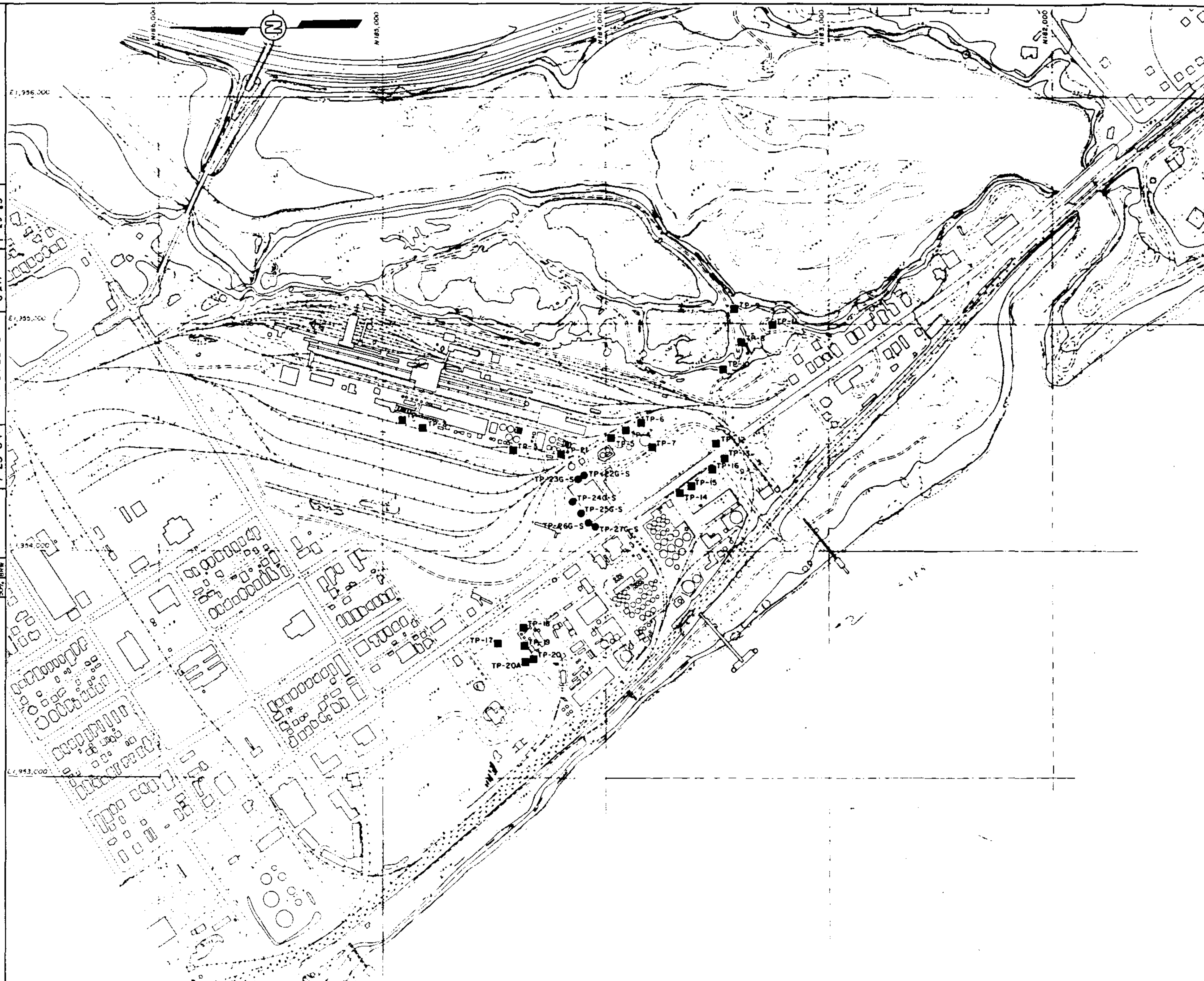
In situ falling head permeability tests were conducted in Borings LB-8, LB-10, and LB-11 to determine the hydraulic conductivity of waste materials in the coke plant lagoon area. Tests were conducted by seating two-inch-diameter PVC casing at the bottom of the boring, filling the casing with clean water, and recording the fall of the water level within the casing as a function of time.

All borings except LB-5 penetrated through waste material into underlying natural materials. Boring LB-6, located near Boring LB-5, but at a lower elevation, penetrated through the Lagoon No. 5 waste into natural materials to confirm the base of that lagoon. Tables C.1 and C.2 present a summary of the samples which were collected for chemical analysis and proximate analysis during the lagoon boring program. These tables list each sample identification number, the boring from which the sample was collected, the boring location, the sampling depth, and the type of material from which the sample was obtained (i.e., waste or natural material).

On July 20, 1984, testing was conducted in the Lagoon No. 5 tar pit to determine the potential for the release of airborne volatile organics during excavation. Three MSA Model 210 PM air monitoring pumps were set in a triangular pattern immediately around the tar pit while a fourth pump was attached on the arm of the backhoe near the backhoe bucket. The upper three to four feet of tar material was disturbed using the backhoe bucket for approximately 20 minutes to enhance release of volatile organic compounds. The pumps were then allowed to operate for approximately two additional hours to ensure an adequate sample volume. At the conclusion of the testing, the backhoe bucket was steam cleaned and the sample vials were packaged for transport to the IT laboratory for analysis.

Results

The depths of the waste identified in the lagoon borings (Appendix H) were utilized to evaluate the results of the geophysical seismic surveys conducted in the lagoon area during the Phase I investigation. The seismic survey in Lagoon No. 1 appears to have identified the ground water level in the waste (approximately Elevation 517 feet MSL) rather than the bottom of the lagoon. The borings in Lagoon No. 1 (LB-7 and LB-8) indicate that the base of the lagoon ranges between Elevations 509.1 and 513.9 feet MSL. The seismic survey results for Lagoon No. 5



LEGEND

TP-1 ■ TEST PIT LOCATION

TP-22G-S ● LOCATION OF SAMPLE COLLECTED BY ALLIED CHEMICAL PERSONNEL

SCALE 0 200 400 600FEET

REFERENCES
1 TOPOGRAPHIC MAP PREPARED BY EASTERN MAPPING CO., PITTSBURGH, PENNSYLVANIA DATED DECEMBER, 1983-SCALE 1" = 200'
2 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF IRONTON, OHIO-KY AND ASHLAND, KY-OHIO QUADRANGLES-DATED 1972 AND 1968 (PHOTOREVISED 1975) SCALE 1" = 2000'

DRAWN BY	D Weick	CHECKED BY	TMJ	1-25-85	DRAWING NUMBER 83-1625-E57
	7-25-84	APPROVED BY	JLH	1-25-85	

FIGURE B-I

PLAN AND LOCATION OF TEST PITS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

TABLE B.3
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	CYANIDE (Total) mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4^-	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
TP-11G-S	66/50	22	0.62	2.7	56	ND	3.8
TP-11H-S	33	22	13	1.3	840	ND	54
TP-11I-S	3.8	31/17	4.2	0.4/ND	11/ND	ND	7.4
TP-12G-S	4.9	28/17	0.61	0.8/1.1	22/22	ND	<1.0
TP-13G-S	8.0	ND	0.63	1.1/1.6	68/45	ND	<1.0
TP-14G-S	40	17	1.2	4.3/4.4/4.8	45/22	ND	400
TP-14H-S	5.9/5.0	14	ND	ND	56	ND	<1.0
TP-15G-S	10	11	0.63	1.0/0.7	45	ND	<1.0
TP-15H-S	12	11	0.62	0.1	112	ND	<1.0
TP-16G-S	9.0/8.0	120/110	1.2	1.0/0.98	110	ND	<1.0
TP-16H-S	160	140/140	18	7.9	300	ND	66
TP-17G-S	13/18	25	ND	1.2	22/22	ND	<1.0
TP-17H-S	57/61	12	1.2/0.83	1.1	56	ND	<1.0
TP-17I-S	13	43/56	0.82/0.84	0.29/0.26	120/140	ND	<1.0

See footnotes at end of table.

TABLE B.3
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	CYANIDE (Total) mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4^-	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
TP-18G-S	14/9.9	17	ND/ND	5.5	70	ND	41
TP-18H-S	31	38	ND	2.4/1.4	840/790	ND	6.0
TP-18I-S	79	84	0.61	48	12	0.37	1100
TP-19G-S	11/13	61	ND	ND	86	ND	4.7
TP-19H-S	13/10	47	ND	ND	30	ND	<1.0
TP-19I-S	42	11	0.59	0.84	670	ND	9.8/16
TP-20G-S	8.5	6.6	0.63/0.60	ND	30	ND	<1.0
TP-20H-S	9.2	28	ND	ND/ND	13	ND	<1.0
TP-20G-W[5]	0.36	15/20	ND	0.10	200	<0.010[6]	0.17
TP-21G-S	18	20	2.2	1.0/1.1	5.0/5.0	7.4/4.0	2.0/3.0
TP-21H-S	6.6	20	2.4	0.51	110	ND/ND	<1.0
TP-21I-S	12/11	7.4/7.4	1.2	4.6	140	ND/ND	3.5/3.4
TP-22G-S	5.5/6.7	110/100	ND	930/890	290	<0.010	8.3
TP-23G-S	8.2/8.1	17	ND/ND	3.0	230/230	ND	24

See footnotes at end of table.

TABLE B.3
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	CYANIDE (Total) mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4-	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
TP-24G-S	6.9	12	ND/ND	0.41	130	ND/ND	ND/ND
TP-25G-S	7.0	15	ND	2.4	50/50	ND	1.3
TP-26G-S	2.6	22/20	ND	0.46	200/190	ND	ND/ND
TP-27G-S	3.6	15	ND	0.94/0.72	240	ND	ND

(1) mg/kg = milligrams per kilogram or parts per million.

(2) ND indicates none detected.

(3) The indicated sample was analyzed in duplicate or triplicate.

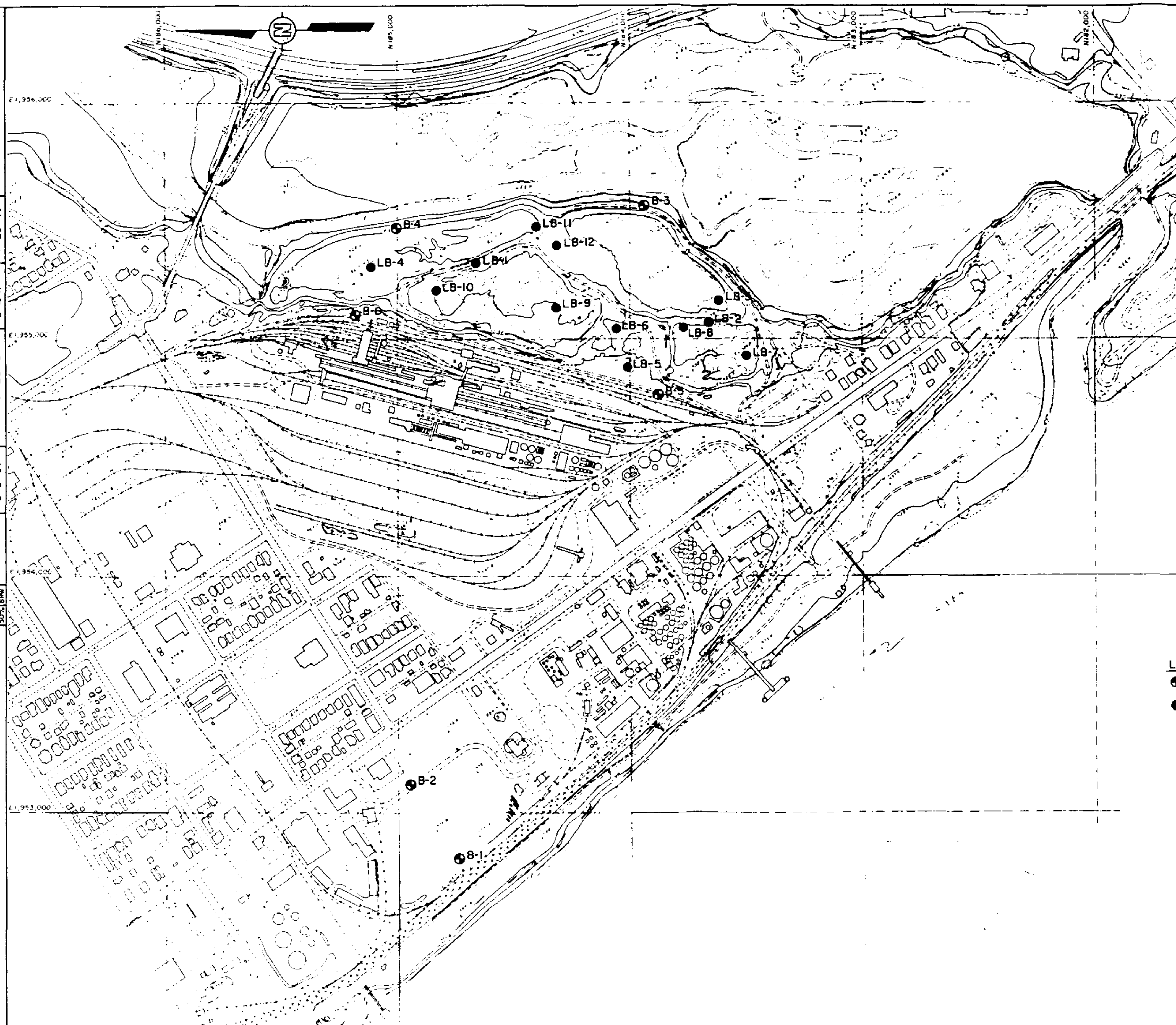
(4) The corresponding compound was detected at less than 1 milligram per liter or part per million.

(5) Water quality sample: concentrations shown are milligrams per liter or parts per million.

(6) The corresponding compound was detected at less than 10 micrograms per liter or parts per billion.

FIGURE

FIGURES



LEGEND:

- B-3 DEEP GEOTECHNICAL BORING
- LB-7 LAGOON BORING

SCALE 0 200 400 600 FEET

FIGURE C-1

PLAN AND LOCATION OF LAGOON AND GEOTECHNICAL BORINGS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

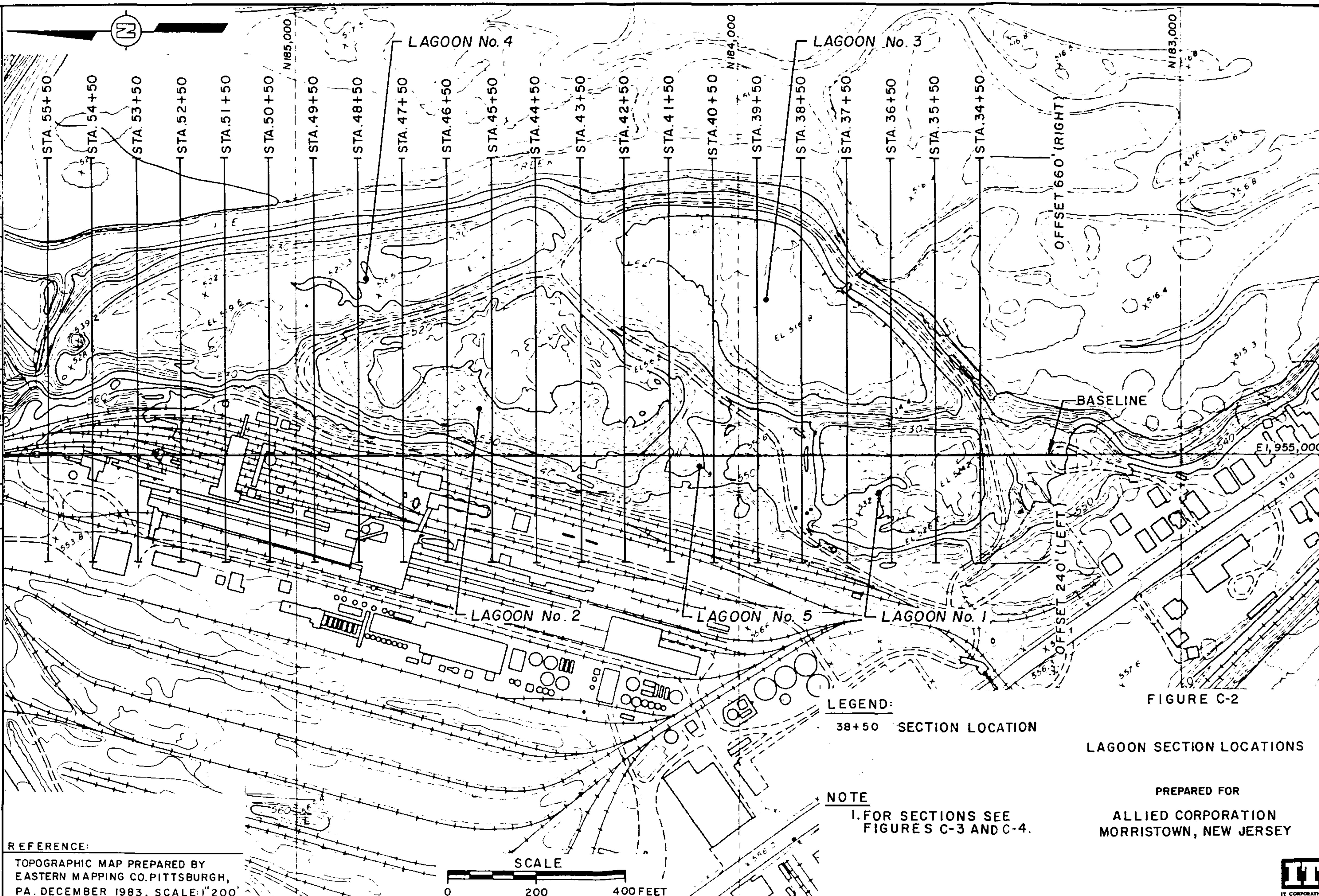
IT CORPORATION

REFERENCES

1. TOPOGRAPHIC MAP PREPARED BY EASTERN MAPPING CO., PITTSBURGH, PENNSYLVANIA DATED DECEMBER, 1983 - SCALE 1" = 200'
2. 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF IRONTON, OHIO-KY AND ASHLAND, KY-OHIO QUADRANGLES - DATED 1972 AND 1968 (PHOTOREVISED 1975) - SCALE 1" = 2000'

DRAWN BY	J. LaGrasa 8-6-84		
CHECKED BY	RJK	1-25-85	DRAWING NUMBER 83-1625-E58
APPROVED BY	JLH	1-25-85	

IE IE 50% BRN



DRAWN BY	D. Weick	12-18-84	CHECKED BY	DPH	12-22-84	DRAWING NUMBER	831625-B68
IB			APPROVED BY	JLH	12-23-84		

LEGEND:

38+50 SECTION LOCATION

NOTE

1. FOR SECTIONS SEE FIGURES C-3 AND C-4.

REFERENCE:

TOPOGRAPHIC MAP PREPARED BY EASTERN MAPPING CO. PITTSBURGH, PA. DECEMBER 1983, SCALE: 1"200'

FIGURE C-2

LAGOON SECTION LOCATIONS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

suggest a bottom elevation ranging between 520 and 530 feet MSL. Boring LB-6 (Lagoon No. 5) indicates that the base of the lagoon is at Elevation 509.52 feet MSL. Although Boring LB-5 (Lagoon No. 5) did not encounter natural materials before being terminated at Elevation 516.94 feet MSL, the depth of waste at this location is presumably similar to that in Boring LB-6. The seismic survey results for Lagoons Nos. 2, 3, and 4 are believed to be accurate representations of the base of waste material in these lagoons.

Stratification of waste materials was evident in the lagoons during the drilling program. The stratification indicates that several changes in the waste stream received by each lagoon occurred during the operational life of the lagoon area. The most obvious differences in physical properties of the various waste types were consistency, density, and water content. Two different types of waste were identified in Lagoons Nos. 1 and 3 during the boring program as shown in Boring Logs LB-7 and LB-8, and LB-3 and LB-12, respectively (Appendix H).

Borings on the inner lagoon dike (LB-1 and LB-2; Figure C-1) indicate the upper 10 to 15 feet of the inner dikes is comprised of fill material similar to waste materials in adjacent lagoons. Boring logs for Borings B-3 and B-4 (Appendix H) describe the materials which comprise the outer lagoon dike while the log for Boring B-6 (Appendix H) describes the materials comprising the old Ironton flood wall. The outer lagoon dike is apparently constructed of layers of fill materials composed of both a silt-coal-slag-sand mixture and a clayey silt to silty clay material. The thickness and continuity of these layers are believed to vary and are dependent on their method of placement during construction of the outer lagoon dike. The Ironton flood wall was presumably constructed of silty clay as indicated in the log of Boring B-6 which has since been covered by coke plant fill material consisting of gravel, sand, coal, and slag.

The Phase I sections through the lagoon area (Figure C-2) were used to determine estimates of lagoon waste volumes. The Phase II lagoon boring data were used to supplement the Phase I seismic survey results to reconstruct the lagoon sections (Figures C-3 and C-4). The sections were then used as a guide in recalculating the lagoon waste volumes in Phase II.

In calculating waste quantities for the Phase I remedial investigation report, substantial amounts of the lagoon dikes were included as part of the lagoon waste volumes. Information obtained during the Phase II investigation from the borings on the inner and outer lagoon dikes enabled a separate calculation of the volume of dike material. The volumes for the lagoons and the inner and outer dikes are presented in Table C.3. The outer lagoon dike material was separated into two units based on boring information; the upper unit is believed to comprise the cap material placed subsequent to initial construction of the outer dike. The volumes of the waste layers in Lagoons Nos. 1 and 3 are also presented separately.

Results of chemical analysis of lagoon waste, dike construction materials, and ground water samples collected within the lagoon area are presented in Table C.4. Table C.5 shows a summary of the proximate analyses of waste samples collected during both Phase I and Phase II activities.

The results of the air sampling conducted at the Lagoon No. 5 tar pit are presented in Table C.6. Analysis of Sample TP-001 from the backhoe bucket indicates the release of benzene and toluene while Sample TP-003 recorded the release of only toluene at the perimeter of the pit. Other samples collected immediately adjacent to the pit during testing did not record the presence of benzene, toluene, or ethylbenzene.

In situ permeability tests show a range of permeabilities from 2.0×10^{-6} centimeter per second (cm/sec) in LB-10 (Lagoon No. 2) to 5.2×10^{-4} cm/sec (Lagoon No. 1). The permeability in Boring LB-1 (Lagoon No. 4) is 6.6×10^{-5} cm/sec.

TABLES

TABLE C.1

LAGOON BORING PROGRAM
SAMPLES FOR CHEMICAL ANALYSES

SAMPLE NO.	BORING NO.[1]	BORING LOCATION	SAMPLE DEPTH (ft)	MATERIAL
LB-1G-WS	LB-1	Inner Dike	4.0 - 5.0	Waste
LB-1H-WS	LB-1	Inner Dike	10.5 - 11.0	Silty Clay
LB-2G-WS	LB-2	Inner Dike	3.0 - 3.5	Waste
LB-2H-WS	LB-2	Inner Dike	4.5 - 5.0	Waste
LB-2I-WS	LB-2	Inner Dike	29.0 - 31.0	Sand, some gravel
LB-3G-WS	LB-3	Lagoon No. 3	3.0 - 4.0	Waste
LB-4G-WS	LB-4	Lagoon No. 4	1.0 - 2.0	Waste
LB-4H-WS	LB-4	Lagoon No. 4	8.0 - 8.5	Silt
LB-4I-WS	LB-4	Lagoon No. 4	14.0 - 14.7	Silty Sand
LB-5G-WS	LB-5	Lagoon No. 5	4.0 - 4.5	Waste
LB-5H-WS	LB-5	Lagoon No. 5	40.0 - 41.0	Waste
LB-6G-WS	LB-6	Lagoon No. 5	2.0 - 2.5	Waste
LB-6H-WS	LB-6	Lagoon No. 5	20.0 - 21.0	Waste
LB-6I-S	LB-6	Lagoon No. 5	41.0 - 42.0	Silty Clay
LB-7G-WS	LB-7	Lagoon No. 1	6.0 - 7.0	Waste
LB-7H-WS	LB-7	Lagoon No. 1	19.5 - 20.0	Sand
LB-8G-WS	LB-8	Lagoon No. 1	16.0 - 17.0	Waste
LB-8H-WS	LB-8	Lagoon No. 1	27.5 - 28.5	Silty Sand
LB-9G-WS	LB-9	Lagoon No. 2	6.5 - 7.5	Waste
LB-9H-S	LB-9	Lagoon No. 2	18.0 - 19.5	Silty Sand
LB-10G-WS	LB-10	Lagoon No. 2	4.0 - 5.0	Waste
LB-10H-S	LB-10	Lagoon No. 2	11.0 - 12.0	Silty Clay
LB-11G-WS	LB-11	Lagoon No. 4	4.0 - 6.0	Waste
LB-11H-S	LB-11	Lagoon No. 4	16.5 - 17.5	Silty Sand
LB-12G-WS	LB-12	Lagoon No. 3	7.5 - 8.5	Silt
LB-12H-S	LB-12	Lagoon No. 3	16.5 - 17.5	Silty Sand

[1] See Figure C-1 for boring locations.

TABLE C.2

LAGOON BORING PROGRAM
SAMPLES FOR PROXIMATE ANALYSES

SAMPLE NUMBER	BORING NUMBER	BORING LOCATION	SAMPLE DEPTH (ft)	MATERIAL
Phase I:(1)				
L1-0002	N/A	Lagoon No. 1	0.4	Waste
L1-0005	N/A	Lagoon No. 1	1.0	Waste
L-2A	N/A	Lagoon No. 2	1.0-4.0	Waste
L-2B	N/A	Lagoon No. 2	1.0-4.0	Waste
L-2C	N/A	Lagoon No. 2	1.0-4.0	Waste
L-3A	N/A	Lagoon No. 3	1.0-4.0	Waste
L-3B	N/A	Lagoon No. 3	1.0-4.0	Waste
L-3C	N/A	Lagoon No. 3	1.0-4.0	Waste
L-4A	N/A	Lagoon No. 4	1.0-4.0	Waste
L-4B	N/A	Lagoon No. 4	1.0-4.0	Waste
L-4C	N/A	Lagoon No. 4	1.0-4.0	Waste
L5-0003	N/A	Lagoon No. 5	0.4	Waste
L5-0005	N/A	Lagoon No. 5	0.0	Waste
Phase II:(2)				
LB-1G-WS	LB-1	Inner Dike	4.0-5.0	Waste
LB-2H-WS	LB-2	Inner Dike	4.5-5.0	Waste
LB-3G-WS	LB-3	Lagoon No. 3	3.0-4.0	Waste
LB-4G-WS	LB-4	Lagoon No. 4	1.0-2.0	Waste
LB-4H-WS	LB-4	Lagoon No. 4	8.0-8.5	Silt
LB-5G-WS	LB-5	Lagoon No. 5	4.0-4.5	Waste
LB-5H-WS	LB-5	Lagoon No. 5	40.0-41.0	Waste
LB-6G-WS	LB-6	Lagoon No. 5	2.0-2.5	Waste
LB-6H-WS	LB-6	Lagoon No. 5	20.0-21.0	Waste
LB-8G-WS	LB-8	Lagoon No. 1	16.0-17.0	Waste
LB-8H-WS	LB-8	Lagoon No. 1	27.5-28.5	Silty Sand
LB-9G-WS	LB-9	Lagoon No. 2	6.5-7.5	Waste
LB-10G-WS	LB-10	Lagoon No. 2	4.0-5.0	Waste
B-3 S-2	B-3	Outer Dike	8.0-9.5	Waste
B-3 S-3	B-3	Outer Dike	13.0-14.5	Waste
B-3 S-4	B-3	Outer Dike	18.0-19.5	Waste
B-4 S-2	B-4	Outer Dike	8.0-9.5	Waste
B-4 S-3	B-4	Outer Dike	13.0-14.5	Waste
B-5 Composite(3)	B-5	Flood Wall	0.0-9.5	Waste
B-6 Grab 1	B-6	Flood Wall	0.0	Waste

(1) For sample locations, see Figure 4-32 of the Phase I report.

(2) For sample locations, see Figure C-1 in Appendix C.

(3) Sample is a composite of Samples Grab 1, S-1, and S-2 from Boring B-5.

TABLE C.3

ESTIMATED LAGOON WASTE QUANTITIES
COKE PLANT LAGOON AREA

LOCATION	ESTIMATED AVERAGE WASTE LAYER THICKNESS (ft)	WASTE DESCRIPTION	APPROXIMATE VOLUME (yds^3)
Inner Dike	12.5	Gravelly sand, coal, slag, and cinders	37,820
Outer Dike			
- Upper Unit	5.5	Clayey silt to silty clay	25,400
- Lower Unit	13.0	Slag, cinders, coal, sand, and gravel	128,040
Lagoon No. 1			
- Upper Unit	2.5	Coal and coke, lime sludge, silt, sand, and gravel	10,040
- Lower Unit	10.0-16.0	Coal, coke, and slag; gravelly sand	20,120
Lagoon No. 2	5.0-10.0	Coal, tar, slag, and silt; silty clay (sludge)	69,970
Lagoon No. 3			
- Upper Unit	3.0-6.0	Coal and coke	9,660
- Lower Unit	8.0-17.5	Silty clay (sludge)	81,700
Lagoon No. 4	2.0-19.0	Cinders, coal, and slag	80,490
Lagoon No. 5	30.0-41.0	Coal, tar, sand, lime sludge, coke, cinders; silty clay (sludge)	115,400
		TOTAL VOLUME	578,640

((

TABLE C.4

RESULTS OF CHEMICAL ANALYSES
LAGOON SAMPLES

	PARAMETERS						
SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
LB-1G-WS	4.9	32	2.5/2.5[2]	ND[3]	300	ND	3.1
LB-1H-WS	92	76	0.61	ND/ND	680	ND	<1.0[4]
LB-2G-WS	44/43	420	91	1.5	210	ND	12
LB-2H-WS	89	33	6.8	99	90/79	0.57	8,300
LB-2I-WS	44/45	430	15/14	1.5	310	0.031	30
LB-3G-WS	160/170	92	2.4	23/35	660	0.071/0.067	80
LB-4G-WS	9.8	39	4.4	ND	130	ND	17
LB-4H-WS	44	61	41	0.90	2500/2200	ND	54
LB-4I-WS	69	55	0.59	1.2	740	ND	ND
LB-4G-W[5]	5.6	27	ND	0.32	1000	<0.010[6]	0.32
LB-5G-WS	6.0/6.0	11	1.8	0.54	680/490	ND	16
LB-5H-WS	30	22	7.5/6.8	ND	90/120	ND	2.2

See footnotes at end of table.

TABLE C.4
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
LB-6G-WS	8.5	32/35	1.2	ND	700	ND	11
LB-6H-WS	39	76	1.9/2.5	3.3	150	0.038/0.020	720
LB-6I-S	120	70/75	3.8/4.2	0.29	57/45	<0.010	1.3
LB-7G-WS	170/140	440	18	ND	1200	0.020	ND
LB-7H-WS	66	250	0.61/ND	ND	37	ND	ND
LB-8G-WS	62	1200	86	ND	1600	0.10/0.12	240
LB-8H-WS	190	140	27	91	320	0.043/0.057	320
LB-9G-WS	170/170	78	21/17	630/550	ND	71	17,000
LB-9H-S	3.0	17/14	4.5	0.53	90/87	0.15	16
LB-10G-WS	12/15	39	20/21	1.5/1.8	1970	ND/ND	170
LB-10H-S	21	28	2.2	0.20	49	ND	<1.0
LB-10I-W[5]	0.14/0.16	65/56	0.11	0.026	610/580	ND	0.078
LB-11G-WS	14	120	8.8	0.99	5200	IS[7]	23
LB-11H-S	35	58	ND	1.6/1.5	140	ND	<1.0
LB-11G-W[5]	0.12	21	0.16	0.046	72/74	<0.010	0.062

See footnotes at end of table.

TABLE C.4
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
LB-12G-WS	90/90	12	37	4.5/3.2	2200	ND	<1.0
LB-12H-S	22	15/14	ND	0.27	270	ND	ND
LB-12G-W[5]	6.3	10/8.9	0.48	0.023	120/120	ND	ND/0.028

(1) mg/kg = milligrams per kilogram or parts per million.

(2) The indicated sample was analyzed in duplicate.

(3) ND indicates none detected.

(4) The corresponding compound was detected at less than 1 milligram per kilogram or part per million.

(5) Water quality sample: concentrations shown are milligrams per liter or parts per million.

(6) The corresponding compound was detected at less than 10 micrograms per liter or parts per billion.

(7) IS indicates that there was insufficient sample to perform the analysis due to sample breakage during shipment.

TABLE C.5

RESULTS OF PROXIMATE ANALYSES
LAGOON WASTE SAMPLES

SAMPLE NUMBER	MOISTURE (%)	VOLATILE MATTER (%)	FIXED CARBON (%)	ASH (%)	SULFUR (%)
Phase I:[1]					
L1-0002	39.6	22.5	<1.0	38.0	-
L1-0005	45.9	21.3	<1.0	33.7	-
L-2A	34.9	10.9	39.3	14.9	-
L-2B	13.7	10.4	44.7	31.2	-
L-2C	32.7	8.2	43.2	16.0	-
L-3A	45.8	13.7	5.9	34.7	-
L-3B	38.8	12.5	21.6	27.2	-
L-3C	41.9	8.2	17.1	32.9	-
L-4A	47.5	5.5	29.3	17.7	-
L-4B	40.3	7.6	22.8	29.3	-
L-4C	46.9	10.6	8.3	34.2	-
L5-0003	7.8	14.0	25.8	52.3	0.3
L5-0005	14.3	35.5	44.9	5.2	0.6
Phase II:[2]					
LB-1G-WS	10.3	8.0	39.3	42.4	-
LB-2H-WS	15.2	23.1	41.1	20.6	-
LB-3G-WS	48.3	12.4	6.5	32.8	-
LB-4G-WS	7.9	5.2	55.6	31.4	-
LB-4H-WS	47.1	8.6	7.7	36.6	-
LB-5G-WS	10.8	10.5	36.3	42.4	0.4
LB-5H-WS	34.5	2.2	41.5	21.9	0.3
LB-6G-WS	6.7	13.5	55.8	24.0	0.5
LB-6H-WS	26.6	9.5	40.6	23.3	0.4
LB-8G-WS	52.4	12.2	14.5	20.9	-
LB-8H-WS	32.0	11.0	28.8	28.2	-
LB-9G-WS	21.4	22.5	25.9	30.2	-
LB-10G-WS	38.1	7.5	41.1	13.3	-
B-3 S-2	25.1	8.1	22.0	44.8	-
B-3 S-3	31.6	2.5	23.7	42.3	-
B-3 S-4	30.0	3.4	26.6	40.0	-
B-4 S-2	15.8	3.4	15.1	65.8	-
B-4 S-3	19.8	7.2	20.9	52.1	-
B-5 Composite[3]	18.8	3.5	23.0	54.6	-
B-6 Grab 1	11.8	7.8	58.3	22.1	-

[1] For sample locations, see Figure 4-32 of the Phase I report.

[2] For sample locations, see Table C.2 and Figure C-1.

TABLE C.6

SUMMARY OF AIR MONITORING RESULTS
LAGOON NO. 5 TAR PIT

SAMPLE IDENTIFICATION	MONITORING LOCATION	SAMPLING DATE	UNITS	BENZENE	TOLUENE	ETHYLBENZENE
TP-001	Backhoe Bucket	7/20/84	mg/m^3 (1)	0.35	0.39	<0.10
TP-002	Pit Perimeter	7/20/84	mg/m^3	<0.10	<0.10	<0.10
TP-003	Pit Perimeter	7/20/84	mg/m^3	<0.10	0.11	<0.10
TP-004	Pit Perimeter	7/20/84	mg/m^3	<0.10	<0.10	ND (2)
Blank	--	--	mg (3)	ND	ND	ND

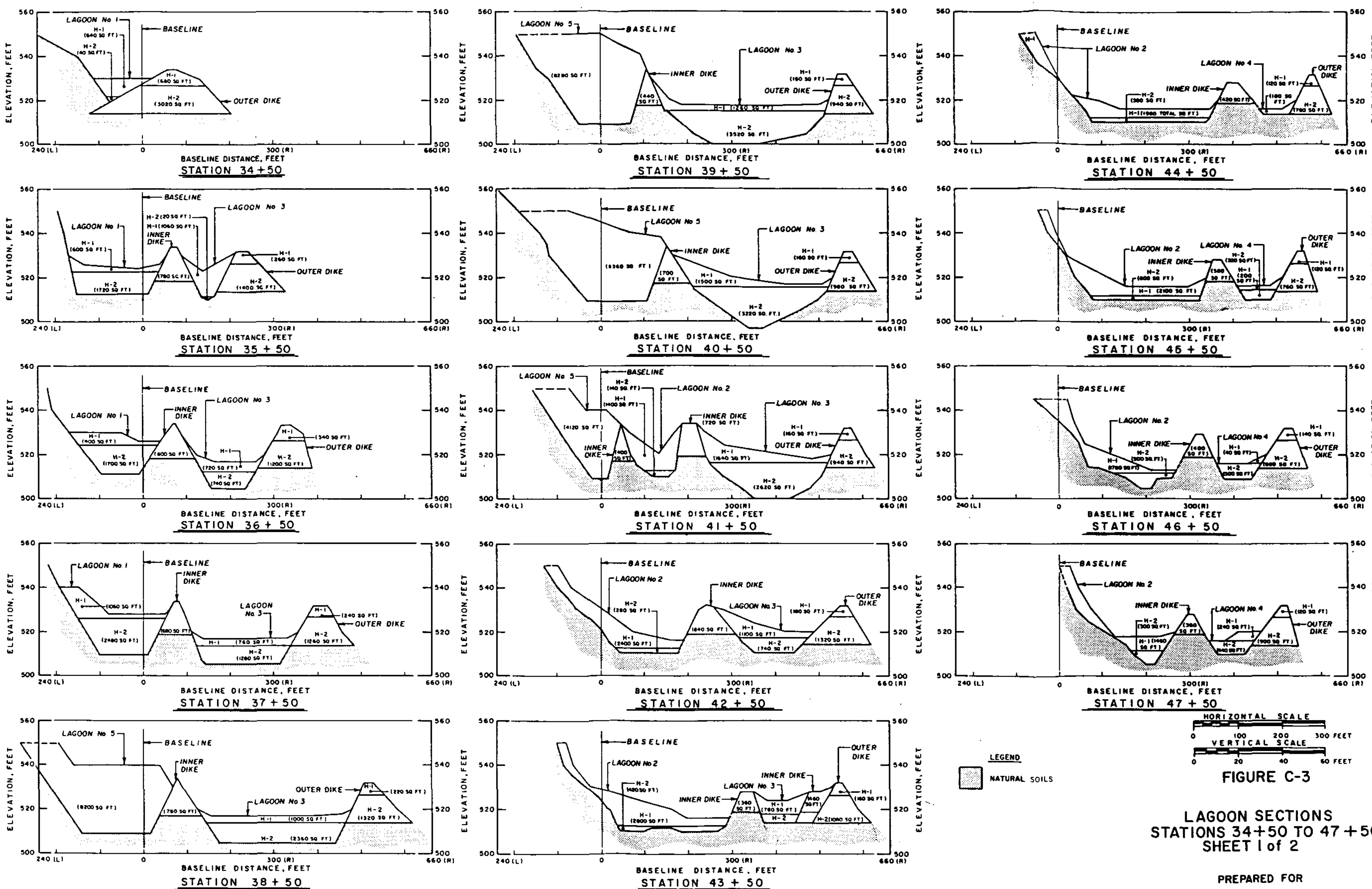
(1) mg/m^3 = milligrams per cubic meter.

(2) ND indicates none detected; detection limit is 0.001 mg/m^3 or 0.001 mg.

(3) mg = milligrams.

DRAWING NUMBER 83-1625-E68

DRAWN BY	CHECKED BY	APPROVED BY
RW 12-11-84	TMJ 1-25-85	JLH 1-25-85



LEGEND

NATURAL SOILS

HORIZONTAL SCALE 0 100 200 300 FEET

VERTICAL SCALE 0 20 40 60 FEET

FIGURE C-3

LAGOON SECTIONS
STATIONS 34+50 TO 47+50
SHEET 1 of 2

PREPARED FOR

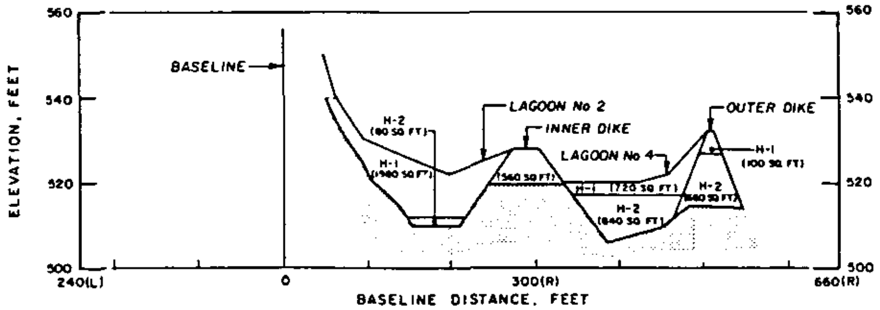
ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

NOTES:

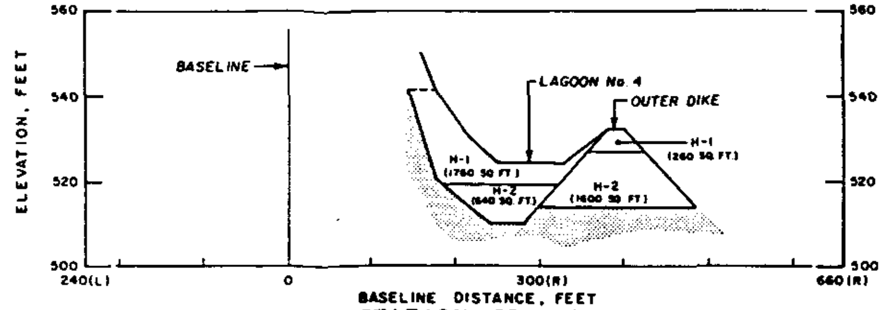
1. ALL ELEVATIONS SHOWN ARE REFERENCED U.S.G.S. M.S.L. DATUM.
2. FOR PLAN AND LOCATION OF SECTIONS SEE FIGURE C-2.

IT CORPORATION

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
RW 12-11-84	TMT 1-25-85	JLH 1-25-85	83-1625-E69



STATION 48 + 50



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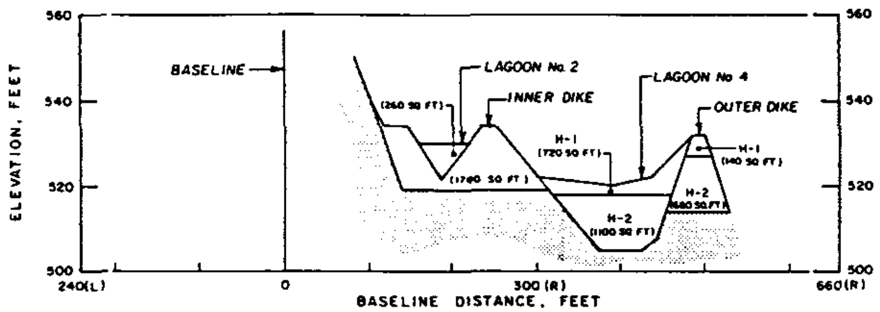
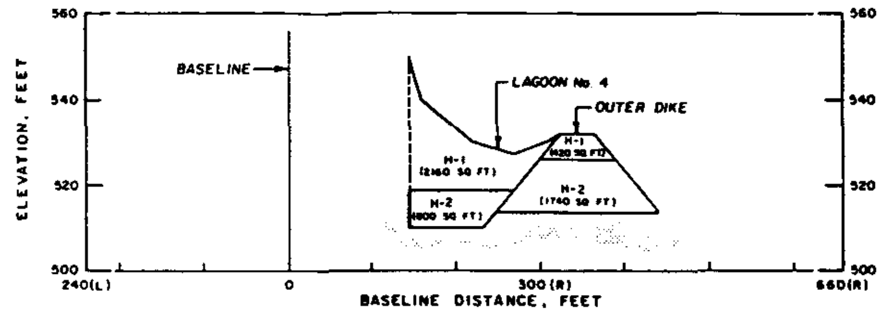
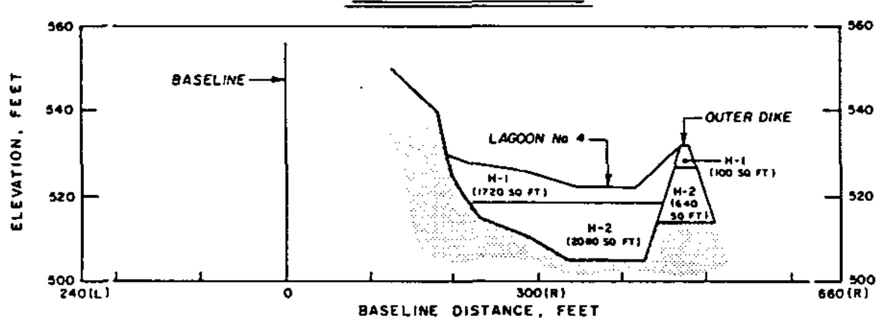


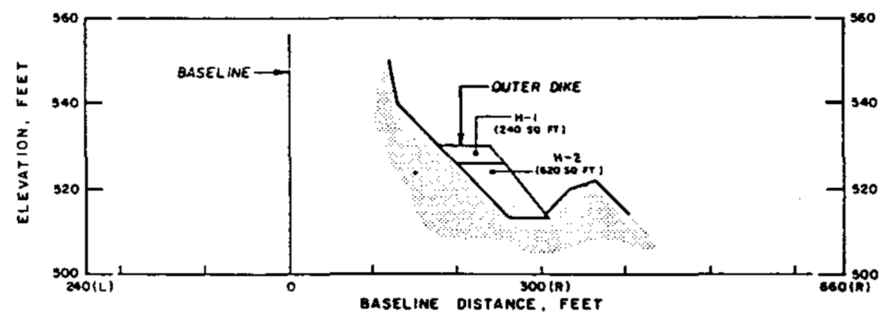
STATION 49 + 50



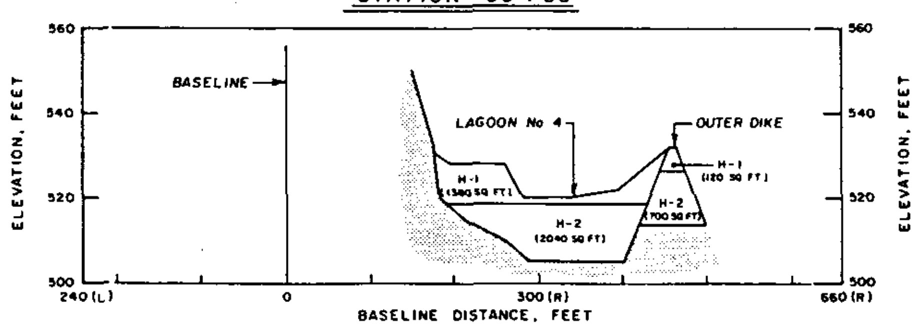
STATION 54 + 50



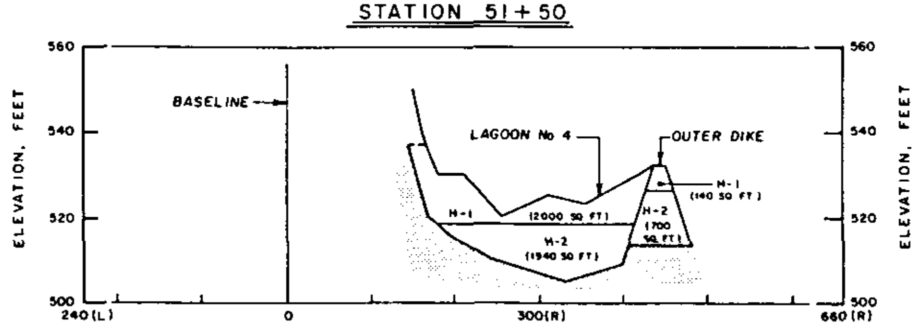
STATION 50 + 50



STATION 55 + 50



STATION 51 + 50



STATION 52 + 50

LEGEND

NATURAL SOIL

NOTES:

1. ALL ELEVATIONS SHOWN ARE REFERENCED U.S.G.S. M.S.L. DATUM.
2. FOR PLAN AND LOCATION OF SECTIONS, SEE FIGURE C-2.

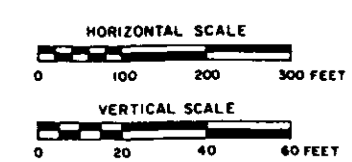


FIGURE C-4

LAGOON SECTIONS
STATIONS 48+50 TO 55+50
SHEET 2 of 2

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APPENDIX
D

APPENDIX D

TECHNICAL MEMORANDUM
ICE CREEK INVESTIGATION

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APPENDIX D

TECHNICAL MEMORANDUM
ICE CREEK INVESTIGATION

An investigation was conducted on Ice Creek to characterize the creek bed sediments beginning July 28, 1984. A total of 19 borings were drilled at 12 locations for sediment sampling and testing. The study was performed to refine the evaluation completed during the Phase I remedial investigation (RI) of (1) the site impact on Ice Creek, (2) the impact of the leachate from creek sediments on the Coal Grove well field water quality, (3) the percentage of flow contributed to the Coal Grove well field by Ice Creek, and (4) the impact of potential off-site contaminant sources on Ice Creek.

Methods

With the exception of Boring ICB-12, all borings were drilled from a sectional barge with a CME-55 rotary drilling rig. Boring ICB-12, located on the Ice Creek floodplain, was drilled with a hand auger. A plan and location of the Ice Creek borings is shown in Figure D-1.

During the drilling program, the following drilling techniques were used to ensure recovery of the wide range of materials encountered:

- Standard split-spoon sampling through hollow stem augers
- Continuous split tube sampling system with hollow stem augers
- Pushing polyvinyl chloride (PVC) pipe with applied suction or plunger.

Generally, the PVC pipe method was used where sediments were soft and highly saturated with water. By creating a partial vacuum within the pipe with either suction or a plunger, relatively good recovery of sample cores was achieved. The continuous tube system was used to retrieve cores of relatively stiff fine-grained sediments. Nearly continuous recovery was possible with this sampler. Where coarse-grained materials (sand and gravel) were encountered, a split-spoon sampler was driven to obtain samples. Because of its location, Boring ICB-12 was drilled with a bucket-type hand auger. Continuous six-inch sample cores were obtained over the entire length of the boring.

As sample cores were retrieved, a visual descriptive log was prepared of sediments in each boring. Included on the boring log were notes on drilling procedures, sampling intervals and methods, zones of potential contamination, and other relevant boring information. The boring logs are presented in Appendix H. Composite samples were collected for chemical analysis in 500-milliliter glass jars with teflon-lined caps and two 40-milliliter vials from intervals selected by the field geologist. These samples were obtained for analysis of ammonia, chloride, total cyanide, phenolics, sulfate, benzene, and naphthalene. Subsequent to collection, the samples were stored on ice until delivery to the IT laboratory. Chain-of-custody forms accompanied each sample during shipment.

Fourteen Shelby tube samples were collected for laboratory determination of permeability of the creek bed sediments. Additionally, the Shelby tube samples were used to conduct 1:4 American Society for Testing and Materials (ASTM D 3987-81) batch leachate and column leachate tests. Twelve of the fourteen Shelby tube samples were selected for the column permeability testing. Leachates from the column tests were scheduled to receive analysis for pH, specific conductance, chloride, sulfate, and the volatile Contract Laboratory Parameter (CLP) list. The soil from the Shelby tube samples from Boring ICB-1A was scheduled to be analyzed for all CLP list parameters because of the key location of this boring. The batch test leachate from these samples was also scheduled for analysis of CLP list parameters. The other 11 Shelby tube soils were scheduled for analysis of volatile CLP list parameters, phenolics, and naphthalene. The batch test leachates from these 11 samples were scheduled to be analyzed for ammonia, chloride, total cyanide, phenolics, sulfate, and naphthalene.

Table D.1 provides a summary of sample designations for each boring, the sampling depths, and the type of sediment in the sample.

Results

Borings drilled in the reaches of Ice Creek downstream of the coke plant lagoons encountered stream sediments comprised primarily of low-permeability silt and clay. These fine-grained sediments attain a thickness of approximately 36.0 feet (estimated at Boring ICB-3) near the mouth of the creek and become gradually thinner upstream. Adjacent to and upstream of the coke plant lagoons, the fine-grained sediments are found only in thin layers overlying the aquifer sand and gravel. These silts and clays were not present in Boring ICB-5 near Cemetery Bridge and are probably not present anywhere upstream of the bridge. The sand and gravel decreases in thickness downstream and may eventually pinch out near the mouth of the creek.

Visual observations were made at several locations during the drilling program:

- Boring ICB-1 - A layer of slag-like material was encountered at a depth of 12.9 to 13.4 feet
- Boring ICB-6 - Several layers of a material exhibiting a tar-like consistency, appearance, and odor were noted between depths of 0.0 to 7.5 feet
- Boring ICB-8 - The silty clay from 0.0 to 4.0 feet contained a tar-like material and odor
- Boring ICB-9 - Sediments from 0.0 to 9.5 feet contained slag and exhibited a tar-like odor. Black sand and slag were encountered from 14.5 to 15.0 feet and an oily film was observed on material retrieved from the 12.5- to 15.5-foot sampling interval.

Chemical analyses of the Ice Creek sediment samples collected during the drilling program and the laboratory permeability and leach tests were conducted to further define these field observations. Results of the chemical analyses of the composite samples are presented in Table D.2. Tables D.3 and D.4 show the results of the chemical analyses of the three Shelby tube samples from Boring ICB-1A. The results of the chemical analyses of the sediment from the other 11 Shelby tubes are presented in Tables D.5 and D.6. Leachates from the column permeability tests were analyzed for pH, specific conductance, chloride, and sulfate. The results of those analyses are presented in Table D.7.

The results of the chemical analyses of the batch test leachates from Boring ICB-1A samples are presented in Tables D.8 and D.9. Table D.10 shows the results of the chemical analyses of the batch test leachates from all other Ice Creek Shelby tube samples. Because volatile organic compounds were not detected in the creek sediments, analysis for volatile CLP list parameters, originally scheduled for the leachates from the sediments, was not conducted.

TABLES

TABLE D.1

SUMMARY OF ICE CREEK SAMPLING DATA

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (ft)	TYPE OF SEDIMENT
ICB-1	ICB-1G-S	0.0-4.5	silt
	ICB-1H-S	4.5-9.0	silt
	ICB-1I-WS	12.9-13.4	coal and slag
	ICB-1J-S	9.0-14.0	silty clay and sand
	ICB-1K-S	14.0-16.5	silty clay and sand
ICB-1A	ST-1	17.0-19.0	silty clay
	ST-2	20.0-22.0	silty clay
	ST-3	23.0-25.0	silty clay
ICB-2	ICB-2G-S	0.0-5.0	silt
	ICB-2H-S	5.0-8.0	clayey silt
	ICB-2I-S	8.0-11.0	clayey silt and sand
	ICB-2J-S	11.0-17.0	sand and silt
	ICB-2K-S	17.0-20.0	silty clay
	ICB-2L-S	21.5-25.0	silty clay
	ICB-2M-S	35.0-35.9	sand and gravel
ICB-2A	ST-1	15.0-17.0	silt
	ST-2	19.0-21.0	silty clay
	ST-3	21.0-23.0	silty clay
ICB-3	ICB-3G-S	0.0-5.0	clayey silt
	ICB-3H-S	5.0-10.0	clayey silt
	ICB-3I-S	10.0-15.0	clayey silt
ICB-4	ICB-4G-S	0.0-3.0	clayey silt to silty clay
	ICB-4H-S	3.0-9.0	silty clay
	ICB-4I-S	13.0-14.5	sand
ICB-4A	ST-1	2.0-4.0	silty clay
	ST-2	4.0-6.0	silty clay
ICB-5	ICB-5G-S	0.0-5.5	sand
	ICB-5H-S	5.5-16.5	sand
ICB-6	ICB-6G-S	0.0-3.9	fill and clayey silt
	ICB-6H-S	3.9-7.4	sand and clayey silt
	ICB-6I-S	7.4-12.5	sand
	ICB-6J-S	13.0-16.0	sand

TABLE D.1
(Continued)

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (ft)	TYPE OF SEDIMENT
ICB-6A	ST-1	1.0-3.0	clayey silt
	ST-2	8.0-9.4	sand
ICB-7	ICB-7G-S	0.0-6.0	silty sand
	ICB-7H-S	6.0-10.5	silty sand and silty clay
	ICB-7I-S	10.5-18.0	sand, gravel, and silty clay
ICB-8	ICB-8G-S	0.0-3.9	silty clay
	ICB-8H-S	3.9-10.9	sand and silty clay
	ICB-8I-S	13.0-16.0	slag, silty clay, and sand
ICB-8A	ST-1	1.0-3.0	silty clay
	ST-2	3.0-5.0	silty clay
ICB-9	ICB-9G-S	0.0-5.8	silt, slag, and clayey silt
	ICB-9H-S	5.8-12.5	clayey silt, silty clay, and sand
	ICB-9I-S	12.5-20.5	silty clay, sand, and slag
	ICB-9J-S	20.5-25.5	sand and gravel
ICB-9A	ST-1	5.0-7.0	clayey silt
	ST-2	15.0-17.0	silty clay and sand
ICB-10	ICB-10G-S	0.0-3.0	silty clay
	ICB-10H-S	3.0-8.0	silty clay
ICB-11	ICB-11G-S	0.0-7.8	silt, sand, and silty clay
	ICB-11H-S	7.8-17.8	sand
ICB-12	ICB-12G-S	0.0-3.0	sand, slag, coal
	ICB-12H-S	5.0-6.0	silty clay to clay
	ICB-12I-S	8.5-9.5	silty clay to clay

TABLE D.2

RESULTS OF CHEMICAL ANALYSES
ICE CREEK SOIL SAMPLES

	PARAMETERS						
SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
ICB-1G-S	41	27	ND[2]	0.58	370	ND	7.1
ICB-1H-S	210	31	5.7/6.7[3]	ND	1000	ND	12
ICB-1I-WS	25/23	40	1.3	1.0/1.1	590	ND/ND	38
ICB-1J-S	180	36	2.8	0.30	1500	ND	8.4/6.0
ICB-1K-S	5.0	45/55	ND	ND	79	ND	<1.0[4]
ICB-2G-S	250	65	5.9	0.15	360	ND	2.3
ICB-2H-S	330	40	1.2	ND	ND	ND	<1.0
ICB-2I-S	160	43/40	0.63	ND	160	ND	<1.0
ICB-2J-S	130/140	46/43	ND/ND	ND/ND	180/180	ND	ND
ICB-2K-S	23	31	ND	ND	40	ND	ND
ICB-2L-S	70	32	ND	ND	28	ND	ND
ICB-2M-S	26	29	ND/ND	0.65	51	ND	ND

See footnotes at end of table.

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TABLE D.2
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PARAMETERS PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
ICB-3G-S	460	95	0.63	ND	180	ND	<1.0
ICB-3H-S	400	88	1.3	ND	400/380	ND	<1.0
ICB-3I-S	770	110	3.1	ND	760	ND	<1.0
ICB-3J-S	670	130	0.61	0.14	270	ND	<1.0
ICB-3K-S	150	64	1.2	0.68	140/120	ND	2.1
ICB-3L-S	180/200	41	2.0	0.29	ND	ND/ND	ND/ND
ICB-4G-S	160	57	0.84	1.1	270	ND	ND
ICB-4H-S	78	36/38	ND	0.45/0.33	56	ND	ND
ICB-4I-S	3.5/3.5	14	0.83	1.1/1.2	11	ND	ND
ICB-5G-S	13	26	1.4	2.0	55	ND	<1.0
ICB-5H-S	9.8	20	1.0	2.0	240/260	ND	ND
ICB-6G-S	220	54	13	2.4	710	ND	16
ICB-6H-S	120	31	0.74/0.66	2.4	280	ND	6.3
ICB-6I-S	15	51	4.8/3.2	0.15/0.13	550	ND	<1.0
ICB-6J-S	10	18	ND	0.10	90	ND	<1.0

See footnotes at end of table.

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TABLE D.2
(Continued)

SAMPLE IDENTIFICATION	PARAMETERS AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
ICB-7G-S	75	43	1.2/1.2	1.2	290	ND	1.0
ICB-7H-S	38	33	0.75	0.24	310	ND	1.3
ICB-7I-S	79	33	ND	0.85	260/260	ND	ND
ICB-8G-S	280/260	190/180	2.6/3.2	0.94	540	ND	5.0
ICB-8H-S	210	97	0.73	3.0	380	ND/ND	<1.0
ICB-8I-S	120/130	69/66	0.67	1.1	200	ND	<1.0
ICB-9G-S	200	110/110	8.7	0.43	480	ND	2.0
ICB-9H-S	390	270	2.9/2.9	1.8	660	ND	12
ICB-9I-S	67	87/87	0.50	0.20	25	ND	<1.0
ICB-9J-S	81	110/110	ND	0.99	25	ND	ND
ICB-10G-S	160	23/24	ND	0.86	35	ND	ND
ICB-10H-S	130	28/31	ND/ND	0.77	5.0	ND	ND/ND
ICB-10I-S	41	20	ND	0.71	70	ND	ND

TABLE D.2
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[1] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PARAMETERS PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
ICB-11G-S	31	18	ND	0.69	20	ND	ND
ICB-11H-S	9.9	18/17	ND	1.1/0.93	85	ND	ND/<1.0
ICB-12G-S	130/130	310/300	3.6/3.2	1.5	360	ND	4.3
ICB-12G-W[5]	0.22	14	0.06	0.85	9.5	ND	ND
ICB-12H-S	130	120/130	ND	0.62	100	ND	ND
ICB-12I-S	110	150/140	ND	1.3	70	ND	ND

(1) mg/kg = milligrams per kilogram or parts per million.

(2) ND indicates none detected.

(3) The indicated sample was analyzed in duplicate.

(4) The corresponding compound was detected at less than 1 milligram per kilogram or part per million.

(5) Ground water sample: milligrams per liter or parts per million.

TABLE D.3

RESULTS OF CHEMICAL ANALYSES
BORING ICB-1A SEDIMENT

PARAMETER	SAMPLE IDENTIFICATION ICB-1A ST-1	ICB-1A ST-2	ICB-1A ST-3
VOLATILE PRIORITY POLLUTANTS:[1]			
Acrolein	ND[3]	ND	ND
Acrylonitrile	ND	ND	ND
Benzene	ND	ND	ND
Bromoform	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND
Chlorobenzene	ND	ND	ND
Chlorodibromomethane	ND	ND	ND
Chloroethane	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND
Chloroform	ND	ND	ND
Dichlorobromomethane	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND
1,3-Dichloropropylene[2]	ND	ND	ND
Ethylbenzene	ND	ND	ND
Methyl bromide	ND	ND	ND
Methyl chloride	ND	ND	ND
Methylene chloride	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND
Tetrachloroethylene	ND	ND	ND
Toluene	ND	ND	ND
trans-1,2-Dichloroethylene	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND
Trichloroethylene	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND
Vinyl Chloride	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:[1]			
Acetone	ND	ND	ND
2 Butanone	ND	ND	ND
Carbon disulfide	ND	ND	12
2-Hexanone	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND
Styrene	ND	ND	ND
Vinyl acetate	ND	ND	ND
o-Xylene	ND	ND	ND

See footnotes at end of table.

TABLE D.3
(Continued)

PARAMETER	SAMPLE IDENTIFICATION ICB-1A ST-1	ICB-1A ST-2	ICB-1A ST-3
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(4)			
Acenaphthene	ND/ND(7)	ND	ND
Acenaphthylene	ND/ND	ND	ND
Anthracene	ND/ND	ND	ND
Benzidine	ND/ND	ND	ND
Benzo(a)anthracene	ND/ND	ND	ND
Benzo(a)pyrene	ND/ND	ND	ND
3,4-Benzofluoranthene	ND/ND	ND	ND
Benzo(g,h,i)perylene	ND/ND	ND	ND
Benzo(k)fluoranthene	ND/ND	ND	ND
Bis(2-chloroethoxy)methane	ND/ND	ND	ND
Bis(2-chloroethyl)ether	ND/ND	ND	ND
Bis(2-chloroisopropyl)ether	ND/ND	ND	ND
Bis(chloromethyl)ether(5)	ND/ND	ND	ND
Bis(2-ethylhexyl)phthalate	<1.0(8)/ND	<1.0	<1.0
4-Bromophenyl phenyl ether	ND/ND	ND	ND
Butyl benzyl phthalate	ND/ND	ND	ND
2-Chloronaphthalene	ND/ND	ND	ND
4-Chlorophenyl phenyl ether	ND/ND	ND	ND
Chrysene	ND/ND	ND	ND
Dibenzo(a,h)anthracene	ND/ND	ND	ND
1,2-Dichlorobenzene	ND/ND	ND	ND
1,3-Dichlorobenzene	ND/ND	ND	ND
1,4-Dichlorobenzene	ND/ND	ND	ND
3,3'-Dichlorobenzidine	ND/ND	ND	ND
Diethyl phthalate	ND/ND	ND	ND
Dimethyl phthalate	ND/ND	ND	ND
Di-n-butyl phthalate	ND/ND	ND	ND
2,4-Dinitrotoluene	ND/ND	ND	ND
2,6-Dinitrotoluene	ND/ND	ND	ND
Di-n-octyl phthalate	<1.0/ND	<1.0	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND/ND	ND	ND
Fluoranthene	ND/ND	ND	ND
Fluorene	ND/ND	ND	ND
Hexachlorobenzene	ND/ND	ND	ND
Hexachlorobutadiene	ND/ND	ND	ND
Hexachlorocyclopentadiene	ND/ND	ND	ND
Hexachloroethane	ND/ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND/ND	ND	ND
Isophorone	ND/ND	ND	ND
Naphthalene	ND/ND	ND	ND
Nitrobenzene	ND/ND	ND	ND
N-Nitrosodimethylamine	ND/ND	ND	ND
N-Nitrosodi-n-propylamine	ND/ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND/ND	ND	ND
Phenanthrene	ND/ND	ND	ND
Pyrene	ND/ND	ND	ND
1,2,4-Trichlorobenzene	ND/ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND/ND	ND	ND

See footnotes at end of table.

TABLE D.3
(Continued)

PARAMETER	SAMPLE IDENTIFICATION ICB-1A ST-1	ICB-1A ST-2	ICB-1A ST-3
ACID EXTRACTABLE PRIORITY POLLUTANTS:(4)			
2-Chlorophenol	ND/ND	ND	ND
2,4-Dichlorophenol	ND/ND	ND	ND
2,4-Dimethylphenol	ND/ND	ND	ND
4,6-Dinitro-o-cresol	ND/ND	ND	ND
2,4-Dinitrophenol	ND/ND	ND	ND
2-Nitrophenol	ND/ND	ND	ND
4-Nitrophenol	ND/ND	ND	ND
p-Chloro-m-cresol	ND/ND	ND	ND
Pentachlorophenol	ND/ND	ND	ND
Phenol	ND/ND	ND	ND
2,4,6-Trichlorophenol	ND/ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(4)			
Aniline	ND/ND	ND	ND
Benzoic Acid	ND/ND	ND	ND
Benzyl Alcohol	ND/ND	ND	ND
4-Chloroaniline	ND/ND	ND	ND
Dibenzofuran	ND/ND	ND	ND
2-Methylnaphthalene	ND/ND	ND	ND
2-Methylphenol	ND/ND	ND	ND
4-Methylphenol	ND/ND	ND	ND
2-Nitroaniline	ND/ND	ND	ND
3-Nitroaniline	ND/ND	ND	ND
4-Nitroaniline	ND/ND	ND	ND
2,4,5-Trichlorophenol	ND/ND	ND	ND
METALS(4)			
Aluminum	14,000	11,000	13,000
Antimony	ND	ND	ND
Arsenic	13	8.7	12
Barium	160	120	140
Beryllium	1.0	0.8	1.2
Boron	ND	ND	ND
Cadmium	ND/ND	0.88	0.28
Chromium	41/41	27	25
Cobalt	14	12	14
Copper	22	18	20/21
Iron	33,000	230	320
Lead	18	18	530
Manganese	880	400	620
Mercury	ND	ND	ND
Nickel	34	27	31/28
Selenium	ND	ND	ND
Silver	ND	ND	ND
Thallium	ND	ND	ND
Tin	3.0	2.2	ND
Vanadium	12	6.7/6.7	5.8
Zinc	820	730	860

TABLE D.3
(Continued)

FOOTNOTES

(1) Concentration in micrograms per kilogram (μg/kg) or parts per billion.

(2) The indicated compound is incorrectly identified in Part C of NPDES Form 2C as 1,2-dichloropropylene. However, the sample was screened for the presence of both compounds.

(3) ND indicates that the corresponding parameter was not detected.

(4) Concentration in milligrams per kilogram (mg/kg) or parts per million.

(5) Decomposes rapidly in water.

(6) Detected as compound in parentheses.

(7) The indicated sample was analyzed in duplicate.

(8) "<" indicates that the corresponding parameter was detected but its concentration was less than the value indicated.

TABLE D.4

RESULTS OF CHEMICAL ANALYSES
GENERAL CHEMISTRY - ICB-1A SEDIMENT

PARAMETER	UNITS[1]	SAMPLE IDENTIFICATION ICB-1A ST-1	ICB-1A ST-2	ICB-1A ST-3
Ammonia	mg/kg NH_3-N	42	56	65
Chloride	mg/kg	33	24	19
Cyanide, Total	mg/kg	ND[2]	ND	ND
Phenolics	mg/kg	ND	ND	ND
Sulfide	mg/kg S^{-2}	ND	ND/ND[3]	ND

(1) mg/kg = milligrams per kilogram or parts per million.
(2) ND indicates none detected.
(3) The indicated sample was analyzed in duplicate.

TABLE D.5

RESULTS OF CHEMICAL ANALYSES
ICE CREEK SEDIMENT

PARAMETER	SAMPLE IDENTIFICATION					
	ICB-2A ST-1	ICB-2A ST-2	ICB-2A ST-3	ICB-4A ST-1	ICB-4A ST-2	ICB-6A ST-1
VOLATILE PRIORITY POLLUTANTS:[1]						
Acrolein	ND[3]	ND	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	ND
Chloroform	60	<10[4]	<10	<10	<10	<10
Dichlorobromomethane	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene[2]	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	<10	ND	ND	<10
Methyl bromide	ND	ND	ND	ND	ND	ND
Methyl chloride	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:[1]						
Acetone	ND	ND	ND	ND	ND	ND
2 Butanone	ND	ND	ND	ND	ND	ND
Carbon disulfide	<10	ND	<10	100	22	<10
2-Hexanone	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND
Vinyl acetate	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE D.5
(Continued)

PARAMETER	SAMPLE IDENTIFICATION ICB-6A ST-2	ICB-8A ST-1	ICB-8A ST-2	ICB-9A ST-1	ICB-9A ST-2
VOLATILE PRIORITY POLLUTANTS:[1]					
Acrolein	ND	ND	ND	ND	ND/ND[5]
Acrylonitrile	ND	ND	ND	ND	ND/ND
Benzene	ND	ND	ND	ND	ND/ND
Bromoform	ND	ND	ND	ND	ND/ND
Carbon Tetrachloride	ND	ND	ND	ND	ND/ND
Chlorobenzene	ND	ND	ND	ND	ND/ND
Chlorodibromomethane	ND	ND	ND	ND	ND/ND
Chloroethane	ND	ND	ND	ND	ND/ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND/ND
Chloroform	20	110	ND	ND	ND/ND
Dichlorobromomethane	ND	ND	ND	ND	ND/ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND/ND
1,1-Dichloroethane	ND	ND	ND	ND	ND/ND
1,2-Dichloroethane	ND	ND	ND	ND	ND/ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND/ND
1,2-Dichloropropane	ND	ND	ND	ND	ND/ND
1,3-Dichloropropylene[2]	ND	ND	ND	ND	ND/ND
Ethylbenzene	ND	<10	ND	ND	ND/ND
Methyl bromide	ND	ND	ND	ND	ND/ND
Methyl chloride	ND	ND	ND	ND	ND/ND
Methylene chloride	ND	ND	ND	ND	ND/ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND/ND
Tetrachloroethylene	ND	ND	ND	ND	ND/ND
Toluene	ND	ND	ND	ND	ND/ND
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND/ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND/ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND/ND
Trichloroethylene	ND	ND	ND	ND	ND/ND
Trichlorofluoromethane	ND	ND	ND	ND	ND/ND
Vinyl Chloride	ND	ND	ND	ND	ND/ND
VOLATILE NONPRIORITY POLLUTANTS:[1]					
Acetone	ND	ND	ND	ND	ND/ND
2 Butanone	ND	ND	ND	ND	ND/ND
Carbon disulfide	ND	ND	ND	ND	ND/ND
2-Hexanone	ND	ND	ND	ND	ND/ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND/ND
Styrene	ND	ND	ND	ND	ND/ND
Vinyl acetate	ND	ND	ND	ND	ND/ND
o-Xylene	ND	ND	ND	ND	ND/ND

See footnotes at end of table.

TABLE D.5
(Continued)

FOOTNOTES

(1)Concentration in μg/kg or parts per billion.

(2)The indicated compound is incorrectly identified in Part C of NPDES Form 2C as 1,2-dichloropropylene. However, the sample was screened for the presence of both compounds.

(3)ND indicates that the corresponding parameter was not detected.

(4)"<10" indicates that the corresponding compound was detected but its concentration was less than 10 micrograms per kilogram.

(5)The indicated sample was analyzed in duplicate.

TABLE D.6

RESULTS OF CHEMICAL ANALYSES
PHENOLICS AND NAPHTHALENE
ICE CREEK SEDIMENTS

SAMPLE IDENTIFICATION	PHENOLICS mg/kg[1]	NAPHTHALENE mg/kg
ICB-2A, ST-1	1.1	<1.0
ICB-2A, ST-2	0.80	<1.0
ICB-2A, ST-3	0.20	<1.0
ICB-4A, ST-1	ND[2]	<1.0
ICB-4A, ST-2	0.60	ND
ICB-6A, ST-1	0.90	6.8
ICB-6A, ST-2	ND	ND/ND[3]
ICB-8A, ST-1	0.60	37
ICB-8A, ST-2	0.98	1.9
ICB-9A, ST-1	2.4	90
ICB-9A, ST-2	0.80	1.8

(1) mg/kg = milligrams per kilogram or parts per million.

(2) ND indicates none detected.

(3) The indicated sample was analyzed in duplicate.

TABLE D.7

RESULTS OF PERMEABILITY LEACHATE STUDY
ICE CREEK SAMPLES

BORING NO.	SAMPLE NO.	CHLORIDE mg/ℓ [1]	pH	SPECIFIC CONDUCTANCE µmhos/cm @ 25°C	SULFATE mg/ℓ SO_4
ICB-1A	ST-1	24	6.10	1,080	30
ICB-1A	ST-1	19	6.90	1,080	60
ICB-1A	ST-1	3.0	7.70	1,140	ND [2]
ICB-1A	ST-1	ND	7.70	668	1.2
ICB-1A	ST-2	21	6.60	305	4.0
ICB-1A	ST-2	7.3	5.80	407	IS [3]
ICB-1A	ST-2	1.9	6.20	340	4.0
ICB-1A	ST-2	1.3	6.15	340	5.0
ICB-1A	ST-3	31	6.10	478	ND
ICB-1A	ST-3	11	6.50	273	2.0
ICB-1A	ST-3	3.0	6.10	205	IS
ICB-1A	ST-3	2.1	6.30	205	1.0
ICB-1A	ST-3	ND	6.70	205	IS
ICB-2A	ST-1	12	6.80	142	2.4
ICB-2A	ST-1	3.9	7.20	130	ND
ICB-2A	ST-1	IS	6.90	108	5.5
ICB-2A	ST-1	ND	6.90	102	IS
ICB-2A	ST-3	12	6.10	134	9.5
ICB-2A	ST-3	5.8	6.60	109	2.5
ICB-2A	ST-3	IS	6.80	61	1.5
ICB-2A	ST-3	2.5	6.70	54	IS
ICB-4A	ST-2	20	7.50	579	ND
ICB-4A	ST-2	10	7.50	579	IS
ICB-4A	ST-2	4.6	6.70	648	4.0
ICB-4A	ST-2	1.9	7.10	620	ND
ICB-6A	ST-1	23	8.20	599	3.9
ICB-6A	ST-1	16	7.80	570	5.0
ICB-6A	ST-1	2.6	7.80	477	6.0
ICB-6A	ST-1	ND	7.80	443	IS

TABLE D.7
(Continued)

BORING NO.	SAMPLE NO.	CHLORIDE mg/ℓ[1]	pH	SPECIFIC CONDUCTANCE μmhos/cm @ 25°C	SULFATE mg/ℓ SO_4
ICB-6A	ST-1	ND	7.70	474	10
ICB-6A	ST-1	ND	7.50	502	IS
ICB-6A	ST-2	34	7.05	803	>50[4]
ICB-6A	ST-2	1.9	7.50	141	20
ICB-6A	ST-2	ND	7.40	105	9.4
ICB-6A	ST-2	ND	7.55	45	3.3
ICB-8A	ST-1	82	7.50	998	14
ICB-8A	ST-1	36	7.90	641	ND
ICB-8A	ST-1	4.2	7.80	504	10
ICB-8A	ST-1	1.0	7.60	469	IS
ICB-8A	ST-1	ND	7.50	438	10
ICB-8A	ST-2	100	7.90	1,120	ND
ICB-8A	ST-2	96	7.60	1,110	20
ICB-8A	ST-2	20	7.70	646	IS
ICB-8A	ST-2	2.2	7.70	572	10
ICB-8A	ST-2	ND	7.60	568	IS
ICB-9A	ST-1	41	8.10	863	21
ICB-9A	ST-1	3.2	8.40	1,040	8.6
ICB-9A	ST-1	1.2	8.00	631	ND
ICB-9A	ST-1	1.1	7.90	531	IS
ICB-9A	ST-2	210	7.50	2,220	32
ICB-9A	ST-2	60	7.60	705	3.3
ICB-9A	ST-2	23	8.00	324	4.3
ICB-9A	ST-2	10	8.10	180	2.1

(1) mg/ℓ = milligrams per liter or parts per million.

(2) ND = none detected.

(3) IS indicates that there was insufficient sample for analysis.

(4) Insufficient sample remained for further analysis.

TABLE D.8

RESULTS OF BATCH TEST LEACHATE ANALYSES
BORING ICB-1A SAMPLES

PARAMETER	SAMPLE IDENTIFICATION ICB-1A ST-1	ICB-1A ST-2	ICB-1A ST-3
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)			
Acenaphthene	ND(4)	ND	ND
Acenaphthylene	ND	ND	ND
Anthracene	ND	ND	ND
Benzidine	ND	ND	ND
Benzo(a)anthracene	ND	<10(5)	ND
Benzo(a)pyrene	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND
Bis(chloromethyl)ether(2)	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	<10
4-Bromophenyl phenyl ether	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND
Chrysene	ND	<10	ND
Dibenzo(a,h)anthracene	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND
Diethyl phthalate	ND	ND	ND
Dimethyl phthalate	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND
2,6-Dinitrotoluene	ND	<10	ND
Di-n-octyl phthalate	<10	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(3)	ND	ND	ND
Fluoranthene	ND	ND	ND
Fluorene	ND	ND	ND
Hexachlorobenzene	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND
Hexachloroethane	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND
Isophorone	ND	ND	ND
Naphthalene	<10	<10	ND
Nitrobenzene	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(3)	ND	ND	ND
Phenanthrene	ND	ND	ND
Pyrene	<10	<10	<10
1,2,4-Trichlorobenzene	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND

See footnotes at end of table.

TABLE D.8
(Continued)

PARAMETER	SAMPLE IDENTIFICATION		
	ICB-1A ST-1	ICB-1A ST-2	ICB-1A ST-3
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)			
2-Chlorophenol	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND
2-Nitrophenol	ND	ND	ND
4-Nitrophenol	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND
Pentachlorophenol	ND	ND	ND
Phenol	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)			
Aniline	ND	ND	ND
Benzoic Acid	ND	ND	ND
Benzyl Alcohol	ND	ND	ND
4-Chloroaniline	ND	ND	ND
Dibenzofuran	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND
2-Methylphenol	ND	ND	ND
4-Methylphenol	ND	ND	ND
2-Nitroaniline	ND	ND	ND
3-Nitroaniline	ND	ND	ND
4-Nitroaniline	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND
METALS(6)			
Aluminum	0.20	0.62	0.31
Antimony	ND/ND	ND	ND
Arsenic	0.003/0.003	0.004	0.002
Barium	0.12/0.12	0.10	0.04
Beryllium	ND/ND	ND	ND
Boron	ND/ND	ND	ND
Cadmium	ND/ND	ND	ND
Chromium	ND	ND	ND
Cobalt	ND/ND	ND	0.01
Copper	ND	ND	ND
Iron	0.17	0.43	0.21
Lead	ND/ND	ND	ND
Manganese	1.2	0.90	0.20
Mercury	0.0003	ND	ND/ND
Nickel	ND	ND	ND
Selenium	ND/ND	0.001	0.001
Silver	ND/ND	ND	0.004
Thallium	ND/ND	ND	ND
Tin	ND/ND	ND	ND
Vanadium	ND	ND	ND
Zinc	0.07/0.07	0.41	0.18

TABLE D.8
(Continued)

FOOTNOTES

(1)Concentration in micrograms per liter (μg/ℓ) or parts per billion.

(2)Decomposes rapidly in water.

(3)Detected as compound in parentheses.

(4)ND indicates that the corresponding parameter was not detected.

(5)"<" indicates that the corresponding parameter was detected but its concentration was less than the value indicated.

(6)Concentration in milligrams per liter (mg/ℓ) or parts per million.

TABLE D.9

RESULTS OF BATCH TEST LEACHATE ANALYSES
GENERAL CHEMISTRY - BORING ICB-1A SAMPLES

PARAMETER	UNITS[1]	SAMPLE IDENTIFICATION		
		ICB-1A ST-1	ICB-1A ST-2	ICB-1A ST-3
Ammonia	mg/ℓ NH_3-N	0.73/0.71[2]	1.2	0.94
Chloride	mg/ℓ	1.9	2.2	0.96
Cyanide, Total	mg/ℓ	ND[3]	ND	ND
Phenolics	mg/ℓ	0.042	ND	0.021
Sulfate	mg/ℓ SO_4	3.7	16	2.9
Sulfide	mg/ℓ S^{-2}	ND	ND	ND

[1] mg/ℓ = milligrams per liter or parts per million.

[2] The indicated sample was analyzed in duplicate.

[3] ND indicates none detected.

TABLE D.10

RESULTS OF BATCH TEST LEACHATE ANALYSES
ICE CREEK SAMPLES

SAMPLE IDENTIFICATION	AMMONIA mg/ℓ[1] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PHENOLICS mg/ℓ	SULFATE mg/ℓ SO_4	NAPHTHALENE µg/ℓ
ICB-2A, ST-1	2.2	1.9	ND[2]	0.015	15	ND
ICB-2A, ST-2	0.30/0.27[3]	1.2/1.2	ND/ND	0.029	3.4/3.5	ND
ICB-2A, ST-3	0.43	ND	ND	ND	6.0	ND
ICB-4A, ST-1	2.3	1.2	ND	ND	16	ND
ICB-4A, ST-2	1.7/1.7	1.2	ND	0.019	18	ND
ICB-6A, ST-1	12	2.9	ND	0.026	25	ND
ICB-6A, ST-2	0.43	1.2	ND	0.015	190	ND
ICB-8A, ST-1	20	1.4	ND	0.016	58	ND
ICB-8A, ST-2	15	19	ND	0.024	45/46	ND
ICB-9A, ST-1	14	8.1/7.8	ND	0.005	100	ND
ICB-9A, ST-2	5.7	12	ND	0.049	20	ND

(1) mg/ℓ = milligrams per liter or parts per million.

(2) ND indicates none detected.

(3) The indicated sample was analyzed in duplicate.

TABLE D.11

ICE CREEK PERMEABILITY DATA

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (ft)	SAMPLE DESCRIPTION	PERMEABILITY (cm/sec)
LABORATORY PERMEABILITY VALUES:				
ICB-1A	ST-1	17.0-19.0	Silty clay	2.65×10^{-8}
ICB-1A	ST-2	20.0-22.0	Sandy silty clay	4.71×10^{-8}
ICB-1A	ST-3	23.0-25.0	Sandy silty clay	1.7×10^{-7}
ICB-2A	ST-1	15.0-17.0	Clayey silt, some sand	1.04×10^{-6}
ICB-2A	ST-3	21.0-23.0	Silty clay, some sand	1.16×10^{-6}
ICB-4A	ST-2	4.0-6.0	Silty clay	3.33×10^{-8}
ICB-6A	ST-1	1.0-3.0	Clayey silt	1.88×10^{-7}
ICB-6A	ST-2	8.0-9.4	Fine to coarse sand	1.4×10^{-2}
ICB-8A	ST-1	1.0-3.0	Silty clay	2.17×10^{-7}
ICB-8A	ST-2	3.0-5.0	Silty clay	1.45×10^{-7}
ICB-9A	ST-1	5.0-7.0	Silty clay	1.20×10^{-6}
ICB-9A	ST-2	15.0-17.0	Fine to medium sand and silty clay	1.04×10^{-3}
FIELD PERMEABILITY VALUE[(1)]				
ICB-7	NA	11.2[(2)]	Silty sand	1.9×10^{-3}

[(1)]Constant head permeability test.

[(2)]Depth to bottom of casing.

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TECHNICAL MEMORANDUM HYDROGEOLOGIC INVESTIGATION

In accordance with the Phase II remedial investigation work plan for the Allied Chemical/Ironton coke site, monitoring wells were installed, developed, and sampled by IT Corporation (IT) between July 14 and October 11, 1984. Although ten new wells were initially scheduled for installation, eight wells were added to the program to better define hydrogeologic conditions at the site. The primary objectives of the hydrogeologic investigation were as follows:

- Confirm Phase I computer simulation results of flow balance, contaminant transport and dispersion, and mass loading
- Provide input data for Phase II computer simulation, including:
  - Range of permeability of aquifer materials
  - Continuity of aquifer materials
  - Saturated thickness of aquifer
  - Ground water elevations and ground water quality south, west, and east of the Coal Grove well field
- Provide monitoring points upgradient of the site and the Goldcamp area to assess the potential for off-site contaminant sources and determine the ground water gradient north of the site
- Assess the impact of suspected or known sources on ground water quality
- Enable monitoring/sampling at any depth within the aquifer at each well to identify contaminant stratification or concentration gradients within the ground water regime
- Further define the limits of the extent of ground water contamination identified in the Phase I investigation

- Further define local geology and hydrogeology
- Replace or supplement existing monitoring wells.

To achieve these objectives, soil and ground water samples were collected and in situ permeability tests were conducted at each monitoring well location during drilling. Following well installation, the new wells were developed and ground water samples were collected from functional existing monitoring wells, accessible industrial water supply wells, and the newly installed monitoring wells. A ground water level survey was conducted for all accessible site wells following ground water sampling.

Methods

Borings for monitoring well installation were advanced to bedrock using 6-1/4-inch inside-diameter hollow-stem augers. To limit cross contamination, all downhole equipment was thoroughly cleaned using a high-pressure steam cleaner between each boring. Soil samples were obtained to characterize subsurface materials by driving a standard split-barrel sampler (split-spoon) at approximately five-foot intervals. Soil samples were placed in sealed glass jars, labeled, boxed, and stored on site. Boring logs containing detailed descriptions of materials encountered were prepared by an IT geologist for each boring and are presented in Appendix H. The location of site wells is shown in Figure E-1.

Soil samples were collected for chemical analysis in selected borings at approximately the following depths:

- 20 feet below ground surface
- Slightly below ground water table
- At or near top of bedrock.

Additional samples for chemical analysis were collected at the geologist's discretion, based on obvious or suspected contamination. Samples for chemical analysis were retained in 500-milliliter amber glass jars with teflon lid liners and 40-milliliter volatile organic analyses (VOA) vials. Upon encountering the ground water table, ground water samples were collected through the augers in selected borings and retained in bottles containing appropriate preservatives. Ground water samples obtained during drilling were collected using a Kemmerer sampler. These samples were collected to conduct a preliminary evaluation of ground water chemistry prior to well sampling. All samples collected for chemical analysis (soil and water) were placed in coolers and maintained at wet-ice temperature (four degrees Celsius). Chain-of-custody forms accompanied samples until delivery to IT's laboratory in Murrysville, Pennsylvania.

In situ falling head permeability tests were conducted in selected borings in both fine- and coarse-grained aquifer materials to evaluate the range of permeability of the alluvial aquifer at the site and to confirm permeability assumptions used in the Phase I computer simulation. The tests were conducted by seating casing in the aquifer materials, filling the casing with clean water, and recording the fall of the water level within the casing as a function of time.

Monitoring wells installed in the completed borings were constructed of four-inch inside-diameter Schedule 40 polyvinyl chloride (PVC) pipe with threaded flush joint couplings. Slotted well screens with a slot size of 0.010 inch penetrate the entire saturated thickness of the aquifer. Wells were installed by allowing natural coarse materials to collapse around the screen and placing a bentonite seal above the sand pack. The remainder of the boring annulus was then filled with cement/bentonite grout to impede infiltration of surface water into the completed well. A protective steel casing with locking cap was cemented into place over each completed well and bumper posts were installed where appropriate for additional protection.

Following completion, each well was surveyed by IT personnel to determine coordinates and elevations. Monitoring well installation details are presented in Appendix G.

Upon completion of the monitoring well installation program, the wells were developed using a Grundfos stainless steel submersible pump with a pumping rate of approximately 25 gallons per minute. The pump was specially fitted with teflon neck rings and bearings and an oil- and grease-resistant electric cable which resists contaminants and simplifies the task of decontaminating equipment between wells. All downhole equipment was steam cleaned and several hundred gallons of clean water was pumped through the pump and discharge line following development of each well.

Well development was conducted by initially pumping from a location just below the static water level in the well. As the suspended sediment in the discharged ground water decreased, the pump was lowered in approximately five-foot increments so that each five-foot zone of the well screen was purged until relatively clear ground water was obtained. This procedure was conducted over the entire screened interval of each monitoring well so that all water and fines associated with the drilling of the wells were removed and resulting conditions in the well represented in situ aquifer conditions.

Wells MW-5, MW-7, MW-15, MW-16, and MW-17 were apparently finished in aquifer materials which would not produce ground water at a rate of 25 gallons per minute. These wells were developed by lowering the pump to the bottom of the well, pumping the well dry, and allowing the well to recharge. This procedure was repeated until relatively clear ground water was discharged. The C-Series and T-Series monitoring wells were developed during Phase I field activities; further development of these wells was not conducted.

Prior to obtaining ground water samples from monitoring wells, purging was conducted to evacuate stagnant ground water from the sampling zone within the wells. This procedure induced ground water flow into the wells so that a representative sample was obtained. Purging was conducted immediately prior to ground water sampling by using a low-volume (one-gallon-per-minute) bladder-type pump. All downhole equipment was thoroughly cleaned following its use at each well.

Production wells scheduled for sampling were purged using the stainless steel submersible pump to ensure good communication between the well and aquifer. In wells where the bladder pump was to be used for sampling, purging was also conducted with the bladder pump immediately prior to sample collection. The bottom portion of some MW-Series wells, which were expected to contain a separate organic phase, was not purged so that adequate samples of the organic materials could be collected with a Kemmerer water sampler.

Ground water samples were collected from wells using either a bladder-type pump or a Kemmerer sampler. These instruments enabled collection of representative ground water samples by minimizing sample agitation and air contact prior to placement in sample bottles. Because of its efficiency, the bladder pump was used to collect samples except where a separate organic phase was expected to be present. In the latter case, the Kemmerer sampler was utilized to collect a sample since the Kemmerer is relatively easily cleaned. Generally, samples were collected immediately after purging so that samples were representative of in situ ground water. Sample bottles containing the appropriate chemical preservatives were filled directly from the sampling device in the field. Sample bottles were labeled at the time of collection with the appropriate information including, but not limited to, a unique sample identification number, project name and number, date of collection, well number, and name of collector. Samples were cooled and chain-of-custody and water quality records accompanied each sample to the IT laboratory.

Results of the Phase I computer simulation of ground water flow and contaminant transport indicate that contaminant concentrations in the ground water were likely to be greatest in the upper portions of the saturated aquifer. Based on these results, ground water samples were collected from C-Series, MW-Series, and former production wells near the water table. Due to well construction limitations (i.e., three-foot well screens), it was possible only to collect ground water samples from the bottom of the T-Series wells.

In addition to the ground water samples collected near the water table in each well, and the samples collected from the bottom of the T-Series wells, the following 11 wells were sampled at a depth near the bottom of the aquifer:

- MW-1
- MW-2
- MW-3
- MW-4
- MW-9
- MW-11
- MW-12
- MW-14
- MW-15
- MW-18
- TPPW-1

The samples from this deeper zone were collected to enable further assessment of vertical dispersion of contaminants within the ground water regime and identify any vertical stratification of contaminants in the subsurface.

A separate organic phase was identified in several of the Phase II borings and in Well T-13D during the Phase I investigation. In an attempt to characterize this material, which appeared to lie directly above bedrock, samples were collected from the bottom of the following wells:

- MW-1
- MW-2
- MW-12
- MW-18
- TPPW-1.

Table E.1 indicates the wells which were sampled and analyzed and the number of samples collected from each well.

As indicated in the Phase I report (Figures 4-23 to 4-27), several zones of differing ground water chemistry were apparent at the site. Based on the Phase I report results, wells were separated into five groups, as shown in Table E.2, based on geographic location and historical ground water chemistry data. Ground water sampling was conducted in as short a time period as possible to minimize the potential influence of time on ground water quality analytical results. This method enables the most accurate assessment of ground water chemistry possible at the site given the number of wells to be sampled.

Results

The boring logs (Appendix H) indicate fairly uniform aquifer materials comprised of loose to very dense fine to coarse sand with a trace to some fine gravel. A lower permeability layer of varying thickness was encountered above the aquifer material in many of the borings. These soft to stiff clays and clayey silts generally appear to be thinner toward the center of the site (i.e., away from the banks of the Ohio River and Ice Creek). Because these materials are absent in several borings, they are not believed to be continuous over a significant area. A gravel and cobble layer ranging up to three feet thick and overlying the bedrock surface was present in several borings. However, due to its absence in most of the borings, this layer is also believed to be relatively discontinuous.

Several observations were made during the monitoring well/boring program:

- A black oil-like liquid was encountered just above bedrock in Boring MW-2; a strong chemical odor was evident
- Ground water in Boring MW-4 appeared black and soil and ground water samples collected from below the water table exhibited a tar-like odor
- Samples collected from Boring MW-12 from 49.0 feet to bedrock were stained black and a creosote

odor was evident in both the soil and ground water

- An oily sheen was noted on the ground water returning with the auger cuttings from a depth of approximately 45 feet in Boring MW-14.

A summary of well sampling and permeability test data collected during the hydrogeologic investigation is presented in Table E.3. The permeability values calculated for the alluvial aquifer materials range from 1.5×10^{-4} to 8.7×10^{-2} centimeter per second (cm/sec). The lower of these two permeability values corresponds to medium dense silty fine sand in Boring MW-7 while the higher value corresponds to loose fine sand in Boring MW-6.

Results of the chemical analyses of soil and ground water samples collected during drilling of the borings for the monitoring wells are presented in Tables E.4 and E.5. Results of the chemical analyses of ground water samples collected during the September sampling event from all monitoring wells and accessible industrial supply wells are shown in Tables E.6 through E.9. In addition, ground water samples were collected monthly (April 1984 to September 1984) from the Coal Grove wells. Results of the chemical analyses of these samples are presented in Tables E.10 and E.11. Data from the water level survey conducted on October 3, 1984 are presented in Table E.13.

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E

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TECHNICAL MEMORANDUM
HYDROGEOLOGIC INVESTIGATION

APPENDIX E

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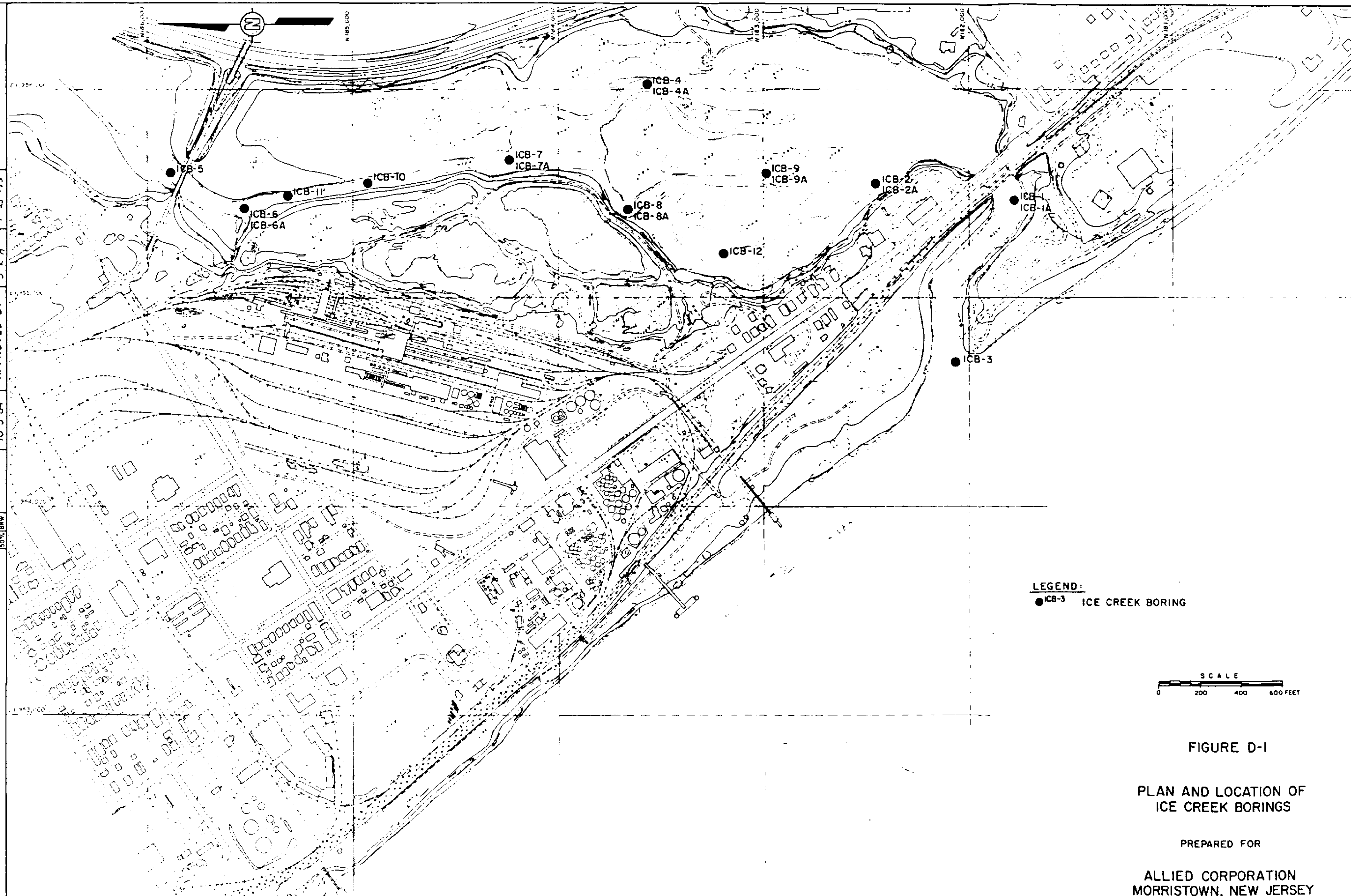
FIGURE

IE	DRAWN BY	cjb/	CHECKED BY	RJK	1-25-85	DRAWING NUMBER 831625-E61
IE / 50% BRW		10-3-84	APPROVED BY	JLH	1-25-85	



REFERENCES

1. TOPOGRAPHIC MAP PREPARED BY EASTERN MAPPING CO., PITTSBURGH, PENNSYLVANIA DATED DECEMBER, 1983 - SCALE 1" = 200'
2. 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF IRONTON, OHIO-KY AND ASHLAND, KY-OHIO QUADRANGLES - DATED 1972 AND 1968 (PHOTOREVISED 1975) - SCALE 1" = 2000'

FIGURE D-1

PLAN AND LOCATION OF ICE CREEK BORINGS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

TABLES

TABLE E.1

WELLS SAMPLED FOR GROUND WATER CHEMICAL ANALYSIS

WELL NO.	NO. OF SAMPLES	WELL NO.	NO. OF SAMPLES
T-1	1	CPPW-3	1
T-2	1	CPPW-4	1
T-3S	1	CPPW-5	1
T-3D	1	OLD CPPW-6	1
T-4S	1	MW-1	3
T-4D	1	MW-2	3
T-6	1	MW-3	2
T-7	1	MW-4	2
T-9	1	MW-5	1
T-11	1	MW-6	1
C-1	1	MW-7	1
C-2	1	MW-8	1
C-3	1	MW-9	2
C-4	1	MW-10	1
C-5	1	MW-11	2
C-6	1	MW-12	3
C-7	1	MW-13	1
C-8	1	MW-14	2
C-9	1	MW-15	2
C-10	1	MW-16	1
C-12	1	MW-17	1
C-13	1	MW-18	3
TPPW-1	2		
TPPW-2	1		36
	25		

Total Samples for chemical analysis = 61.

TABLE E.2

AREAL GROUPING OF WELLS

SOUTH OF SITE/ COAL GROVE AREA	COKE PLANT	TAR PLANT	LAGOON AREA	GOLDCAMP AREA
C-12	C-5	TPPW-1	C-1	T-1
C-13	C-6	TPPW-2	C-2	T-2
MW-5	C-7	MW-11	C-4	T-3S
MW-7	C-8	MW-17	C-10	T-3D
MW-8	C-9	MW-18	MW-15	T-4S
MW-10	CPPW-3	T-9	MW-16	T-4D
MW-13	CPPW-4	T-11		T-6
CG-3	CPPW-5			T-7
CG-4	Old CPPW-6			MW-1
	MW-4			MW-2
	MW-6			MW-3
				MW-9
				MW-12
				MW-14

TABLE E.3

MONITORING WELL SAMPLING AND PERMEABILITY TEST DATA

MONITORING WELL	CHEMICAL SOIL SAMPLE	DEPTH (ft)	GROUND WATER SAMPLE	APPROXIMATE DEPTH (ft)	PERMEABILITY (cm/sec)	DEPTH TO TOP OF TEST ZONE (ft)
MW-1	MW-1G-S	18.5-20.0	MW-1G-W	30.0	-[1]	-
	MW-1H-S	28.5-30.0				
	MW-1I-S	72.5-73.0				
MW-2	MW-2G-S	18.5-20.0	MW-2G-W	44.0	3.6×10^{-4}	58.4
	MW-2H-S	39.0-40.5				
MW-3	MW-3G-S	19.0-20.5	MW-3G-W	49.0	7.8×10^{-4}	46.9
	MW-3H-S	44.0-45.5				
	MW-3I-S	86.0-86.5				
MW-4	MW-4G-S	19.0-20.5	MW-4G-W	48.0	1.2×10^{-3}	42.4
	MW-4H-S	39.0-40.5				
	MW-4I-S	82.0-82.9				
MW-5	-	-	MW-5G-W	31.0	2.2×10^{-5}	36.6
					1.1×10^{-3}	61.4
MW-6	MW-6G-S	19.0-20.5	MW-6G-W	33.0	8.7×10^{-2}	39.0
	MW-6H-S	34.0-35.5				
	MW-6I-S	74.0-74.3				
MW-7	MW-7G-S	18.5-20.0	MW-7G-W	26.0	1.8×10^{-4}	33.5
	MW-7H-S	28.5-30.0				
	MW-7I-S	61.0-61.9				
MW-8	MW-8G-S	19.0-20.5	MW-8G-W	22.0	-	-
	MW-8H-S	59.0-60.5				
MW-9	MW-9G-S	14.0-15.5	MW-9G-W	38.0	-	-
	MW-9H-S	39.0-40.5				
MW-10	-	-	MW-10G-W	26.0	-	-
MW-11	MW-11G-S	19.0-20.5	MW-11G-W	38.0	7.4×10^{-4}	44.0
	MW-11H-S	34.0-35.5				
	MW-11I-S	39.0-40.5				
	MW-11J-S	74.5-76.0				
MW-12	MW-12G-S	18.5-20.0	MW-12G-W	44.0	-	-
	MW-12H-S	43.5-45.0				
	MW-12I-S	79.0-79.8				
MW-13	-	-	-	-	8.6×10^{-3}	32.0
MW-14	MW-14G-S	29.0-30.5	MW-14G-W	28.0	8.7×10^{-4}	41.8
	MW-14H-S	49.5-51.0				
MW-15	MW-15G-S	20.0-21.5	MW-15G-W	20.0	1.8×10^{-3}	31.5
	MW-15H-S	28.5-30.0				
MW-16	MW-16G-S	18.5-20.0	MW-16G-W	23.0	1.7×10^{-2}	45.8
	MW-16H-S	42.5-44.0				
MW-17	MW-17G-S	23.5-25.0	MW-17G-W	20.0	3.2×10^{-2}	31.2
	MW-17H-S	44.5-46.0				
	MW-17I-S	54.5-56.0				
MW-18	MW-18G-S	29.5-31.0	-	-	7.2×10^{-2}	41.3

[1] No test performed or no sample collected.

TABLE E.4

RESULTS OF CHEMICAL ANALYSES
MONITORING WELLS - SOIL SAMPLES[1]

SAMPLE IDENTIFICATION	AMMONIA mg/kg[2] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
MW-1G-S	2.9	8.3	ND[3]	ND	82	ND	<1.0[4]
MW-1H-S	8.3	16/10[5]	0.59/ND	0.32	120	ND	<1.0
MW-1I-S	3.0	39/34	1.3	0.68	23	0.18	1.2
MW-2G-S	3.0/4.5	43	ND	1.2	480	ND	<1.0
MW-2H-S	1.2	33	5.2	0.70	29	ND	ND
MW-3G-S	2.8	11/15	ND	0.90/0.95	45	ND	<1.0
MW-3H-S	8.4	28/22	1.2	0.28	53	ND	ND
MW-3I-S	11	800	ND/ND	ND	130	ND	<1.0/<1.0
MW-4G-S	2.0	<5.0[6]	ND	ND	23	ND	<1.0/<1.0
MW-4H-S	18	150	3.1	0.94	45/56	ND	ND
MW-4I-S	44	68	3.2	0.18	110	ND	ND

See footnotes at end of table

TABLE E.4
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[2] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
MW-6G-S	1.0	36	ND	0.91	23	ND	ND
MW-6H-S	ND	21	ND	0.76/0.74	48	ND	ND
MW-6I-S	9.2/12	53	ND	ND	140	ND	<1.0
MW-7G-S	14/16	41	ND	0.97	230	ND	1.4
MW-7H-S	17	40	ND	1.9/2.1	67	ND	1.8
MW-7I-S	5.9/5.9	36	ND	0.74/0.57	43	ND	ND
MW-8G-S	3.6/2.7	60/60	ND	0.75	45	ND	ND/ND
MW-8H-S	ND/ND	63	ND	2.2	22	ND	ND/ND
MW-9G-S	28/29	27/30	ND/ND	0.62/0.66	17	ND	ND
MW-9H-S	12	17	ND	2.1	34	ND	ND
MW-11G-S	6.6	15	ND	0.57	15	ND	ND
MW-11H-S	4.4	5.0	ND	0.64	25	ND	<1.0
MW-11I-S	5.2	25	ND	0.17	35	ND	ND
MW-11J-S	14	35	ND	0.94	80	ND	<1.0

See footnotes at end of table.

TABLE E.4
(Continued)

SAMPLE IDENTIFICATION	PARAMETERS AMMONIA mg/kg[2] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
MW-12G-S	1.0	17	ND	1.4	15	ND	ND
MW-12H-S	15/14	9.9/9.9	ND	0.31	25	ND	<1.0
MW-12I-S	3.3	9.9	ND	0.48	65	ND	<1.0
MW-14G-S	3.7/3.8	20	ND	0.60/0.83	150	ND	ND
MW-14H-S	1.9	30/32	ND	1.3	40/50	ND	ND
MW-15G-S	220	39	4.8	3.2	710	ND	1.6
MW-15H-S	87	37	1.2/1.2	2.1	400/390	ND	3.6
MW-16G-S	23	20	ND/ND	1.6	20	ND	ND
MW-16H-S	3.9	22	ND	1.5	35	ND/ND	<1.0

See footnotes at end of table.

TABLE E.4
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/kg[2] NH_3-N	CHLORIDE mg/kg	TOTAL CYANIDE mg/kg	PHENOLICS mg/kg	SULFATE mg/kg SO_4	BENZENE mg/kg	NAPHTHALENE mg/kg
				PARAMETERS			
MW-17G-S	1.8/1.0	12	ND/ND	1.6	100/93	ND/ND	ND
MW-17H-S	2.7	7.5/5.5	34/34	2.0	150	ND/<0.010[7]	<1.0
MW-17I-S	ND	20	ND	2.2	25/25	ND/ND	ND/<1.0
MW-18G-S	ND	17/17	ND	0.74	45	ND	ND

(1)Soil samples taken during drilling of borings for monitoring wells.

(2)mg/kg = milligrams per kilogram or parts per million.

(3)ND indicates none detected.

(4)The corresponding compound was detected at less than 1 milligram per kilogram or part per million.

(5)The indicated sample was analyzed in duplicate.

(6)The corresponding compound was detected at less than 5 milligrams per kilogram or parts per million.

(7)The corresponding compound was detected at less than 10 micrograms per kilogram or parts per billion.

TABLE E.5

RESULTS OF CHEMICAL ANALYSES
GROUND WATER SAMPLES[1]

SAMPLE IDENTIFICATION	AMMONIA mg/ℓ[2] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PHENOLICS mg/ℓ	SULFATE mg/ℓ SO_4	BENZENE mg/ℓ	NAPHTHALENE mg/ℓ
	PARAMETERS						
MW-2G-W	0.12	200/170[3]	0.031	0.040	230/230	0.050	<0.010[4]
MW-3G-W	0.18/ND[5]	65	0.038	0.010	6000	ND	ND
MW-4G-W	0.40	12	3.8	0.021	230	ND	ND
MW-5G-W	0.12	32/32	ND/ND	0.050/0.058	50/49	ND	ND
MW-6G-W	0.08/0.12	49	0.02/ND	0.12	180	ND	ND
MW-7G-W	ND	81/71	ND/ND	ND/ND	140	ND	ND
MW-8G-W	ND/ND	71	0.02/0.02	0.013	160	ND	ND
MW-9G-W	ND	110	0.83	0.055	200	ND	<0.010
MW-10G-W	0.34	120	ND	0.008	260	ND/ND	ND
MW-11G-W	0.06	9.9/9.7	ND/ND	ND	IS[6]	ND	<0.010
MW-12G-W	0.10/0.10	51	ND/ND	0.032	4.0	3.2	0.20
MW-14G-W	ND	7.9	0.02	0.017	730/700	ND/ND	ND
MW-15G-W	1.6/1.4	42	3.8	0.18/0.22	320	ND	<0.010

See footnotes at end of table.

TABLE E.5
(Continued)

SAMPLE IDENTIFICATION	PARAMETERS AMMONIA mg/ℓ[1] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PHENOLICS mg/ℓ	SULFATE mg/ℓ SO_4	BENZENE mg/ℓ	NAPHTHALENE mg/ℓ
MW-16G-W	ND	26	0.05	0.049	1.0	ND	ND
MW-17G-W	0.08/0.10	7.4/7.7	0.05/0.05	0.021	200	ND	ND
P-2-W	ND	23	ND/ND	ND	86	ND	ND

(1)Ground water samples taken during installation of monitoring wells.

(2)mg/ℓ = milligrams per liter or parts per million.

(3)The indicated sample was analyzed in duplicate.

(4)The corresponding compound was detected at less than ten micrograms per liter or parts per billion.

(5)ND indicates none detected.

(6)IS indicates that insufficient sample was available for analysis.

TABLE E.6

RESULTS OF CHEMICAL ANALYSES
GENERAL CHEMISTRY - GROUND WATER SAMPLES

SAMPLE IDENTIFICATION	AMMONIA mg/ℓ[1] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PARAMETERS PHENOLICS mg/ℓ	SULFATE mg/ℓ SO_4	SULFIDE mg/ℓ
C-1H-W	0.06	770/750[3]	0.14/0.15	0.011	15/19	ND
C-2H-W	ND[2]	36	ND	0.005	70	ND
C-3H-W	ND	160	0.09/0.10	0.013	240	ND
C-4H-W	0.12	240	0.21/0.11	0.99	230	ND
C-5H-W	0.13	38/38	ND	0.013	280	ND
C-6H-W	ND	25/26	ND	ND	90	ND
C-7H-W	ND	34	ND	0.10	320/320	ND
C-8H-W	0.10	40	ND	0.010	370	ND
C-9H-W	0.18	31	ND	0.005	130	ND
C-10H-W	ND/ND	20/19	0.04/0.05	0.070	200	ND
C-12H-W	ND	70	ND	0.011	190/180	ND
C-13H-W	ND	130	ND/ND	0.013	45	ND
CPPW-3H-W	ND	180	ND	0.006	170	ND/ND
CPPW-4H-W	ND	69	ND	0.005	100	ND
CPPW-5H-W	0.12	130	ND	ND	400	ND
CPPW-6H-W	ND	85	0.10/0.11	0.050	ND	ND

TABLE E.6
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/ℓ[1] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PHENOLICS mg/ℓ	SULFATE mg/ℓ SO_4	SULFIDE mg/ℓ
	PARAMETERS					
MW-1H-W	ND/0.06	13	ND	0.015/0.013	280	ND/ND
MW-1I-W	0.64	11	ND	0.011	250	ND
MW-1J-W	0.82	10	ND	0.008	340	ND/ND
MW-2H-W	2.3	240	0.02	0.24	180	ND
MW-2I-W	ND	650	0.06	1.0	180	ND
MW-2J-W	ND	350	0.02/0.04	0.69	180	0.8
MW-3H-W	0.16	27	ND	0.007/0.008	220	ND/ND
MW-3I-W	0.10/0.18	480	0.38/0.30	0.050	75	ND
MW-4H-W	ND	18/18	0.05	0.021	120	ND
MW-4I-W	0.07	20/22	0.09/0.10	0.10/0.14	140/140	0.8
MW-5H-W	ND	85	ND	0.005	72	ND
MW-6H-W	ND	43	ND	ND	160	ND
MW-7H-W	ND/0.06	7.8/8.4	ND/ND	0.060	60	ND
MW-8H-W	ND/ND	22	ND	0.009	360	ND
MW-9H-W	ND/ND	46	0.23	0.005	240	ND
MW-9I-W	0.12	45	0.32	0.090	250	ND
MW-10H-W	ND	51	ND	0.008	190/190	ND

TABLE E.6
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/ℓ[1] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PARAMETERS PHENOLICS mg/ℓ	SULFATE mg/ℓ SO_4	SULFIDE mg/ℓ
MW-11H-W	ND	7.8	ND	0.008	120	ND
MW-11I-W	ND	130	0.35	ND	190	ND
MW-12H-W	14/15	85	ND	1.8/1.9	7.5/8.0	ND
MW-12I-W	0.12/0.12	92	ND/ND	9.1/8.9	4.0	ND
MW-12J-W	0.26	87/82	ND/ND	7.1	6.0	ND
MW-13H-W	ND	8.6/8.7	ND	0.25	110	ND
MW-14H-W	ND	17/18	ND	0.008	400	ND/ND
MW-14I-W	0.06	44/45	ND	0.005/ND	210	ND/ND
MW-14J-W	ND	33/32	ND	0.012	290	ND
MW-15H-W	0.06	59	0.04	ND	30	ND
MW-15I-W	0.06	60	0.07	0.005	28	ND
MW-16H-W	ND	32/32	ND	ND	38	ND
MW-17H-W	ND	17	0.02	ND	270	ND
MW-18H-W	0.06	14/13	ND	ND	180	ND
MW-18I-W	ND	16	ND	ND	220	ND
MW-18J-W	ND	16/16	ND	ND	210	ND

TABLE E.6
(Continued)

SAMPLE IDENTIFICATION	AMMONIA mg/ℓ[1] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PHENOLICS mg/ℓ	SULFATE mg/ℓ SO_4	SULFIDE mg/ℓ
				PARAMETERS		
PUMP No. 1	ND	37	ND	0.008	92/90	ND
T-1H-W	ND	16	0.09/0.06	0.010	250	ND/ND
T-2H-W	0.06	26	0.05	4.1/4.4	ND	ND/ND
T-3DH-W	ND/ND	120/120	ND/ND	0.015	ND	ND/ND
T-3SH-W	0.18	57/64	ND	0.005	48	ND
T-4DH-W	0.18	88	ND/ND	0.012	190/190	ND
T-4SH-W	0.07	18/16	ND/ND	0.009	100	ND
T-6H-W	ND/ND	390	0.12/0.11	0.010	250	ND
T-7H-W	ND/ND	230	0.08/0.06	0.005	160	ND
T-9H-W	0.10/0.06	400	2.7/2.8	0.27/0.24	75/70	ND
T-11H-W	0.16	700	0.15/0.14	0.016	340	1.8
TPPW-1H-W	0.06/0.06	920	ND	0.60	10	ND
TPPW-1I-W	0.20	5500/5600	0.04/0.04	1.2	180/180	ND
TPPW-1J-W	ND	5500/5400	0.04	2.4	160	ND/ND
TPPW-2H-W	ND	230	0.09	0.009	4.0	ND

(1) mg/ℓ = milligrams per liter or parts per million.

(2) ND indicates that the corresponding parameter was not detected.

(3) The indicated sample was analyzed in duplicate.

TABLE E.7

RESULTS OF CHEMICAL ANALYSES
GROUND WATER SAMPLES

PARAMETER	SAMPLE IDENTIFICATION					
	C-1H W	C-2H W	C-3H W	C-4H W	C-5H W	C-6H W
<u>VOLATILE PRIORITY POLLUTANTS:</u>[1]						
Acrolein	ND[3]	ND	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	1100	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	44	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene[2]	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	31	ND	ND
Methyl bromide	ND	ND	ND	ND	ND	ND
Methyl chloride	ND	ND	ND	ND	ND	ND
Methylene chloride	19	ND	180	ND	23	18
1,1,2,2-Tetrachloroethane	190	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	39	ND	ND
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	82	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND
<u>VOLATILE NONPRIORITY POLLUTANTS:</u>[1]						
Acetone	ND	ND	ND	ND	ND	ND
2 Butanone	ND	ND	ND	ND	ND	ND
Carbon disulfide	ND	ND	ND	ND	ND	ND
2-Hexanone	310	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	270	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	38	ND	ND
Vinyl acetate	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	120	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	C-1H W	C-2H W	C-3H W	C-4H W	C-5H W	C-6H W
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)						
Acenaphthene	<10	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzidine	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND	ND	<10(4)	ND	<10	<10
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND
Bis(chloromethyl)ether(5)	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	10	ND	ND	<10	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	<10	ND	<10	<10
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND	ND	ND	ND
Diethyl phthalate	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	<10	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND	ND
Naphthalene	100	ND	ND	670	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	C-1H W	C-2H W	C-3H W	C-4H W	C-5H W	C-6H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:[(1)]						
2-Chlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	110	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:[(1)]						
Aniline	ND	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	<10	ND	ND
Benzyl Alcohol	ND	ND	43	ND	ND	ND
4-Chloroaniline	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	<10	ND	ND
2-Methylphenol	ND	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND
METALS[(7)]						
Aluminum	-[(8)]	-	-	-	-	-
Antimony	-	-	-	-	-	-
Arsenic	-	-	-	-	-	-
Barium	-	-	-	-	-	-
Beryllium	-	-	-	-	-	-
Boron	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-
Chromium	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-
Copper	-	-	-	-	-	-
Iron	-	-	-	-	-	-
Lead	-	-	-	-	-	-
Manganese	-	-	-	-	-	-
Mercury	-	-	-	-	-	-
Nickel	-	-	-	-	-	-
Selenium	-	-	-	-	-	-
Silver	-	-	-	-	-	-
Thallium	-	-	-	-	-	-
Tin	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-
Zinc	-	-	-	-	-	-

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	C-7H W	C-8H W	C-9H W	C-10H W	C-12H W	C-13H W
VOLATILE PRIORITY POLLUTANTS:[1]						
Acrolein	ND	ND	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene[2]	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND
Methyl bromide	ND	ND	ND	ND	ND	ND
Methyl chloride	ND	ND	ND	ND	ND	ND
Methylene chloride	46	44	<10	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:[1]						
Acetone	ND	ND	ND	ND	ND	ND
2 Butanone	ND	ND	ND	ND	ND	ND
Carbon disulfide	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND
Vinyl acetate	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION C-7H W	C-8H W	C-9H W	C-10H W	C-12H W	C-13H W
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:[1]						
Acenaphthene	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzidine	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	<10	ND	ND	ND	≤10[9]	<10
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND
Bis(chloromethyl)ether[5]	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	<10	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND	<10	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Chrysene	<10	ND	ND	ND	≤10	<10
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND	ND	ND	ND
Diethyl phthalate	ND	<10	ND	ND	ND	ND
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	<10	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	<10	ND	ND
1,2-Diphenylhydrazine (Azobenzene)[6]	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)[6]	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	C-7H W	C-8H W	C-9H W	C-10H W	C-12H W	C-13H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND	ND	ND	ND
4-Chloroaniline	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND
2-Methylphenol	ND	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND
METALS(7)						
Aluminum	-	-	-	-	-	-
Antimony	-	-	-	-	-	-
Arsenic	-	-	-	-	-	-
Barium	-	-	-	-	-	-
Beryllium	-	-	-	-	-	-
Boron	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-
Chromium	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-
Copper	-	-	-	-	-	-
Iron	-	-	-	-	-	-
Lead	-	-	-	-	-	-
Manganese	-	-	-	-	-	-
Mercury	-	-	-	-	-	-
Nickel	-	-	-	-	-	-
Selenium	-	-	-	-	-	-
Silver	-	-	-	-	-	-
Thallium	-	-	-	-	-	-
Tin	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-
Zinc	-	-	-	-	-	-

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	CPPW-3H W	CPPW-4H W	CPPW-5H W	CPPW-6H W	T-1H W	T-2H W
VOLATILE PRIORITY POLLUTANTS:(1)						
Acrolein	ND	ND/ND(10)	ND	ND	ND	ND
Acrylonitrile	ND	ND/ND	ND	ND	ND	ND
Benzene	ND	ND/ND	ND	ND	ND	18,000
Bromoform	ND	ND/ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND/ND	ND	ND	ND	ND
Chlorobenzene	ND	ND/ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND/ND	ND	ND	ND	ND
Chloroethane	ND	ND/ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND/ND	ND	ND	ND	ND
Chloroform	ND	ND/ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND/ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND/ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND/ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND/ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND/ND	ND	ND	ND	ND
1,3-Dichloropropylene(2)	ND	ND/ND	ND	ND	ND	ND
Ethylbenzene	ND	ND/ND	ND	ND	ND	1900
Methyl bromide	ND	ND/ND	ND	ND	ND	ND
Methyl chloride	ND	ND/ND	ND	ND	ND	ND
Methylene chloride	ND	66/50	38	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND/ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND/ND	ND	ND	ND	ND
Toluene	ND	ND/ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	<10/<10	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND/ND	ND	ND	ND	ND
Trichloroethylene	ND	ND/ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND/ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND/ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:(1)						
Acetone	ND	ND/ND	ND	ND	ND	ND
2 Butanone	ND	ND/ND	ND	ND	ND	ND
Carbon disulfide	ND	ND/ND	ND	ND	ND	ND
2-Hexanone	ND	ND/ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND/ND	ND	ND	ND	ND
Styrene	ND	ND/ND	ND	ND	ND	ND
Vinyl acetate	ND	ND/ND	ND	ND	ND	ND
o-Xylene	ND	ND/ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	CPPW-3H	CPPW-4H	CPPW-5H	CPPW-6H	T-1H W	T-2H W
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)						
Acenaphthene	ND	ND	ND	ND	ND	ND/ND
Acenaphthylene	ND	ND	ND	ND	ND	ND/ND
Anthracene	ND	ND	ND	ND	ND	<10/≤26
Benzidine	ND	ND	ND	ND	ND	ND/ND
Benzo(a)anthracene	<10	<10	ND	<10	ND	ND/ND
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND/ND
3,4-Benzofluoranthene	ND	ND	ND	ND	ND	ND/ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND/ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND/ND
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND/ND
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND/ND
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND/ND
Bis(chloromethyl)ether(5)	ND	ND	ND	ND	ND	ND/ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND/ND
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND/ND
Butyl benzyl phthalate	23	ND	ND	ND	ND	ND/ND
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND/ND
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND/ND
Chrysene	<10	<10	ND	<10	ND	ND/ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND/ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND/ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND/ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND/ND
3,3'-Dichlorobenzidine	ND	ND	ND	ND	ND	ND/ND
Diethyl phthalate	ND	ND	ND	ND	ND	ND/ND
Dimethyl phthalate	ND	ND	ND	ND	ND	ND/ND
Di-n-butyl phthalate	ND	ND	<10	ND	ND	ND/ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND/ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND/ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND/ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND	ND	ND	ND	ND	ND/ND
Fluoranthene	ND	ND	ND	ND	ND	ND/ND
Fluorene	ND	ND	ND	ND	ND	ND/ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND/ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND/ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND/ND
Hexachloroethane	ND	ND	ND	ND	ND	ND/ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND/ND
Isophorone	ND	ND	ND	ND	ND	ND/ND
Naphthalene	ND	ND	ND	ND	ND	4200/4800
Nitrobenzene	ND	ND	ND	ND	ND	ND/ND
N-Nitrosodimethylamine	ND	ND	ND	ND	ND	ND/ND
N-Nitrosodi-n-propylamine	ND	ND	ND	ND	ND	ND/ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND	ND	ND	ND	ND	ND/ND
Phenanthrene	ND	ND	ND	ND	ND	<10/≤26
Pyrene	ND	ND	ND	ND	ND	ND/ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND/ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND	ND	ND	ND/ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION CPPW-3H	CPPW-4H	CPPW-5H	CPPW-6H	T-1H W	T-2H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND	ND	ND	ND	ND	ND/ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND/ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	5900/9300
4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND/ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND/ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND/ND
4-Nitrophenol	ND	ND	ND	ND	ND	ND/ND
p-Chloro-m-cresol	ND	ND	ND	ND	ND	ND/ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND/ND
Phenol	ND	ND	ND	ND	ND	ND/ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND/ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND	ND	ND	ND	ND/ND
Benzoic Acid	ND	ND	ND	ND	ND	ND/ND
Benzyl Alcohol	ND	ND	ND	ND	ND	ND/ND
4-Chloroaniline	ND	ND	ND	ND	ND	ND/ND
Dibenzofuran	ND	ND	ND	ND	ND	ND/ND
2-Methylnaphthalene	ND	ND	ND	ND	ND	270/330
2-Methylphenol	ND	ND	ND	ND	ND	ND/ND
4-Methylphenol	ND	ND	ND	330	ND	ND/ND
2-Nitroaniline	ND	ND	ND	ND	ND	ND/ND
3-Nitroaniline	ND	ND	ND	ND	ND	ND/ND
4-Nitroaniline	ND	ND	ND	ND	ND	ND/ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND/ND
METALS(7)						
Aluminum	-	-	-	-	0.23	0.20
Antimony	-	-	-	-	ND/<0.01	ND
Arsenic	-	-	-	-	0.059	0.20
Barium	-	-	-	-	0.32	0.29
Beryllium	-	-	-	-	ND	ND/ND
Boron	-	-	-	-	ND	ND
Cadmium	-	-	-	-	ND	ND
Chromium	-	-	-	-	ND	ND/ND
Cobalt	-	-	-	-	ND	ND
Copper	-	-	-	-	ND	ND/ND
Iron	-	-	-	-	0.88	45/45
Lead	-	-	-	-	ND/ND	ND
Manganese	-	-	-	-	0.16	0.30
Mercury	-	-	-	-	ND	ND
Nickel	-	-	-	-	ND	0.06/<0.05
Selenium	-	-	-	-	ND/ND	ND
Silver	-	-	-	-	ND/ND	ND
Thallium	-	-	-	-	ND/ND	ND
Tin	-	-	-	-	ND/ND	ND
Vanadium	-	-	-	-	ND	ND
Zinc	-	-	-	-	0.01	0.53

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	T-3DH W	T-3SH W	T-4DH W	T-4SH W	T-6H W	T-7H W
VOLATILE PRIORITY POLLUTANTS:[1]						
Acrolein	ND	ND/ND	ND	ND	ND	ND/ND
Acrylonitrile	ND	ND/ND	ND	ND	ND	ND/ND
Benzene	ND	ND/ND	ND	ND	<10	ND/ND
Bromoform	ND	ND/ND	ND	ND	ND	ND/ND
Carbon Tetrachloride	ND	ND/ND	ND	ND	ND	ND/ND
Chlorobenzene	ND	ND/ND	ND	ND	ND	ND/ND
Chlorodibromomethane	ND	ND/ND	ND	ND	ND	ND/ND
Chloroethane	ND	ND/ND	ND	ND	ND	ND/ND
2-Chloroethylvinyl ether	ND	ND/ND	ND	ND	ND	ND/ND
Chloroform	ND	ND/ND	ND	ND	ND	ND/ND
Dichlorobromomethane	ND	ND/ND	ND	ND	ND	ND/ND
Dichlorodifluoromethane	ND	ND/ND	ND	ND	ND	ND/ND
1,1-Dichloroethane	ND	ND/ND	ND	ND	ND	ND/ND
1,2-Dichloroethane	ND	ND/ND	ND	ND	ND	ND/ND
1,1-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND/ND
1,2-Dichloropropane	ND	ND/ND	ND	ND	ND	ND/ND
1,3-Dichloropropylene[2]	ND	ND/ND	ND	ND	ND	ND/ND
Ethylbenzene	ND	ND/ND	31	ND	ND	ND/ND
Methyl bromide	ND	ND/ND	ND	ND	ND	ND/ND
Methyl chloride	ND	ND/ND	ND	ND	ND	ND/ND
Methylene chloride	ND	ND/ND	ND	ND	ND	ND/ND
1,1,2,2-Tetrachloroethane	ND	ND/ND	ND	ND	ND	ND/ND
Tetrachloroethylene	ND	ND/ND	ND	ND	ND	ND/ND
Toluene	ND	ND/ND	ND	ND	ND	ND/ND
trans-1,2-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND/ND
1,1,1-Trichloroethane	ND	ND/ND	ND	ND	ND	ND/ND
1,1,2-Trichloroethane	ND	ND/ND	ND	ND	ND	ND/ND
Trichloroethylene	ND	ND/ND	ND	ND	ND	ND/ND
Trichlorofluoromethane	ND	ND/ND	ND	ND	ND	ND/ND
Vinyl Chloride	ND	ND/ND	ND	ND	ND	ND/ND
VOLATILE NONPRIORITY POLLUTANTS:[1]						
Acetone	ND	ND/ND	ND	ND	ND	ND/ND
2 Butanone	ND	ND/ND	ND	ND	ND	ND/ND
Carbon disulfide	ND	ND/ND	ND	ND	ND	ND/ND
2-Hexanone	ND	ND/ND	ND	ND	ND	ND/ND
4-Methyl-2-pentanone	ND	ND/ND	ND	ND	ND	ND/ND
Styrene	ND	ND/ND	ND	ND	ND	ND/ND
Vinyl acetate	ND	ND/ND	ND	ND	ND	ND/ND
o-Xylene	ND	ND/ND	ND	ND	ND	ND/ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	T-3DH W	T-3SH W	T-4DH W	T-4SH W	T-6H W	T-7H W
<u>BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:</u>(1)						
Acenaphthene	ND	ND	ND/ND	ND	ND	ND
Acenaphthylene	ND	ND	ND/ND	ND	ND	ND
Anthracene	ND	<10	ND/ND	ND	ND	ND
Benzidine	ND	ND	ND/ND	ND	ND	ND
Benzo(a)anthracene	ND	ND	ND/ND	ND	ND	ND
Benzo(a)pyrene	ND	ND	ND/ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND/ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND/ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND/ND	ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND	ND/ND	ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND	ND/ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND/ND	ND	ND	ND
Bis(chloromethyl)ether(5)	ND	ND	ND/ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND/<10	ND	190	ND
4-Bromophenyl phenyl ether	ND	ND	ND/ND	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND/ND	ND	<10	ND
2-Chloronaphthalene	ND	ND	ND/ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND/ND	ND	ND	ND
Chrysene	ND	ND	ND/ND	ND	ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND/ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND/ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND/ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND/ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND/ND	ND	ND	ND
Diethyl phthalate	ND	ND	ND/ND	ND	ND	ND
Dimethyl phthalate	ND	ND	ND/ND	ND	ND	ND
Di-n-butyl phthalate	ND	<10	ND/ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND/ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND/ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND/ND	ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND	ND	ND/ND	ND	ND	ND
Fluoranthene	ND	ND	ND/ND	<10	ND	ND
Fluorene	ND	ND	ND/ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND/ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND/ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND/ND	ND	ND	ND
Hexachloroethane	ND	ND	ND/ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND/ND	ND	ND	ND
Isophorone	ND	ND	ND/ND	ND	ND	ND
Naphthalene	ND	ND	ND/ND	ND	ND	ND
Nitrobenzene	ND	ND	ND/ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND/ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND/ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND	ND	ND/ND	ND	ND	ND
Phenanthrene	ND	<10	ND/ND	ND	ND	ND
Pyrene	ND	ND	ND/ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND/ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND/ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	T-3DH W	T-3SH W	T-4DH W	T-4SH W	T-6H W	T-7H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND	ND	ND/ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND/ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND/ND	ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND/ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND/ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND/ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND/ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND/ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND/ND	ND	ND	ND
Phenol	ND	ND	ND/ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND/ND	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND	ND/ND	ND	ND	ND
Benzoic Acid	ND	ND	ND/ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND/ND	ND	ND	ND
4-Chloroaniline	ND	ND	ND/ND	ND	ND	ND
Dibenzofuran	ND	ND	ND/ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND/ND	ND	ND	ND
2-Methylphenol	ND	ND	ND/ND	ND	ND	ND
4-Methylphenol	ND	ND	ND/ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND/ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND/ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND/ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND/ND	ND	ND	ND
METALS(7)						
Aluminum	0.23/0.22	ND	0.20	ND	ND	ND/ND
Antimony	ND	ND	ND	ND	ND	ND
Arsenic	0.070	0.070	0.024	ND	ND	ND
Barium	0.55	0.98	0.28	0.11	0.13	0.10
Beryllium	ND	ND	ND	ND	ND	ND/ND
Boron	ND	ND	ND/ND	ND	ND	ND
Cadmium	ND	ND	ND	ND	ND	ND
Chromium	ND/ND	ND	0.001/ND	ND/ND	ND	0.001/ND
Cobalt	ND	ND	ND	ND	ND	ND
Copper	ND/0.01	ND	0.02	0.02	ND	ND/ND
Iron	13	47	9.8	9.9	3.4	2.4
Lead	ND	ND	ND	ND	ND	ND
Manganese	0.35	0.10	12	10	6.9	2.0/2.0
Mercury	0.0004	0.0008	ND	ND	ND	ND
Nickel	0.08	ND	0.08	ND	0.12	ND
Selenium	ND	ND	ND	ND	ND	0.001/ND
Silver	ND	ND	ND	ND	ND	ND
Thallium	ND	ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND	ND	ND
Vanadium	ND	ND	0.12	0.11	ND	ND
Zinc	0.19	0.82	0.92	0.48/0.49	0.05	0.13

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	T-9H W	T-11H W	TPPW-1H W	TPPW-1I W	TPPW-1J W	TPPW-2H W
VOLATILE PRIORITY POLLUTANTS:(1)						
Acrolein	ND	ND/ND	ND	ND	ND	ND
Acrylonitrile	ND	ND/ND	ND	ND	ND	ND
Benzene	1400	190/180	<10	<10	<10	ND
Bromoform	ND	ND/ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND/ND	ND	ND	ND	ND
Chlorobenzene	ND	ND/ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND/ND	ND	ND	ND	ND
Chloroethane	ND	ND/ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND/ND	ND	ND	ND	ND
Chloroform	ND	ND/ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND/ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND/ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND/ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND/ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND/ND	ND	ND	ND	ND
1,3-Dichloropropylene(2)	ND	ND/ND	ND	ND	ND	ND
Ethylbenzene	35	ND/ND	<10	14	18	ND
Methyl bromide	ND	ND/ND	ND	ND	ND	ND
Methyl chloride	ND	ND/ND	ND	ND	ND	ND
Methylene chloride	ND	20/21	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND/ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND/ND	ND	ND	ND	ND
Toluene	ND	ND/ND	<10	<10	13	ND
trans-1,2-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND/ND	<10	ND	ND	ND
1,1,2-Trichloroethane	ND	ND/ND	ND	ND	ND	ND
Trichloroethylene	ND	ND/ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND/ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND/ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:(1)						
Acetone	ND	ND/ND	ND	ND	ND	ND
2 Butanone	ND	ND/ND	ND	ND	ND	ND
Carbon disulfide	ND	ND/ND	ND	ND	ND	ND
2-Hexanone	ND	ND/ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND/ND	ND	ND	ND	ND
Styrene	ND	ND/ND	ND	ND	ND	ND
Vinyl acetate	ND	ND/ND	ND	ND	ND	ND
o-Xylene	<10	ND/ND	ND	<10	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	T-9H W	T-11H W	TPPW-1H W	TPPW-1I W	TPPW-1J W	TPPW-2H W
<u>BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:</u>(1)						
Acenaphthene	ND	ND	880	400	2300	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	<10	ND	≤250	≤320	≤3000	ND
Benzidine	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND	<10	ND	ND	≤200	ND
Benzo(a)pyrene	ND	ND	ND	ND	47	ND
3,4-Benzofluoranthene	ND	ND	ND	ND	≤38	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	≤38	ND
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	230	31	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND
Bis(chloromethyl)ether(5)	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	<10	ND	770	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	<10	ND	ND	ND	ND	<10
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Chrysene	ND	<10	ND	ND	≤200	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND	ND	ND	ND
Diethyl phthalate	ND	ND	ND	ND	31	ND
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND	ND	ND	160	ND	ND
Fluoranthene	<10	ND	100	ND	1500	ND
Fluorene	ND	ND	470	260	890	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	720	410	3400	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND	ND	ND	ND	ND	ND
Phenanthrene	<10	ND	≤250	≤320	≤3000	ND
Pyrene	ND	ND	ND	ND	100	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	T-9H W	T-11H W	TPPW-1H W	TPPW-1I W	TPPW-1J W	TPPW-2H W
<u>ACID EXTRACTABLE PRIORITY POLLUTANTS:</u>(1)						
2-Chlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	56	190	480	ND
4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND
Phenol	<25	ND	<25	41	59	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND
<u>ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:</u>(1)						
Aniline	ND	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	38	50	260	ND
4-Chloroaniline	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	530	330	1100	ND
2-Methylnaphthalene	ND	ND	170	350	810	ND
2-Methylphenol	67	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND
<u>METALS</u>(7)						
Aluminum	1.7	-	-	-	-	-
Antimony	0.003	-	-	-	-	-
Arsenic	0.070	-	-	-	-	-
Barium	0.25	-	-	-	-	-
Beryllium	0.001	-	-	-	-	-
Boron	ND	-	-	-	-	-
Cadmium	0.001	-	-	-	-	-
Chromium	0.021/0.022	-	-	-	-	-
Cobalt	ND	-	-	-	-	-
Copper	0.20	-	-	-	-	-
Iron	16	-	-	-	-	-
Lead	0.05	-	-	-	-	-
Manganese	0.31	-	-	-	-	-
Mercury	ND/ND	-	-	-	-	-
Nickel	0.08	-	-	-	-	-
Selenium	0.018	-	-	-	-	-
Silver	ND	-	-	-	-	-
Thallium	ND	-	-	-	-	-
Tin	ND	-	-	-	-	-
Vanadium	0.11	-	-	-	-	-
Zinc	0.22	-	-	-	-	-

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-1H W	MW-1I W	MW-1J W	MW-2H W	MW-2I W	MW-2J W
VOLATILE PRIORITY POLLUTANTS:(1)						
Acrolein	ND/ND	ND	ND	ND	ND	ND
Acrylonitrile	ND/ND	ND	ND	ND	ND	ND
Benzene	ND/<10	ND	<10	470	750	620
Bromoform	ND/ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND/ND	ND	ND	ND	ND	ND
Chlorobenzene	ND/ND	ND	ND	ND	<10	<10
Chlorodibromomethane	ND/ND	ND	ND	ND	ND	ND
Chloroethane	ND/ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND/ND	ND	ND	ND	ND	ND
Chloroform	ND/ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND/ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND/ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND/ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND/ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND/ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND/ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene(2)	ND/ND	ND	ND	ND	ND	ND
Ethylbenzene	<10/<10	ND	52	440	1000	650
Methyl bromide	ND/ND	ND	ND	ND	ND	ND
Methyl chloride	ND/ND	ND	ND	ND	ND	ND
Methylene chloride	ND/ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND/ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND/ND	ND	ND	ND	ND	ND
Toluene	<10/<10	ND	21	1400	2800	3500
trans-1,2-Dichloroethylene	ND/ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND/ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND/ND	ND	ND	ND	ND	ND
Trichloroethylene	ND/ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND/ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND/ND	ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:(1)						
Acetone	ND/ND	ND	ND	ND	ND	ND
2 Butanone	ND/ND	ND	ND	ND	ND	ND
Carbon disulfide	ND/ND	ND	ND	<10	ND	ND
2-Hexanone	ND/ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND/ND	ND	ND	ND	ND	ND
Styrene	ND/ND	ND	<10	480	1000	880
Vinyl acetate	ND/ND	ND	ND	ND	ND	ND
o-Xylene	ND/ND	ND	58	990	3200	1400

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-1H W	MW-1I W	MW-1J W (2)	MW-2H W	MW-2I W	MW-2J W
<u>BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:</u> (1)						
Acenaphthene	ND	<10	340	560	470	970
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	<10	≤230	≤250	≤500	≤1400
Benzidine	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND	ND	ND	ND	≤14	≤240
Benzo(a)pyrene	ND	ND	ND	ND	ND	610
3,4-Benzofluoranthene	ND	ND	ND	ND	ND	≤130
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	35
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	≤130
Bis(2-chloroethoxy)methane	ND	ND	ND	120	180	ND
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND
Bis(chloromethyl)ether (5)	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Chrysene	ND	ND	ND	ND	≤14	≤240
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND	ND	ND	ND
Diethyl phthalate	ND	ND	ND	ND	ND	<10
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	<10	<10	ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene) (6)	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	12	98	640
Fluorene	ND	ND	170	160	220	310
Hexachlorobenzene	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	26
Isophorone	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	1700	12,400	12,000	10,000
Nitrobenzene	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine) (6)	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	<10	≤230	≤250	≤500	≤1400
Pyrene	ND	ND	24	ND	18	320
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE 2.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-1H W	MW-1I W	MW-1J W	MW-2H W	MW-2I W	MW-2J W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	110	390
4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND	ND	<25	ND
Phenol	ND	ND	ND	ND	ND	<25
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND	ND	120	ND
4-Chloroaniline	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	130	230	250	460
2-Methylnaphthalene	ND	ND	340	880	830	910
2-Methylphenol	ND	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND	ND	ND
3-Nitroaniline	ND	ND	440	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND
METALS(7)						
Aluminum	ND	0.23	0.24	ND	0.40	0.27
Antimony	ND	ND/ND	ND	ND	ND	ND
Arsenic	0.024	0.024	0.024	ND	0.024	0.012
Barium	0.21	0.38	0.24	0.26	0.59	0.46
Beryllium	ND	ND	ND	ND	ND	ND
Boron	ND	ND	ND	ND	ND	ND
Cadmium	ND	ND	0.001	0.001	ND	0.001
Chromium	ND/ND	ND	0.001	ND	0.001	0.001
Cobalt	ND	ND	ND	ND	ND	ND
Copper	ND	0.04	ND	ND	ND	ND
Iron	27	28	27	7.5	13	0.06
Lead	ND	ND	ND	ND	ND	ND
Manganese	22	24	22	15	4.5	15
Mercury	ND	ND	ND	ND	ND	0.0003
Nickel	0.08	ND	ND	ND	ND	ND
Selenium	ND	ND	0.001	ND	ND	0.001
Silver	ND	ND	ND	ND	ND	ND
Thallium	ND	ND/ND	ND	ND	ND	ND
Tin	ND	ND	ND	ND/ND	ND	ND
Vanadium	0.14/0.16	ND	ND	0.11	0.31	ND
Zinc	0.09	0.06	0.55	0.01	0.06	0.09

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-3H W	MW-3I W	MW-4H W	MW-4I W	MW-5H W	MW-6H W
VOLATILE PRIORITY POLLUTANTS:(1)						
Acrolein	ND	ND/ND	ND	ND	ND	ND
Acrylonitrile	ND	ND/ND	ND	ND	ND	ND
Benzene	ND	<10/<10	ND	ND	ND	ND
Bromoform	ND	ND/ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND/ND	ND	ND	ND	ND
Chlorobenzene	ND	ND/ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND/ND	ND	ND	ND	ND
Chloroethane	ND	ND/ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND/ND	ND	ND	ND	ND
Chloroform	ND	ND/ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND/ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND/ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND/ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND/ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND/ND	ND	ND	ND	ND
1,3-Dichloropropylene(2)	ND	ND/ND	ND	ND	ND	ND
Ethylbenzene	<10	<10/<10	ND	ND	ND	ND
Methyl bromide	ND	ND/ND	ND	ND	ND	ND
Methyl chloride	ND	ND/ND	ND	ND	ND	ND
Methylene chloride	ND	ND/ND	<10	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND/ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND/ND	ND	ND	ND	ND
Toluene	ND	ND/ND	ND	ND	<10	ND
trans-1,2-Dichloroethylene	ND	ND/ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND/ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND/ND	ND	ND	ND	ND
Trichloroethylene	ND	ND/ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND/ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND/ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:(1)						
Acetone	ND	ND/ND	ND	ND	ND	ND
2 Butanone	ND	ND/ND	ND	ND	ND	ND
Carbon disulfide	ND	ND/ND	ND	ND	ND	ND
2-Hexanone	ND	ND/ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND/ND	ND	ND	ND	ND
Styrene	ND	ND/ND	ND	ND	ND	ND
Vinyl acetate	ND	ND/ND	ND	ND	ND	ND
o-Xylene	ND	ND/ND	ND	ND	<10	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-3H W	MW-3I W	MW-4H W	MW-4I W	MW-5H W	MW-6H W
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)						
Acenaphthene	ND/ND	ND	<10	ND	ND	ND
Acenaphthylene	ND/ND	ND	ND	ND	ND	ND
Anthracene	ND/ND	ND	ND	ND	ND	ND
Benzidine	ND/ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	ND/ND	ND	ND	ND	≤11	ND
Benzo(a)pyrene	ND/ND	ND	ND	ND	ND	ND
3,4-Benzofluoranthene	ND/ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND/ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND/ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	ND/ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	ND/ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND/ND	ND	ND	ND	ND	ND
Bis(chloromethyl)ether(5)	ND/ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND/15	18	ND	ND	ND	ND
4-Bromophenyl phenyl ether	ND/ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	ND/11	ND	ND	ND	ND	ND
2-Chloronaphthalene	ND/ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND/ND	ND	ND	ND	ND	ND
Chrysene	ND/ND	ND	ND	ND	≤11	ND
Dibenzo(a,h)anthracene	ND/ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND/ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND/ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND/ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND/ND	ND	ND	ND	ND	ND
Diethyl phthalate	ND/ND	ND	ND	ND	ND	ND
Dimethyl phthalate	ND/ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND/ND	ND	ND	ND	<10	<10
2,4-Dinitrotoluene	ND/ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND/ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND/ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND/ND	ND	ND	ND	ND	ND
Fluoranthene	ND/ND	ND	ND	ND	ND	ND
Fluorene	ND/ND	ND	<10	<10	ND	ND
Hexachlorobenzene	ND/ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND/ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND/ND	ND	ND	ND	ND	ND
Hexachloroethane	ND/ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND/ND	ND	ND	ND	ND	ND
Isophorone	ND/ND	ND	ND	ND	ND	ND
Naphthalene	ND/ND	ND	ND	ND	ND	ND
Nitrobenzene	ND/ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	ND/ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND/ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND/ND	ND	ND	ND	ND	ND
Phenanthrene	ND/ND	ND	ND	ND	ND	ND
Pyrene	ND/ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND/ND	ND	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND/ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.9

RESULTS OF ANALYSES FOR PYRIDINE AND QUINOLINE GROUND WATER SAMPLES

SAMPLE IDENTIFICATION	PARAMETER	
	PYRIDINE	QUINOLINE
T-1H-W	ND[1]	ND
T-2H-W	ND	ND
T-3SH-W	ND	ND
T-3DH-W	ND	ND
T-4SH-W	ND	ND
T-4DH-W	ND	ND
T-6H-W	ND	ND
T-7H-W	ND	ND
T-9H-W	ND	ND
C-9H-W	ND	ND
MW-1H-W	ND	ND
MW-1I-W	ND	ND
MW-1J-W	ND	ND
MW-2H-W	ND	ND
MW-2I-W	ND	ND
MW-2J-W	ND	ND
MW-3H-W	ND	ND
MW-3I-W	ND	ND
MW-9H-W	ND	ND
MW-9I-W	ND	ND
MW-12H-W	ND	ND
MW-12I-W	ND	ND
MW-12J-W	ND	ND
MW-14H-W	ND	ND
MW-14I-W	ND	ND
MW-14J-W	ND	ND

[1] ND indicates that the compound was not detected.

TABLE E.7
(Continued)

FOOTNOTES

(1) Concentration in μg/l or parts per billion.

(2) The indicated compound is incorrectly identified in Part C of NPDES Form 2C as 1,2-dichloropropylene. However, the sample was screened for the presence of both compounds.

(3) ND indicates that the corresponding parameter was not detected.

(4) "<" indicates that the corresponding compound was detected but its concentration was less than the value indicated.

(5) Decomposes rapidly in water.

(6) Detected as compound in parentheses.

(7) Concentration in mg/l or parts per million.

(8) Sample not analyzed for metals.

(9) ≤ - compound was found at a concentration equal to or less than the indicated value. Compounds are reported as "less than or equal to" the indicated concentration because some compounds exhibit the same mass spectra and retention time and therefore cannot be resolved.

(10) The indicated sample was analyzed in duplicate.

TABLE E.8

RESULTS OF CHEMICAL ANALYSES
POLYCHLORINATED BIPHENYLS
GROUND WATER SAMPLES

SAMPLE IDENTIFICATION	POLYCHLORINATED BIPHENYLS[1] mg/ℓ[2]	SOURCE AROCLOR[3]
C-1H-W	ND[4]	-
C-2H-W	ND	-
C-3H-W	ND	-
C-4H-W	ND	-
C-5H-W	ND	-
C-6H-W	ND	-
C-7H-W	ND	-
C-8H-W	ND	-
C-9H-W	IS[5]	-
C-10H-W	ND	-
C-12H-W	ND	-
C-13H-W	ND	-
CPPW-3H-W	ND	-
CPPW-4H-W	ND	-
CPPW-5H-W	ND	-
CPPW-6H-W	ND	-
MW-1H-W	ND	-
MW-1I-W	ND	-
MW-1J-W	ND	-
MW-2H-W	ND/ND[6]	-
MW-2I-W	ND/ND	-
MW-2J-W	ND	-
MW-3H-W	ND	-
MW-3I-W	ND	-
MW-4H-W	ND/ND	-
MW-4I-W	ND/ND	-
MW-5H-W	ND	-
MW-6H-W	ND	-
MW-7H-W	ND	-
MW-8H-W	ND	-
MW-9H-W	ND	-
MW-9I-W	ND	-
MW-10H-W	ND	-
MW-11H-W	ND	-
MW-11I-W	ND	-
MW-12H-W	ND	-
MW-12I-W	ND	-
MW-12J-W	ND/ND	-
MW-13H-W	ND	-

TABLE E.8
(Continued)

SAMPLE IDENTIFICATION	POLYCHLORINATED BIPHENYLS[1] mg/ℓ[2]	SOURCE AROCLOR[3]
MW-14H-W	ND	-
MW-14I-W	ND	-
MW-14J-W	ND	-
MW-15H-W	ND	-
MW-15I-W	ND	-
MW-16H-W	ND	-
MW-17H-W	ND	-
MW-18H-W	ND	-
MW-18I-W	ND	-
MW-18J-W	ND	-
PUMP #1	ND	-
T-1H-W	ND/ND	-
T-2H-W	ND	-
T-3DH-W	ND	-
T-3SH-W	ND	-
T-4DH-W	ND	-
T-4SH-W	ND	-
T-6H-W	ND/ND	-
T-7H-W	ND/ND	-
T-9H-W	ND	-
T-11H-W	ND	-
TPPW-1H-W	ND	-
TPPW-1I-W	ND	-
TPPW-1J-W	ND	-
TPPW-2H-W	ND	-

(1)Method blanks were consistently <0.001 milligram per liter or part per million polychlorinated biphenyl.

(2)Reported values were not corrected for percent recovery, mg/ℓ = milligrams per liter or parts per million.

(3)All samples were screened for Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260, to determine whether PCBs were present and which aroclor standards were required for instrument calibration. Specific aroclors are given where results are quantified.

(4)ND indicates that PCBs were not detected. Detection limit is <0.001 milligram per liter or part per million.

(5)Insufficient sample was available to determine the indicated parameter.

(6)Duplicate extractions and analyses were performed on the indicated samples as part of the laboratory Quality Control program.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-3H W	MW-3I W	MW-4H W	MW-4I W	MW-5H W	MW-6H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND/ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	ND/ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND/ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	ND/ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND/ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND/ND	ND	ND	ND	ND	ND
4-Nitrophenol	ND/ND	ND	ND	ND	ND	ND
p-Chloro-m-cresol	<25/<25	ND	ND	ND	ND	ND
Pentachlorophenol	ND/ND	ND	ND	ND	ND	ND
Phenol	ND/ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND/ND	ND	ND	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND/ND	ND	ND	ND	ND	ND
Benzoic Acid	ND/ND	ND	ND	ND	ND	ND
Benzyl Alcohol	ND/ND	ND	ND	ND	96	ND
4-Chloroaniline	ND/ND	ND	ND	ND	ND	ND
Dibenzofuran	ND/ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND/ND	ND	ND	ND	ND	ND
2-Methylphenol	ND/ND	ND	ND	ND	ND	ND
4-Methylphenol	ND/ND	ND	ND	ND	ND	ND
2-Nitroaniline	ND/ND	ND	ND	ND	ND	ND
3-Nitroaniline	ND/ND	ND	ND	ND	ND	ND
4-Nitroaniline	ND/ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND/ND	ND	ND	ND	ND	ND
METALS(7)						
Aluminum	0.30	ND	0.40/0.36	0.44	-	-
Antimony	ND	ND	ND	ND	-	-
Arsenic	ND	0.012	0.024	0.024	-	-
Barium	0.22/0.21	0.52	0.43	0.46	-	-
Beryllium	ND/ND	ND	ND	ND	-	-
Boron	ND/ND	ND	ND	ND	-	-
Cadmium	0.008	0.005	ND	ND/ND	-	-
Chromium	ND	0.001	ND	ND	-	-
Cobalt	ND/ND	ND	ND	ND	-	-
Copper	ND	ND	0.01/ND	ND	-	-
Iron	1.0	13	0.58	0.13	-	-
Lead	ND	ND	ND	ND	-	-
Manganese	12	4.4	4.9	5.5	-	-
Mercury	ND/ND	0.0011	0.0012	ND	-	-
Nickel	ND	ND	ND	ND	-	-
Selenium	0.001	0.001	0.001	0.001	-	-
Silver	ND	ND	ND	ND	-	-
Thallium	ND	ND	ND	ND	-	-
Tin	ND	ND	ND	ND	-	-
Vanadium	0.10	0.29	ND	ND	-	-
Zinc	0.04	0.03	0.01	0.02	-	-

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-7H W	MW-8H W	MW-9H W	MW-9I W	MW-10H W	MW-11H W
VOLATILE PRIORITY POLLUTANTS:(1)						
Acrolein	ND	ND	ND	ND/ND	ND	ND
Acrylonitrile	ND	ND	ND	ND/ND	ND	ND
Benzene	<10	ND	ND	ND/<10	ND	ND
Bromoform	ND	ND	ND	ND/ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND/ND	ND	ND
Chlorobenzene	<10	ND	ND	ND/ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND/ND	ND	ND
Chloroethane	ND	ND	ND	ND/ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND/ND	ND	ND
Chloroform	ND	ND	ND	ND/ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND/ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND/ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND/ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND/ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND/ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND/ND	ND	ND
1,3-Dichloropropylene(2)	ND	ND	ND	ND/ND	ND	ND
Ethylbenzene	ND	ND	ND	ND/ND	ND	ND
Methyl bromide	ND	ND	ND	ND/ND	ND	ND
Methyl chloride	ND	ND	ND	ND/ND	ND	ND
Methylene chloride	ND	<10	ND	<10/ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND/ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND/ND	ND	ND
Toluene	<10	ND	ND	ND/ND	ND	ND
trans-1,2-Dichloroethylene	ND	ND	ND	ND/ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND/ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND/ND	ND	ND
Trichloroethylene	ND	ND	ND	ND/ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND/ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND/ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:(1)						
Acetone	ND	ND	ND	ND/ND	ND	ND
2 Butanone	ND	ND	ND	ND/ND	ND	ND
Carbon disulfide	ND	ND	ND	ND/ND	ND	ND
2-Hexanone	ND	ND	ND	ND/ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND/ND	ND	ND
Styrene	ND	ND	ND	ND/ND	ND	ND
Vinyl acetate	ND	ND	ND	ND/ND	ND	ND
o-Xylene	27	ND	ND	ND/ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-7H W	MW-8H W	MW-9H W	MW-9I W	MW-10H W	MW-11H W
<u>BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:</u>[1]						
Acenaphthene	ND	ND	ND	ND	ND	ND
Acenaphthylene	ND	ND	ND	ND	ND	ND
Anthracene	ND	ND	ND	ND	ND	ND
Benzidine	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	≤12	≤12	ND	ND	<10	ND
Benzo(a)pyrene	ND	ND	ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND	ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND	ND	ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND	ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND	ND	ND	ND
Bis(chloromethyl)ether[5]	ND	ND	ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND	ND	ND	ND
Chrysene	≤12	≤12	ND	ND	<10	ND
Dibenzo(a,h)anthracene	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND	ND	ND	ND
Diethyl phthalate	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	<10	<10	ND	ND
2,4-Dinitrotoluene	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND	ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene)[6]	ND	ND	ND	ND	ND	ND
Fluoranthene	ND	ND	ND	ND	ND	ND
Fluorene	ND	ND	ND	ND	ND	ND
Hexachlorobenzene	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND	ND	ND	ND
Hexachloroethane	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND	ND	ND	ND
Isophorone	ND	ND	ND	ND	ND	ND
Naphthalene	ND	ND	ND	ND	ND	ND
Nitrobenzene	ND	ND	ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)[6]	ND	ND	ND	ND	ND	ND
Phenanthrene	ND	ND	ND	ND	ND	ND
Pyrene	ND	ND	11	<10	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-7H W	MW-8H W	MW-9H W	MW-9I W	MW-10H W	MW-11H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	<25	ND	ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND	ND	<25	ND
Pentachlorophenol	ND	ND	ND	ND	ND	ND
Phenol	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND	ND	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND	ND	ND	ND	ND
Benzoic Acid	ND	ND	ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND	ND	ND	ND
4-Chloroaniline	ND	ND	ND	ND	ND	ND
Dibenzofuran	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND
2-Methylphenol	ND	ND	ND	ND	ND	ND
4-Methylphenol	ND	ND	ND	ND	ND	ND
2-Nitroaniline	ND	ND	ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND	ND	ND	ND
METALS(7)						
Aluminum	-	-	-	-	-	-
Antimony	-	-	-	-	-	-
Arsenic	-	-	-	-	-	-
Barium	-	-	-	-	-	-
Beryllium	-	-	-	-	-	-
Boron	-	-	-	-	-	-
Cadmium	-	-	-	-	-	-
Chromium	-	-	-	-	-	-
Cobalt	-	-	-	-	-	-
Copper	-	-	-	-	-	-
Iron	-	-	-	-	-	-
Lead	-	-	-	-	-	-
Manganese	-	-	-	-	-	-
Mercury	-	-	-	-	-	-
Nickel	-	-	-	-	-	-
Selenium	-	-	-	-	-	-
Silver	-	-	-	-	-	-
Thallium	-	-	-	-	-	-
Tin	-	-	-	-	-	-
Vanadium	-	-	-	-	-	-
Zinc	-	-	-	-	-	-

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-11I W	MW-12H W	MW-12I W	MW-12J W	MW-13H W	MW-14H W
VOLATILE PRIORITY POLLUTANTS:[1]						
Acrolein	ND	ND	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND	ND	ND
Benzene	ND	3700	4400	5600	260	ND
Bromoform	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	<10	<10	<10	<10	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	<10	<10	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	42	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene[2]	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	780	660	890	ND	ND
Methyl bromide	ND	ND	ND	ND	ND	ND
Methyl chloride	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	ND
Toluene	ND	24	470	1000	67	ND
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	<10	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:[1]						
Acetone	ND	ND	ND	ND	ND	ND
2 Butanone	ND	ND	ND	ND	ND	ND
Carbon disulfide	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	180	450	ND	ND
Styrene	ND	20	34	110	ND	ND
Vinyl acetate	ND	ND	ND	ND	ND	ND
o-Xylene	ND	370	410	1800	350	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-11I W	MW-12H W	MW-12I W	MW-12J W	MW-13H W	MW-14H W
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)						
Acenaphthene	ND	120	650/550	480	ND	ND
Acenaphthylene	ND	ND	ND/ND	ND	ND	ND
Anthracene	ND	≤35	≤69/≤83	≤240	ND	ND
Benzidine	ND	ND	ND/ND	ND	ND	ND
Benzo(a)anthracene	ND	ND	ND/ND	<10	ND	ND
Benzo(a)pyrene	ND	ND	ND/ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND	ND/ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND	ND/ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND	ND/ND	ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND	ND/ND	ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND	ND/ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND/ND	ND	ND	ND
Bis(chloromethyl)ether(5)	ND	ND	ND/ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	83	ND	ND/ND	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND	ND/ND	ND	ND	ND
Butyl benzyl phthalate	ND	ND	ND/ND	ND	ND	ND
2-Chloronaphthalene	ND	ND	ND/ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND/ND	ND	ND	ND
Chrysene	ND	ND	ND/ND	<10	ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND/ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND	ND/ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND	ND/ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND	ND/ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND/ND	ND	ND	ND
Diethyl phthalate	ND	ND	ND/ND	ND	ND	ND
Dimethyl phthalate	ND	ND	ND/ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND	ND/ND	<10	ND	ND
2,4-Dinitrotoluene	ND	ND	ND/ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND	ND/ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND	ND/ND	ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND	ND	ND/ND	ND	ND	ND
Fluoranthene	ND	ND	<10/ND	12	ND	ND
Fluorene	ND	<10	27/41	98	ND	ND
Hexachlorobenzene	ND	ND	ND/ND	ND	ND	ND
Hexachlorobutadiene	ND	ND	ND/ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND	ND/ND	ND	ND	ND
Hexachloroethane	ND	ND	ND/ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND/ND	ND	ND	ND
Isophorone	ND	ND	ND/ND	ND	ND	ND
Naphthalene	ND	3600	7500/7400	12,000	ND	ND
Nitrobenzene	ND	ND	ND/ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND	ND/ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND/ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND	ND	ND/ND	ND	ND	ND
Phenanthrene	ND	≤35	≤69/≤83	≤240	ND	ND
Pyrene	ND	ND	ND/<10	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND/ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND/ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION			
	MW-18H W	MW-18I W	MW-18J W	PUMP NO. 1
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)				
Acenaphthene	ND	ND/ND	<10	21
Acenaphthylene	ND	ND/ND	ND	ND
Anthracene	ND	ND/ND	ND	≤12
Benzidine	ND	ND/ND	ND	ND
Benzo(a)anthracene	ND	ND/ND	ND	ND
Benzo(a)pyrene	ND	ND/ND	ND	ND
3,4-Benzofluoranthene	ND	ND/ND	ND	ND
Benzo(g,h,i)perylene	ND	ND/ND	ND	ND
Benzo(k)fluoranthene	ND	ND/ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND/ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND/ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND/ND	ND	ND
Bis(chloromethyl)ether(5)	ND	ND/ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	30/ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND/ND	ND	ND
Butyl benzyl phthalate	<10	ND/<10	ND	ND
2-Chloronaphthalene	ND	ND/ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND/ND	ND	ND
Chrysene	ND	ND/ND	ND	ND
Dibenzo(a,h)anthracene	ND	ND/ND	ND	ND
1,2-Dichlorobenzene	ND	ND/ND	ND	ND
1,3-Dichlorobenzene	ND	ND/ND	ND	ND
1,4-Dichlorobenzene	ND	ND/ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND/ND	ND	ND
Diethyl phthalate	ND	ND/ND	ND	ND
Dimethyl phthalate	ND	ND/ND	ND	ND
Di-n-butyl phthalate	ND	ND/ND	ND	ND
2,4-Dinitrotoluene	ND	ND/ND	ND	ND
2,6-Dinitrotoluene	ND	ND/ND	ND	ND
Di-n-octyl phthalate	ND	<10/ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND	ND/ND	ND	ND
Fluoranthene	ND	ND/ND	ND	<10
Fluorene	ND	ND/ND	ND	<10
Hexachlorobenzene	ND	ND/ND	ND	ND
Hexachlorobutadiene	ND	ND/ND	ND	ND
Hexachlorocyclopentadiene	ND	ND/ND	ND	ND
Hexachloroethane	ND	ND/ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND/ND	ND	ND
Isophorone	ND	ND/ND	ND	ND
Naphthalene	ND	ND/ND	ND	ND
Nitrobenzene	ND	ND/ND	ND	ND
N-Nitrosodimethylamine	ND	ND/ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND/ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND	ND/ND	ND	ND
Phenanthrene	ND	ND/ND	ND	≤12
Pyrene	ND	ND/ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND/ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND/ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION			
	MW-18H W	MW-18I W	MW-18J W	PUMP NO. 1
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)				
2-Chlorophenol	ND	ND/ND	ND	ND
2,4-Dichlorophenol	ND	ND/ND	ND	ND
2,4-Dimethylphenol	ND	ND/ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND/ND	ND	ND
2,4-Dinitrophenol	ND	ND/ND	ND	ND
2-Nitrophenol	ND	ND/ND	ND	ND
4-Nitrophenol	ND	ND/<25	ND	ND
p-Chloro-m-cresol	ND	ND/ND	ND	ND
Pentachlorophenol	ND	ND/ND	ND	ND
Phenol	ND	ND/ND	ND	ND
2,4,6-Trichlorophenol	ND	ND/ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)				
Aniline	ND	ND/ND	ND	ND
Benzoic Acid	ND	ND/ND	ND	ND
Benzyl Alcohol	ND	ND/ND	ND	ND
4-Chloroaniline	ND	ND/ND	ND	ND
Dibenzofuran	ND	ND/ND	ND	ND
2-Methylnaphthalene	ND	ND/ND	ND	ND
2-Methylphenol	ND	ND/ND	ND	ND
4-Methylphenol	ND	ND/ND	ND	ND
2-Nitroaniline	ND	ND/ND	ND	ND
3-Nitroaniline	ND	ND/ND	ND	ND
4-Nitroaniline	ND	ND/ND	ND	ND
2,4,5-Trichlorophenol	ND	ND/ND	ND	ND
METALS(7)	-	-	-	-
Aluminum	-	-	-	-
Antimony	-	-	-	-
Arsenic	-	-	-	-
Barium	-	-	-	-
Beryllium	-	-	-	-
Boron	-	-	-	-
Cadmium	-	-	-	-
Chromium	-	-	-	-
Cobalt	-	-	-	-
Copper	-	-	-	-
Iron	-	-	-	-
Lead	-	-	-	-
Manganese	-	-	-	-
Mercury	-	-	-	-
Nickel	-	-	-	-
Selenium	-	-	-	-
Silver	-	-	-	-
Thallium	-	-	-	-
Tin	-	-	-	-
Vanadium	-	-	-	-
Zinc	-	-	-	-

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-11I W	MW-12H W	MW-12I W	MW-12J W	MW-13H W	MW-14H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND	ND	ND/ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND	ND/ND	ND	<25	ND
2,4-Dimethylphenol	ND	1700	4100/3200	690	ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND/ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND	ND/ND	ND	ND	ND
2-Nitrophenol	ND	ND	ND/ND	ND	ND	ND
4-Nitrophenol	ND	ND	ND/ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND	ND/ND	ND	ND	ND
Pentachlorophenol	ND	ND	ND/ND	ND	ND	ND
Phenol	ND	ND	ND/ND	ND	<25	ND
2,4,6-Trichlorophenol	ND	ND	ND/ND	ND	<25	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND	ND/ND	ND	ND	ND
Benzoic Acid	ND	ND	ND/ND	ND	ND	ND
Benzyl Alcohol	ND	ND	ND/ND	ND	ND	ND
4-Chloroaniline	ND	ND	ND/ND	ND	ND	ND
Dibenzofuran	ND	15	90/71	230	ND	ND
2-Methylnaphthalene	ND	180	690/430	550	ND	ND
2-Methylphenol	ND	ND	ND/ND	ND	ND	ND
4-Methylphenol	ND	ND	7200/5800	39,000	ND	ND
2-Nitroaniline	ND	ND	ND/ND	ND	ND	ND
3-Nitroaniline	ND	ND	ND/ND	ND	ND	ND
4-Nitroaniline	ND	ND	ND/ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND	ND/ND	ND	ND	ND
METALS(7)						
Aluminum	-	0.40	0.30	0.20	-	0.24
Antimony	-	ND	ND	ND	-	ND
Arsenic	-	0.047	0.059	0.047	-	ND
Barium	-	1.7	1.8	1.5	-	0.40
Beryllium	-	ND	ND	ND	-	ND
Boron	-	ND	ND	ND	-	ND
Cadmium	-	ND	ND	ND	-	0.001
Chromium	-	0.001	ND	ND	-	ND
Cobalt	-	ND	ND	ND	-	ND
Copper	-	0.01	ND	0.01	-	0.33
Iron	-	45/45	48	37	-	0.07
Lead	-	ND	ND	ND	-	ND
Manganese	-	5.8	3.0	5.6	-	1.9
Mercury	-	0.0002	ND	ND	-	ND
Nickel	-	ND	ND	ND	-	ND
Selenium	-	ND	ND	ND	-	0.022
Silver	-	ND	ND	ND	-	ND
Thallium	-	ND	ND	ND	-	ND
Tin	-	ND	ND	ND	-	ND
Vanadium	-	ND/ND	ND	0.10	-	ND
Zinc	-	0.03/0.03	0.05	0.10	-	1.4

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-14I W	MW-14J W	MW-15H W	MW-15I W	MW-16H W	MW-17H W
VOLATILE PRIORITY POLLUTANTS:[1]						
Acrolein	ND	ND	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND	ND	ND
Benzene	ND	ND	ND	ND	ND	ND
Bromoform	ND	ND	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	ND	ND	ND
Chloroethane	ND	ND	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND	ND	ND
Chloroform	ND	ND	ND	ND	ND	ND
Dichlorobromomethane	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND	ND	ND
1,3-Dichloropropylene[2]	ND	ND	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND	ND	ND
Methyl bromide	ND	ND	ND	ND	ND	ND
Methyl chloride	ND	ND	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND	ND	ND
Toluene	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethylene	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:[1]						
Acetone	ND	ND	ND	ND	ND	ND
2 Butanone	ND	ND	ND	ND	ND	ND
Carbon disulfide	ND	ND	ND	ND	ND	ND
2-Hexanone	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND	ND	ND
Styrene	ND	ND	ND	ND	ND	ND
Vinyl acetate	ND	ND	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-14I W	MW-14J W	MW-15H W	MW-15I W	MW-16H W	MW-17H W
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)						
Acenaphthene	ND	ND/ND	ND/ND	ND	ND	ND
Acenaphthylene	ND	ND/ND	ND/ND	ND	ND	ND
Anthracene	ND	ND/ND	ND/ND	ND	ND	ND
Benzidine	ND	ND/ND	ND/ND	ND	ND	ND
Benzo(a)anthracene	ND	ND/ND	ND/ND	<10	ND	ND
Benzo(a)pyrene	ND	ND/ND	ND/ND	ND	ND	ND
3,4-Benzofluoranthene	ND	ND/ND	ND/ND	ND	ND	ND
Benzo(g,h,i)perylene	ND	ND/ND	ND/ND	ND	ND	ND
Benzo(k)fluoranthene	ND	ND/ND	ND/ND	ND	ND	ND
Bis(2-chloroethoxy)methane	ND	ND/ND	ND/ND	ND	ND	ND
Bis(2-chloroethyl)ether	ND	ND/ND	ND/ND	ND	ND	ND
Bis(2-chloroisopropyl)ether	ND	ND/ND	ND/ND	ND	ND	ND
Bis(chloromethyl)ether(5)	ND	ND/ND	ND/ND	ND	ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND/ND	ND/100	ND	ND	ND
4-Bromophenyl phenyl ether	ND	ND/ND	ND/ND	ND	ND	ND
Butyl benzyl phthalate	ND	ND/ND	ND/ND	ND	10	ND
2-Chloronaphthalene	ND	ND/ND	ND/ND	ND	ND	ND
4-Chlorophenyl phenyl ether	ND	ND/ND	ND/ND	ND	ND	ND
Chrysene	ND	ND/ND	ND/ND	<10	ND	ND
Dibenzo(a,h)anthracene	ND	ND/ND	ND/ND	ND	ND	ND
1,2-Dichlorobenzene	ND	ND/ND	ND/ND	ND	ND	ND
1,3-Dichlorobenzene	ND	ND/ND	ND/ND	ND	ND	ND
1,4-Dichlorobenzene	ND	ND/ND	ND/ND	ND	ND	ND
3,3'-Dichlorobenzidine	ND	ND/ND	ND/ND	ND	ND	ND
Diethyl phthalate	ND	ND/ND	ND/ND	ND	ND	ND
Dimethyl phthalate	ND	ND/ND	ND/ND	ND	ND	ND
Di-n-butyl phthalate	ND	ND/ND	ND/ND	ND	ND	ND
2,4-Dinitrotoluene	ND	ND/ND	ND/ND	ND	ND	ND
2,6-Dinitrotoluene	ND	ND/ND	ND/ND	ND	ND	ND
Di-n-octyl phthalate	ND	ND/ND	ND/ND	ND	ND	ND
1,2-Diphenylhydrazine (Azobenzene)(6)	ND	ND/ND	ND/ND	ND	ND	ND
Fluoranthene	ND	ND/ND	<10/ND	ND	ND	ND
Fluorene	ND	ND/ND	ND/ND	ND	ND	ND
Hexachlorobenzene	ND	ND/ND	ND/ND	ND	ND	ND
Hexachlorobutadiene	ND	ND/ND	ND/ND	ND	ND	ND
Hexachlorocyclopentadiene	ND	ND/ND	ND/ND	ND	ND	ND
Hexachloroethane	ND	ND/ND	ND/ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND/ND	ND/ND	ND	ND	ND
Isophorone	ND	ND/ND	ND/ND	ND	ND	ND
Naphthalene	ND	ND/ND	ND/ND	ND	ND	ND
Nitrobenzene	ND	ND/ND	ND/ND	ND	ND	ND
N-Nitrosodimethylamine	ND	ND/ND	ND/ND	ND	ND	ND
N-Nitrosodi-n-propylamine	ND	ND/ND	ND/ND	ND	ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(6)	ND	ND/ND	ND/ND	ND	ND	ND
Phenanthrene	ND	ND/ND	ND/ND	ND	ND	ND
Pyrene	ND	ND/ND	ND/ND	ND	ND	ND
1,2,4-Trichlorobenzene	ND	ND/ND	ND/ND	ND	ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND/ND	ND/ND	ND	ND	ND

See footnotes at end of table.

TABLE E.7
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	MW-14I W	MW-14J W	MW-15H W	MW-15I W	MW-16H W	MW-17H W
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)						
2-Chlorophenol	ND	ND/ND	ND/ND	ND	ND	ND
2,4-Dichlorophenol	ND	ND/ND	ND/ND	ND	ND	ND
2,4-Dimethylphenol	ND	ND/ND	ND/ND	ND	ND	ND
4,6-Dinitro-o-cresol	ND	ND/ND	ND/ND	ND	ND	ND
2,4-Dinitrophenol	ND	ND/ND	ND/ND	ND	ND	ND
2-Nitrophenol	ND	ND/ND	ND/ND	ND	ND	ND
4-Nitrophenol	ND	ND/ND	ND/ND	ND	ND	ND
p-Chloro-m-cresol	ND	ND/ND	ND/ND	ND	ND	ND
Pentachlorophenol	ND	ND/ND	ND/ND	ND	ND	ND
Phenol	ND	ND/ND	ND/ND	ND	ND	ND
2,4,6-Trichlorophenol	ND	ND/ND	ND/ND	ND	ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND/ND	ND/ND	ND	ND	ND
Benzoic Acid	ND	ND/ND	ND/ND	ND	ND	ND
Benzyl Alcohol	ND	ND/ND	ND/ND	ND	ND	ND
4-Chloroaniline	ND	ND/ND	ND/ND	ND	ND	ND
Dibenzofuran	ND	ND/ND	ND/ND	ND	ND	ND
2-Methylnaphthalene	ND	ND/ND	ND/ND	ND	ND	ND
2-Methylphenol	ND	ND/ND	ND/ND	ND	ND	ND
4-Methylphenol	ND	ND/ND	ND/ND	ND	ND	ND
2-Nitroaniline	ND	ND/ND	ND/ND	ND	ND	ND
3-Nitroaniline	ND	ND/ND	ND/ND	ND	ND	ND
4-Nitroaniline	ND	ND/ND	ND/ND	ND	ND	ND
2,4,5-Trichlorophenol	ND	ND/ND	ND/ND	ND	ND	ND
METALS(7)						
Aluminum	0.38	-	-	-	-	-
Antimony	ND	-	-	-	-	-
Arsenic	ND	-	-	-	-	-
Barium	0.22	-	-	-	-	-
Beryllium	ND	-	-	-	-	-
Boron	ND	-	-	-	-	-
Cadmium	ND	-	-	-	-	-
Chromium	ND	-	-	-	-	-
Cobalt	ND	-	-	-	-	-
Copper	0.01	-	-	-	-	-
Iron	0.05	-	-	-	-	-
Lead	ND	-	-	-	-	-
Manganese	3.4	-	-	-	-	-
Mercury	ND	-	-	-	-	-
Nickel	<0.05	-	-	-	-	-
Selenium	0.010	-	-	-	-	-
Silver	ND	-	-	-	-	-
Thallium	ND	-	-	-	-	-
Tin	ND	-	-	-	-	-
Vanadium	0.43	-	-	-	-	-
Zinc	0.07	-	-	-	-	-

TABLE E.7
(Continued)

PARAMETER	MW-18H W	MW-18I W	MW-18J W	PUMP No. 1
	SAMPLE IDENTIFICATION			
VOLATILE PRIORITY POLLUTANTS:(1)				
Acrolein	ND	ND	ND	ND
Acrylonitrile	ND	ND	ND	ND
Benzene	ND	ND	ND	<10
Bromoform	ND	ND	ND	ND
Carbon Tetrachloride	ND	ND	ND	ND
Chlorobenzene	ND	ND	ND	ND
Chlorodibromomethane	ND	ND	ND	<10
Chloroethane	ND	ND	ND	ND
2-Chloroethylvinyl ether	ND	ND	ND	ND
Chloroform	ND	ND	ND	<10
Dichlorobromomethane	ND	ND	ND	<10
Dichlorodifluoromethane	ND	ND	ND	ND
1,1-Dichloroethane	ND	ND	ND	ND
1,2-Dichloroethane	ND	ND	ND	ND
1,1-Dichloroethylene	ND	ND	ND	ND
1,2-Dichloropropane	ND	ND	ND	ND
1,3-Dichloropropylene(2)	ND	ND	ND	ND
Ethylbenzene	ND	ND	ND	ND
Methyl bromide	ND	ND	ND	ND
Methyl chloride	ND	ND	ND	ND
Methylene chloride	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND
Tetrachloroethylene	ND	ND	ND	ND
Toluene	ND	ND	ND	<10
trans-1,2-Dichloroethylene	ND	ND	ND	ND
1,1,1-Trichloroethane	ND	ND	<10	ND
1,1,2-Trichloroethane	ND	ND	ND	ND
Trichloroethylene	ND	ND	ND	ND
Trichlorofluoromethane	ND	ND	ND	ND
Vinyl Chloride	ND	ND	ND	ND
VOLATILE NONPRIORITY POLLUTANTS:(1)				
Acetone	ND	ND	ND	ND
2 Butanone	ND	ND	ND	ND
Carbon disulfide	ND	ND	ND	<10
2-Hexanone	ND	ND	ND	ND
4-Methyl-2-pentanone	ND	ND	ND	ND
Styrene	ND	ND	ND	ND
Vinyl acetate	ND	ND	ND	ND
o-Xylene	ND	ND	ND	ND

See footnotes at end of table.

TABLE E.10

RESULTS OF CHEMICAL ANALYSES
COAL GROVE GROUND WATER SAMPLES

SAMPLE IDENTIFICATION	SAMPLING DATE	PARAMETERS: AMMONIA mg/ℓ[1] NH_3-N	CHLORIDE mg/ℓ	TOTAL CYANIDE mg/ℓ	PHENOLICS mg/ℓ	BENZENE mg/ℓ
CG-3G	04/84	<0.05/<0.05[2,3]	30/30	<0.02/<0.02	0.022	<0.010
CG-4G	04/84	<0.05/<0.05	30/31	<0.02/<0.02	0.040	<0.010
CH-3H	05/84	0.16/0.18	8.3	<0.02	0.010/0.012	ND[4]
CG-4H	05/84	0.15	31/33	<0.02	<0.005	ND
C-13G	05/84	2.2	190	<0.02	0.010/0.012	ND/ND
CG-3I	06/84	0.08/0.08	71/71	ND/ND	0.010/0.006	ND/ND
CG-4I	06/84	0.08	32/32	ND	ND	ND
CG-3J	07/84	0.08/0.06	54/55	ND/ND	0.012/0.015	ND/ND
CG-4J	07/84	ND	31/31	ND	0.009/0.010	ND
CG-3K	08/84	ND/ND	77/76	ND/ND	ND/ND	ND/ND
CG-4K	08/84	ND/ND	25	ND	ND	ND
CG-3L	09/84	ND/ND	78/79	ND	ND	ND/ND
CG-4L	09/84	ND	35/35	ND/ND	0.009/0.008	ND

(1)mg/ℓ = milligrams per liter or parts per million.

(2)The indicated sample was analyzed in duplicate.

(3)"<" indicates that the corresponding parameter was detected, but its concentration was less than the value indicated.

(4)ND indicates that the corresponding parameter was not detected.

TABLE E.11

RESULTS OF CHEMICAL ANALYSIS
COAL GROVE - GROUND WATER SAMPLES

PARAMETER	CG-3H	CG-4H	C-13G	CG-3I	CG-4I
	SAMPLE IDENTIFICATION				
	MAY 1984			JUNE 1984	
VOLATILE PRIORITY POLLUTANTS:[1]					
Acrolein	ND[3]	ND	ND/ND[4]	ND/ND	ND
Acrylonitrile	ND	ND	ND/ND	ND/ND	ND
Benzene	ND	ND	ND/ND	ND/ND	ND
Bromoform	ND	ND	ND/ND	ND/ND	ND
Carbon Tetrachloride	ND	ND	ND/ND	ND/ND	ND
Chlorobenzene	ND	ND	ND/ND	ND/ND	ND
Chlorodibromomethane	ND	ND	ND/ND	ND/ND	ND
Chloroethane	ND	ND	ND/ND	ND/ND	ND
2-Chloroethylvinyl ether	ND	ND	ND/ND	ND/ND	ND
Chloroform	ND	ND	ND/ND	ND/ND	ND
Dichlorobromomethane	ND	ND	ND/ND	ND/ND	ND
Dichlorodifluoromethane	ND	ND	ND/ND	ND/ND	ND
1,1-Dichloroethane	ND	ND	ND/ND	ND/ND	ND
1,2-Dichloroethane	ND	ND	ND/ND	ND/ND	ND
1,1-Dichloroethylene	ND	ND	ND/ND	ND/ND	ND
1,2-Dichloropropane	ND	ND	ND/ND	ND/ND	ND
1,3-Dichloropropylene[2]	ND	ND	ND/ND	ND/ND	ND
Ethylbenzene	ND	ND	ND/ND	ND/ND	ND
Methyl bromide	ND	ND	ND/ND	ND/ND	ND
Methyl chloride	ND	ND	ND/ND	ND/ND	ND
Methylene chloride	ND	ND	ND/ND	ND/ND	ND
1,1,2,2-Tetrachloroethane	ND	ND	ND/ND	ND/ND	ND
Tetrachloroethylene	ND	ND	ND/ND	ND/ND	ND
Toluene	ND	ND	ND/ND	ND/ND	ND
trans-1,2-Dichloroethylene	ND	ND	ND/ND	ND/ND	ND
1,1,1-Trichloroethane	ND	ND	ND/ND	ND/ND	ND
1,1,2-Trichloroethane	ND	ND	ND/ND	ND/ND	ND
Trichloroethylene	ND	ND	ND/ND	ND/ND	ND
Trichlorofluoromethane	ND	ND	ND/ND	ND/ND	ND
Vinyl Chloride	ND	ND	ND/ND	ND/ND	ND
VOLATILE NONPRIORITY POLLUTANTS:[1]					
Acetone	—[5]	—	—	—	—
2 Butanone	ND	ND	ND/ND	ND/ND	ND
Carbon disulfide	ND	ND	ND/ND	ND/ND	ND
2-Hexanone	ND	ND	ND/ND	ND/ND	ND
4-Methyl-2-pentanone	ND	ND	ND/ND	ND/ND	ND
Styrene	ND	ND	ND/ND	ND/ND	ND
Vinyl acetate	ND	ND	ND/ND	ND/ND	ND
o-Xylene	ND	ND	ND/ND	ND/ND	ND

See footnotes at end of table.

TABLE E.11
(Continued)

PARAMETER	SAMPLE IDENTIFICATION				
	CG-3H	CG-4H	C-13G	CG-3I	CG-4I
	MAY 1984			JUNE 1984	
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:[1]					
Acenaphthene	ND	ND	ND/ND	ND/ND	ND
Acenaphthylene	ND	ND	ND/ND	ND/ND	ND
Anthracene	ND	ND	ND/ND	ND/ND	ND
Benzidine	ND	ND	ND/ND	ND/ND	ND
Benzo(a)anthracene	ND	ND	ND/ND	ND/ND	ND
Benzo(a)pyrene	ND	ND	ND/ND	ND/ND	ND
3,4-Benzofluoranthene	ND	ND	ND/ND	ND/ND	ND
Benzo(g,h,i)perylene	ND	ND	ND/ND	ND/ND	ND
Benzo(k)fluoranthene	ND	ND	ND/ND	ND/ND	ND
Bis(2-chloroethoxy)methane	ND	ND	ND/ND	ND/ND	ND
Bis(2-chloroethyl)ether	ND	ND	ND/ND	ND/ND	ND
Bis(2-chloroisopropyl)ether	ND	ND	ND/ND	ND/ND	ND
Bis(chloromethyl)ether[6]	ND	ND	ND/ND	ND/ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND	ND/<10[8]	<10/<10	<10
4-Bromophenyl phenyl ether	ND	ND	ND/ND	ND/ND	ND
Butyl benzyl phthalate	ND	ND	ND/ND	ND/ND	<10
2-Chloronaphthalene	ND	ND	ND/ND	ND/ND	ND
4-Chlorophenyl phenyl ether	ND	ND	ND/ND	ND/ND	ND
Chrysene	ND	ND	ND/ND	ND/ND	ND
Dibenzo(a,h)anthracene	ND	ND	ND/ND	ND/ND	ND
1,2-Dichlorobenzene	ND	ND	ND/ND	ND/ND	ND
1,3-Dichlorobenzene	ND	ND	ND/ND	ND/ND	ND
1,4-Dichlorobenzene	ND	ND	ND/ND	ND/ND	ND
3,3'-Dichlorobenzidine	ND	ND	ND/ND	ND/ND	ND
Diethyl phthalate	ND	ND	ND/ND	ND/ND	ND
Dimethyl phthalate	ND	ND	ND/ND	ND/ND	ND
Di-n-butyl phthalate	3.4	ND	33/64	ND/ND	ND
2,4-Dinitrotoluene	ND	ND	ND/ND	ND/ND	ND
2,6-Dinitrotoluene	ND	ND	ND/ND	ND/ND	ND
Di-n-octyl phthalate	ND	ND	ND/ND	ND/<10	<10
1,2-Diphenylhydrazine (Azobenzene)[7]	ND	ND	ND/ND	ND/ND	ND
Fluoranthene	ND	ND	ND/ND	ND/ND	ND
Fluorene	ND	ND	ND/ND	ND/ND	ND
Hexachlorobenzene	ND	ND	ND/ND	ND/ND	ND
Hexachlorobutadiene	ND	ND	ND/ND	ND/ND	ND
Hexachlorocyclopentadiene	ND	ND	ND/ND	ND/ND	ND
Hexachloroethane	ND	ND	ND/ND	ND/ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND	ND/ND	ND/ND	ND
Isophorone	ND	ND	ND/ND	ND/ND	ND
Naphthalene	ND	ND	ND/ND	ND/ND	ND
Nitrobenzene	ND	ND	ND/ND	ND/ND	ND
N-Nitrosodimethylamine	ND	ND	ND/ND	ND/ND	ND
N-Nitrosodi-n-propylamine	ND	ND	ND/ND	ND/ND	ND
N-Nitrosodiphenylamine (Diphenylamine)[7]	ND	ND	ND/ND	ND/ND	ND
Phenanthrene	ND	ND	ND/ND	ND/ND	ND
Pyrene	ND	ND	ND/ND	ND/ND	ND
1,2,4-Trichlorobenzene	ND	ND	ND/ND	ND/ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND	ND/ND	ND/ND	ND

See footnotes at end of table.

TABLE E.11
(Continued)

PARAMETER	SAMPLE IDENTIFICATION				
	CG-3H MAY 1984	CG-4H MAY 1984	C-13G MAY 1984	CG-3I JUNE 1984	CG-4I JUNE 1984
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)					
2-Chlorophenol	ND	ND	ND/ND	ND/ND	ND
2,4-Dichlorophenol	ND	ND	ND/ND	ND/ND	ND
2,4-Dimethylphenol	ND	ND	ND/ND	ND/ND	ND
4,6-Dinitro-o-cresol	ND	ND	ND/ND	ND/ND	ND
2,4-Dinitrophenol	ND	ND	ND/ND	ND/ND	ND
2-Nitrophenol	ND	ND	ND/ND	ND/ND	ND
4-Nitrophenol	ND	ND	ND/ND	ND/ND	ND
p-Chloro-m-cresol	ND	ND	ND/ND	ND/ND	ND
Pentachlorophenol	ND	ND	ND/ND	ND/ND	ND
Phenol	ND	ND	ND/ND	ND/ND	ND
2,4,6-Trichlorophenol	ND	ND	ND/ND	ND/ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)					
Aniline	ND	ND	ND/ND	ND/ND	ND
Benzoic Acid	ND	ND	ND/ND	ND/ND	ND
Benzyl Alcohol	ND	ND	ND/ND	ND/ND	ND
4-Chloroaniline	ND	ND	ND/ND	ND/ND	ND
Dibenzofuran	ND	ND	ND/ND	ND/ND	ND
2-Methylnaphthalene	ND	ND	ND/ND	ND/ND	ND
2-Methylphenol	ND	ND	ND/ND	ND/ND	ND
4-Methylphenol	ND	ND	ND/ND	ND/ND	ND
2-Nitroaniline	ND	ND	ND/ND	ND/ND	ND
3-Nitroaniline	ND	ND	ND/ND	ND/ND	ND
4-Nitroaniline	ND	ND	ND/ND	ND/ND	ND
2,4,5-Trichlorophenol	ND	ND	ND/ND	ND/ND	ND
METALS(9)					
Aluminum	0.26/0.26	0.36	<0.10	0.52/0.57	0.29
Antimony	<0.01	<0.01/<0.01	<0.01	ND/ND	ND
Arsenic	<0.001/<0.001	<0.001	<0.001	ND/ND	ND
Barium	0.11/0.08	0.38	0.28	0.18/0.12	0.17
Beryllium	<0.01	<0.01/<0.01	<0.01	ND/ND	ND
Boron	0.20	<0.10	<0.10/<0.10	ND/ND	ND
Cadmium	<0.001	<0.001/<0.001	<0.001	0.005/0.005	ND
Chromium	0.005	0.061/0.068	0.038	0.12/0.12	0.076/0.056
Cobalt	0.15/0.14	0.12	0.06	ND/ND	ND
Copper	0.06/0.04	0.05	0.06	0.20/0.20	0.04
Iron	0.11/0.05	0.31	1.3	0.67/0.65	0.35
Lead	0.92/0.98	<0.01	<0.01/<0.01	ND/ND	ND
Manganese	0.18/0.21	0.17	2.2	0.29/0.28	0.27
Mercury	<0.0002	<0.0002/<0.0002	<0.0002	0.0007/0.0005	ND
Nickel	0.12/0.11	0.10	0.20	0.16/0.14	0.19
Selenium	<0.001	<0.001/<0.001	<0.001	ND/ND	ND
Silver	0.004	<0.001	<0.001	0.008/0.008	ND/ND
Thallium	<0.001	<0.001/<0.001	<0.01	ND/ND	ND
Tin	0.30/0.30	0.40	0.20	ND/ND	ND
Vanadium	<0.10	<0.10/<0.10	0.17	ND/ND	ND
Zinc	0.67/0.65	0.72	1.2	2.0/2.0	0.47

TABLE E.11
(Continued)

PARAMETER	SAMPLE IDENTIFICATION					
	CG-3J	CG-4J	CG-3K	CG-4K	CG-3L	CG-4L
VOLATILE PRIORITY POLLUTANTS:(1)	JULY 1984		AUGUST 1984		SEPTEMBER 1984	
Acrolein	ND/ND	ND	ND/ND	ND	ND/ND	ND
Acrylonitrile	ND/ND	ND	ND/ND	ND	ND/ND	ND
Benzene	ND/ND	ND	ND/ND	ND	ND/ND	ND
Bromoform	ND/ND	ND	ND/ND	ND	ND/ND	ND
Carbon Tetrachloride	ND/ND	ND	ND/ND	ND	ND/ND	ND
Chlorobenzene	ND/ND	ND	ND/ND	ND	ND/ND	ND
Chlorodibromomethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
Chloroethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
2-Chloroethylvinyl ether	ND/ND	ND	ND/ND	ND	ND/ND	ND
Chloroform	ND/ND	ND	ND/ND	ND	ND/ND	ND
Dichlorobromomethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
Dichlorodifluoromethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
1,1-Dichloroethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
1,2-Dichloroethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
1,1-Dichloroethylene	ND/ND	ND	ND/ND	ND	ND/ND	ND
1,2-Dichloropropane	ND/ND	ND	ND/ND	ND	ND/ND	ND
1,3-Dichloropropylene(2)	ND/ND	ND	ND/ND	ND	ND/ND	ND
Ethylbenzene	ND/ND	ND	ND/ND	ND	ND/ND	ND
Methyl bromide	ND/ND	ND	ND/ND	ND	ND/ND	ND
Methyl chloride	ND/ND	ND	ND/ND	ND	ND/ND	ND
Methylene chloride	ND/ND	ND	ND/ND	ND	<10/<10	<10
1,1,2,2-Tetrachloroethane	ND/ND	ND	<10/ND	ND	ND/ND	ND
Tetrachloroethylene	ND/ND	ND	ND/ND	ND	ND/ND	ND
Toluene	ND/ND	ND	ND/ND	ND	ND/ND	ND
trans-1,2-Dichloroethylene	ND/ND	ND	ND/ND	ND	ND/ND	ND
1,1,1-Trichloroethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
1,1,2-Trichloroethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
Trichloroethylene	ND/ND	ND	ND/ND	ND	ND/ND	ND
Trichlorofluoromethane	ND/ND	ND	ND/ND	ND	ND/ND	ND
Vinyl Chloride	ND/ND	ND	ND/ND	ND	ND/ND	ND
VOLATILE NONPRIORITY POLLUTANTS:(1)						
Acetone	—	—	—	—	ND/ND	ND
2 Butanone	ND/ND	ND	ND/ND	ND	ND/ND	ND
Carbon disulfide	ND/ND	ND	ND/ND	ND	ND/ND	ND
2-Hexanone	ND/ND	ND	ND/ND	ND	ND/ND	ND
4-Methyl-2-pentanone	ND/ND	ND	ND/ND	ND	ND/ND	ND
Styrene	ND/ND	ND	ND/ND	ND	ND/ND	ND
Vinyl acetate	ND/ND	ND	ND/ND	ND	ND/ND	ND
o-Xylene	ND/ND	ND	<10/ND	ND	ND/ND	ND

See footnotes at end of table.

TABLE E.11
(Continued)

PARAMETER	CG-3J	CG-4J	CG-3K	CG-4K	CG-3L	CG-4L
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:(1)	JULY 1984		AUGUST 1984		SEPTEMBER 1984	
Acenaphthene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Acenaphthylene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Anthracene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Benzidine	ND	ND/ND	ND	ND/ND	ND/ND	ND
Benzo(a)anthracene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Benzo(a)pyrene	ND	ND/ND	ND	ND/ND	ND/ND	ND
3,4-Benzofluoranthene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Benzo(g,h,i)perylene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Benzo(k)fluoranthene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Bis(2-chloroethoxy)methane	ND	ND/ND	ND	ND/ND	ND/ND	ND
Bis(2-chloroethyl)ether	ND	ND/ND	ND	ND/ND	ND/ND	ND
Bis(2-chloroisopropyl)ether	ND	ND/ND	ND	ND/ND	ND/ND	ND
Bis(chloromethyl)ether(6)	ND	ND/ND	ND	ND/ND	ND/ND	ND
Bis(2-ethylhexyl)phthalate	ND	ND/ND	ND	ND/ND	ND/<10	<10
4-Bromophenyl phenyl ether	ND	ND/ND	ND	ND/ND	ND/ND	ND
Butyl benzyl phthalate	ND	ND/ND	ND	ND/ND	<10	ND
2-Chloronaphthalene	ND	ND/ND	ND	ND/ND	ND/ND	ND
4-Chlorophenyl phenyl ether	ND	ND/ND	ND	ND/ND	ND/ND	ND
Chrysene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Dibenzo(a,h)anthracene	ND	ND/ND	ND	ND/ND	ND/ND	ND
1,2-Dichlorobenzene	ND	ND/ND	ND	ND/ND	ND/ND	ND
1,3-Dichlorobenzene	ND	ND/ND	ND	ND/ND	ND/ND	ND
1,4-Dichlorobenzene	ND	ND/ND	ND	ND/ND	ND/ND	ND
3,3'-Dichlorobenzidine	ND	ND/ND	ND	ND/ND	ND/ND	ND
Diethyl phthalate	ND	ND/ND	ND	ND/ND	ND/ND	ND
Dimethyl phthalate	ND	ND/ND	ND	ND/ND	ND/ND	ND
Di-n-butyl phthalate	ND	ND/ND	ND	ND/ND	<10/<10	<10
2,4-Dinitrotoluene	ND	ND/ND	ND	ND/ND	ND/ND	ND
2,6-Dinitrotoluene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Di-n-octyl phthalate	ND	ND/ND	ND	ND/<10	ND/<10	ND
1,2-Diphenylhydrazine (Azobenzene)(7)	ND	ND/ND	ND	ND/ND	ND/ND	ND
Fluoranthene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Fluorene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Hexachlorobenzene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Hexachlorobutadiene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Hexachlorocyclopentadiene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Hexachloroethane	ND	ND/ND	ND	ND/ND	ND/ND	ND
Indeno(1,2,3-cd)pyrene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Isophorone	ND	ND/ND	ND	ND/ND	ND/ND	ND
Naphthalene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Nitrobenzene	ND	ND/ND	ND	ND/ND	ND/ND	ND
N-Nitrosodimethylamine	ND	ND/ND	ND	ND/ND	ND/ND	ND
N-Nitrosodi-n-propylamine	ND	ND/ND	ND	ND/ND	ND/ND	ND
N-Nitrosodiphenylamine (Diphenylamine)(7)	ND	ND/ND	ND	ND/ND	ND/ND	ND
Phenanthrene	ND	ND/ND	ND	ND/ND	ND/ND	ND
Pyrene	ND	ND/ND	ND	ND/ND	ND/ND	ND
1,2,4-Trichlorobenzene	ND	ND/ND	ND	ND/ND	ND/ND	ND
2,3,7,8-Tetrachlorodibenzo-p-dioxin	ND	ND/ND	ND	ND/ND	ND/ND	ND

See footnotes at end of table.

TABLE E.11
(Continued)

PARAMETER	CG-3J	CG-4J	CG-3K	CG-4K	CG-3L	CG-4L
	SAMPLE IDENTIFICATION					
ACID EXTRACTABLE PRIORITY POLLUTANTS:(1)	JULY 1984		AUGUST 1984		SEPTEMBER 1984	
2-Chlorophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
2,4-Dichlorophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
2,4-Dimethylphenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
4,6-Dinitro-o-cresol	ND	ND/ND	ND	ND/ND	ND/ND	ND
2,4-Dinitrophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
2-Nitrophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
4-Nitrophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
p-Chloro-m-cresol	ND	ND/ND	ND	ND/ND	ND/ND	ND
Pentachlorophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
Phenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
2,4,6-Trichlorophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
ACID AND BASE-NEUTRAL/ EXTRACTABLE NONPRIORITY POLLUTANTS:(1)						
Aniline	ND	ND/ND	ND	ND/ND	ND/ND	ND
Benzoic Acid	ND	ND/ND	ND	ND/ND	ND/ND	ND
Benzyl Alcohol	ND	ND/ND	ND	ND/ND	ND/ND	ND
4-Chloroaniline	ND	ND/ND	ND	ND/ND	ND/ND	ND
Dibenzofuran	ND	ND/ND	ND	ND/ND	ND/ND	ND
2-Methylnaphthalene	ND	ND/ND	ND	ND/ND	ND/ND	ND
2-Methylphenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
4-Methylphenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
2-Nitroaniline	ND	ND/ND	ND	ND/ND	ND/ND	ND
3-Nitroaniline	ND	ND/ND	ND	ND/ND	ND/ND	ND
4-Nitroaniline	ND	ND/ND	ND	ND/ND	ND/ND	ND
2,4,5-Trichlorophenol	ND	ND/ND	ND	ND/ND	ND/ND	ND
METALS(9)						
Aluminum	0.11/0.09	0.03	0.07/0.06	0.07	ND/ND	ND
Antimony	ND/ND	ND	ND/ND	ND	0.003/0.003	0.002
Arsenic	ND/ND	ND	ND/ND	ND	ND	ND/ND
Barium	0.07/0.07	0.06	0.09/0.08	0.09	0.10/0.08	0.05
Beryllium	ND/ND	ND	ND/ND	ND	ND/ND	ND
Boron	ND/ND	ND	ND/ND	ND	0.61/0.48	ND
Cadmium	ND/0.002	0.008	ND/ND	ND	ND/ND	ND
Chromium	0.014/0.013	0.017	0.013/0.012	0.014	0.008/0.008	0.012
Cobalt	ND/ND	ND	ND	ND/ND	ND/ND	ND
Copper	0.06/0.05	0.02	ND	ND/ND	0.06/0.08	0.02
Iron	0.02/0.02	ND	0.14/0.12	0.33	ND/ND	0.25
Lead	0.04/0.04	0.02	ND/ND	ND	ND/ND	ND
Manganese	0.16/0.16	0.19	0.25/0.25	0.26	0.22/0.22	0.24
Mercury	0.0014/0.0017	0.0009	ND/ND	ND	0.0006/0.0004	0.0003
Nickel	ND/ND	ND	ND/ND	ND	ND/ND	ND
Selenium	0.002/0.002	ND	ND/ND	ND	0.002/0.002	0.001
Silver	0.002/0.003	ND	0.009/0.006	0.006	ND/ND	ND
Thallium	ND/ND	ND	0.001/0.001	0.001	ND/ND	ND
Tin	ND	ND	ND/ND	ND	ND/ND	ND
Vanadium	ND/ND	ND	ND/ND	ND	ND/ND	ND
Zinc	0.20/0.20	0.20	0.16/0.17	0.24	0.06/0.07	0.09

TABLE E.11
(Continued)

FOOTNOTES

(1) Concentration in µg/l or parts per billion.

(2) The indicated compound is incorrectly identified in Part C of NPDES Form 2C as 1,2-dichloropropylene. However, the sample was screened for the presence of both compounds.

(3) ND indicates that the corresponding parameter was not detected.

(4) The indicated sample was analyzed in duplicate.

(5) Sample not analyzed for acetone.

(6) Decomposes rapidly in water.

(7) Detected as compound in parentheses.

(8) "<" indicates that the corresponding parameter was detected but its concentration was less than the value indicated.

(9) Concentration in mg/ℓ or parts per million.

TABLE E.12

HYDROGEOLOGIC INVESTIGATION
CHEMICAL ANALYSES - CAS NUMBERS

PARAMETER	CAS NUMBER[1]
VOLATILE PRIORITY POLLUTANTS:	
Acrolein	107-02-8
Acrylonitrile	107-13-1
Benzene	71-43-2
Bromoform	75-25-2
Carbon Tetrachloride	56-23-5
Chlorobenzene	108-90-7
Chlorodibromomethane	124-48-1
Chloroethane	75-00-3
2-Chloroethylvinyl ether	110-75-8
Chloroform	67-66-3
Dichlorobromomethane	75-27-4
Dichlorodifluoromethane	75-71-8
1,1-Dichloroethane	75-34-3
1,2-Dichloroethane	107-06-2
1,1-Dichloroethylene	75-35-4
1,2-Dichloropropane	78-87-5
1,3-Dichloropropylene[2]	542-75-6
Ethylbenzene	100-41-4
Methyl bromide	74-83-9
Methyl chloride	74-87-3
Methylene chloride	75-09-2
1,1,2,2-Tetrachloroethane	79-34-5
Tetrachloroethylene	127-18-4
Toluene	108-88-3
trans-1,2-Dichloroethylene	156-60-5
1,1,1-Trichloroethane	71-55-6
1,1,2-Trichloroethane	79-00-5
Trichloroethylene	79-01-6
Trichlorofluoromethane	75-69-4
Vinyl Chloride	75-01-4
VOLATILE NONPRIORITY POLLUTANTS:	
Acetone	67-64-1
2 Butanone	78-93-3
Carbon disulfide	75-15-0
2-Hexanone	591-78-6
4-Methyl-2-pentanone	108-10-1
Styrene	100-42-5
Vinyl acetate	108-05-4
o-Xylene	95-47-6

See footnotes at end of table.

TABLE E.12
(Continued)

PARAMETER	CAS NUMBER[1]
BASE-NEUTRAL EXTRACTABLE PRIORITY POLLUTANTS:	
Acenaphthene	83-32-9
Acenaphthylene	208-96-8
Anthracene	120-12-7
Benzidine	92-87-5
Benzo(a)anthracene	56-55-3
Benzo(a)pyrene	50-32-8
3,4-Benzofluoranthene	205-99-2
Benzo(g,h,i)perylene	191-24-2
Benzo(k)fluoranthene	207-08-9
Bis(2-chloroethoxy)methane	111-91-1
Bis(2-chloroethyl)ether	111-44-4
Bis(2-chloroisopropyl)ether	39638-32-9
Bis(chloromethyl)ether	542-88-1
Bis(2-ethylhexyl)phthalate	117-81-7
4-Bromophenyl phenyl ether	101-55-3
Butyl benzyl phthalate	85-68-7
2-Chloronaphthalene	91-58-7
4-Chlorophenyl phenyl ether	7005-72-3
Chrysene	218-01-9
Dibenzo(a,h)anthracene	53-70-3
1,2-Dichlorobenzene	95-50-1
1,3-Dichlorobenzene	541-73-1
1,4-Dichlorobenzene	106-46-7
3,3'-Dichlorobenzidine	91-94-1
Diethyl phthalate	84-66-2
Dimethyl phthalate	131-11-3
Di-n-butyl phthalate	84-74-2
2,4-Dinitrotoluene	121-14-2
2,6-Dinitrotoluene	606-20-2
Di-n-octyl phthalate	117-84-0
1,2-Diphenylhydrazine (Azobenzene)	122-66-7
Fluoranthene	206-44-0
Fluorene	86-73-7
Hexachlorobenzene	118-71-1
Hexachlorobutadiene	87-68-3
Hexachlorocyclopentadiene	77-47-4
Hexachloroethane	67-72-1
Indeno(1,2,3-cd)pyrene	193-39-5
Isophorone	78-59-1
Naphthalene	91-20-3
Nitrobenzene	98-95-3
N-Nitrosodimethylamine	62-75-9
N-Nitrosodi-n-propylamine	621-64-7
N-Nitrosodiphenylamine (Diphenylamine)	86-30-6
Phenanthrene	85-01-8
Pyrene	129-00-0
1,2,4-Trichlorobenzene	120-82-1
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1764-01-6

See footnotes at end of table.

TABLE E.12
(Continued)

PARAMETER	CAS NUMBER[1]
ACID EXTRACTABLE PRIORITY POLLUTANTS:	
2-Chlorophenol	95-57-8
2,4-Dichlorophenol	120-83-2
2,4-Dimethylphenol	105-67-9
4,6-Dinitro-o-cresol	534-52-1
2,4-Dinitrophenol	51-28-5
2-Nitrophenol	88-75-5
4-Nitrophenol	100-02-7
p-Chloro-m-cresol	59-50-7
Pentachlorophenol	87-86-5
Phenol	108-95-2
2,4,6-Trichlorophenol	88-06-2
ACID AND BASE-NEUTRAL EXTRACTABLE NONPRIORITY POLLUTANTS:	
Aniline	65-53-3
Benzoic Acid	65-85-0
Benzyl Alcohol	100-51-6
4-Chloroaniline	106-47-8
Dibenzofuran	132-64-9
2-Methylnaphthalene	91-57-6
2-Methylphenol	95-48-7
4-Methylphenol	106-44-5
2-Nitroaniline	88-74-4
3-Nitroaniline	99-09-2
4-Nitroaniline	100-01-6
2,4,5-Trichlorophenol	95-95-4

(1) The numbers presented are the Chemical Abstracts Service (CAS) numbers used for cataloging the indicated compounds in the Chemical Abstracts Index.

(2) The indicated compound is incorrectly identified in Part C of NPDES Form 2C as 1,2,Dichloropropylene.

TABLE E.13

MONITORING WELL WATER LEVELS ON OCTOBER 3, 1984

WELL NUMBER	TOP OF RISER ELEVATION (ft)	APPROXIMATE GROUND SURFACE ELEVATION (ft)	WATER LEVEL ELEVATION (ft)
MW-1	551.62	548.04	518.91
MW-2	561.60	559.00	518.85
MW-3	562.24	559.12	518.78
MW-4	558.13	556.18	518.21
MW-5	542.21	539.36	514.30
MW-6	553.80	551.44	519.01
MW-7	540.52	538.32	512.52
MW-8	541.85	539.25	518.06
MW-9	560.55	557.25	519.13
MW-10	539.32	536.82	512.37 (1)
MW-11	559.41	556.61	518.08
MW-12	562.17	559.07	518.84
MW-13	547.59	544.90	516.34
MW-14	547.05	544.27	518.84
MW-15	535.21	533.54	516.04
MW-16	536.02	533.10	516.63
MW-17	538.65	535.17	518.46
MW-18	538.95	535.95	518.87
C-1	534.81	531.60	516.18
C-2	534.21	532.80	516.02
C-3	560.27	557.80	518.00
C-4	556.44	553.60	517.83
C-5	560.09	557.00	518.34
C-6	561.89	559.30	518.36
C-7	555.03	552.30	518.64
C-8	556.38	553.70	518.72
C-9	560.32	557.50	518.82
C-10	546.80	544.80	517.66
C-11 (2)	-	-	-
C-12	542.92	541.10	515.88
C-13	547.48	545.10	509.63
T-1	562.61	- (3)	519.40
T-2	562.18	-	519.07
T-3S	552.85	-	519.69
T-3D	552.34	-	518.71
T-4S	551.37	-	519.01

TABLE E.13
(Continued)

WELL NUMBER	TOP OF RISER ELEVATION (ft)	APPROXIMATE GROUND SURFACE ELEVATION (ft)	WATER LEVEL ELEVATION (ft)
T-4D	551.50	-	519.04
T-5S	550.18	-	518.81
T-5D	550.84	-	518.92
T-6	559.87(4)	-	519.02
T-7	559.59(4)	-	-(5)
T-9	561.03	-	518.92
T-10	561.40	-	518.82
T-11	560.61	-	518.02
T-12	534.22	-	518.61
T-13S	537.70	-	518.68
CPPW-3	557.66	-	518.29
CPPW-4	557.32	-	518.17
CPPW-5	557.88	-	519.36
Old CPPW-6	558.10	-	518.42
TPPW-2	560.10	-	518.14

(1) Water level at MW-10 measured November 19, 1984.

(2) Well C-11 destroyed and later plugged by Iron City Fuels, Inc., in May 1984.

(3) Data necessary to determine ground surface elevation not available.

(4) Elevation resurveyed from Phase 1 due to repair of riser pipe.

(5) Water level in Well T-7 not measured due to bent standpipe at time of survey.

The percentages calculated for the validated model indicate that the Coal Grove wells draw a majority of their water (41 percent) from the aquifer southeast of Ice Creek. Slightly smaller percentages are drawn from the Ohio River (29 percent) and Ice Creek (27 percent), with underflow beneath Ice Creek constituting the smallest portion of Coal Grove pumpage (3 percent). The flow balances for the validated model and the sensitivity analyses are discussed further in Section F.2.2.4.

F.2.2.4 Sensitivity Analyses

The rationale for formulation of the finite element grid system and selection of values for hydrogeologic parameters (Table F.1) was discussed in Section F.2.2.1. A series of computer simulations of ground water flow were performed to evaluate the sensitivity of model results (such as predicted piezometric heads, ground water flow vectors, and inflow components to the Coal Grove well field) to various parameters. Values of pertinent input parameters were systematically varied within the validated model as outlined in Table F.3.

The validated model (Simulation 1) best represents the current understanding of present site hydrogeologic conditions. The potential for variability in input parameters was considered in interpreting the results of horizontal flow modeling. This issue is addressed by the remaining seven simulations in which high and low values for the following key parameters were input individually to the validated model:

- Aquifer permeability
- Ice Creek bed resistivity
- Infiltration rate
- Ohio riverbank/outer lagoon dike permeability.

Two additional sensitivity analyses were made to evaluate the effects of variation in ground water flow conditions resulting from two selected flood events in the Ohio River and Ice Creek. These events correspond to stages which are equaled or exceeded an average of 1 and 16 percent of the days per year. The area of the aquifer that could be affected by these flood events is dependent upon the duration and magnitude of the increased stage. Records at the Army Corps of Engineers gaging station at Ashland, Kentucky indicate the typical durations of these flood events are as follows (normal pool is assumed at 516.0 feet MSL):

Ohio River Stage (feet MSL)	Percent of Days per Year Equaled or Exceeded	Typical Duration of Event (days)
518	16	6
533	1	10

Results of the flow balance calculations for Simulations 1 through 8 are presented in Table F.4. The flow balances and computed heads for the validated model and the sensitivity analyses are discussed below.

Validated Model (Simulation 1)

As discussed in Section F.2.2.2, the validated model provides a good representation of field conditions based on the available data base. Under these conditions, inflow to the Coal Grove wells is almost equally distributed between three sources: water associated with the site (discharge from Ice Creek and underflow from the site beneath the creek), the Ohio River, and a somewhat larger contribution from natural infiltration southeast of Ice Creek. Approximately nine-tenths of the discharge associated with the site is due to leakage from Ice Creek and about one-tenth is from underflow. The quality of the water leaking from Ice Creek is difficult to characterize relative to potential site discharges due to possible contributions of chemical constituents from areas upstream of or to the east of the Allied Chemical/Ironton Coke site.

Sensitivity to Recharge Rate (Simulations 2 and 3)

A decreased or increased recharge rate produces computed piezometric heads lower or higher than measured, respectively. With decreased recharge, the percentage contributed from recharge decreases and the amounts of leakage from Ice Creek and the Ohio River increase; the opposite situation occurs with increased recharge. The percentage of underflow beneath the creek is not sensitive to the specified recharge rate.

Sensitivity to Aquifer Permeability (Simulations 4 and 5)

The effect of aquifer permeability on computed piezometric heads is approximately opposite that of infiltration rate; input of lower permeability values results in higher computed heads, while higher permeabilities produce lower computed heads. Piezometric heads in the Coal Grove area are more sensitive to permeability than to recharge rate. The Ohio River bank zone adjacent to Coal Grove must be assigned a permeability equal to that of the aquifer to match heads surrounding the well field. An aquifer permeability higher than that of the validated model produces a drawdown at the Coal Grove wells which is less than is observed in the field.

The major effect of permeability on the balance of flow to Coal Grove is in the contributions from the site. For a lower aquifer permeability, leakage from the creek is increased and underflow is decreased, with a net increase in percent associated with the site; for a higher permeability, leakage from the creek is decreased and underflow is approximately doubled, with a net decrease in the amount of water crossing the southern bank of Ice Creek.

Sensitivity to Ice Creek Bed Resistivity (Simulations 6 and 7)

When the value for Ice Creek bed resistivity within the validated model was decreased (increased communication between the creek and the aquifer), the computed piezometric heads between the creek and the Coal Grove well field were too high, indicating that somewhat less communication occurs in the field. When creek bed resistivity was increased, computed heads for the site were high, the cone of influence of the Coal Grove wells was larger than indicated by water level measurements, and the predicted drawdown at the well field was greater than the available aquifer thickness. These conditions indicate that an insufficient amount of water was allowed to flow toward the wells from the site in this case, thus implying that the simulated communication between the creek and the aquifer was not adequate.

Flow balance results indicate that with decreased creek bed resistivity, contributions from infiltration and the Ohio River are decreased; the net flow associated with the site increases significantly, virtually all of which is due to leakage from the creek. With increased creek bed resistivity, contributions from infiltration and the Ohio River are increased; the net contribution from the site decreases significantly while, within this percentage, underflow is approximately tripled and leakage is approximately one-third of that predicted by the validated model.

Sensitivity to Ohio River/Outer Lagoon Dike Permeability - Zone 3 (Simulation 8)

For the case where the Ohio River bank adjacent to the tar plant and the outer lagoon dike areas (Zone 3) are assigned a permeability equal to that of the alluvial aquifer, the steeper gradients at the site which are observed in the field are not computed by the model. This has a minor effect on computed heads in the Coal Grove area and on the flow balance to the wells.

Sensitivity to Ohio River/Ice Creek Stage (Simulations 9 and 10)

The results of the simulations to predict areas affected by the selected flood events (1 and 16 percent events) are presented in Figure F-6, which indicates regions where ground water flow directions are changed more than 90 degrees from their average steady-state orientations. The results indicate that areas of flow reversal for the relatively infrequent 1 percent event may extend 1,000 feet into the aquifer from the Ohio River or Ice Creek boundary, while effects of the more common 16 percent event are generally limited to localized areas within 400 feet of the surface water bodies. The regions of flow reversal for these events indicate areas where ground water quality may be affected, both by mixing of chemical constituents present in the aquifer and by potential dilution by waters from the Ohio River or Ice Creek. These effects are considered in Section F.3.5.

Flow balance calculations were not performed for Simulations 9 and 10 because the relative flow contributions were time dependent.

Summary

The basic flow paths shown in Figure F-4 are representative of steady-state or average flow conditions at the site and result from representative site-specific parameters as shown in Table F.1. Table F.4 shows the sensitivity of contributions of flow to the Coal Grove well field for variations in pertinent hydrogeologic parameter values summarized in Table F.3.

F.2.3 VERTICAL FLOW ANALYSIS

As discussed in Chapter 4.0, ground water levels near Ice Creek indicate that there is hydraulic communication between Ice Creek and the aquifer. The configuration of the Ice Creek bed sediments, as illustrated in Figure 4-4, implies that the majority of leakage from Ice Creek occurs through the outer portions of the creek channel rather than vertically through the thick, less permeable sediments.

An analysis of vertical leakage through the Ice Creek bed sediments relative to leakage through the channel sides for elevated creek stages was performed in order to evaluate the potential impacts on ground water quality. The portion of leakage which occurs vertically through the bed sediments may change in water quality due to attenuation or leaching characteristics of those sediments.

Vertical leakage which may occur due to elevated creek stage was estimated for an area of Ice Creek near the Coal Grove wells. Flow rates were calculated for the region of Ice Creek intersected by Geologic Section B-B' (Figure 4-4) based on Darcy's law:

$$Q = KIA \qquad (F.2)$$

where

Q = volumetric flow rate,
K = permeability,
I = vertical hydraulic gradient, and
A = cross-sectional area across which flow occurs.

The results from laboratory permeability tests of Ice Creek bed sediments (Chapter 4.0) show an average value of approximately 3×10^{-7} cm/sec. For conservative purposes, a permeability value of 3×10^{-6} cm/sec was used in the calculations.

Vertical head differences between Ice Creek and the underlying aquifer were determined for creek stages corresponding to the 16 and 1 percent flood events described in Section F.2.2.4. Maximum expected head differences were computed by assuming that the ground water heads beneath the creek were constant at preflood event levels. Measured ground water levels indicate that heads within the aquifer near the creek are approximately at creek level under normal conditions. The vertical hydraulic gradients were therefore determined by dividing the maximum head differences for the flood events by the 25-foot thickness of the creek bed sediments.

The results of the computation of vertical leakage rates through Ice Creek bed sediments are presented in Figure F-7. Vertical flow rates calculated using Darcy's law are presented as percentages of the flow rate through creek channel walls as predicted by the horizontal flow model for the corresponding conditions.

Based on the assumptions made to perform the calculations, there is essentially no leakage vertically through the bed sediments under normal creek stage conditions. This scenario is representative of conditions where heads in the aquifer beneath the creek are approximately equal to water levels in Ice Creek. When Ice Creek levels rise to 518 feet (16 percent flood event), the induced vertical leakage is calculated to be approximately 1 percent of the flow expected to occur through the outer portions of the channel. For creek levels of 533 feet (1 percent flood event), the calculated vertical flow rate is approximately 2 percent of the expected leakage through the channel banks.

The results of the vertical flow analysis indicate that the quality of ground water flowing toward the Coal Grove wells from the north is likely to be influenced predominantly by the quality of Ice Creek water. This is because the amount of leakage occurring vertically through the low-permeability bed sediments is expected to be small relative to more direct leakage through the creek channel sides. Correspondingly, the influence of potentially contaminated creek bed sediments on water quality at the Coal Grove wells is expected to be small relative to the water quality in the creek itself.

F.3.0 MASS TRANSPORT ANALYSES

The mass transport characteristics of the flow regime were studied to more fully understand the extent and sources of ground water contamination at the site. The following mechanisms affecting the transport of solutes in a porous medium (Bear, 1979) were considered:

- Advection
- Mechanical dispersion
- Molecular diffusion
- Soil-solute interactions

- Chemical reactions and decay (source-sink phenomena for the solute).

Soil-solute interactions and chemical reactions/decay are considered geochemical processes. A site-specific discussion of geochemical processes is presented in the Phase I report. Advection, mechanical dispersion, and molecular diffusion can be classified as hydrogeologic processes and are discussed below as related to the mass transport analyses.

The specific objectives of analyzing the characteristics of chemical constituent transport at the site were:

- Evaluate the existing ground water quality and mass transport characteristics of the alluvial aquifer relative to the identification and location of potential contaminant sources

- Assess the relative importance of the identified sources for specific chemical constituents

- Evaluate the time-dependent nature of the existing water quality at the site; i.e., whether the concentration levels are likely to increase or decrease in the future

- Estimate the mass loadings of various chemical constituents from the site to the Ohio River, Ice Creek, and the Coal Grove well field

- Evaluate the estimated mass loadings from the site relative to the total mass flow rates in the Ohio River, Ice Creek, and the Coal Grove well field (i.e., estimate the potential increases in water quality concentrations at these locations due to mass loadings from the site)

- Define the source areas of greatest concern for the various estimated off-site chemical constituent migrations

- Establish a framework for evaluating the effects of future conditions or remedial actions on chemical constituent transport at the site.

The mass transport analyses described in this section were primarily based on the development of steady-state and transient models of dispersion in the horizontal plane. The hydrogeologic conditions and finite element grid system for the validated horizontal flow model were used in these dispersion simulations. As discussed previously, the horizontal flow model incorporates the vertical variation of many hydrogeologic parameters observed at the site. An analysis of vertical variation in the dispersion of chemical constituents is presented in Section F.3.2; however, the horizontal dispersion models are sufficient to accomplish the objectives of this analysis based on:

- An increased understanding of existing vertical variation in ground water quality based upon multilevel samples obtained in the Phase II field program (Chapter 4.0)
- The lack of extensive low- or high-permeability strata within the relatively homogeneous site aquifer
- The moderate saturated thickness of the aquifer, generally ranging between 10 and 40 feet
- The results of Phase I vertical dispersion simulations, discussed in Section F.3.2.

These factors reduce uncertainties associated with the assumption of complete vertical mixing which is inherent in horizontal dispersion modeling.

F.3.1 TRANSIENT DISPERSION SIMULATION

Most of the facilities and operations present at the Ironton site have been in existence for over 40 years. It is therefore likely that the source strengths associated with long-term site activities have, on the average, achieved steady-state conditions. To evaluate the time necessary to reach steady-state conditions and the rate at which concentrations may change at various distances from a source, transient dispersion processes were examined using results from the horizontal ground water flow model in conjunction with a one-dimensional analytical solution for dispersion in porous media. The analytical solution was used in order to provide representative results which could be specifically interpreted for each area of the aquifer.

The analysis of transient dispersion at the site was based on ground water flow rates calculated in the horizontal flow modeling effort. Ground water flow velocities govern the rate at which chemical constituents are transported by advective processes, and therefore can be used to predict ground water travel times and associated advective transport from a source.

In addition to the rate of ground water flow, dispersion processes also affect chemical constituent migration rates. These effects were assessed using the one-dimensional analytical solution presented by Bear (1975). This solution was used to predict transient concentrations at different distances from a source, based on computed ground water velocities for the site aquifer. Dispersion parameters were set at values equal to those used in the horizontal steady-state simulations, described in Section F.3.3.1.

Transient dispersion analyses using the one-dimensional analytical solution were based on ground water flow velocities computed in the horizontal flow model. Dispersion processes are largely governed by ground water pore velocity, which is defined as the Darcy velocity divided by aquifer porosity. An average pore velocity of approximately 0.3 foot per day for ground water flow at the Ironton site was determined to be representative based on horizontal flow modeling results.

The transient dispersion analysis was performed for pore velocities of 0.2 and 0.4 foot per day, representing paths of relatively slower and faster flow rates, respectively. This range of velocities incorporates variations from the representative velocity of 0.3 foot per day along ground water flow paths at the site. The results of the analysis are presented in Figure F-8 as plots of percentage of steady-state concentration value versus time.

The results in Figure F-8 are for distances of 100 and 500 feet from a constant concentration source. These values reflect the distances between potential sources at the site and areas which they may be affecting, such as the Ohio River, Ice Creek, and many of the monitoring wells throughout the site. The dispersion results can therefore be utilized to understand the time-dependent transport of chemical constituents from potential sources throughout the site.

The results presented in Figure F-8 indicate that concentrations of chemical constituents would occur at pertinent monitoring locations within two years after source initiation. The major effects of a dispersing chemical constituent plume should be observed within one to five years, and steady-state values will be approached within approximately 6 to 15 years. Geochemical mechanisms, e.g., retardation factor greater than one, could increase these estimated times and result in lower observed concentrations for some chemical constituents.

Because the operations and facilities at the Ironton site have been present for over 40 years, these results indicate there should be no general long-term increase in monitoring well concentrations at the site as long as the present source loadings are not significantly increased. Water quality currently observed at monitoring wells on the site is therefore expected to reflect the major effects of chemical constituent loadings. As a result, the steady-state dispersion simulations performed for various source locations should be representative of average site conditions.

The transient dispersion calculations assume the strength of the source is constant. Given the generally limited information available for many of the sources and the probability that their strength has been variable, this assumption may not be valid in all cases. Contaminant loadings from unknown and more recent sources (less than three to six years), such as surface spills, leaking pipelines or tanks, or recent waste disposal, may have entered the aquifer. If such an event has happened, the effects of the contamination should be seen in the future at downgradient monitoring points. However, the mass loading from this type of source would have to be significant relative to the known areas of contamination for the incremental concentration changes in the aquifer to be of real importance.

F.3.2 VERTICAL DISPERSION

An analysis of vertical dispersion from point and area sources was performed in the Phase I investigations using the GEOFLOW program. This analysis responded to concerns that many of the monitoring wells, particularly in the tar plant area, had small screened intervals near the bottom of the aquifer. As a result, it was uncertain whether measured concentrations at these wells were representative of concentrations present in the aquifer at shallower depths. This uncertainty was of particular concern for monitoring wells located close to a source because dispersive mixing of chemical constituents through the aquifer's saturated thickness occurs with distance downgradient of the source. The vertical dispersion simulations performed during the Phase I investigations indicated that vertical variations in ground water quality were expected to be small at distances beyond 100 to 150 feet downgradient of an area source and 150 to 250 feet from a point source.

During the Phase II field investigations, monitoring wells were installed which had screened intervals extending throughout the majority of the aquifer's saturated thickness. Water quality samples from these wells are representative of the entire vertical extent of the aquifer for soluble compounds and, when compared to water quality samples from wells screened deeper in the aquifer, do not indicate systematically higher concentrations at shallow depths near sources.

Based on samples from monitoring wells with longer screened intervals from Phase II investigations, it was determined that water quality data for soluble compounds would be representative for the vertical extent of the aquifer. Therefore, two-dimensional horizontal dispersion simulations which assume complete vertical mixing would provide representative water quality results. However, Phase II field investigations indicate that relatively insoluble base-neutral compounds, such as naphthalene, may be stratifying at the base of the aquifer. The horizontal dispersion model results were therefore not interpreted for these compounds.

F.3.3 STEADY-STATE DISPERSION SIMULATIONS

Seven horizontal dispersion simulations were performed to determine the nature and extent of potential steady-state chemical constituent distributions dispersing from the major potential sources identified in Chapter 4.0. The locations of these sources are shown in Figure F-9. The simulations were subsequently evaluated to determine the relative portions of dispersing solutes which may be received by Ice Creek, the Ohio River, and the Coal Grove wells from each potential source.

The simulations were performed assuming steady-state conditions in order to assess the long-term effects of sources of various chemical constituents. Calculated steady-state concentrations represent predicted maximum long-term concentrations for the ground water flow and mass transport conditions of the simulation. The assumption of steady-state dispersion conditions is based upon the relatively long presence of most site facilities and operations and on results of the ground water flow modeling effort. An evaluation of transient dispersion and time required to reach steady-state conditions is included in Section F.3.1.

The objectives of the dispersion simulations were to assess the degree and extent to which areas of the aquifer are affected by each assumed source; determine their relative effects on Ice Creek, the Ohio River, and the Coal Grove wells; to provide information about source locations and mass loading rates; and to aid in the evaluation of water quality data. The computed concentrations illustrate relative values rather than absolute magnitudes.

F.3.3.1 Input Data

The governing equations which describe two-dimensional contaminant transport are summarized in the Phase I report. The relevant hydrogeologic and dispersion input data for the simulations are listed in Table F.5. The validated flow model was used for the dispersion analyses (Figure F-4). Additional parameters required for mass transport simulation include effective porosity, dispersivity, and retardation factor:

- Effective Porosity - A value of 0.2 was assumed for the effective porosity of the aquifer. This value is typical for alluvial sands (Freeze and Cherry, 1979; Bear, 1979).
- Dispersivity - The values of 100 feet and 20 feet assigned to longitudinal and transverse dispersivities, respectively, are representative for this type of aquifer and for the scale of the analysis (Konikow and Bredehoeft, 1974; Pinder, 1973; Anderson, 1984).
- Retardation Factor - In using a retardation factor of 1.0, it was assumed that geochemical processes have little effect on chemical concentrations during transport. This is a conservative assumption and is consistent with site-specific discussions in the Phase I report.

F.3.3.2 Analyses

The chemical constituent sources were represented by constant concentration nodes at the locations shown in Figure F-9. Each of the seven sources was studied separately and only the source location was changed for the individual simulations. The locations of the potential contaminant sources were determined based on site history and evaluations of chemical analyses of water, waste, and soil samples, as described in Chapter 4.0. The sources were modeled as having a constant dimensionless concentration of 1.0, resulting in computed values which indicate relative concentrations with distance away from the source. The computed concentrations do not indicate absolute magnitude (e.g., milligrams per liter), but can be correlated to ground water quality measurements in a relative sense.

Six of the seven potential sources were modeled as being located at points. Leakage from Ice Creek occurs at more than one point and was simulated as an area source, the location of which was determined from the horizontal flow simulations.

Additional runs were made to determine the effects of simulating the Goldcamp disposal site and the lagoons as area sources. The point source simulations were found to be most appropriate relative to the objectives of the study. The location of a point source takes into account the ground water flow conditions in a particular section of the site and the proximity of a given source to Ice Creek, the Ohio River, the northern site boundary, or the Coal Grove well field. Ramifications of the differences between possible point and area sources were considered in interpreting results of the analyses (Section F.3.5.1).

The mathematical aspects of boundary conditions for the mass transport equation are discussed in the Phase I report. For the horizontal dispersion analyses, a zero concentration condition was used along the Ohio River which assumes that river contaminant concentrations remain relatively small compared to aquifer source concentrations. A zero dispersive flux boundary condition was specified along the remaining boundary of the grid.

Dispersion simulations were performed to compute steady-state concentration contours in the alluvial aquifer representing the chemical constituents dispersing from the identified potential sources. Because each source is represented by a normalized concentration of 1.0, the contours show relative concentrations at different distances and directions from the source. Since the concentration contours represent steady-state conditions, it is implicitly assumed that the sources have been present long enough to establish steady-state levels. The time required to reach steady state is discussed in Section F.3.1.

F.3.3.3 Results

Steady-state dispersion simulations were performed using the horizontal model for each of the seven potential source locations illustrated in Figure F-9. The results of the steady-state horizontal dispersion simulations were used to identify and evaluate the principal locations affected by a given source and to assess measured ground water quality data. A primary objective of this effort was to determine the relative mass loadings which may be received by Ice Creek, the Ohio River, and the Coal Grove wells for each source area.

Figures F-10, F-11, and F-12 show the computed steady-state concentration contours in the alluvial aquifer representing the contaminant plumes produced by potential Sources 1, 3, and 6, respectively. Because each source is represented by a normalized concentration of 1.0, the contours directly show relative concentrations at different distances and directions from the source. The concentration contours represent steady-state conditions; therefore, it is implicitly assumed that the sources have been acting a sufficient time period to establish steady-state levels. The computed steady-state concentration distributions represent the predicted maximum long-term concentrations for the assumed conditions.

Relative mass loadings for each simulation were determined by summing nodal mass fluxes at the appropriate receptor areas, which were computed for a given constant concentration source. The calculated mass loadings were converted to percentages of the total mass influx at the source to indicate the principal locations which are affected by that source.

Table F.6 presents the results of the source/receptor analyses for each of the seven sources relative to Ice Creek, the Ohio River, and the Coal Grove well field. These percentages should be viewed as representative for each source area because the computations are based on simulated average flow conditions and on dispersion parameters representative for the site. The following points are illustrated by the percentages in Table F.6 and the concentration distributions shown in Figures F-10 through F-12:

- Chemical constituents introduced to the aquifer in the northwest section of the site (Sources 3, 4, and 5) are basically confined to that area, the mass being expected to discharge to the Ohio River.

- Chemical constituents reaching ground water in the central portion of the site (Source 6) are likely to discharge predominantly to the Ohio River, with somewhat lesser amounts reaching Ice Creek and the Coal Grove wells.

- Most of any chemical constituents originating from sources in the eastern section of the site, as represented by Sources 1 and 2, are likely to discharge to Ice Creek. Smaller amounts may reach the Coal Grove wells for sources located in the Lagoon 1 area, and trace amounts may reach the Ohio River.

- Leakage from Ice Creek (Source 7) is expected to discharge almost entirely to the Coal Grove wells, with trace amounts possibly reaching the Ohio River. Chemical constituents introduced into Ice Creek from other sources (e.g., Sources 1, 2, and 7) may, therefore, subsequently reach the well field through leakage out of the creek channel.

F.3.4 MASS LOADING CALCULATIONS

Flow rate and water quality data were used to estimate the mass loadings of chemical constituents entering Ice Creek, the Ohio River, and the Coal Grove well field. These loadings were also compared to the observed mass flow rate at these locations to evaluate the relative contribution of compounds originating from sources associated with the Allied Chemical/Ironton site. This type of information is useful in that (1) it provides an estimate of the incremental change in water quality at a location which may be due to discharges from the site, and (2) the mass loading estimate does not require a detailed understanding of the ground water quality variation and potential chemical constituent sources within the boundaries of the site. That is, flow and water quality data at the boundaries are sufficient to estimate mass loadings. Therefore, the mass loading estimates provide an understanding of the overall effects of the site.

The following procedure was utilized in estimating the mass loading for Ice Creek, the Ohio River, and the Coal Grove well field:

- Calculate ground water flow which leaves the site and reaches one of the above three locations. The flow rates determined for horizontal flow Simulation No. 1 (Figure F-4) were used to represent site conditions.

- Determine the range of water quality variations at monitoring wells located along the boundaries separating the site and a given location. The use of data from Phase II monitoring wells was maximized because these wells have longer screened intervals and therefore provide vertically representative water quality samples. Water quality data obtained by IT, and to a lesser degree by others, were reviewed to evaluate fluctuations in water quality at a monitoring point and eliminate nonrepresentative values. From this information, an estimate of the expected range and typical (or average) concentration at a monitoring location was made for each constituent.

- The mass loadings through different segments of the site boundary were calculated using the following equation:

$$m_i = q_i \bar{C}_i \qquad (F.3)$$

where

m_i = mass loading through Boundary Segment i (lbs/day),
q_i = ground water flow rate through segment (ft^3/day), and
$\bar{C}i$ = average concentration of a given chemical constituent in the ground water (lbs/ft^3).

- These mass loading calculations were performed for Ice Creek, the Ohio River, and the Coal Grove well field.

Tables F.7 and F.8 summarize the water quality data for wells and surface water monitoring points used in the mass loading calculations for Ice Creek and the Ohio River, respectively. Shown in this table are the ranges of concentration measurements at each location and the values that were selected as representative of average conditions which currently exist. The representative values are those indicated in Chapter 4.0 of the report, while the ranges are based on the complete sampling history of the site.

Mass loadings are calculated for chloride, ammonia, cyanide, phenols, and benzene. The calculations were not performed for naphthalene because this constituent appears to be present primarily at the bedrock-aquifer interface rather than being dissolved throughout the vertical extent of the aquifer. This observation is based on water quality and drilling information as described in Chapter 4.0 of the report. As a result, the mass loading calculations would not be appropriate for naphthalene because the calculations use flow rates and concentrations which are vertically representative of the aquifer.

The results of the mass loadings calculations are presented in Tables F.9 through F.11. Included in the tables are estimated contaminant loadings from the site, representative ranges for these loadings, and the estimated increase in concentrations at a potential receptor which may occur due to chemical constituent migration from the site.

In interpreting the results presented in these tables, the variability exhibited by the ground and surface water quality data used in the calculations must be considered. The data for each monitoring point are representative of average conditions over the period for which site water quality has been sampled, but may not reflect complete spatial or temporal variabilities in ground water concentrations. Variability also exists in the ground water flow and surface water flow rates which were used. Nevertheless, the results can be used as indicators of potential water quality changes during the monitoring period as long as proper care is taken in interpreting the numbers. An attempt to incorporate the inherent variability in these parameters was made in establishing representative ranges of concentrations observed at each monitoring location. The ranges provide more inclusive indicators of the changes in water quality that may occur due to ground water discharges from the site.

In summary, the results presented in Tables F.9, F.10, and F.11 indicate the following:

- <u>Ice Creek</u>

  - Under average conditions, the mass loadings of chloride and ammonia discharging from the site to Ice Creek are expected to be less than 50 pounds per day; these loadings would increase concentrations of these constituents in Ice Creek by less than 10 milligrams per liter.

  - The estimated mass loadings to Ice Creek calculated for cyanide, phenolics, and benzene are less than one pound per day. On the average, the concentrations of these parameters in Ice

Creek are expected to increase by amounts below the corresponding detection limits in response to ground water discharge.

- Ohio River

  - The estimated mass loadings from the site to the Ohio River are less than 50 pounds per day for chloride and less than 2 pounds per day for ammonia. Due to the high flow rate of the river and its water quality upstream of the site, these loadings are not expected to increase Ohio River concentrations by more than 0.001 milligram per liter.

  - Under average conditions, the calculations indicate that the mass loadings of cyanide, phenolics, and benzene from the site to the Ohio River should be less than one pound per day. The data indicate an increase of less than 10^{-6} milligram per liter in Ohio River concentrations due to these loadings; see Section F.3.5.2 for additional discussion of benzene and phenolics loadings to the Ohio River.

- Coal Grove Well Field

  - The estimated mass loadings to the Coal Grove wells due to leakage from Ice Creek and ground water underflow from the site are less than one pound per day for ammonia, cyanide, phenolics, and benzene; the estimated mass loading for chloride is on the order of 100 pounds per day.

  - The data indicate that chemical constituent loadings associated with the site may contribute to the concentrations observed at the Coal Grove wells by less than 40 milligrams per liter for chloride and less than one milligram per liter for ammonia. The potential site-associated mass loading contributions to concentrations of cyanide and phenolics are expected to be less than 0.05 milligram per liter. Benzene has not been detected in the current data base for Wells C-13, CG-3, and CG-4.

F.3.5 CORRELATION OF WATER QUALITY DATA WITH MASS TRANSPORT ANALYSES

F.3.5.1 Correlation of Water Quality with Dispersion Simulations

Water quality data from monitoring wells in the vicinity of the seven potential chemical constituent sources identified in Figure F-9 were analyzed to determine the extent to which the data reflect dispersion from these locations. In this analysis, relative concentrations based on the dispersion characteristics of the alluvial aquifer, as determined from the steady-state mass transport simulations, were considered. These simulations were performed for separate source areas and were not designed to directly model observed concentration distributions which may have resulted from multiple sources. The results can, however, be used to evaluate which sources may or may not be partially or completely responsible for measured chemical constituent concentrations in ground water.

In order to make an assessment of site ground water quality which would be representative of average conditions, the temporal variation of concentrations was assessed. Representative values for chlorides, ammonia, cyanide, phenolics, and benzene were determined for each monitoring location and are presented in Chapter 4.0. Based on these water quality data and on the results of the mass transport simulations, the following conclusions can be made for the potential source areas:

- Source 1 (Lagoons 1, 3, and 5) - Elevated levels of several parameters at Well C-4 and lower levels at Well C-10 are consistent with the dispersion of mass from a source near Lagoon 1; however, the dispersion simulation indicates that mass transport from the Source 1 location should result in higher concentrations at Well C-10 than those observed. This implies that another source may be contributing to levels observed at Well C-4 (see Source 6 discussion) or that the well is in a location of isolated, localized contamination which is not acting as a persistent source of mass loading to the ground water. Alternatively, Well C-10 may be isolated from dispersive effects by geologic heterogeneities.

The dispersion plot also indicates that the levels of benzene and phenolics observed at Well MW-13 would not be expected to result from dispersion from Source 1, because higher concentrations than those observed at MW-13 would be expected at Wells C-10 and C-12, closer to the source.

- Source 2 (Lagoons 2 and 4) - Analysis of the northern lagoon area as an areal source indicates that concentrations of introduced chemical constituents would likely be relatively similar at Wells C-2, C-5, C-6, and MW-16. This is fairly consistent with observed water quality data. In addition, chemical constituent concentrations at these wells are generally not elevated relative to other site locations, indicating that mass loadings from the eastern lagoon area are moderate. Relatively higher levels of cyanide and benzene at Well C-2 may indicate potential mass loading from Lagoon 3.

- Source 3 (Goldcamp Disposal Site) - Analysis of the Goldcamp area as point and area sources indicates that dispersion from the northern end is more consistent with observed water quality than dispersion from the disposal site as a whole. This is evidenced by elevated levels of phenolics and benzene at Wells T-2, MW-2, and MW-12, and relatively lower levels at Wells T-4, MW-3, and MW-14.

  In general, observed concentrations at wells closer to the Ohio River (T-3, T-4, T-5, MW-1, MW-14, MW-15) are somewhat lower than those at other wells surrounding the Goldcamp area. This is consistent with downgradient dispersion from the disposal site and with dilution effects of influx of Ohio River water during flood events.

- Source 4 (Anthracene Unit) - Elevated levels of the five parameters considered in this analysis have been observed at Well T-9. In general, concentrations are somewhat lower at downgradient Well T-10 and lower yet at upgradient Well C-9. These water quality data are generally consistent with the dispersion analysis results for mass transport from a source at the anthracene unit near Well T-9.

- Source 5 (Tar Plant Production Well No. 1) - The dispersion analysis for Source 5 indicates that elevated levels of chemical constituents would be expected at Wells T-13 and MW-18 if TPPW-1 were acting as a source. However, the low concentrations of parameters observed at MW-18 may indicate that the production well is no longer acting as a source. The implications of the water quality data in this area are discussed in Chapter 4.0.

- Source 6 (Area Near Wells C-3 and T-11) - Wells C-3 and T-11 show elevated levels of the chemical constituents considered. Analysis of this area as a source indicates that concentrations of introduced compounds could reach Well C-4, possibly contributing to elevated levels observed at that location. Concentrations of several parameters at downgradient Wells MW-11 and MW-8 show somewhat lower values than those at the C-3/T-11 area, generally consistent with dispersion from Source 6. The low levels of phenolics and benzene at MW-8 indicate that dispersion from the C-3/T-11 area would not be expected to cause the concentrations of these parameters observed further downgradient at Well MW-13.

- Source 7 (Leakage from Ice Creek) - The dispersion analysis for leakage from Ice Creek indicates that chemical constituents present in Ice Creek would be expected to appear at Monitoring Well C-13 and the Coal Grove pumping wells at concentrations lower than creek concentrations. A portion of the compounds seen at these wells would be derived from backflow of Ohio River water into the Ice Creek leakage area during flood events.

F.3.5.2 Correlation of Water Quality with Mass Loading Calculations

Ice Creek

The mass loading calculations for chemical constituent transport from the site to Ice Creek indicate that concentrations of chloride and ammonia may be increased up to 8 and 2 milligrams per liter, respectively, due to loadings from the site, while mass loadings of cyanide, phenolics, and benzene are likely to increase concentrations by amounts below the detection limits for these parameters (Table F.9).

Measured water quality in Ice Creek presented in the Phase I report shows elevated levels of chloride and ammonia in downstream samples relative to samples taken upstream of the site. These data indicate increases on the order of 4 milligrams per liter for chloride and 0.5 milligram per liter for ammonia. No conclusive differences between upstream and downstream samples were noted for the other parameters considered. Phase II quality data for Ice Creek (Battelle, 1984) indicate the same trend of increasing downstream concentrations for chloride and ammonia, with chloride concentrations increasing by up to 70 milligrams per liter and ammonia concentrations increasing by approximately 6 milligrams per liter. These levels of chloride and ammonia are higher than those observed in Phase I investigations and are likely to be associated with active domestic sewage discharges identified near Station IC-6 (Battelle, 1984). Cyanide and benzene were not observed above their detection limits in Phase II.

In general, observed water quality in Ice Creek is consistent with the results of the mass loading calculations. The effects of mass loadings from the site are predicted to be less than 8 and 2 milligrams per liter for chloride and ammonia, respectively (Table F.9), and increases in cyanide, phenolics, and benzene are expected to be below detectable limits based on the mass loading analysis.

<u>Ohio River</u>

The results of the mass loading calculations for site contributions to the Ohio River indicate that chemical constituent concentrations in the river are not expected to increase measurably due to site-associated loadings (Table F.10). This is consistent with the water quality data reported in the Phase I investigations, which did not show conclusive concentration increases downstream of the site.

The results of the dispersion simulation for Source No. 3 (Figure F-11) indicate that the mass loading calculations may not account for all potential loadings to the Ohio River. Due to the westerly flow component of ground water in the northern area of the Goldcamp disposal site, a portion of chemical constituents from the source area near Wells T-2 and MW-12 may reach the Ohio River without being detected by riverbank monitoring wells. The primary soluble constituents of concern at this source area are phenolics and benzene.

Estimated mass loadings to the Ohio River for these parameters were computed using concentrations measured near the source area in conjunction with source loading rates computed in the dispersion simulation. Observed chemical constituent concentrations at appropriate monitoring wells were compared to the corresponding computed relative concentrations from the simulation results. These comparisons were then used to scale the simulated mass loading rate at the source, thus providing approximate loading rates required to provide the measured concentrations.

These calculations must be considered approximate because they are based on single data points and are therefore very sensitive to factors such as source interference, analytical uncertainties, and precise source location. The results, however, indicate that loadings on the order of one-half pound per day of phenolics or benzene could result in concentrations at the levels observed in Wells T-2, MW-2, and MW-12. If these loadings discharge entirely to the Ohio River, concentrations would be expected to increase by less than 10^{-5} milligram per liter (0.01 part per billion).

In general, the water quality data available for the Ohio River is consistent with the computed mass loadings from the site. The site-associated mass loadings are expected to have less than measurable impacts on river water quality due to the volume of flow, and no conclusive increases are shown in the available water quality data.

The following technique was used for each simulation to calculate the underflow and leakage components:

1. Calculate the total ground water discharge across the boundary line shown in Figure F-5 which represents the southern stream bank of Ice Creek. The flow through this section of the aquifer includes underflow from the site and leakage from the creek.

2. Calculate the total leakage through the Ice Creek bed by summing computed leakage rates at the corresponding grid system nodes.

3. The magnitude of underflow is the difference between the total discharge across the Ice Creek boundary line determined in Step 1 and the leakage rate from the creek calculated in Step 2.

The water in Ice Creek which infiltrates into the aquifer is a mixture of surface runoff and ground water discharge to Ice Creek upstream and east of the site, in combination with runoff and ground water discharge to Ice Creek from the site. In addition, a small fraction of the Ice Creek flow passes through bed sediments which may attenuate or leach transported chemical constituents. The potential amount of this vertical seepage is considered in the vertical flow analysis presented in Section F.2.3.

The percentage contributions of water to the well field from the various sources were calculated as follows:

- The flow rates for recharge from the Ohio River, leakage from Ice Creek, and underflow beneath the creek from the site were each divided by the total pumpage at Wells CG-3 and CG-4

- Discharge to Ice Creek (upstream of the site) was subtracted from the amount of natural infiltration received within the control volume before dividing by the pumping rate.

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F

APPENDIX F

TECHNICAL MEMORANDUM
ANALYSIS OF GROUND WATER FLOW AND MASS TRANSPORT

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TECHNICAL MEMORANDUM
ANALYSIS OF GROUND WATER FLOW AND MASS TRANSPORT

F.1.0 INTRODUCTION

This Technical Memorandum details the analyses used to interpret data collected during Phase II and previous investigations at the Allied Chemical/Ironton Coke site.

F.1.1 PURPOSE AND OBJECTIVES

Analyses were performed to develop a more complete understanding of ground water flow and chemical constituent transport at the site. Graphical, analytical, and numerical methods were utilized in the data evaluation efforts. The majority of these analyses were based on the development of a computer model of the hydrogeologic system at the Allied Chemical/Ironton Coke site. The objectives of the computer simulations of ground water flow and mass transport were as follows:

- Determine ground water flow rates and directions
- Define and quantify the surface water/ground water interactions between the alluvial aquifer and Ice Creek and the Ohio River
- Determine the source areas for water pumped at the Coal Grove well field and estimate their relative contributions
- Evaluate the observed water quality data relative to the identified potential chemical constituent sources
- Estimate the mass loadings of various chemical constituents from the site into the Ohio River, Ice Creek, and the Coal Grove well field and evaluate these results with respect to background conditions
- Determine the relative importance of the identified sources in terms of chemical constituent loading rates to areas of the aquifer

- Provide a framework for predicting and evaluating the effects of proposed remedial alternatives.

To achieve these goals, a hydrogeologic model of the ground water flow regime at the Allied Chemical/Ironton Coke site was developed. A two-dimensional, horizontal numerical model of the site ground water system was implemented using the GEOFLOW finite element computer program (Haji-Djafari, 1983). This program is capable of modeling detailed areal variations in hydrogeologic conditions and can also incorporate variations in parameters in the vertical dimension, such as variable recharge rates, uneven bedrock surfaces, variable saturated thicknesses, and seepage through low-permeability layers overlying an aquifer. These capabilities, coupled with the characteristics of the single aquifer system at the Ironton site, permit a high degree of model validity using the current data base. (For the purposes of the analyses, the term "aquifer" is used to refer to the water-bearing alluvial sand and gravel deposits in the Ironton site/Coal Grove area.)

The GEOFLOW program used for the horizontal computer simulations was selected for its ability to represent the variety of hydrogeologic conditions encountered at the Ironton site. The finite element program numerically solves the governing equations for two-dimensional ground water flow and mass transport; the flexibility of the GEOFLOW code permits the specification of a broad range of ground water flow and dispersion parameters. A description of this in-house program with relevant equations is presented in the Phase I report.

The use of two-dimensional modeling is of primary importance in achieving the goals of this project: it enhances understanding of site ground water flow and chemical constituent transport, provides quantification of ground water flow and mass loading rates, and can predict future conditions, including simulation of the effects of various remedial actions.

F.1.2 INPUT TO ANALYSIS

The analysis of ground water flow and chemical constituent transport at the site is based upon the results of the field investigation programs presented in Chapter 4.0 of the report. Data used in the assessment include geologic information such as boring logs, permeability test results, piezometric head measurements, and chemical information such as analyses of samples of ground waters, surface waters, wastes, and soils. In addition to these raw data, the analysis incorporated the interpretations of site geology and geochemistry (e.g., geologic cross sections, potential chemical constituent sources) which were based on field data. Finally, additional information, such as historical records, reports from previous investigations, Phase I field programs, and Phase I modeling, was incorporated. Sources of data for specific parameters and analyses are referenced in the corresponding sections of the following text.

F.2.0 FLOW ANALYSES

F.2.1 HORIZONTAL FLOW MODEL

The specific objectives in setting up the two-dimensional horizontal model were as follows:

- Develop a finite element grid system optimizing use of field data and incorporating element geometries conducive to accurate numerical results
- Provide a valid representation of site geologic and hydrogeologic characteristics
- Develop a model having flexibility for future analyses to evaluate potential remedial alternatives.

Site-specific input to the model includes the finite element grid system, boundary conditions (specified piezometric heads where appropriate), aquifer recharge and permeability zones, bedrock elevations, initial saturated thicknesses, and locations of pumping wells with corresponding pumping rates.

F.2.1.1 Finite Element Grid System

Grid System Development

The grid system developed for the site (Figure F-1) consists of 1,437 elements and 1,518 nodes representing the Allied Chemical/Ironton Coke site, the Ohio River, Ice Creek, the alluvial aquifer east of Ice Creek, the Coal Grove municipal well field, and a strip of the aquifer north of the Allied Chemical/Ironton Coke site, including a portion of the Dayton Malleable property.

The following factors govern the grid system configuration:

- Grid boundaries coincide with hydrologic features and the limits of the alluvial aquifer to the east, where appropriate
- The grid includes a portion of the alluvial aquifer to the north of the Allied Chemical/Ironton Coke site which is a source of ground water recharge to the site aquifer
- The southern grid boundary is beyond the limits of the radius of influence of the Coal Grove well field
- The configuration of Ice Creek which is in hydraulic connection with the alluvial aquifer is represented
- Locations of the Coal Grove wells coincide with nodal coordinates
- Configurations of the lagoon and Goldcamp Dump areas are represented
- The grid system is finer in the areas of primary interest to reflect the density of data points, variability of aquifer characteristics, and configurations of physical site features; to enable simulation of potential remedial alternatives; and to increase numerical accuracy of the model.

Boundary Conditions

The selection of representative boundary conditions is important as they affect results computed in the interior of the grid. Constant head or no-flow boundaries were assigned as shown in Figure F-2 according to the following rationale:

- Constant Head Boundary Along Ohio River - The Ohio River is in hydraulic connection with the alluvial aquifer. The constant head represents the approximate normal river stage and allows flow across the boundary along this border of the site.

- Variable Specified Head Along Northern Boundary - Various constant piezometric heads representative of and extrapolated from well measurements were specified along the northern edge of the grid. These constant heads allow flow across the boundary representing recharge from the aquifer north of the grid boundary.

- No-Flow Boundary Along Easternmost Segment of Northern Boundary - Ground water flow is expected to be approximately parallel to this section of the grid boundary; therefore, flow crossing this boundary would be negligible relative to the study objectives.

- No-Flow Boundary Along Eastern Limits of Grid - The eastern edge of the grid system represents the limits of the alluvial aquifer where a natural no-flow boundary is formed by the bedrock-aquifer interface at the eastern limit of the Ohio River Valley deposits.

- No-Flow Boundary Along Southern Edge of Grid - The southern boundary of the grid is located beyond the radius of influence of the Coal Grove wells to prevent restriction of flow to the well field. This boundary condition is valid because ground water flow in this area should generally be perpendicular to the river (parallel to the boundary).

Vertical Recharge Zones

Five vertical recharge zones were used to represent recharge to the alluvial aquifer as shown in Figure F-2:

- Zone 1 - Zone 1 represents net recharge from precipitation infiltrating through surficial deposits overlying the alluvial aquifer.

- Zones 2 and 3 - The Ohio River bank and the outer lagoon dike area were treated as a separate recharge zone due to steep hydraulic gradients in these areas relative to the flat gradients throughout the majority of the site. This implies the presence of materials of significantly lower permeability in these areas which, in conjunction with steep ground surface slopes and high saturation states, indicates that infiltration in these zones may be negligible compared to Zone 1.

- Zones 4 and 5 - Ice Creek was represented as a source or sink of vertical leakage (recharge) into or from the underlying aquifer. The direction of leakage is determined by the difference between the water elevation in Ice Creek and the piezometric head in the adjacent aquifer. The two zones represent areas of different resistivities of the Ice Creek bed sediments, defined in Section F.2.1.2.

Permeability Zones

Two aquifer material zones, representing different permeabilities, were assigned within the grid system (Figure F-2): the alluvial aquifer (Zones 1, 2, 4, and 5), and the outer lagoon dike and Ohio River bank areas (Zone 3). The materials comprising Zone 3 were assigned a permeability lower than that of the alluvial aquifer; the rationale for this assumption is discussed in Sections F.2.1.2 and F.2.2.1.

F.2.1.2 Hydrogeologic Input Parameters

Following implementation of the grid system with various recharge and permeability zones, values of hydrologic parameters were assigned to each element/node as appropriate.

Each element within the grid system was assigned to a permeability and recharge zone as shown in Figure F-2. Initial aquifer saturated thicknesses and bedrock (bottom of aquifer) elevations were also assigned to the elements on the basis of isopach and bedrock elevation contour maps generated from field data (Figures 4-7 and 4-8). Each node along the grid boundary was designated as a constant head node (with specified piezometric head) or as part of a no-flow boundary. Constant head values were assigned on the basis of representative measured heads (Figure 4-6). Nodes corresponding to the Coal Grove wells were specified as pumping wells and assigned corresponding pumping rates.

Alluvial Aquifer Permeability

Initial estimates of aquifer permeability for modeling applications were based on Phase II field permeability tests, specific capacity data from area pumping wells, and experience with alluvial materials having grain-size distributions similar to those recorded in the field investigations.

- Results from aquifer permeability tests performed during the Phase II investigations show some variability, but do not indicate the presence of discernable zones of different permeabilities within the alluvial aquifer (Chapter 4.0). Examination of the results and the tested intervals indicates that a permeability range of approximately 4×10^{-3} to 4×10^{-2} centimeter per second (cm/sec) is representative for the aquifer material.

- Calculations based upon specific capacity data from tests at pumping wells installed at or near the site yield permeability values in the range of approximately 2×10^{-2} to 8×10^{-2} cm/sec. Data were available for coke plant production wells (CCPW-3, old CCPW-6) and for Coal Grove municipal wells (CG-1, CG-2, CG-3) (Chapter 4.0).

- Phase II field investigations indicate that the aquifer materials may be generally characterized as sands with gravels and silts. Alluvial deposits having grain-size distributions similar to those determined for the Ironton site aquifer generally have permeabilities in the range of 5×10^{-3} to 1×10^{-1} cm/sec (Freeze and Cherry, 1979).

Based on the above estimates, aquifer permeabilities between 8×10^{-3} and 8×10^{-2} cm/sec were considered in validating the horizontal model. The most appropriate values within this range were determined by correlation of computed heads and ground water flow patterns with those observed at the site.

Recharge Rate

The range of recharge rates considered for Zone 1, four to ten inches per year, was based on water balance analyses specific to the simulation area using moisture budget calculations (U.S. EPA, 1975). Previous experience with water balance calculations and hydrogeologic simulation indicates that this is a representative range for the Ohio, Kentucky, and West Virginia region.

Ice Creek Bed Resistivity

Field data obtained during the Ice Creek boring program indicate that the bed sediments have a fairly uniform low permeability (10^{-6} to 10^{-8} cm/sec) and vary in thickness from the upper reaches of the creek (approximately 0 feet) to its confluence with the Ohio River (approximately 25 feet). The resistivity of the Ice Creek bed, defined as b'/K' where b' = bed thickness and K' = bed permeability, is used to calculate vertical seepage through the bed sediments. The field data indicate a very high resistance to seepage through the creek bed, particularly in the lower reaches of the creek where bed sediments are thickest. Ground water levels, however, indicate that the creek and the alluvial aquifer are in hydraulic communication, implying that seepage has a horizontal component and occurs through the less-resistant creek bank. Therefore, an "effective" resistivity must be assigned to the Ice Creek bed sediments to allow for a horizontal flow component from the creek. Due to variation in bed thicknesses, the upper reach of the creek was assigned a lower resistivity than that adjacent to and below the coke plant site. Actual values of resistivity were assigned during model validation such that model results closely simulated observed ground water levels and flow patterns.

Ohio River Bank Permeability and Width

The Ohio River bed is directly above the bedrock formation which underlies the site. Materials deposited along the edges of the river have formed a bank zone of variable permeability and width. Flow from the Ohio River into the aquifer induced by pumping at the Coal Grove well field is primarily through the riverbank, with the potential for some discharge through the bed into the aquifer via the thin underlying layer of sand and gravel deposits. North of Ice Creek along the western boundary of the site, ground water flows primarily from the aquifer into the Ohio River under normal stage conditions.

Measured ground water levels (Figure 4-6) indicate that the riverbank is less permeable than the alluvial aquifer in the area adjacent to the tar plant. The ground water gradient from the site toward the river in this area is steeper than gradients in the upstream direction toward Ice Creek and downstream toward Dayton Malleable property.

In the Coal Grove area, the relatively minor drawdown observed in MW-5 indicates that low-permeability bank deposits are not present to restrict recharge from the river to the wells.

The width, w, of the Ohio River Bank Zone was assumed to be 100 feet. The bank width is one of three physical parameters which affect flow from the alluvial aquifer to the Ohio River (or vice versa) as defined by the coefficient of retardation, r (Hantush, 1965), where K equals permeability:

$$r = \frac{w\ K_{aquifer}}{K_{bank}} \qquad (F.1)$$

Therefore, variations in bank permeability implicitly incorporate bank zone width variations in the coefficient of retardation. A bank permeability of 1/40 of the alluvial aquifer permeability was assigned to the riverbank adjacent to the tar plant in order to simulate measured heads as discussed in Section F.2.2.1.

Outer Lagoon Dike Permeability and Width

Relatively steep hydraulic gradients are observed in the outer lagoon dike area. These steeper gradients result from a zone of lower-permeability materials along Ice Creek due to siltation, and from higher recharge in the lagoon area due to rerouting of coke plant runoff to the lagoons. The lagoon recharge is the less significant factor, evidenced by the lack of water table mounding effects observed to the west of the lagoons and by the continued presence of steep hydraulic gradients along the Ice Creek bank south of the lagoon area. The horizontal model therefore incorporates a low-permeability zone in the outer lagoon dike area. The preceding discussion of the simulation of the Ohio River Bank also applies to this zone. Elements representing the area where the field data show steep gradients are included in Zone 3, which is assigned a permeability 1/40 of that of the alluvial aquifer as discussed in Section F.2.2.1.

Specific Yield

Sand and gravel deposits, such as those that form the alluvial aquifer, generally exhibit specific yields in the range of 0.10 to 0.25 (Bear, 1979). A value of 0.2 was used in the flow balance analysis. This value is not important in the steady-state analyses, however, because the specific yield parameter is not required for steady-state calculations.

Ohio River and Ice Creek Water Surface Elevations

Figure F-3 shows the stage-duration curve for the Ohio River at the Ashland River gage (River Mile 322.75) operated by the U.S. Army Corps of Engineers until 1978. The curve indicates the percentage of time that a specified water surface elevation in the river (stage) is equaled or exceeded. The figure indicates that approximately 90 percent of the time the stage is between 518 feet mean sea level (MSL) and the normal pool level of 515 feet as maintained by the Greenup Dam. Depending on the flow rate in the river, the Ohio River surface elevation at the Allied Ironton site has been reported to be between 0.2 and 2.3 feet higher than the normal pool river elevation at the Ashland gage (Benedict, et al., 1983; D'Appolonia, 1984). Although judgment is required in extrapolating measured stage elevations from the Ashland gage to the site, the stage-duration curve is a good indication of stage fluctuations above the normal pool level.

After review of the available stage data at Ashland and consideration of water surface elevations measured during the field programs, an elevation of 516 feet MSL was selected for the Ohio River and Ice Creek at the site. This elevation applies to Ice Creek because the creek water surface is essentially flat near the site due to backwater effects from the Ohio River.

Because the ground water surface over most of the site is relatively flat, transient changes in ground water flow conditions caused by variation in Ohio River/Ice Creek stage were analyzed using horizontal transient flow simulations as discussed in Section F.2.2.4.

Coal Grove Well Pumping Rates

Recent operating records for the Coal Grove well field (Coal Grove, 1983) indicate an average daily pumping rate of 250 gallons per minute (gpm) for Well CG-3 and 275 to 300 gpm for one to 1.5 hours per day from Well CG-4. The 300-gpm/1.5-hour-per-day rate was averaged over a 24-hour period to give the 19-gpm pumping rate used for Well CG-4 in the flow modeling.

F.2.1.3 Assumptions

The following assumptions were made in performing the horizontal flow simulations:

- Ground water flow is along a two-dimensional plane which is nearly horizontal as defined by the bedrock surface (bottom of aquifer). Vertical velocity components are considered negligible with respect to the horizontal components.
- Ground water flow through bedrock underlying the aquifer is negligible relative to the aquifer flow rate.
- Within each permeability zone, the aquifer is homogeneous and isotropic.
- The Ice Creek bed can be divided into two distinct zones; within each zone, bed characteristics are uniform.
- Within each defined recharge zone, the recharge rate is uniform.

F.2.2 HORIZONTAL FLOW ANALYSES

F.2.2.1 Model Validation

The primary objective of model validation is to establish a site-specific model incorporating the combination of values of input parameters (within ranges determined by field measurement, historical information, and/or from literature sources) that allow the model to most closely represent field conditions. The goal of this process is to simulate the behavior of the existing ground water system.

The following information was initially assigned to the model and was not varied during validation:

- The grid system configuration
- Initial alluvial aquifer saturated thicknesses
- Bedrock datum (bottom of aquifer) elevations

- Locations of the Coal Grove wells and their respective pumping rates.

Several parameters were varied, alone and in combination with others, to achieve computed potentiometric heads which would best match those measured in the field:

- Resistivity of Ice Creek bed zones, and number of these zones
- Recharge rate for Zones 1, 2, and 3
- Alluvial aquifer permeability
- Ratios of Ohio River bank/outer lagoon dike permeabilities to aquifer permeability; locations of permeability zones.

Analysis of the effects of varying these parameters in the model validation procedure indicated the presence and extent of two specific areas having lower permeabilities than that of the alluvial aquifer:

Ohio River Bank - Observed ground water levels along the Ohio River bank indicate a variability in the resistance, r (Equation F.1), along the length of the bank included in the simulation. Relatively steep gradients have consistently been measured in the area adjacent to the tar plant; these gradients are less steep along the bank near the mouth of Ice Creek, and toward the north of the site (Dayton Malleable property). In the Coal Grove area, water levels measured in MW-5 show very little drawdown, indicating low resistance to ground water recharge through the riverbank. To best simulate observed conditions, the segment of the riverbank adjacent to the tar plant (Zone 3) was assigned a permeability of 1/40 of the alluvial aquifer permeability.

Outer Lagoon Dike Area - The relatively steep gradients in the outer lagoon dike area were simulated by assigning a lower permeability to the corresponding elements. This zone is a result of siltation in the broad zone of Ice Creek, and its configuration was set to provide the most representative simulation of field conditions.

The final parameters selected for the validated model (Table F.1) best simulate the existing ground water system given the current data base and present understanding of site hydrogeologic conditions.

F.2.2.2 Validated Model

The ground water flow field presented in Figure F-4 represents average conditions at the site as simulated by the validated model. Two primary factors could cause variation in the computed flow field:

- Localized variation in hydrogeologic parameters, or actual parameter values differing from those assumed for the simulation
- Transient changes in boundary conditions such as infiltration, Ohio River and Ice Creek stage, and pumping withdrawals at locations other than the Coal Grove well field.

As discussed in Chapter 4.0, the map of October 3, 1984 water levels (Figure 4-6) is similar to those previously recorded at the site. The observed potentiometric surface for this date exhibits hydraulic gradients and ground water flow patterns typical of the site and represents the most complete data set available for measured heads.

Table F.2 is a comparison of the October 3, 1984 piezometric data with the computed elevations shown in Figure F-4. The computed ground water surface provides a good representation of observed ground water flow conditions illustrated in Figure 4-6. The indications of flow predominantly toward Ice Creek and the Ohio River, the areas of steeper hydraulic gradients, and the general patterns of ground water surface contours are also consistent with previous ground water level maps. The differences between October 3, 1984 measured heads and the computed values are generally small, on the order of 0.5 foot. Differences of one to two feet occur for some areas of the outer lagoon dike, Ohio River bank, and vicinity of the Coal Grove wells, and a difference of over three feet is shown for Well MW-5. These differences may be due to localized variations in permeabilities, transient pumping rates, or greater head variations over short distances in areas of steep ground water gradients. The isolated variations from the October 3, 1984 water levels are not significant relative to the objectives of the modeling; the overall representation of piezometric head values, flow directions, and hydraulic gradients provides a good simulation of the site hydrogeologic system.

F.2.2.3 Balance of Flow Components to Coal Grove

The sources and magnitudes of ground water inflow to the Coal Grove wells were determined using a summation of computed flow rates for appropriate nodes within the grid system. Flows were summed for the control volume (CV) defined as the model grid area southeast of Ice Creek. Figure F-5 illustrates the flows into (I) and out of (O) the ground water system used in the flow balance calculation:

Flow Into Control Volume (I)

- Natural infiltration in the area east and southeast of Ice Creek
- Recharge from the Ohio River
- Ground water inflow along the southern boundary of Ice Creek (refer to boundary location in Figure F-5), consisting of two components:
  - Leakage from Ice Creek
  - Ground water underflow from the Allied Chemical/Ironton site which flows beneath Ice Creek toward the Coal Grove well field.

Flow Out of Control Volume (O)

- Ground water discharge to Ice Creek
- Discharge to the Ohio River near the southwestern corner of the grid system, occurring for some of the flow simulations
- Pumpage from the Coal Grove well field.

TABLE F.3

SUMMARY OF INPUT DATA FOR GROUND WATER FLOW SIMULATIONS[1]

COMPUTER SIMULATION NUMBER	ALLUVIAL AQUIFER PERMEABILITY (cm/s)	ICE CREEK BED RESISTIVITY (yr)		INFILTRATION RATE RATE (in/yr)	OUTER LAGOON DIKE/ OHIO RIVER BANK PERMEABILITY (cm/s)	COAL GROVE WELL PUMPING RATES (gpm)		DESCRIPTION
	ZONES 1 AND 2	ZONE 4	ZONE 5	ZONE 1	ZONE 3[2]	CG-3	CG-4	
1	2×10^{-2}	5.5×10^{-2}	3.9×10^{-2}	8	5×10^{-4}	250	19	Calibrated Model
2	2×10^{-2}	5.5×10^{-2}	3.9×10^{-2}	6	5×10^{-4}	250	19	Low Infiltration Rate
3	2×10^{-2}	5.5×10^{-2}	3.9×10^{-2}	10	5×10^{-4}	250	19	High Infiltration Rate
4	1×10^{-2}	5.5×10^{-2}	3.9×10^{-2}	8	2.5×10^{-4}	250	19	Low Aquifer Permeability
5	4×10^{-2}	5.5×10^{-2}	3.9×10^{-2}	8	1×10^{-3}	250	19	High Aquifer Permeability
6	2×10^{-2}	5.5×10^{-3}	3.9×10^{-3}	8	5×10^{-4}	250	19	Low Ice Creek Bed Resistivity
7	2×10^{-2}	0.55	0.39	8	5×10^{-4}	250	19	High Ice Creek Bed Resistivity
8	2×10^{-2}	5.5×10^{-2}	3.9×10^{-2}	8	2×10^{-2}	250	19	Uniform Alluvial Aquifer Permeability

(1) Refer to Figure F-2 for zone locations.

(2) Zone 3 permeability is equal to 1/40 alluvial aquifer permeability, except in Simulation 8.

TABLE F.4

SUMMARY OF RELATIVE MAGNITUDES OF INFLOW COMPONENTS TO COAL GROVE WELLS[1]

COMPUTER SIMULATION NUMBER[2]	NATURAL INFILTRATION FROM SOUTHEAST OF ICE CREEK (%)	(A) LEAKAGE FROM ICE CREEK (%)	(B) UNDERFLOW BENEATH ICE CREEK (%)	TOTAL FROM SITE (A+B) (%)	RECHARGE FROM OHIO RIVER (%)	DESCRIPTION
1	41	27	3	30	29	Validated Model
2	34	29	3	32	34	Low Infiltration Rate
3	48	25	3	28	24	High Infiltration Rate
4	39	32	2	34	27	Low Aquifer Permeability
5	44	20	6	26	30	High Aquifer Permeability
6	36	41	0	41	23	Low Ice Creek Bed Resistivity
7	47	8	10	18	35	High Ice Creek Bed Resistivity
8	41	28	2	30	29	High Permeability River/Stream Bank Zones

(1) Refer to Figure F-5 for definition of flow components.

(2) Input data for computer simulations are listed in Table F.3.

TABLE F.5

HYDROGEOLOGIC INPUT DATA FOR HORIZONTAL MASS TRANSPORT SIMULATION

PARAMETER	UNITS	VALUE
Alluvial aquifer permeability (Zones 1 and 2)	cm/s	2×10^{-2}
Ohio River bank permeability (Zone 3)	cm/s	5×10^{-4}
Ice Creek bed resistivity	yr	
Zone 4		5.5×10^{-2}
Zone 5		3.9×10^{-2}
Infiltration rate	in./yr	
Zone 1		8
Zone 2		0
Zone 3		0
Coal Grove well pumping rates	gpm	
CG-1		0
CG-2		0
CG-3		250
CG-4		19
Ohio River and Ice Creek water surface elevations	ft, MSL	516.0
Effective porosity	dimensionless	0.2
Dispersivity	feet	
Longitudinal		100
Transverse		20
Source Concentration	dimensionless	1.0
Retardation factor	dimensionless	1.0

TABLE F.6
SOURCE/RECEPTOR ANALYSIS

SOURCE NO.[1]	DESCRIPTION	PERCENTAGE OF TOTAL SOURCE LOADING RECEIVED BY[2]		
		OHIO RIVER	ICE CREEK	COAL GROVE WELLS
1	Lagoons 1, 3, and 5	0.8	92.4	6.8
2	Lagoons 2 and 4	0.0	100	0.0
3	Goldcamp Area	100	0.0	0.0
4	Area of Well T-9	99.9	0.1	0.0
5	Area of TPPW-1	100	0.0	0.0
6	Area of Wells C-3 and T-11	66.7	15.1	18.2
7	Leakage from Ice Creek	0.1	0.0	99.9

(1) Refer to Figure F-9 for potential source locations.

(2) Percentages are approximate and are presented to illustrate general trends in chemical constituent movement from a specific source area. The calculations are sensitive to flow conditions and the dispersion parameter values used in the simulations.

TABLE F.7

CONCENTRATIONS FOR MONITORING POINTS
USED IN ICE CREEK MASS LOADING CALCULATION
(mg/ℓ)

PARAMETER	MONITORING POINT FOR GROUND WATER DISCHARGE FROM SITE											
	C-6		MW-16		C-2		MW-15		C-1		C-10	
	RANGE[1]	REP.[2]	RANGE	REP.	RANGE	REP.	RANGE	REP.	RANGE	REP.	RANGE	REP.
Chloride	22-35	24	-[3]	32	31.5-44	38	59-60	60	554-770	658	19-170	25
Ammonia	0.39-2.1	1.1	-	ND[4]	ND-2.72	1.2	0.06-0.06	0.06	101-170	167	12-57.1	30
Cyanide	ND-0.057	0.048	-	ND	ND-0.29	0.15	0.04-0.07	0.07	0.034-1.8	0.21	0.04-0.15	0.054
Phenolics	ND-0.02	<0.01	-	ND	ND-0.108	0.03	ND-0.005	0.005	0.011-0.08	0.047	0.005-0.11	0.07
Benzene	ND-<0.010	<0.010	-	ND	ND-0.012	<0.010	ND-ND	ND	ND-0.011	<0.010	ND-0.001	ND

[1] Ranges were determined by examining all available data for each monitoring point.

[2] Representative values based on Phase I and Phase II data.

[3] Only one data point available.

[4] ND indicates none detected.

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TABLE F.8

CONCENTRATIONS FOR MONITORING POINTS
USED IN OHIO RIVER MASS LOADING CALCULATION
(mg/ℓ)

PARAMETER	MONITORING POINT FOR GROUND WATER DISCHARGE FROM SITE															
	T-3D		MW-1		T-4D		MW-14		MW-18		MW-17		MW-11		MW-8	
	RANGE(1)	REP.(2)	RANGE	REP.	RANGE	REP.	RANGE	REP.	RANGE	REP.	RANGE	REP.	RANGE	REP.	RANGE	REP.
Chloride	35-120	120	10-13	13	20-110	99	17-45	45	13-16	16	-(3)	17	8-130	130	-	22
Ammonia	1.9-5.8	4.8	0.06-0.82	0.82	0.09-1.5	0.7	ND(4)	0.06	ND-0.06	0.06	-	ND	ND-ND	ND	-	ND
Cyanide	ND-0.05	0.03	ND-ND	ND	<0.012-0.05	<0.02	ND-ND	ND	ND-ND	ND	-	0.02	ND-0.35	0.35	-	ND
Phenolics	ND-0.134	0.018	0.008-0.015	0.012	<0.008-0.13	0.012	0.005-0.012	0.008	-	ND	-	ND	ND-0.008	0.008	-	0.009
Benzene	ND-ND	ND	ND-<0.01	<0.010	ND-ND	ND	ND-<0.001	ND	-	ND	-	ND	-	ND	-	ND

(1) Ranges were determined by examining all available data for each monitoring point.

(2) Representative values based on Phase I and Phase II data.

(3) Only one data point available.

(4) ND indicates none detected.

TABLE F.9

ESTIMATE OF MASS LOADINGS FOR ICE CREEK[1]

PARAMETER	APPROXIMATE MASS LOADING FROM SITE INTO ICE CREEK[2] (lb/day)		POTENTIAL INCREASE IN ICE CREEK CONCENTRATION DUE TO MASS LOADING FROM SITE[3] (mg/ℓ)	
	RANGE[4]	REP.[5]	RANGE[6]	REP.[7]
Chloride	33.2-56.4	38.4	0.71-7.1	2.4
Ammonia	<5.37-<12.3	<9.76	0.18-1.8	0.60
Cyanide	<0.0104-<0.105	<0.0249	0.0005-0.0046	0.0015
Phenolics	<0.0022-<0.0175	<0.0101	0.0002-0.0019	0.0006
Benzene	<0.00038-<0.00118	<0.00070	0.00001-0.0001	0.00004

(1) Mass loading estimates are based on a limited number of data points and are presented to indicate approximate values.

(2) Based on Equation F.3, Q is from the horizontal model (Simulation 1) and C is from Table F.7.

(3) Based on volumetric flow rates in Ice Creek. Assumes initial parameter concentrations are zero in Ice Creek.

(4) Based on water quality variation in Table F.7.

(5) Based on representative water quality values in Table F.7.

(6) Ranges are based on representative mass loading values and typical range of Ice Creek flow rates between 1 and 10 cfs (USGS gaging station records).

(7) Based on representative Ice Creek flow rate of 3 cfs.

TABLE F.10

ESTIMATE OF MASS LOADINGS FOR OHIO RIVER[1]

PARAMETER	MASS LOADING FROM SITE INTO OHIO RIVER[2] (lb/day)		POTENTIAL INCREASE IN OHIO RIVER CONCENTRATION DUE TO MASS LOADING FROM SITE[3] (mg/ℓ)	
	RANGE[4]	REP.[5]	RANGE[6]	REP.[7]
Chloride	13.3-47.7	46.1	8.6×10^{-5} - 4.3×10^{-4}	1.2×10^{-4}
Ammonia	<0.303-1.16	0.905	1.7×10^{-6} - 8.4×10^{-6}	2.4×10^{-6}
Cyanide	<0.0126-0.0429	0.0344	6.4×10^{-8} - 3.2×10^{-7}	9.1×10^{-8}
Phenolics[8]	<0.0045-0.0415	0.00784	1.5×10^{-8} - 7.3×10^{-8}	2.1×10^{-8}
Benzene[8]	<0.00069-<0.00196	<0.00196	3.6×10^{-9} - 1.8×10^{-8}	5.2×10^{-9}

(1) Mass loading estimates are based on a limited number of data points and are presented to indicate approximate values.

(2) Based on Equation F.3, Q is from the horizontal model (Simulation 1) and C is from Table F.8.

(3) Based on volumetric flow rates in the Ohio River.

(4) Based on water quality variation in Table F.8.

(5) Based on representative water quality values in Table F.8.

(6) Ranges are based on representative mass loading value and typical range of Ohio River flow rates between 20,000 and 100,000 cfs (Army Corps of Engineers gaging station records).

(7) Based on representative Ohio River flow rate of 70,000 cfs.

(8) See Section F.3.5.2 of text for additional discussion of mass loadings of phenolics and benzene to the Ohio River.

TABLE F.11

ESTIMATE OF MASS LOADINGS FOR COAL GROVE WELL FIELD[1]

PARAMETER	CONCENTRATION (mg/ℓ) AT MONITORING POINT FOR GROUND WATER DISCHARGE FROM SITE - WELL C-13		MASS LOADING FROM SITE[2] (lb/day)		POTENTIAL CONTRIBUTION TO COAL GROVE WELL FIELD CONCENTRATIONS DUE TO MASS LOADING FROM SITE[3] (mg/ℓ)	
	RANGE	REP.[4]	RANGE[5]	REP.[6]	RANGE[7]	REP.[8]
Chloride	120-130	123	116-126	119	36-39	37
Ammonia	ND[9]-0.68	0.55	<0.048-0.66	0.53	0.015-0.20	0.16
Cyanide	<0.02-0.12	0.05	0.0078-0.12	0.048	0.0024-0.037	0.015
Phenolics	0.011-0.09	0.014	0.011-0.087	0.014	0.0034-0.027	0.0043
Benzene	ND-ND	ND	<0.001-<0.001	<0.001	-	<0.0003

(1) Mass loading estimates are based on a limited number of data points and are presented to indicate approximate values.

(2) Based on Equation F.3; from the horizontal flow model results, Q is 30 percent of the 269 GPM average pumping rate at the Coal Grove wells.

(3) Based on 269 GPM average volumetric flow rate pumped at Coal Grove wells.

(4) Representative concentrations from Chapter 4.0.

(5) Based on water quality variation at Well C-13.

(6) Based on representative concentration at Well C-13.

(7) Based on calculated ranges of mass loadings.

(8) Based on computed representative mass loadings.

(9) ND indicates none detected.

FIGURES

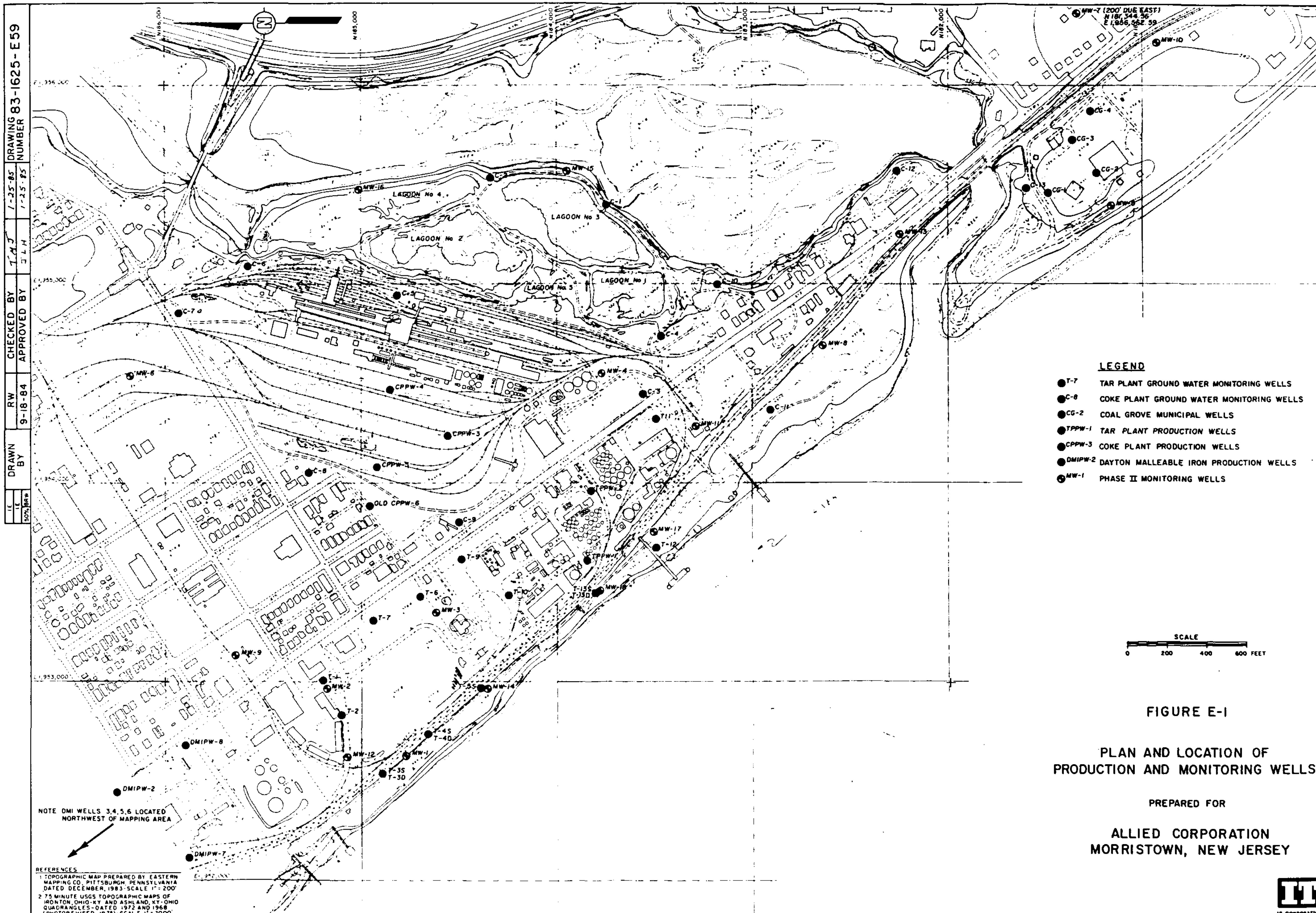

FIGURE E-1

PLAN AND LOCATION OF PRODUCTION AND MONITORING WELLS

PREPARED FOR

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MORRISTOWN, NEW JERSEY

TABLE F.1

HYDROGEOLOGIC PARAMETER VALUES
FOR HORIZONTAL FLOW MODEL

PARAMETER	UNITS	PARAMETER VALUES		
		VALIDATED MODEL	LOW VALUE	HIGH VALUE
Alluvial aquifer permeability (Zones 1 and 2)	cm/s	2×10^{-2}	1×10^{-2}	4×10^{-2}
Outer lagoon dike/Ohio River bank permeability (Zone 3)[1]	cm/s	5×10^{-4}	2.5×10^{-4}	2×10^{-2}
Ice Creek bed resistivity:	yr			
Zone 4		5.5×10^{-2}	$5.5. \times 10^{-3}$	0.55
Zone 5		3.9×10^{-2}	3.9×10^{-3}	0.39
Infiltration rate:	in./yr			
Zone 1		8	6	10
Zone 2		0	NA[2]	NA
Zone 3		0	NA	NA
Specific yield	dimensionless	0.2	NA	NA
Coal Grove well pumping rates:	gpm			
CG-1		0	NA	NA
CG-2		0	NA	NA
CG-3		250	NA	NA
CG-4		19[3]	NA	NA
Ohio River and Ice Water Surface Elevations	ft, MSL	516	-[4]	518, 533[4]

(1)Zone 3 permeability is equal to 1/40 alluvial aquifer permeability except in Simulation 8.

(2)Not analyzed.

(3)The reported operating schedule for Well CG-4 is a pumping rate of 275 to 300 gpm for 1 to 1.5 hours per day. A 300 gpm rate over a 1.5-hour period was assumed and averaged over a 24-hour period to yield a 19 gpm average.

(4)The transient effects of two flood events were analyzed using the horizontal model:

Ohio River Stage (feet MSL)	Percent of Days per Year Equaled or Exceeded	Typical Duration of Event (days)
518	16	6
533	1	10

TABLE F.2

COMPARISON OF MEASURED AND SIMULATED PIEZOMETRIC HEADS IN ALLUVIAL AQUIFER

MONITORING LOCATION	SIMULATED[1] HEAD (feet, MSL)	MEASURED HEAD, 10-03-84 (feet, MSL)	HEAD DIFFERENCE[2]
MW-1	518.16	518.91	-0.75
MW-2	518.46	518.85	-0.39
MW-3	518.56	518.79	-0.23
MW-4	518.10	518.21	-0.11
MW-5	518.40	514.31	-3.91
MW-6	518.90	519.01	-0.11
MW-7	514.50	512.52	+1.98
MW-8	516.81	518.06	-1.25
MW-9	518.68	519.03	-0.35
MW-10	513.29	512.37[3]	+0.92
MW-11	517.74	518.08	-0.34
MW-12	518.08	518.84	-0.76
MW-13	516.09	516.34	-0.25
MW-14	518.33	518.84	-0.51
MW-15	517.50	516.04	+1.46
MW-16	517.68	516.63	+1.05
MW-17	518.05	518.46	-0.41
MW-18	518.23	518.87	-0.64
C-1	517.52	516.18	+1.34
C-2	517.64	516.02	+1.62
C-3	518.00	518.00	0.00
C-4	517.83	517.83	0.00
C-5	518.28	518.34	-0.06
C-6	518.21	518.36	-0.15
C-7	518.59	518.64	-0.05
C-8	518.81	518.72	+0.09

TABLE F.2
(Continued)

MONITORING LOCATION	SIMULATED[1] HEAD (feet, MSL)	MEASURED HEAD, 10-03-84 (feet, MSL)	HEAD DIFFERENCE[2]
C-9	518.58	518.82	-0.24
C-10	517.14	517.66	-0.52
C-11	517.26	-[4]	-
C-12	515.91	515.88	+0.03
C-13	508.60	509.63	-1.03
T-1	518.51	519.40	-0.89
T-2	518.31	519.07	-0.76
T-3S	518.04	519.69	-1.65
T-3D	518.04	518.71	-0.67
T-4S	518.26	519.01	-0.75
T-4D	518.26	519.04	-0.78
T-5S	518.33	518.81	-0.48
T-5D	518.33	518.92	-0.59
T-6	518.61	519.02	-0.41
T-9	518.57	518.92	-0.35
T-10	518.41	518.82	-0.41
T-11	517.95	518.02	-0.07
T-12	518.07	518.61	-0.54
T-13S	518.24	518.68	-0.44
CPPW-3	518.57	518.29	+0.28
CPPW-4	518.60	518.17	+0.43
CPPW-5	518.70	519.36	-0.66
CPPW-6	518.73	518.42	+0.31
TPPW-2	518.25	518.14	+0.11
Mean of the head differences:			-0.24
Mean of the absolute values of the head differences:			0.64

[1] Results from validated computer model, Simulation No. 1.

[2] Head difference = (simulated head) - (measured head).

[3] Measured 11-19-84.

[4] Data not available.

FIGURE

Coal Grove Well Field

The results of the mass loading calculations for the Coal Grove wells indicate that leakage from Ice Creek and ground water underflow from the site may contribute up to 40 milligrams per liter of chloride and 0.2 milligram per liter of ammonia to water pumped at the Coal Grove well field (Table F.11).

The observed water quality in Ice Creek indicates that concentrations of chloride and ammonia are probably increased by both site-associated loadings and by influx of domestic sewage (see Ice Creek discussion). Therefore, mass loadings of chloride and ammonia calculated for the Coal Grove wells which result from leakage from Ice Creek are likely comprised of contributions both from the site and from sewage discharges.

The calculated representative concentration contribution for cyanide is below the detection limit of 0.02 milligram per liter, and the representative observed concentrations for this parameter at the Coal Grove wells are also below the detection limit (Table 4.3, Chapter 4.0). The computed representative concentration contribution of approximately 0.004 milligram per liter for phenolics compares to the observed representative value of 0.013 at Coal Grove Well CG-3 (Table 4.3, Chapter 4.0).

Benzene has not been detected in Well C-13 or in the Coal Grove wells during any of the sampling programs. This supports the results of the flow analysis which indicate that leakage from surface water bodies is a much more significant source of water for the Coal Grove wells than is ground water underflow from the site. Benzene, while fairly persistent in ground water, volatilizes relatively quickly in surface waters. The lack of benzene occurrences in the Coal Grove area therefore supports the conclusion that the pumping wells are drawing significantly more surface water from Ice Creek and the Ohio River than ground water from the site.

The mass loading calculations for the Coal Grove wells are based on one monitoring point, Well C-13, thus increasing the ranges of uncertainty in the analysis. In general, however, the results are consistent with water quality observed in Ice Creek and at the Coal Grove wells.

APPENDIX F
LIST OF REFERENCES

Anderson, M. P., 1984, "Movement of Contaminants in Groundwater: Groundwater Transport - Advection and Dispersion," Groundwater Contamination, National Academy Press, Washington, D.C.

Battelle, 1984, Aquatic Ecological Studies at Allied Chemical's Ironton, Ohio Coke Site, Battelle Columbus Laboratories, Columbus, Ohio.

Bear, J., 1975, Dynamics of Fluids in Porous Media, American Elsevier Publishing Company, Inc., New York, p. 630.

Bear, J., 1979, Hydraulics of Groundwater, McGraw-Hill Book Company, New York, New York.

Benedict, Bowman, Craig, and Moos, 1983, Hydrogeologic Investigation; Iron City Fuels; Ironton, Ohio, Columbus, Ohio.

Coal Grove Municipal Employee, 1983, Verbal Communication.

D'Appolonia Waste Management Services, Inc. (D'Appolonia), 1984, Initial Site Assessment and Remedial Investigation of the Allied Chemical/ Ironton Coke Site, Ironton, Ohio, Phase I Report, D'Appolonia, Pittsburgh, Pennsylvania.

Freeze, R. A. and J. A. Cherry, 1979, Groundwater, Prentice-Hall, Inc., Englewood Cliffs, New Jersey.

Haji-Djafari, S., 1983, GEOFLOW User's Manual, Groundwater Flow and Mass Transport Computer Program, D'Appolonia Waste Management Services, Pittsburgh, Pennsylvania.

Hantush, M. S., 1965, "Wells Near Streams with Semi-Pervious Beds," Journal of Geophysical Research, Vol. 70, No. 12, pp. 2829-2838.

Konikow, L. F. and J. D. Bredehoeft, 1974, "Modeling Flow and Chemical Quality Changes in an Irrigated Stream - Aquifer System," Water Resources Research, Vol. 10, No. 3, pp. 546-562.

Pinder, G. F., 1973, "A Galerkin Finite Element Simulation of Groundwater Contamination on Long Island, New York," Water Resources Research, Vol. 9, No. 6, pp. 1657-1669.

U.S. Environmental Protection Agency, 1975, Use of the Water Balance Method for Predicting Leachate Generation from Solid Waste Disposal Sites, EPA/530/SW-168, Cincinnati, Ohio.

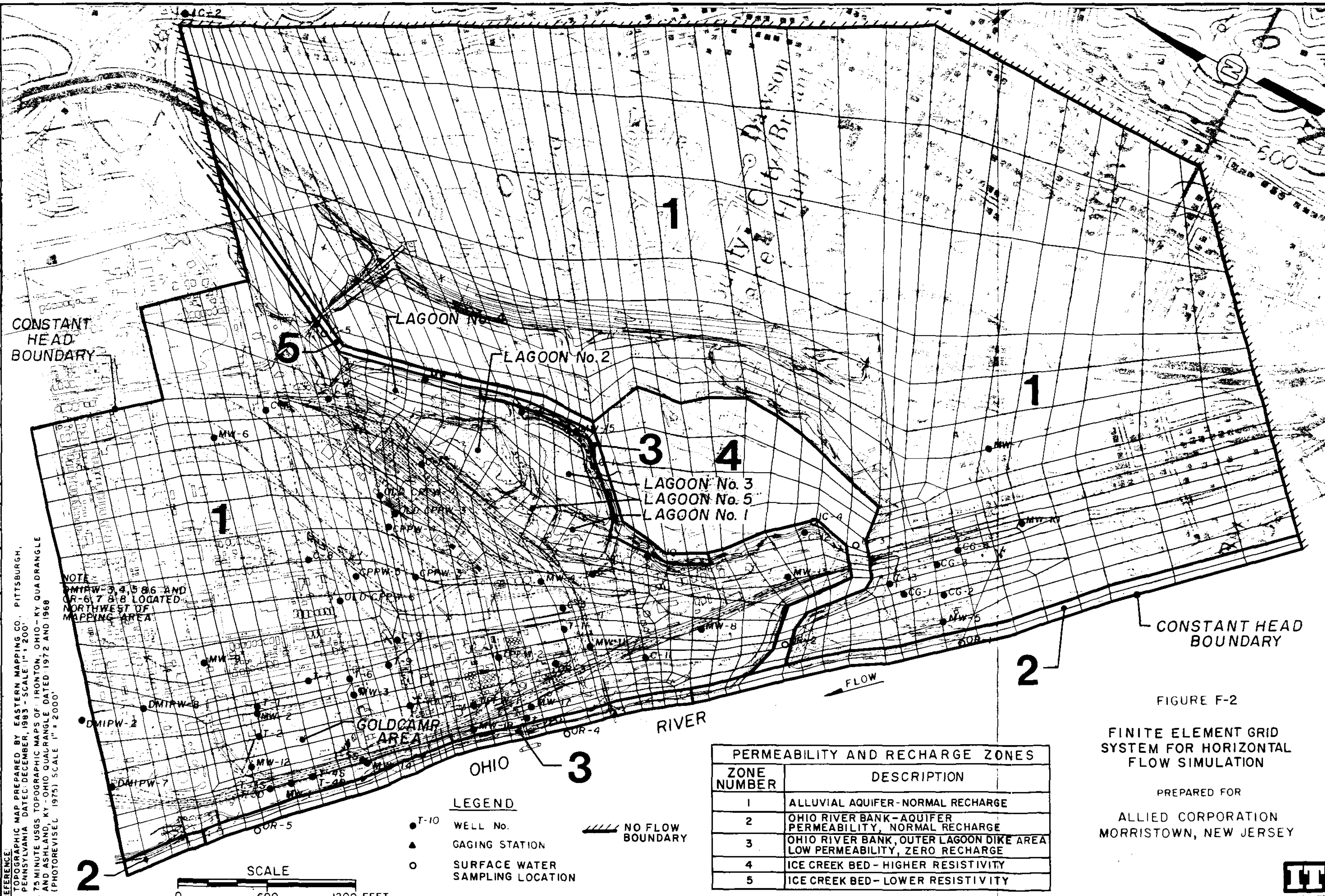
TABLES

SDMS ADMINISTRATIVE RECORD IMAGERY INSERT FORM

SITE NAME	ALLIED CHEMICAL CORPORATION		
DOC ID #	79023		
DESCRIPTION OF ITEM(S)	MAP		
REASON WHY UNSCANNABLE	____ ILLEGIBLE	or	X FORMAT OVERSIZED
DATE OF ITEM(S)	12-19-1984		
NO. OF ITEMS	1		
PHASE	X Remedial ____ Removal ____ Deletion Docket Volume 14 of 15 ____ Original ____ Update # ____		
O.U.			
FRC	Box # 2 Folder # 5		
COMMENTS			

100%	15	100%	12	DRAWN BY		CHECKED BY	MMR	1-28-85	DRAWING NUMBER	831625-B61
ORG	15	BRN.	12			APPROVED BY	JLH	02-07-85		

REFERENCE:
1. TOPOGRAPHIC MAP PREPARED BY EASTERN MAPPING CO., PITTSBURGH, PENNSYLVANIA DATED DECEMBER, 1983 - SCALE: 1" = 200'
2. 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF IRONTON, OHIO-KY QUADRANGLE AND ASHLAND, KY-OHIO QUADRANGLE DATED 1972 AND 1968 (PHOTOREVISED 1975) SCALE 1" = 2000'



PERMEABILITY AND RECHARGE ZONES	
ZONE NUMBER	DESCRIPTION
1	ALLUVIAL AQUIFER-NORMAL RECHARGE
2	OHIO RIVER BANK-AQUIFER PERMEABILITY, NORMAL RECHARGE
3	OHIO RIVER BANK, OUTER LAGOON DIKE AREA LOW PERMEABILITY, ZERO RECHARGE
4	ICE CREEK BED - HIGHER RESISTIVITY
5	ICE CREEK BED - LOWER RESISTIVITY

FIGURE F-2

FINITE ELEMENT GRID SYSTEM FOR HORIZONTAL FLOW SIMULATION

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

00000154

INTERNATIONAL TECHNOLOGY CORPORATION

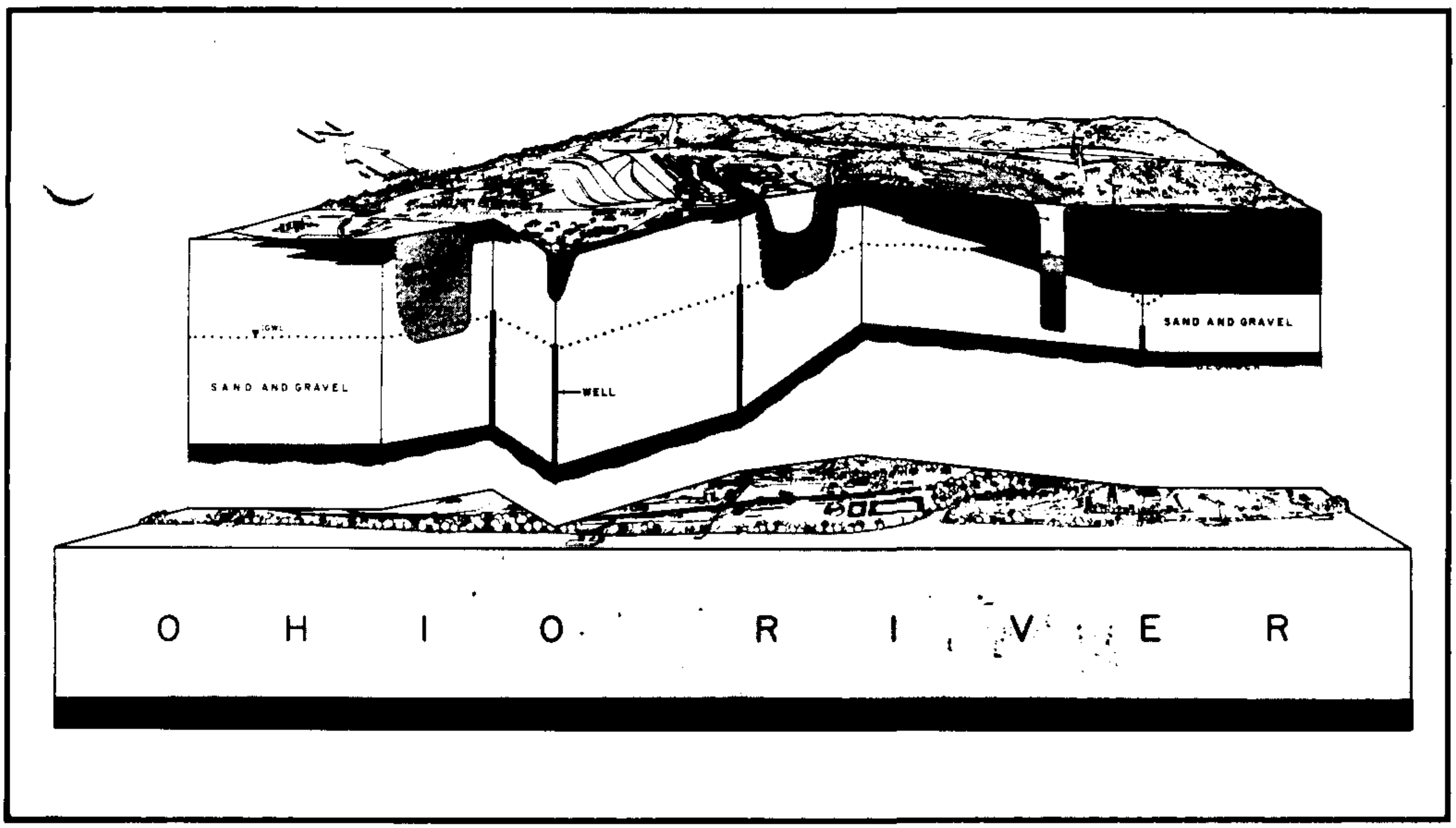
Project No. 831625
July 1986

Volume III
Final Report

Remedial Investigation

Allied Chemical/
Ironton Coke Site
Ironton, Ohio

Allied - Signal Inc.
Morristown, New Jersey



Volume III
Final Report

Remedial Investigation

Allied Chemical/
Ironton Coke Site
Ironton, Ohio

Allied - Signal Inc.
Morristown, New Jersey

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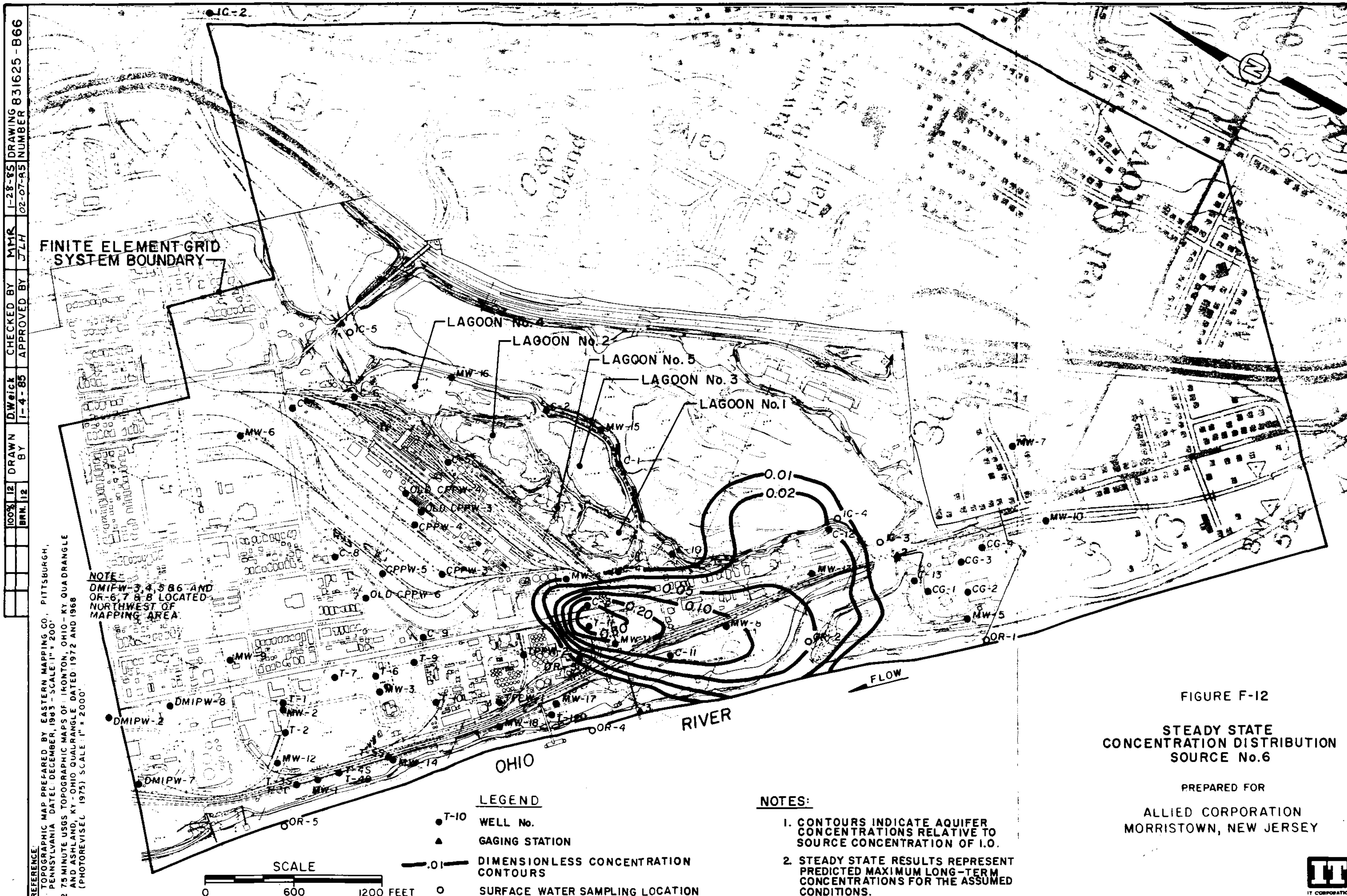
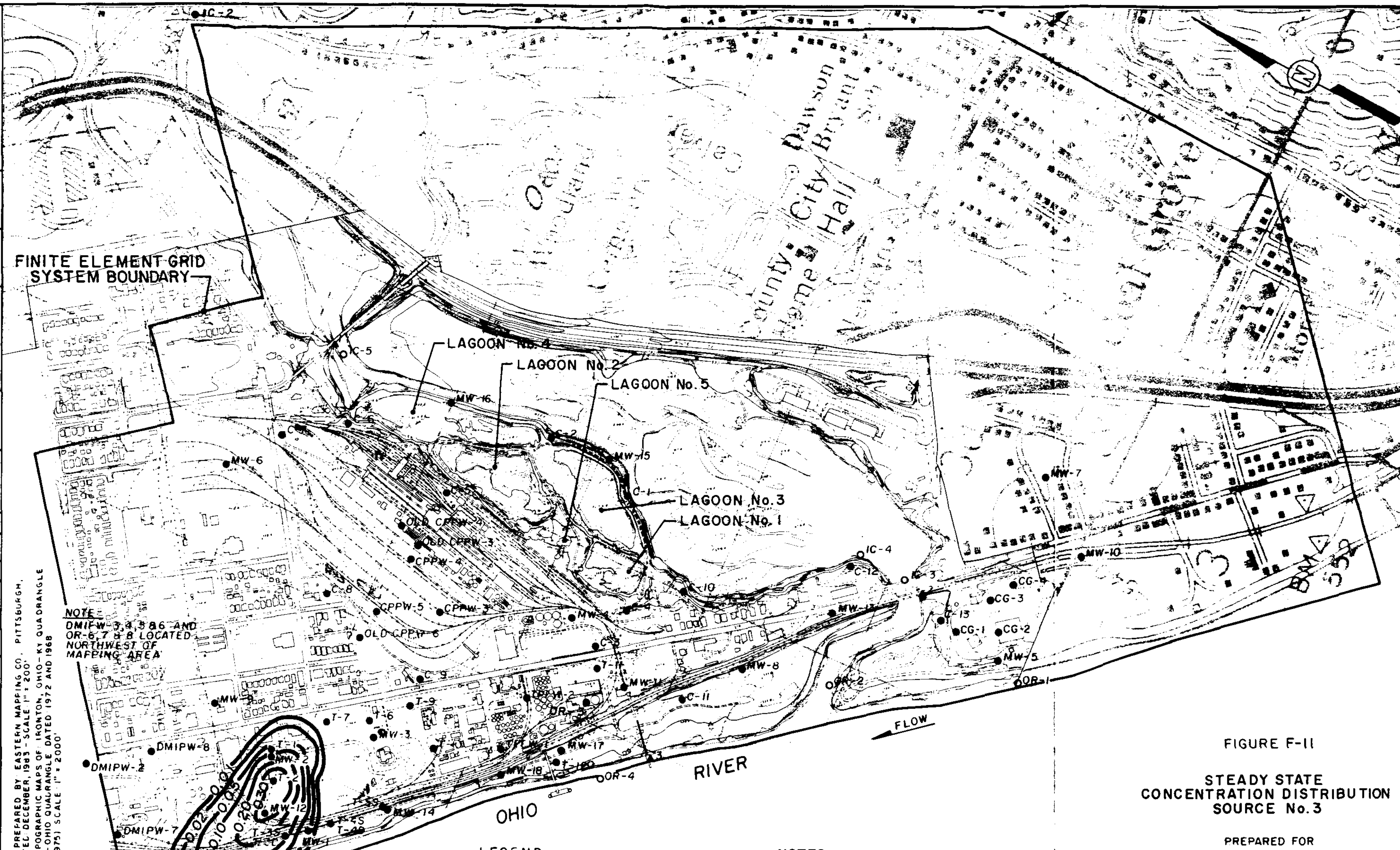


FIGURE F-12

STEADY STATE CONCENTRATION DISTRIBUTION SOURCE No.6



REFERENCE:
1. TOPOGRAPHIC MAP PREPARED BY EASTERN MAPPING CO. PITTSBURGH, PENNSYLVANIA DATED DECEMBER, 1983 - SCALE 1" = 200'
2. 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF IRONTON, OHIO-KY QUADRANGLE AND ASHLAND, KY-OHIO QUADRANGLE DATED 1972 AND 1968 (PHOTOREVISED 1975) SCALE 1" = 2000'

100% 12	DRAWN BY	D.Weick	CHECKED BY	MMR	DRAWING NUMBER
BRN. 12		1-4-85	APPROVED BY	JLH	831625-B65
				1-28-85 / 02-07-85	

SCALE

0 600 1200 FEET

LEGEND

- ● T-10 WELL No.
- ▲ GAGING STATION
- —.01— DIMENSIONLESS CONCENTRATION CONTOURS
- ○ SURFACE WATER SAMPLING LOCATION

NOTES:

1. CONTOURS INDICATE AQUIFER CONCENTRATIONS RELATIVE TO SOURCE CONCENTRATION OF 1.0.
2. STEADY STATE RESULTS REPRESENT PREDICTED MAXIMUM LONG-TERM CONCENTRATIONS FOR THE ASSUMED CONDITIONS.

FIGURE F-11

STEADY STATE CONCENTRATION DISTRIBUTION SOURCE No. 3

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

NOTE: DMIPW-3,4,5 & 6 AND OR-6,7 & 8 LOCATED NORTHWEST OF MAPPING AREA.

LEGEND

● T-10	WELL No.
▲	GAGING STATION
○	SURFACE WATER SAMPLING LOCATION
●2	SOURCE No.

SCALE
0 600 1200 FEET

SOURCE IDENTIFICATION

SOURCE No.	DESCRIPTION	SOURCE No.	DESCRIPTION
1	LAGOON Nos. 1,3 & 5	5	TAR PLANT PRODUCTION WELL No. 1
2	LAGOON Nos. 2 & 4	6	UNIDENTIFIED SOURCE NEAR WELLS C-3 & T-11
3	GOLDCAMP DISPOSAL SITE	7	LEAKAGE FROM ICE CREEK
4	ANTHRACENE UNIT		

FIGURE F-9

LOCATION OF SOURCES FOR MASS TRANSPORT SIMULATIONS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

REFERENCE:
1. TOPOGRAPHIC MAP PREPARED BY: EASTERN MAPPING CO., PITTSBURGH, PENNSYLVANIA DATED: DECEMBER, 1983 - SCALE: 1" = 200'
2. 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF: IRONTON, OHIO-KY. QUADRANGLE AND ASHLAND, KY-OHIO QUADRANGLE DATED: 1972 AND 1968 (PHOTOREVISED 1975) SCALE: 1" = 2000'

DRAWN BY			
CHECKED BY	MMR	1-28-85	DRAWING NUMBER 831625-B63
APPROVED BY	JLH	02-07-85	

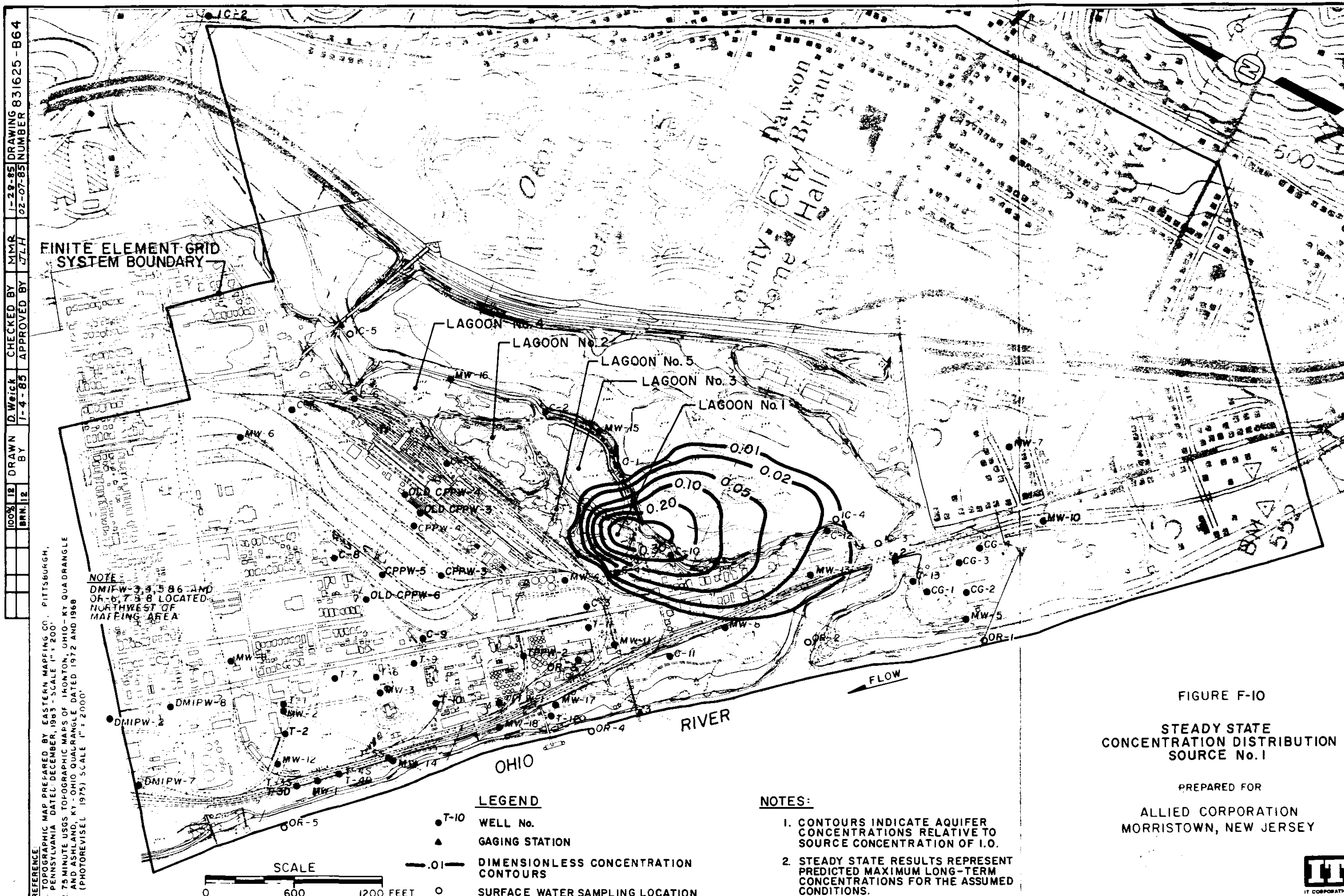
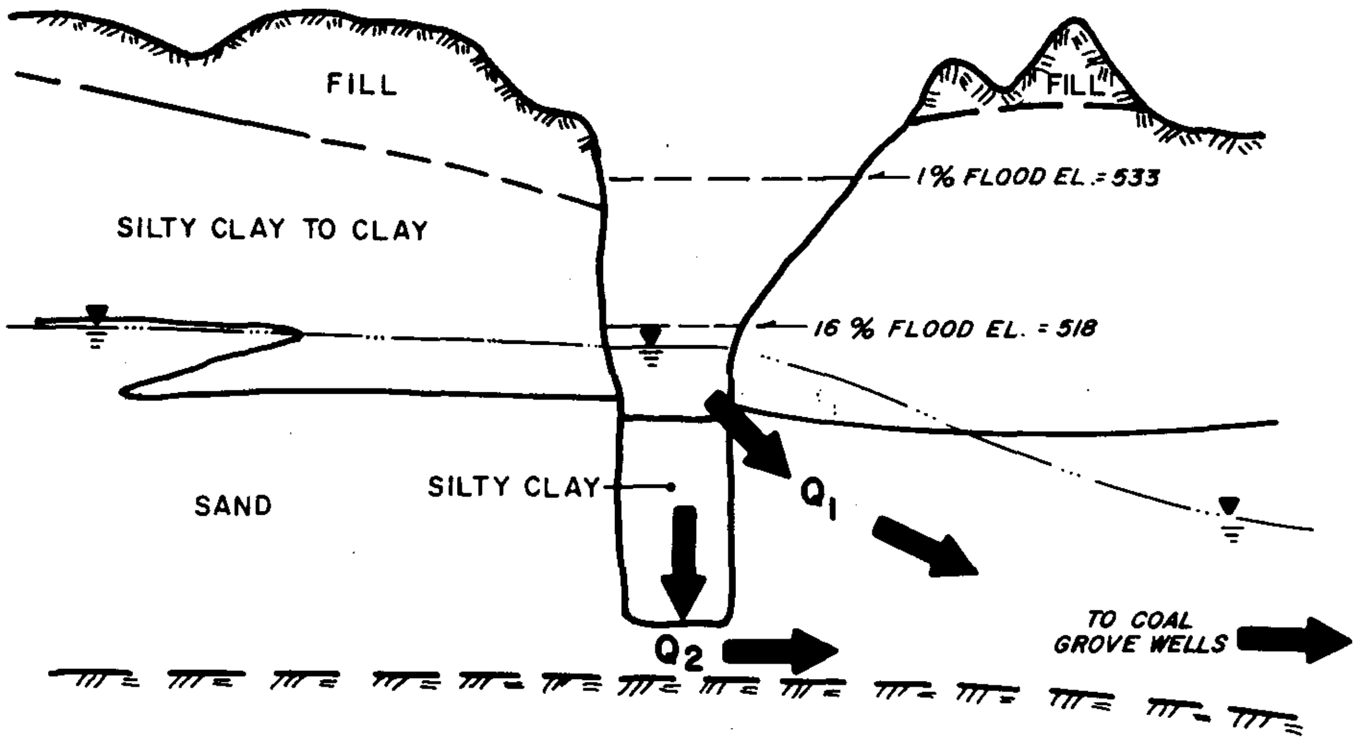


FIGURE F-10

STEADY STATE CONCENTRATION DISTRIBUTION SOURCE No. 1

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
TRS 1-16-85	MMR 1-28-85	JLH 02-07-85	831625-A48



ICE CREEK STAGE (Ft.)	Q_2 as % of Q_1
516 (Average Conditions)	~ 0.0
518 (16 % Flood Event)	~ 0.7
533 (1% Flood Event)	~ 2.0

NOTES:

1. Q_1 = FLOW FROM ICE CREEK THROUGH CHANNEL WALLS, CALCULATED BY HORIZONTAL FLOW MODEL;
   Q_2 = VERTICAL FLOW THROUGH ICE CREEK BED SEDIMENTS, CALCULATED USING DARCY'S LAW.
2. 16 % FLOOD EVENT IS EQUALLED OR EXCEEDED AN AVERAGE OF 16 % OF THE DAYS PER YEAR; 1% FLOOD EVENT IS EQUALLED OR EXCEEDED 1% OF THE DAYS PER YEAR ON AVERAGE.
3. CALCULATIONS AND CROSS SECTION SHOWN ARE FOR GEOLOGIC SECTION B-B' (FIGURE 4-4).

FIGURE F-7

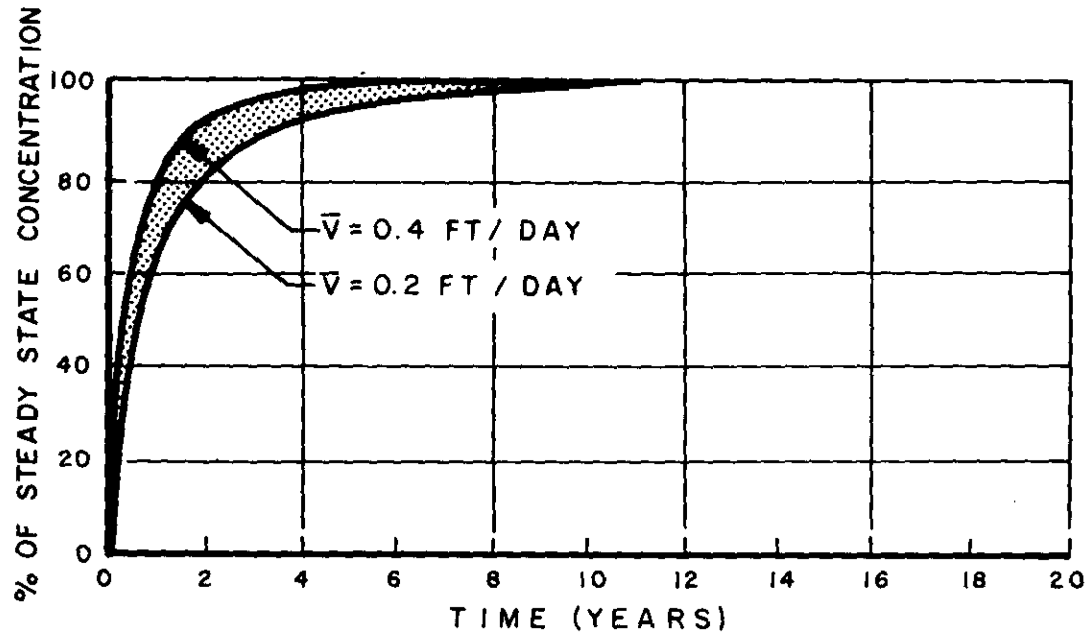
VERTICAL FLOW ANALYSIS

PREPARED FOR

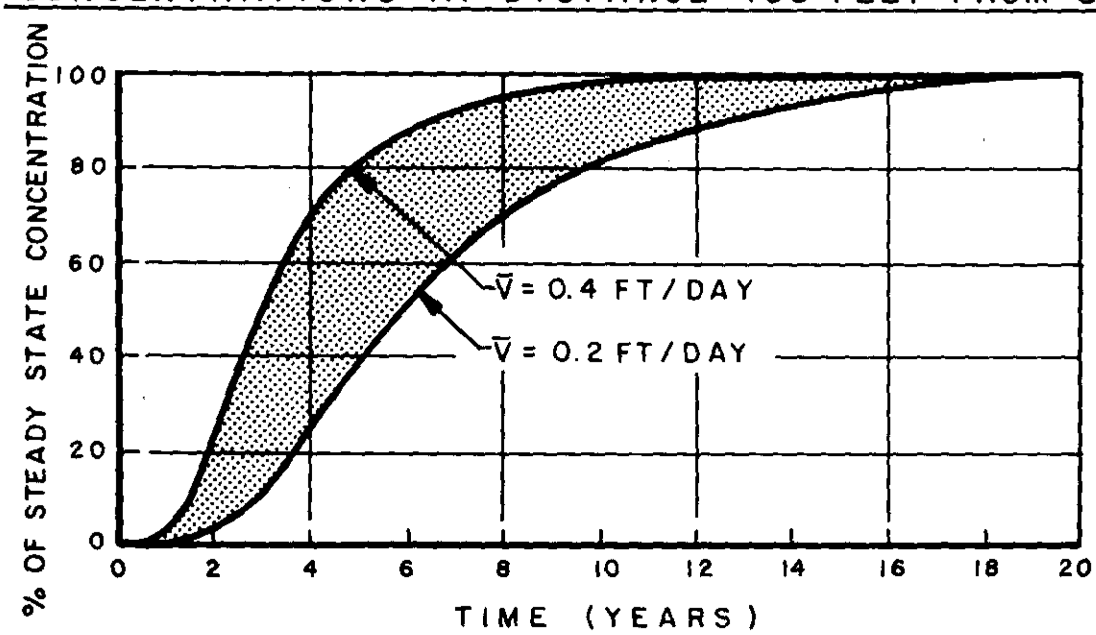
ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY	J. LOBRECO 1-14-85	CHECKED BY / APPROVED BY	MMR / JLH	1-28-85 / 02-07-85	DRAWING NUMBER 831625-A47



CONCENTRATIONS AT DISTANCE = 100 FEET FROM SOURCE



CONCENTRATIONS AT DISTANCE = 500 FEET FROM SOURCE

FIGURE F-8

RESULTS OF TRANSIENT DISPERSION ANALYSIS

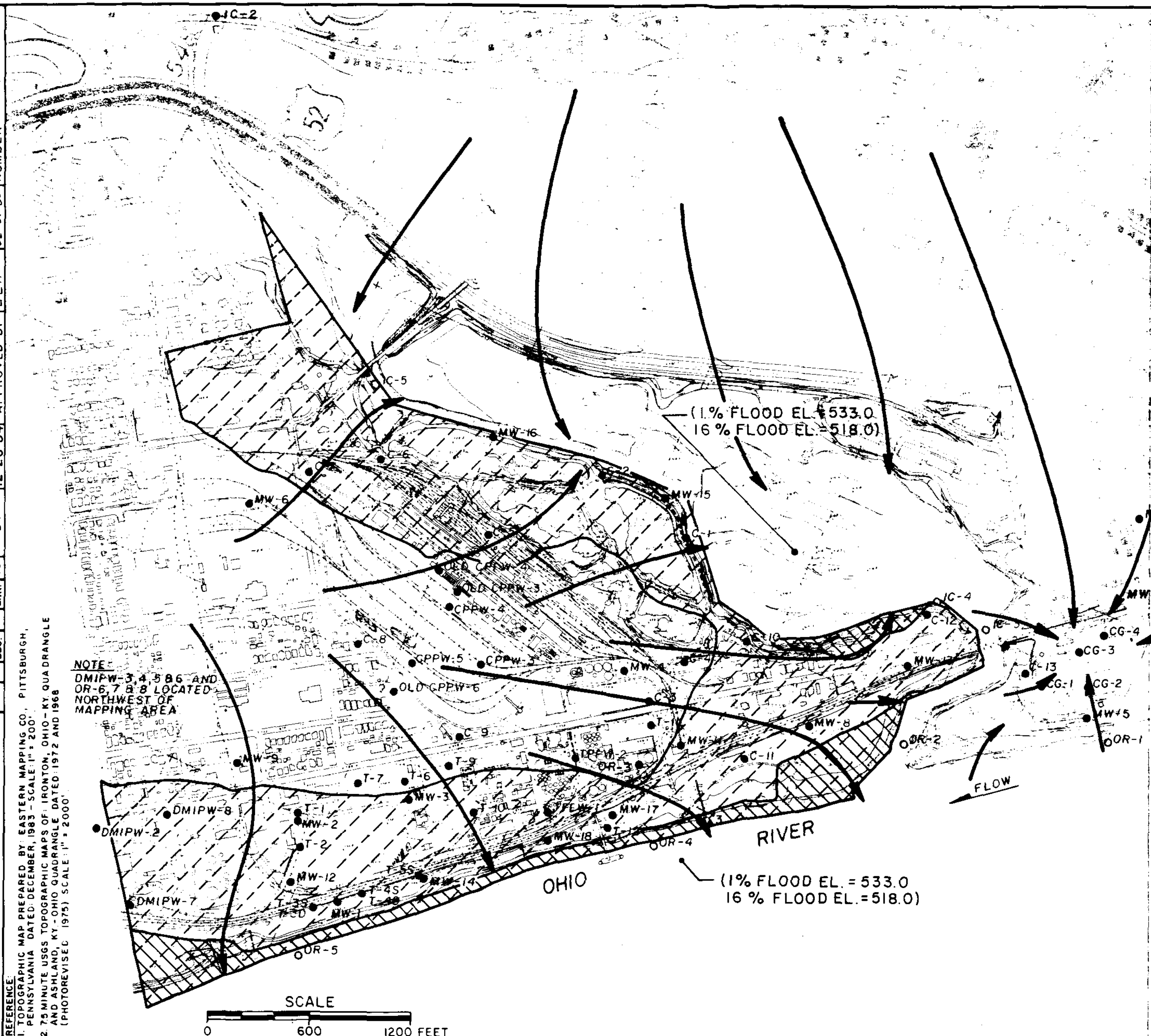
PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

NOTES:

1. $\bar{V}$ = GROUND WATER PORE VELOCITY.
2. ANALYSIS ASSUMES A CONSTANT CONCENTRATION SOURCE.
3. CONCENTRATIONS CALCULATED USING ONE-DIMENSIONAL ANALYTICAL SOLUTION (BEAR, 1975).

IT CORPORATION



LEGEND

- SECTION OF SITE AQUIFER POTENTIALLY AFFECTED BY FLOOD EVENT WHICH IS EQUALLED OR EXCEEDED AN AVERAGE OF 16 % OF THE DAYS PER YEAR.
- SECTION OF SITE AQUIFER POTENTIALLY AFFECTED BY FLOOD EVENT WHICH IS EQUALLED OR EXCEEDED 1% OF THE DAYS PER YEAR.
- GENERALIZED GROUND WATER FLOW DIRECTIONS UNDER NORMAL CONDITIONS
- CG-3 WELL No.
- GAGING STATION
- SURFACE WATER SAMPLING LOCATION

NOTES:

1. AREAS AFFECTED BY FLOODING REPRESENT SECTIONS OF THE SITE AQUIFER WHERE COMPUTED FLOW DIRECTIONS ARE EITHER REVERSED OR SIGNIFICANTLY ALTERED FROM NORMAL CONDITIONS.
2. THE AFFECTED AREAS SHOWN FOR 1% AND 16 % EVENTS ARE BASED UPON TYPICAL HYDROGRAPHS MEASURED AT THE ASHLAND GAGE AND MAY VARY FROM ACTUAL CONDITIONS FOR SPECIFIC TRANSIENT FLOOD EVENTS.

FIGURE F-6

SECTIONS OF THE ALLUVIAL AQUIFER AFFECTED BY FLOODING IN THE OHIO RIVER AND ICE CREEK

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
D. Weick 12-28-84	MHR 1-28-85	JLH 02-07-85	831625-B59

REFERENCE:
1. TOPOGRAPHIC MAP PREPARED BY: EASTERN MAPPING CO., PITTSBURGH, PENNSYLVANIA DATED: DECEMBER, 1983 - SCALE: 1" = 200'
2. 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF: IRONTON, OHIO-KY. QUADRANGLE AND ASHLAND, KY-OHIO QUADRANGLE DATED: 1972 AND 1968 (PHOTOREVISED 1975) SCALE: 1" = 2000'

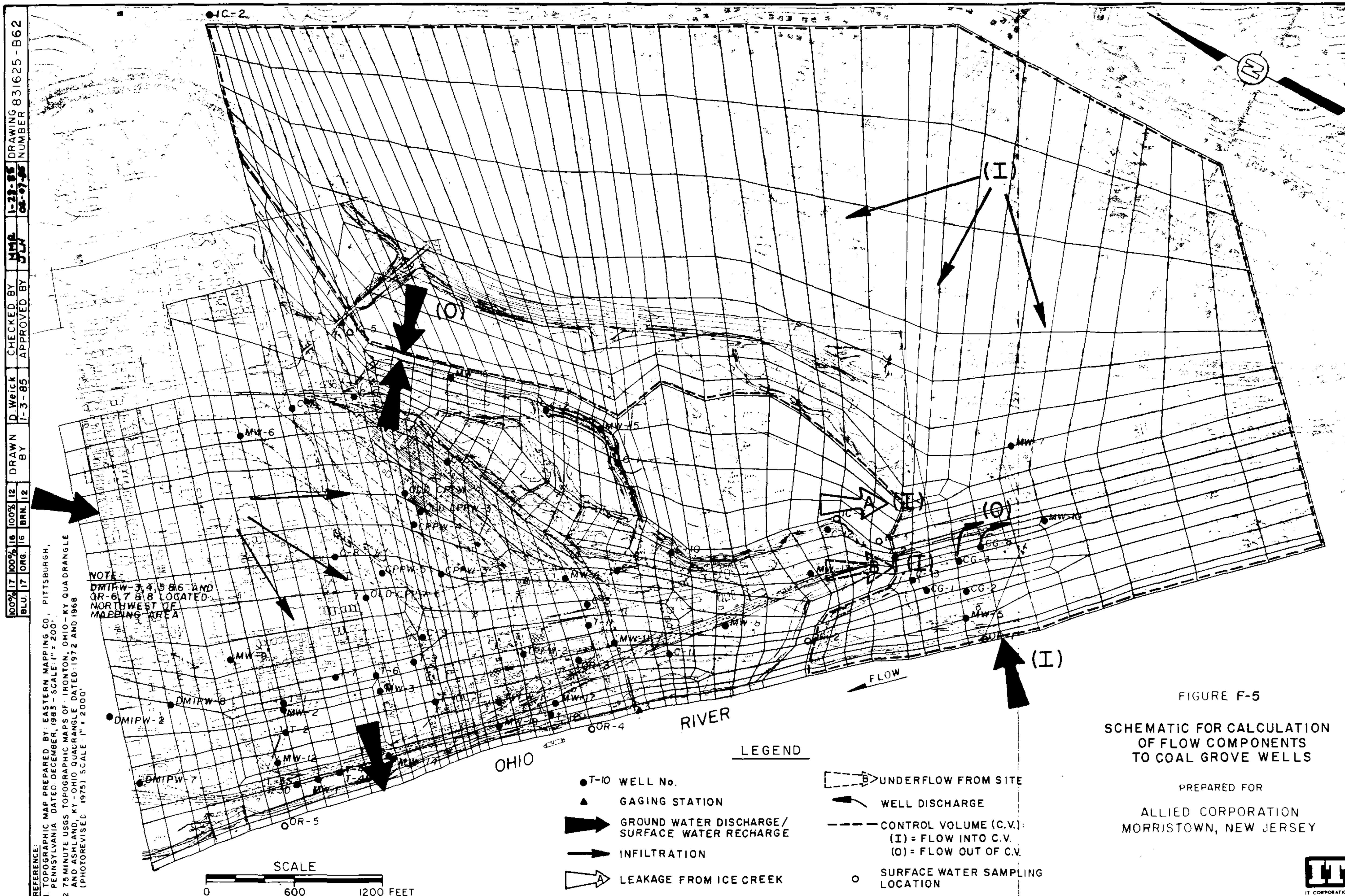


FIGURE F-5

SCHEMATIC FOR CALCULATION OF FLOW COMPONENTS TO COAL GROVE WELLS

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

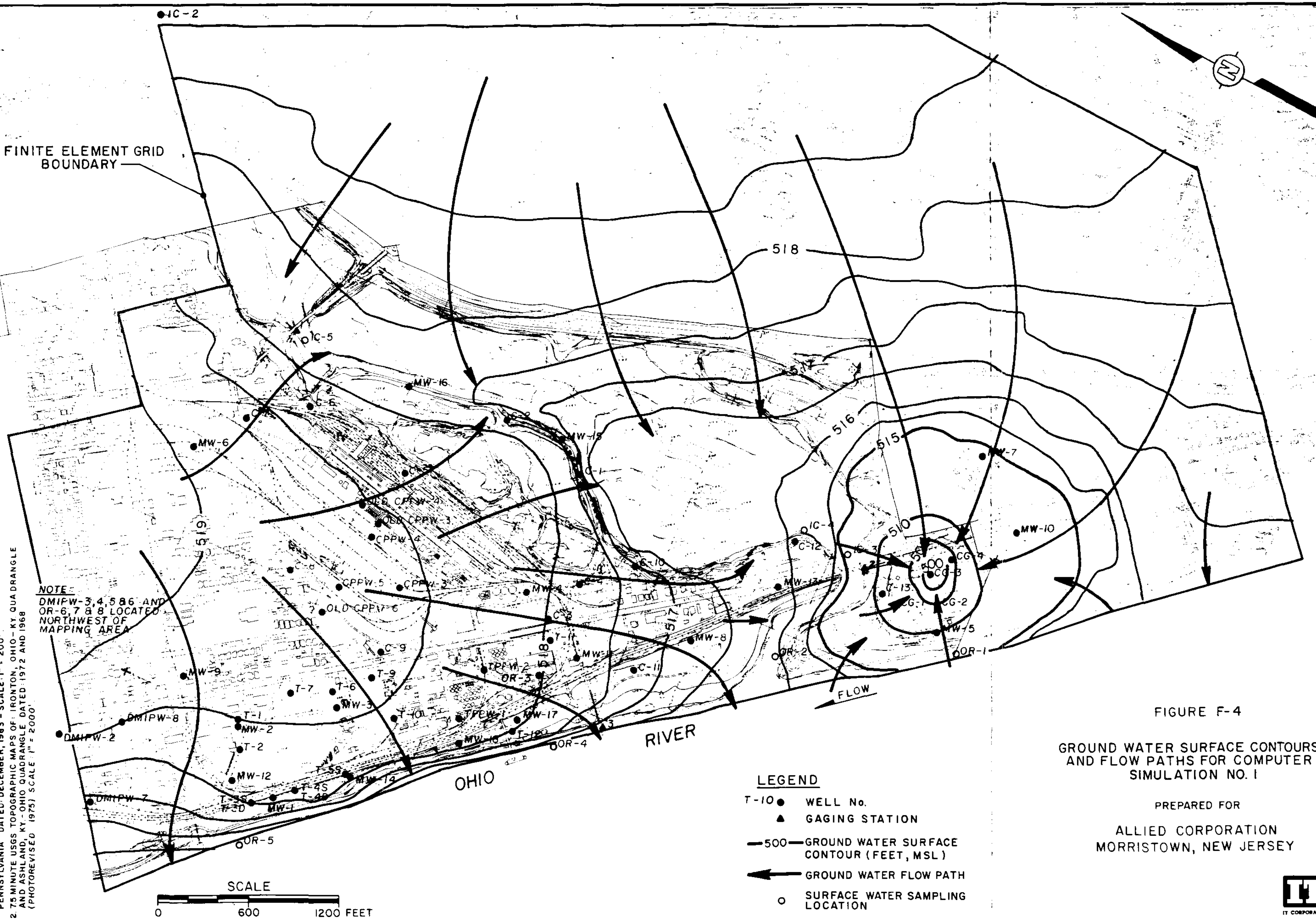


FIGURE F-4

GROUND WATER SURFACE CONTOURS AND FLOW PATHS FOR COMPUTER SIMULATION NO. 1

PREPARED FOR

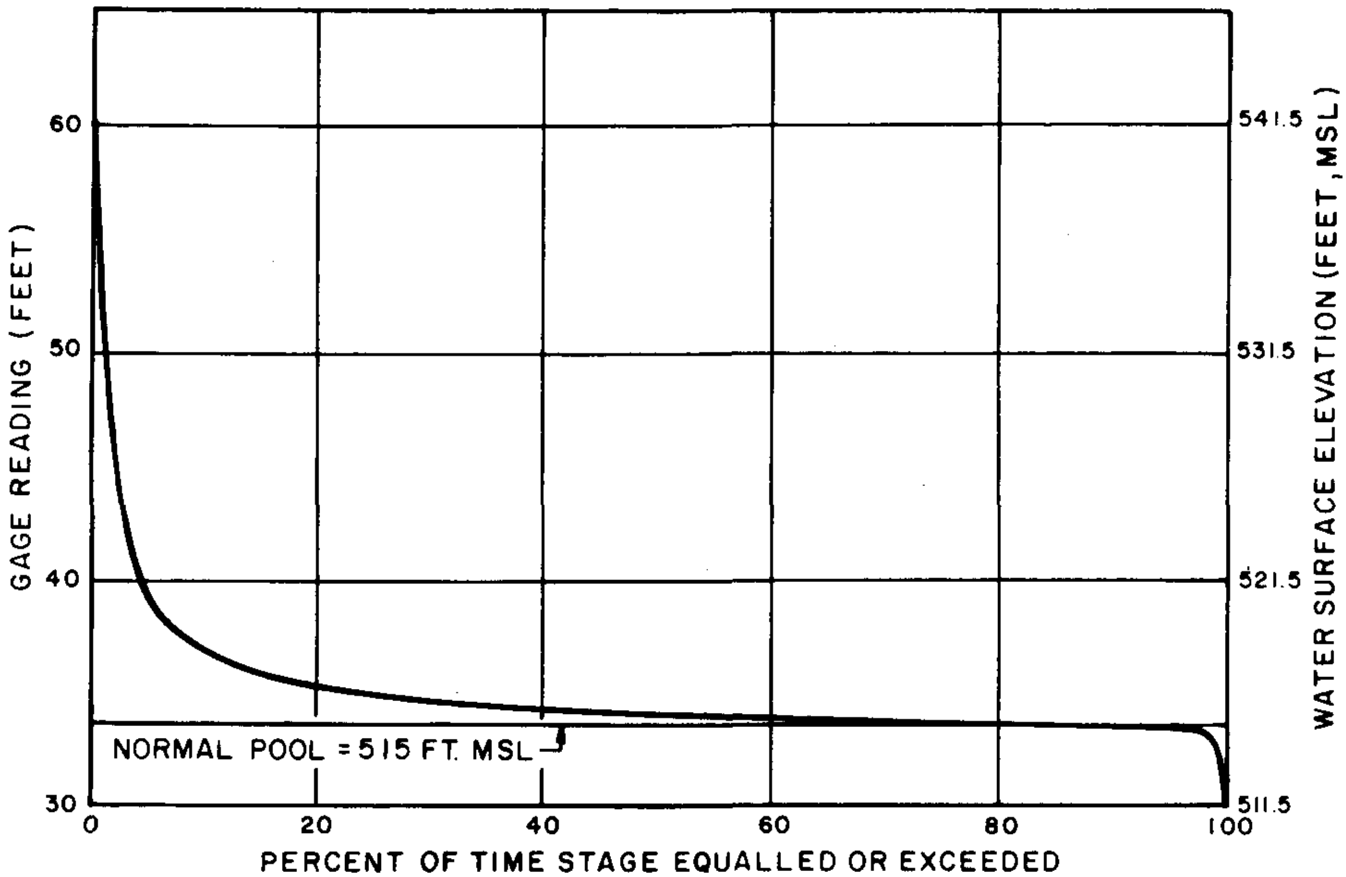
ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY D. Weick 1-2-85 | CHECKED BY MMR 1-28-85 | APPROVED BY JLH 02-07-85 | DRAWING NUMBER 831625-B60

REFERENCE:
1. TOPOGRAPHIC MAP PREPARED BY: EASTERN MAPPING CO. PITTSBURGH, PENNSYLVANIA DATED: DECEMBER, 1983 - SCALE: 1" = 200'
2. 7.5 MINUTE USGS TOPOGRAPHIC MAPS OF: IRONTON, OHIO-KY QUADRANGLE AND ASHLAND, KY-OHIO QUADRANGLE DATED 1972 AND 1968 (PHOTOREVISED 1975) SCALE 1" = 2000'

DRAWN BY	MEL	CHECKED BY	T.MR	1-28-85	DRAWING NUMBER 831625-A46
	3-7-84	APPROVED BY	JLH	02-07-85	



NOTES:

1. PERIOD OF RECORD IS 1962-1978.
2. NORMAL POOL = 33.5 FEET (GAGE READING).
3. ZERO GAGE = 481.5 FEET, MSL.
4. PERCENT OF TIME THAT STAGE IS EQUALLED OR EXCEEDED IS DETERMINED FROM DAILY GAGING STATION RECORDS DURING PERIOD OF RECORD.

FIGURE F-3

STAGE DURATION CURVE
FOR OHIO RIVER AT
ASHLAND GAGING STATION

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

LIST OF FIGURES
(Continued)

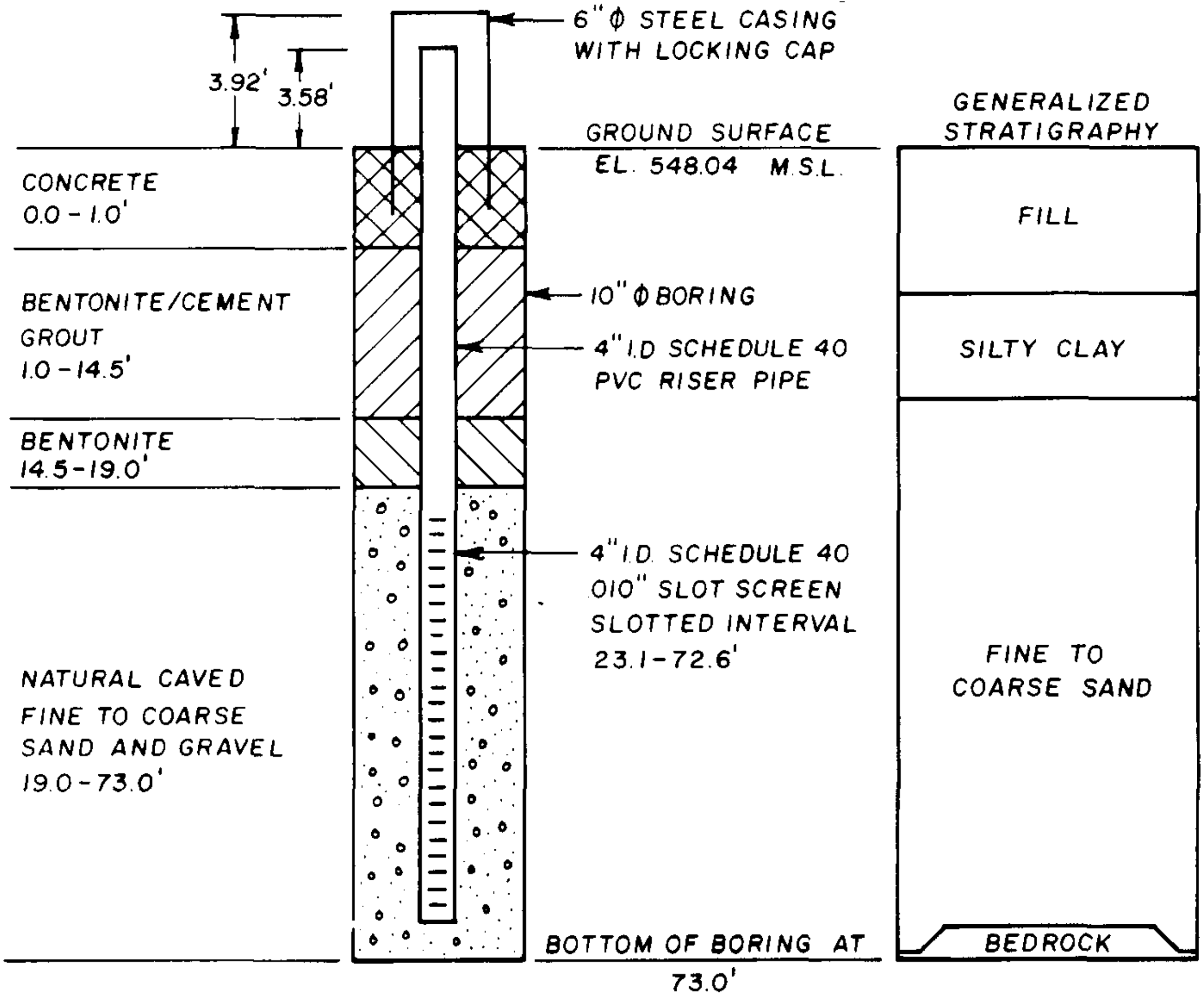
APPENDIX
G

APPENDIX G

MONITORING WELL INSTALLATION DETAILS

DRAWING NUMBER 831625-A49

DRAWN BY	CHECKED BY	APPROVED BY
RW 10-30-84	TMS 11-8-84	JLH 1-25-85



NOTES:

1. ELEVATION OF TOP OF RISER PIPE; 551.62 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 518.91 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-1 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-1

PREPARED FOR

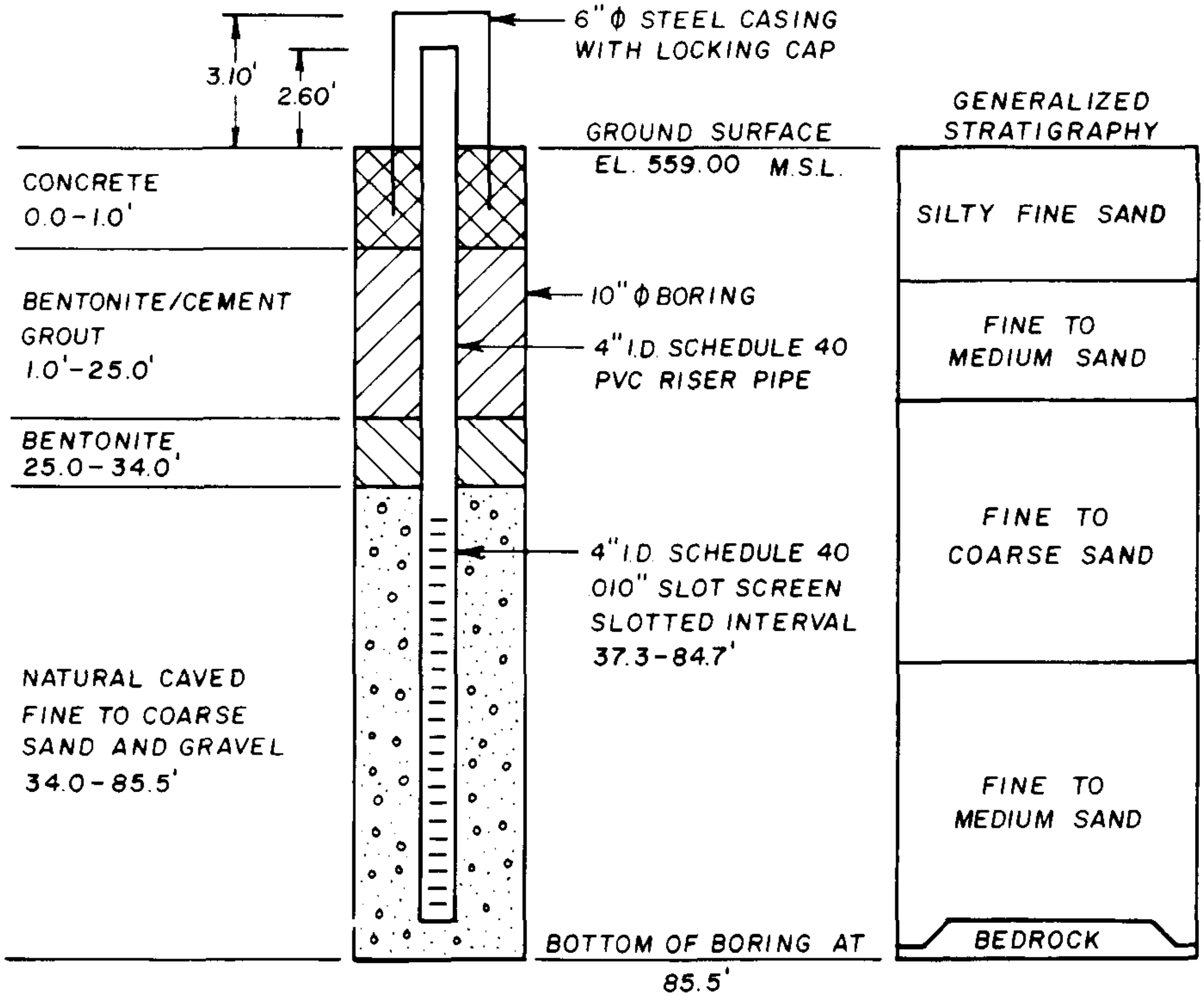
ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

19 1253 HERCULENE A&B SMITH CO PGH PA

DRAWING NUMBER 831625-A50

DRAWN BY RW 10-30-84 | CHECKED BY TMT | APPROVED BY JLH 1-25-85



NOTES:

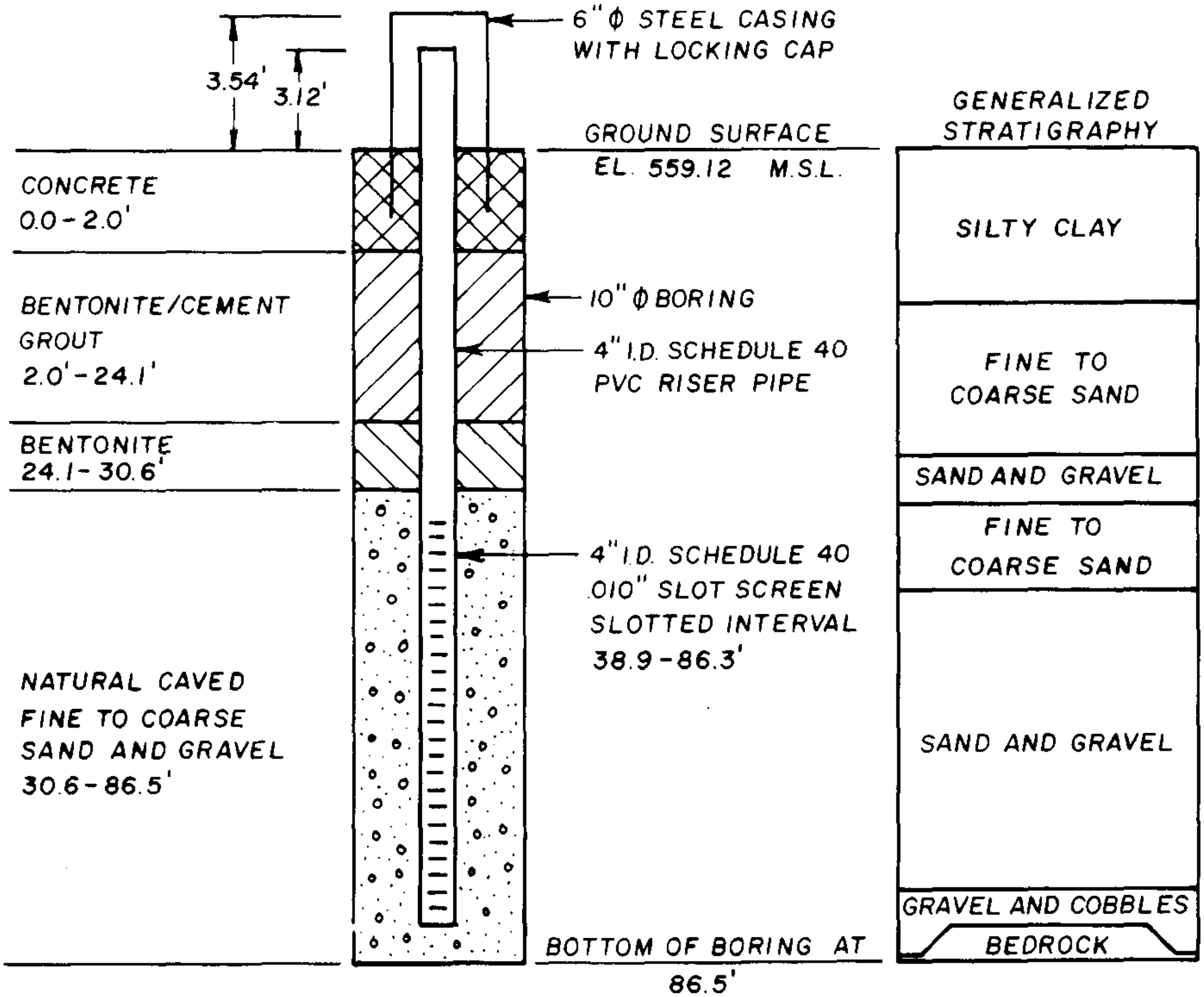
1. ELEVATION OF TOP OF RISER PIPE; 561.60 MSL.
2. ELEVATION OF GROUND WATER ON 10/3/84; 518.85 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-2 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-2

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



NOTES:

1. ELEVATION OF TOP OF RISER PIPE; 562.24 MSL.
2. ELEVATION OF GROUND WATER ON 10/3/84; 518.78 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-3 (APPENDIX F).

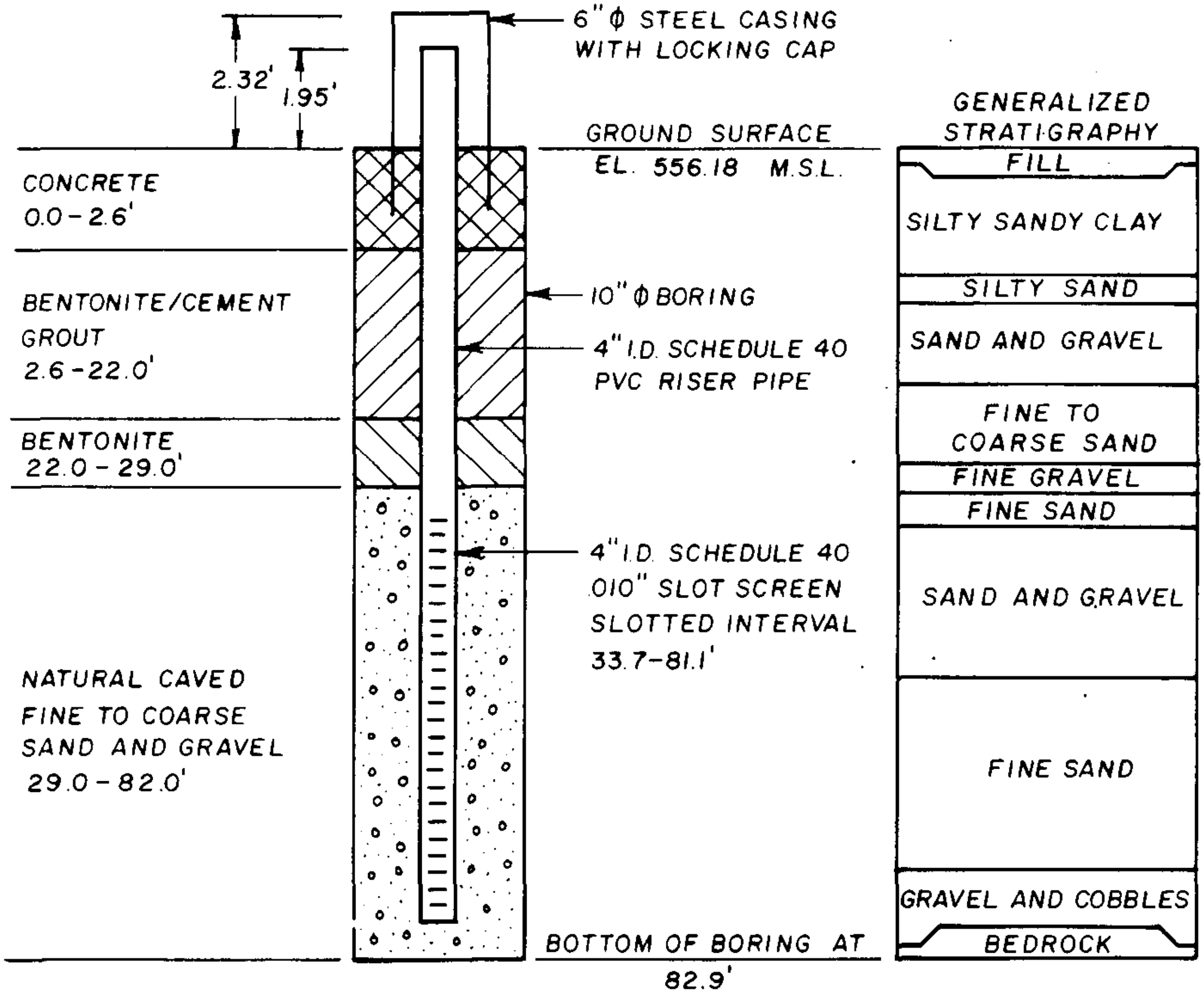
INSTALLATION DETAILS
MONITORING WELL MW-3

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY	RW	CHECKED BY	TMT	11-8-84	DRAWING NUMBER 831625-A51
	10-30-84	APPROVED BY	JLH	1-25-85	



NOTES:

1. ELEVATION OF TOP OF RISER PIPE;
   558.13 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84;
   518.21 MSL.
3. DEPTH DATUM IS GROUND
   SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION
   SEE BORING LOG MW-4 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-4

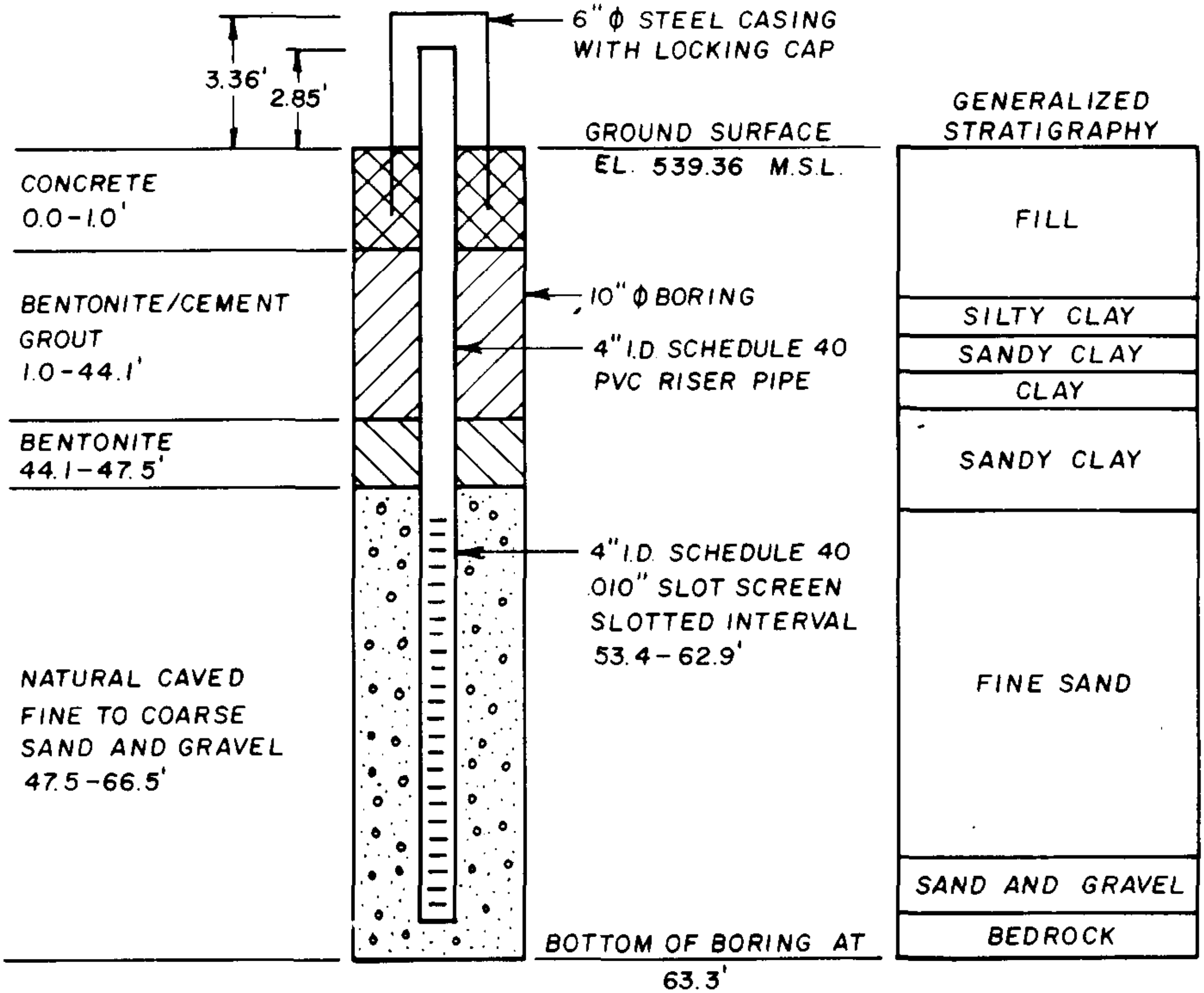
PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
RW 10-30-84	TMT 11-8-84	JLH 1-25-85	831625-A52

DRAWN BY RW 10-30-84
CHECKED BY 11-8-84
APPROVED BY JLH 1-25-85
DRAWING NUMBER 831625-A53



NOTES:

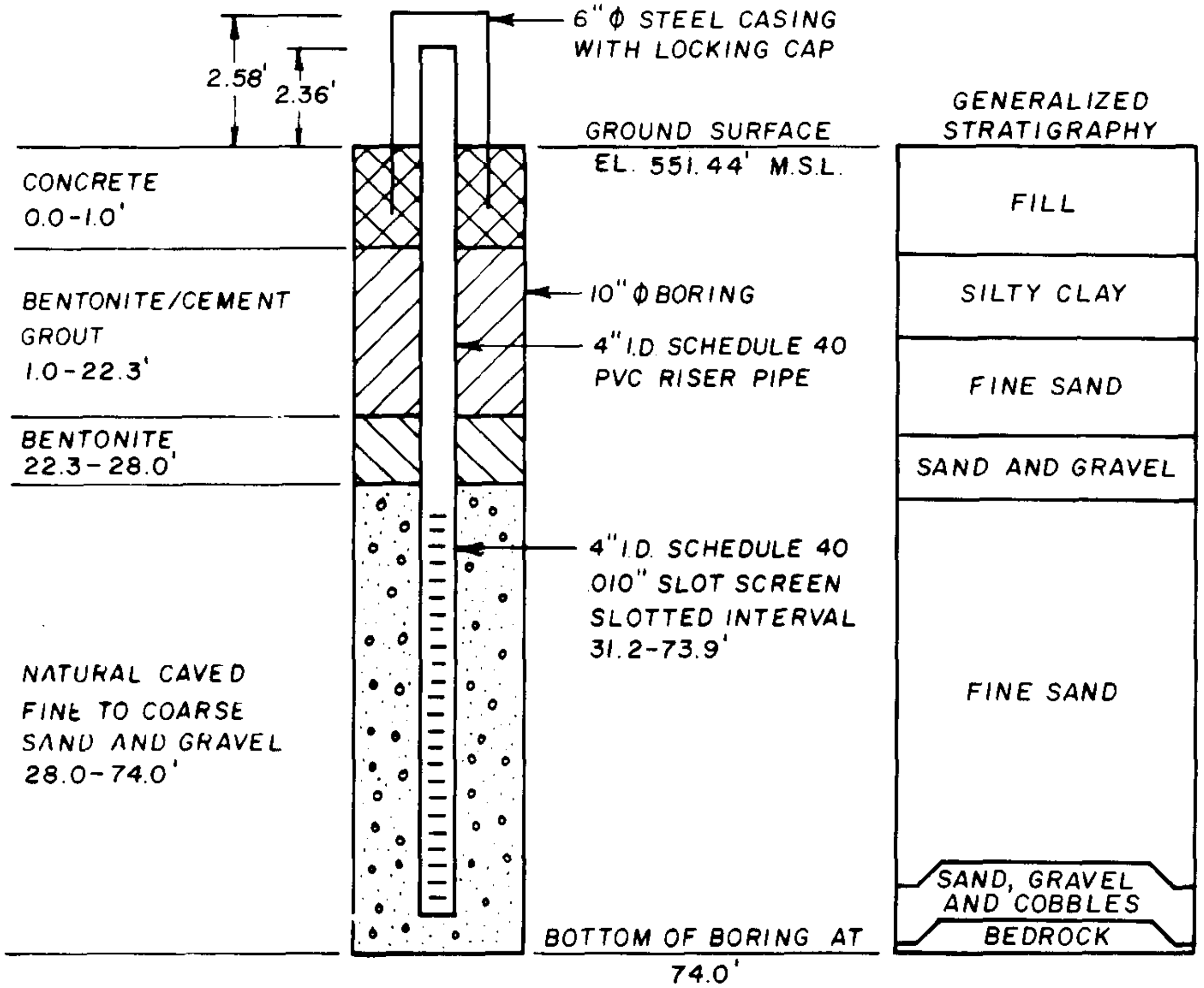
1. ELEVATION OF TOP OF RISER PIPE; 542.21 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 514.30 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-5 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-5

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



DRAWING NUMBER 831625-A54

DRAWN BY	RW	CHECKED BY	TMJ	11-8-84
	10-30-84	APPROVED BY	JLH	1-25-85

NOTES:

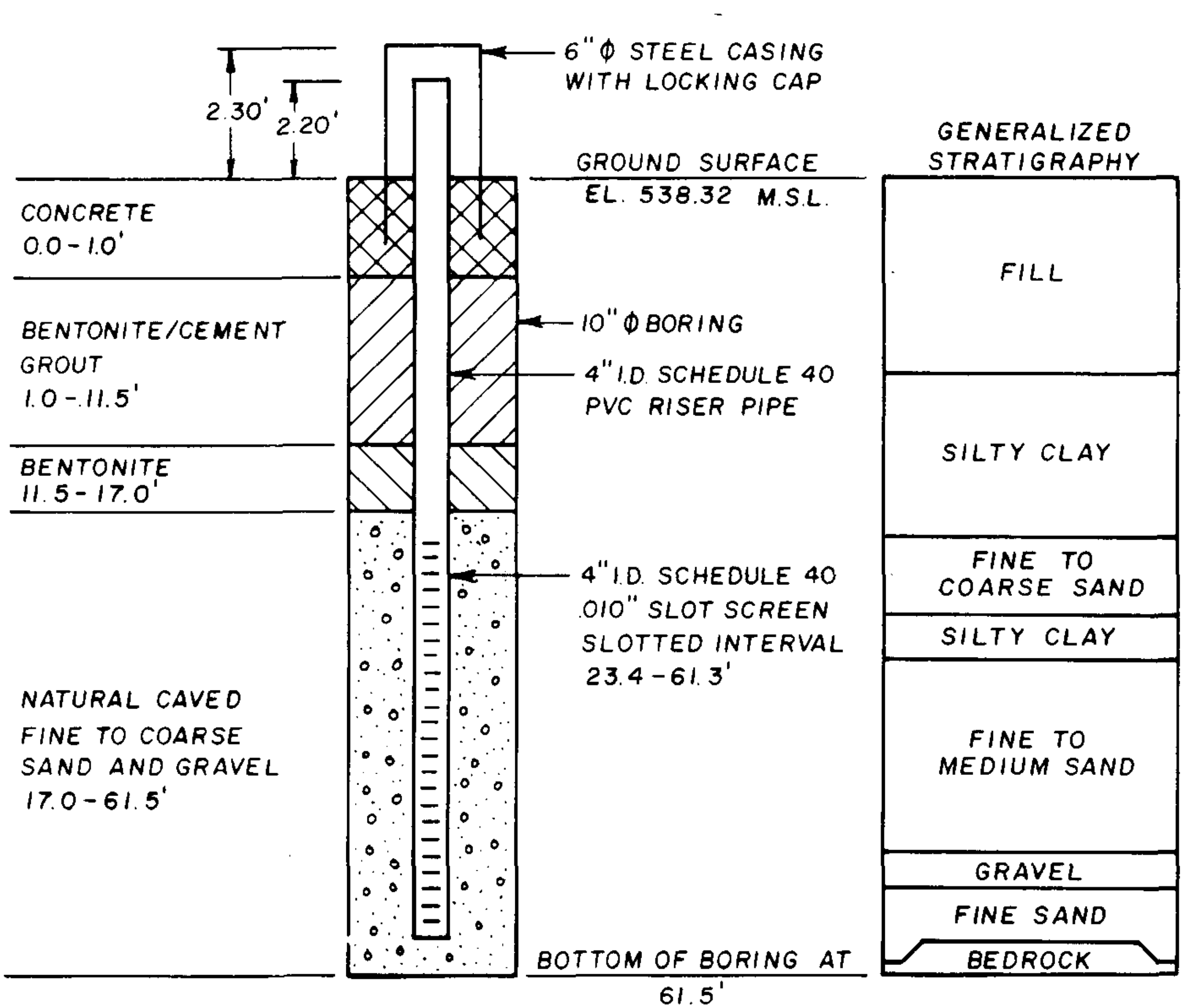
1. ELEVATION OF TOP OF RISER PIPE; 553.80 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 519.01 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-6 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-6

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



DRAWING NUMBER 831625-A55

DRAWN BY RW 10-30-84 | CHECKED BY 7.M.J. 11-2-84 | APPROVED BY JLH 1-25-85

NOTES:

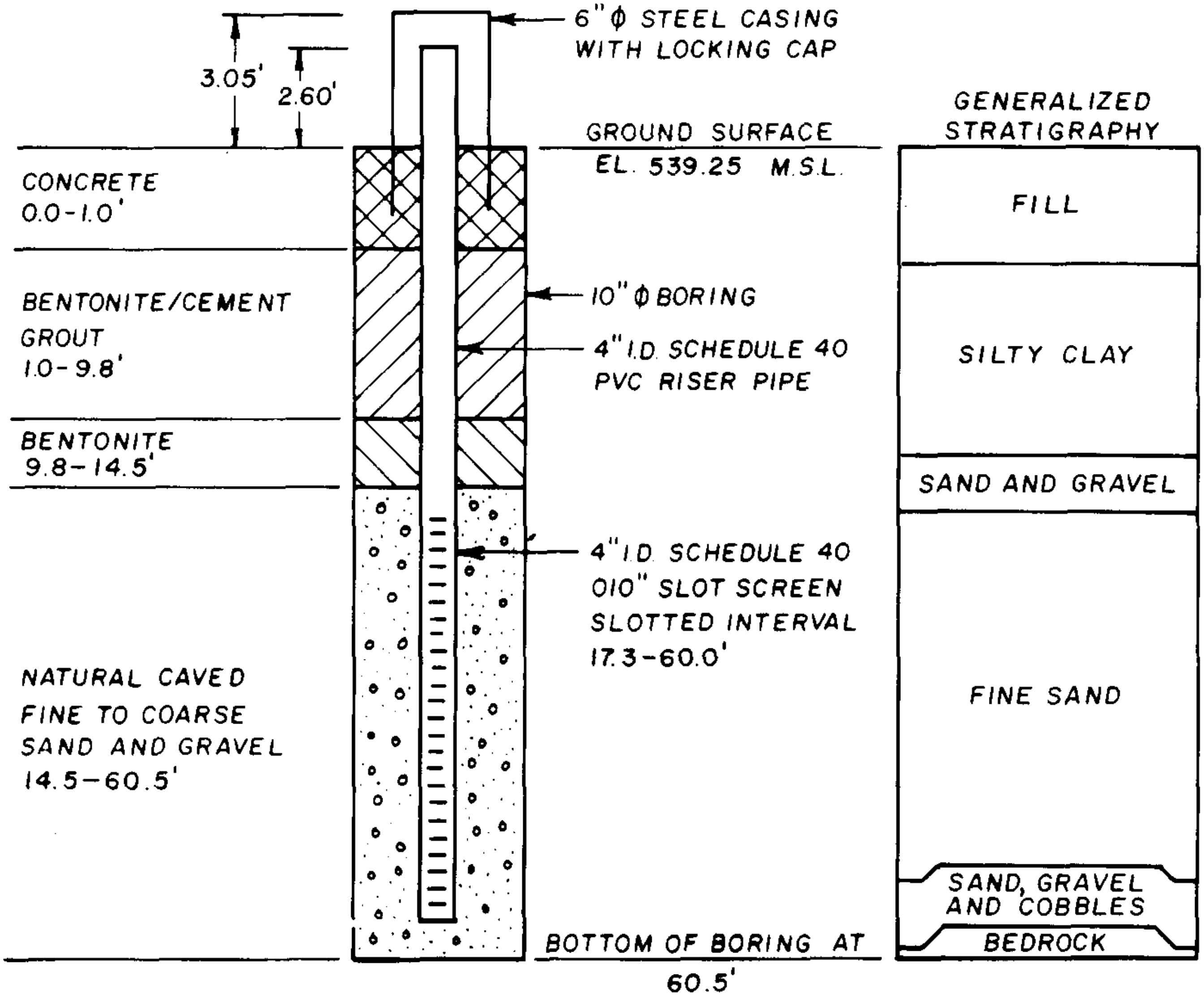
1. ELEVATION OF TOP OF RISER PIPE; 540.52 MSL.
2. ELEVATION OF GROUND WATER ON 10/3/84; 512.52 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-7 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-7

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



NOTES:

1. ELEVATION OF TOP OF RISER PIPE; 541.85 MSL.
2. ELEVATION OF GROUND WATER ON 10/3/84; 518.06 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-8 (APPENDIX F).

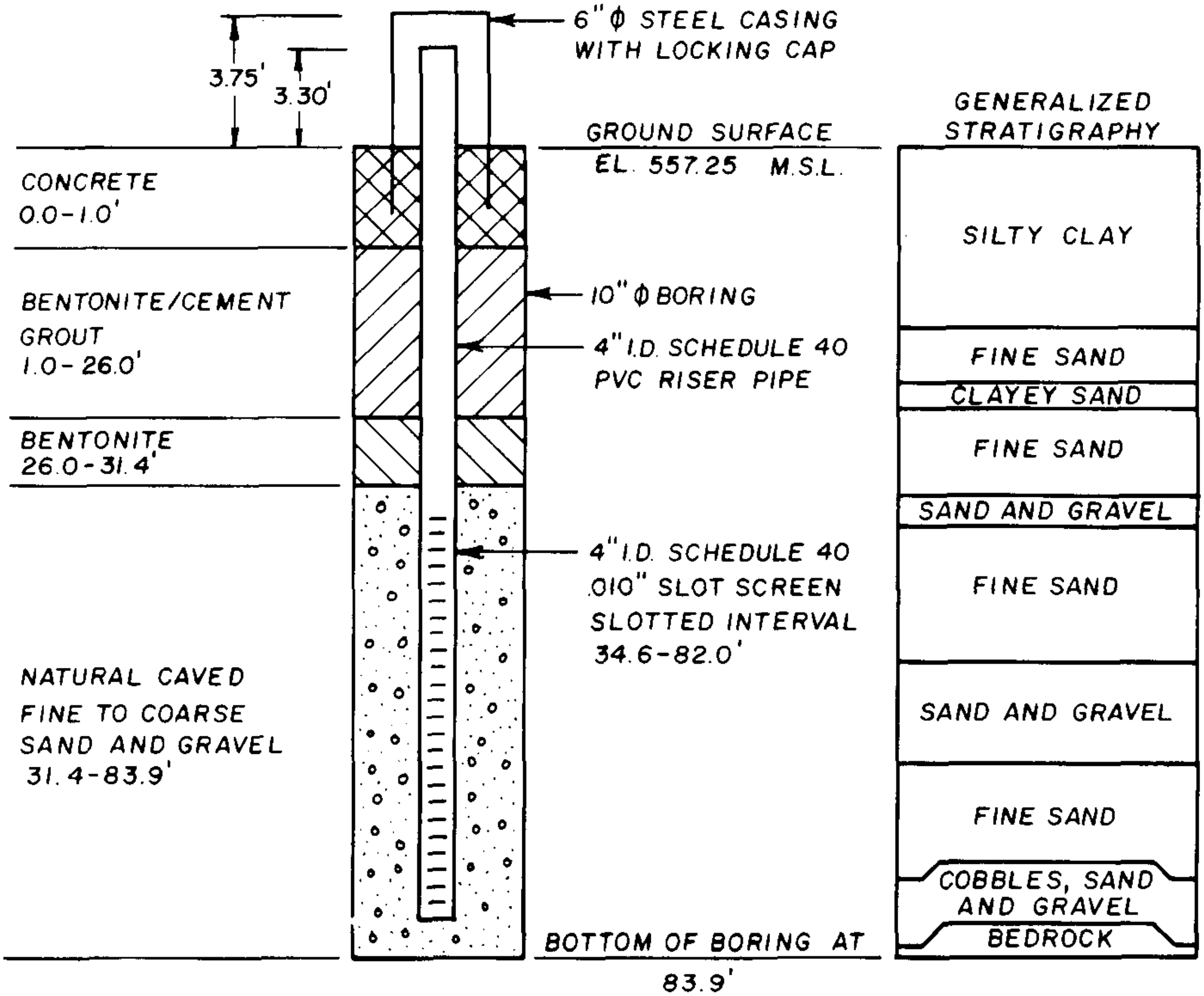
INSTALLATION DETAILS
MONITORING WELL MW-8

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY RW 10-30-84 | CHECKED BY TMT 11-8-84 | APPROVED BY JLM 1-25-85 | DRAWING NUMBER 831625-A56



NOTES:

1. ELEVATION OF TOP OF RISER PIPE; 560.55 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 519.13 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-9 (APPENDIX F).

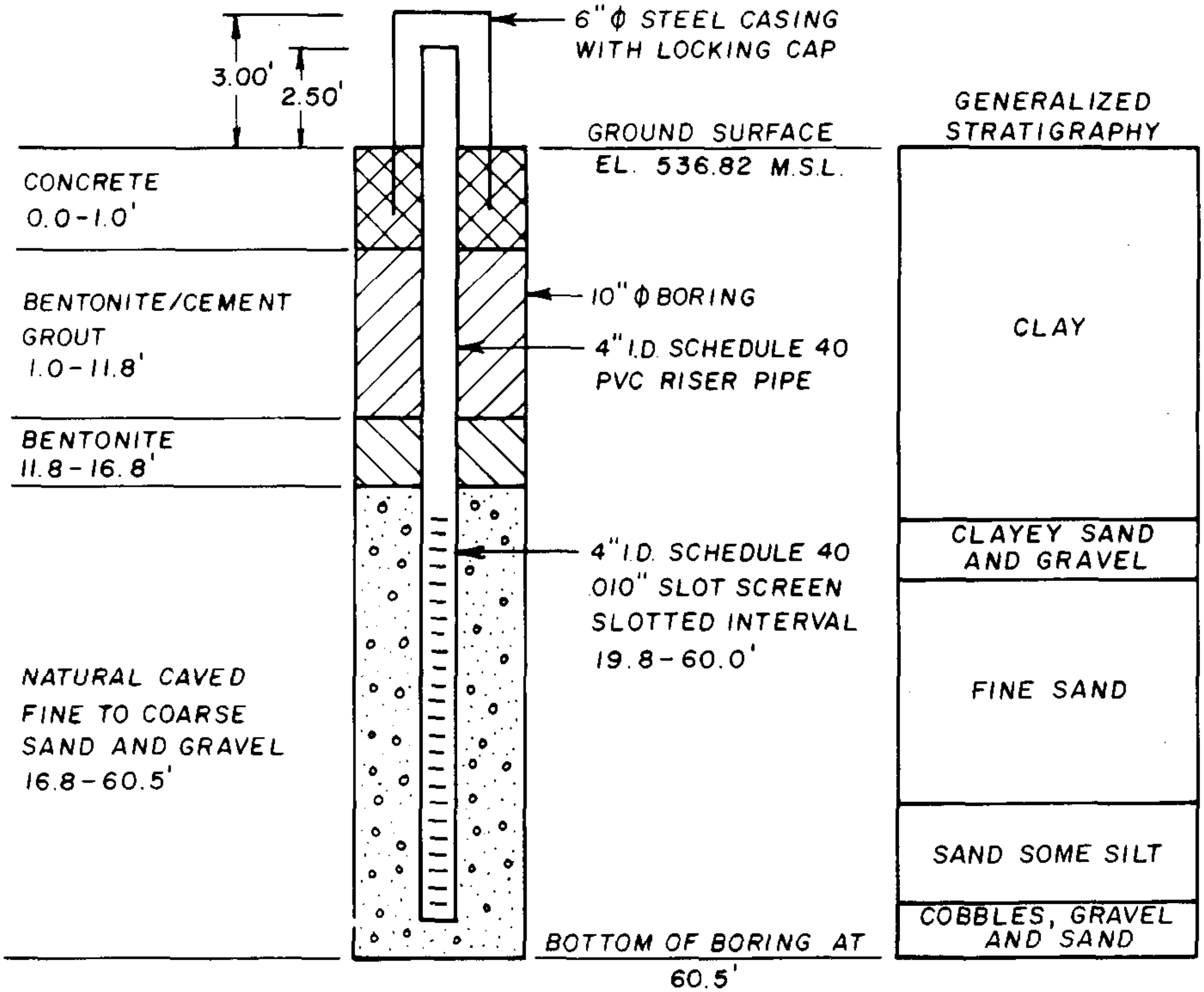
INSTALLATION DETAILS
MONITORING WELL MW-9

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT
IT CORPORATION

DRAWING NUMBER 831625-A57
CHECKED BY TMJ 11-8-84
APPROVED BY JLH 1-25-85
DRAWN BY RW 10-30-84



DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
RW 10-30-84	TMT 11-8-84	JLN 1-25-85	831625-A58

NOTES:

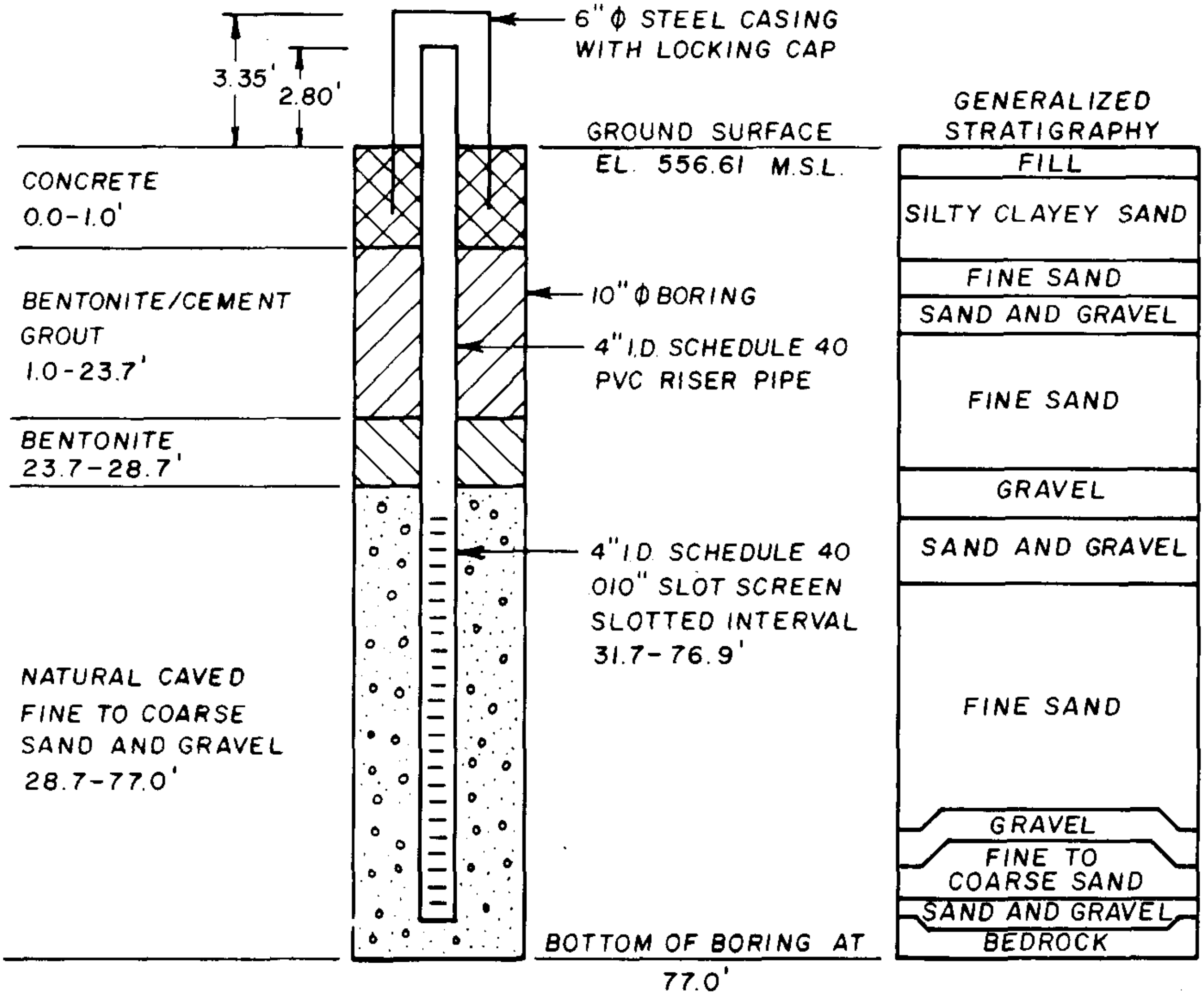
1. ELEVATION OF TOP OF RISER PIPE; 539.32 MSL.
2. ELEVATION OF GROUND WATER ON 10/3/84; 502.03 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-10 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-10

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



NOTES:

1. ELEVATION OF TOP OF RISER PIPE; 559.41' MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 518.08' MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-11 (APPENDIX F).

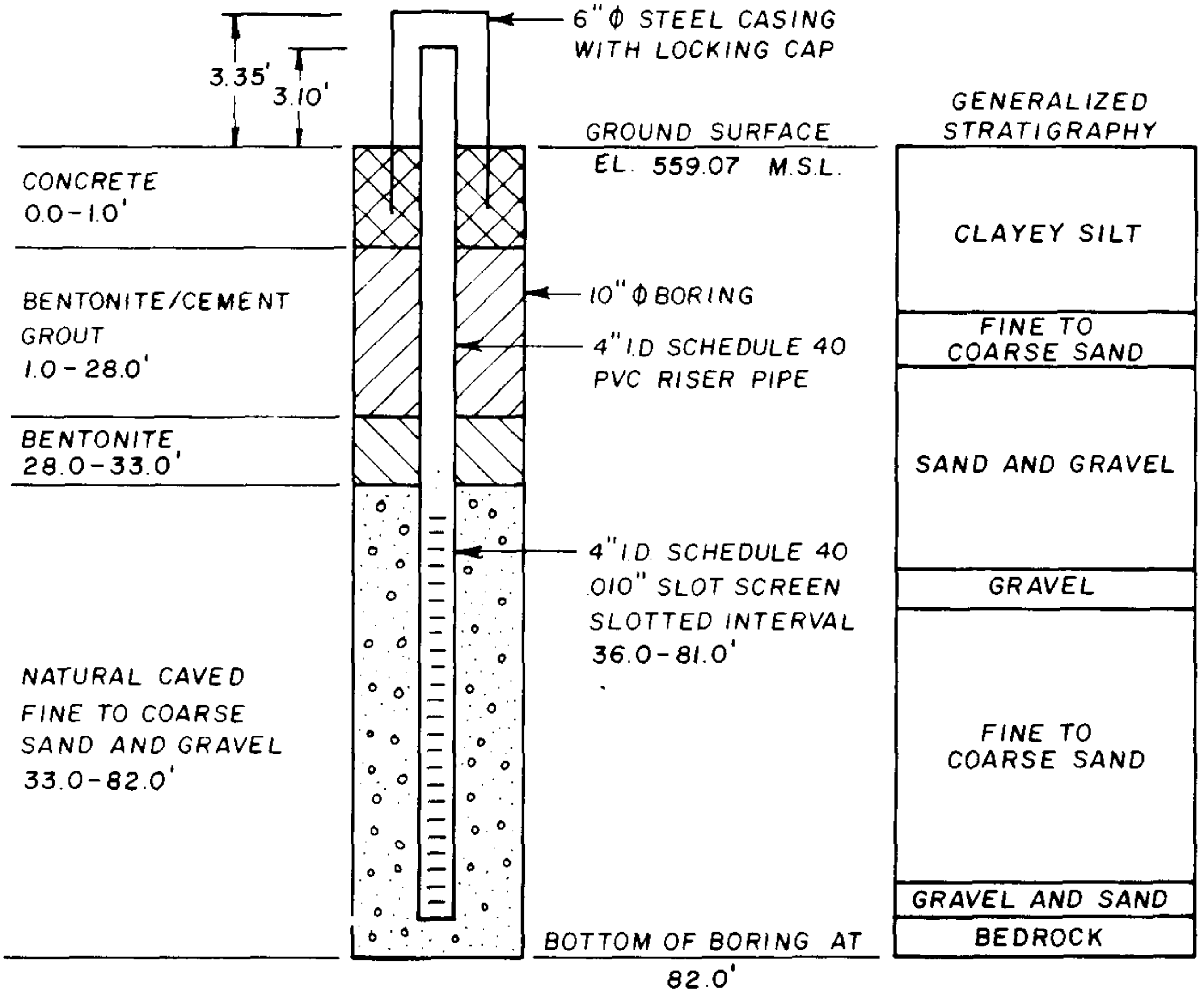
INSTALLATION DETAILS
MONITORING WELL MW-11

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWING NUMBER 831625-A59
CHECKED BY
APPROVED BY
DRAWN BY RW 10-30-84



DRAWN BY: RW 10-30-84 | CHECKED BY: TMJ 11-8-84 | APPROVED BY: JLH 1-25-85 | DRAWING NUMBER 831625-A60

NOTES:

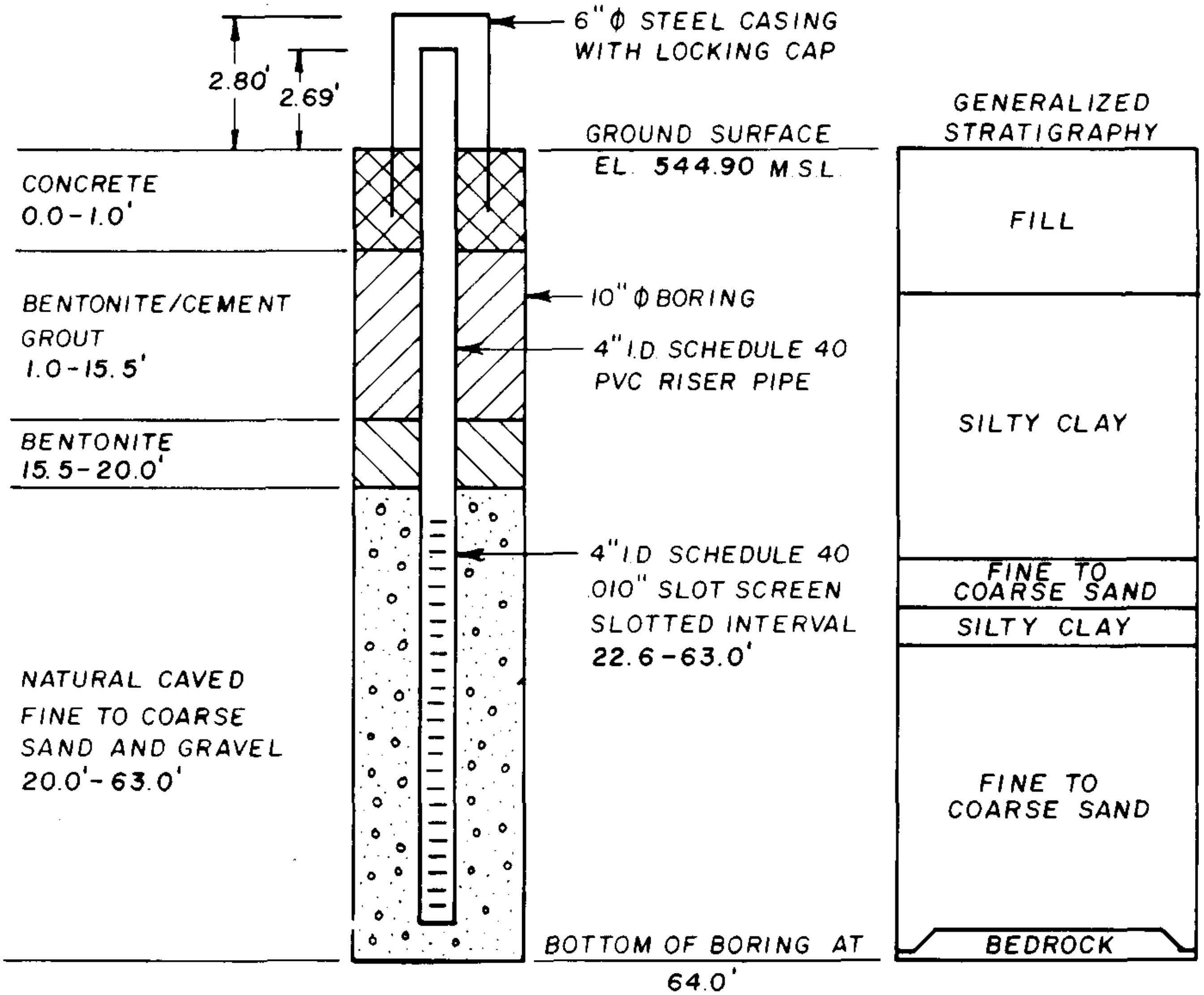
1. ELEVATION OF TOP OF RISER PIPE; 562.17 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 518.84 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-12 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-12

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



DRAWN BY RW 10-30-84 | CHECKED BY TMT 11-8-84 | APPROVED BY JLH 1-25-85 | DRAWING NUMBER 831625-A61

NOTES

1. ELEVATION OF TOP OF RISER PIPE; 547.59 MSL.
2. ELEVATION OF GROUND WATER ON 10/3/84; 516.34 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-13 (APPENDIX F).

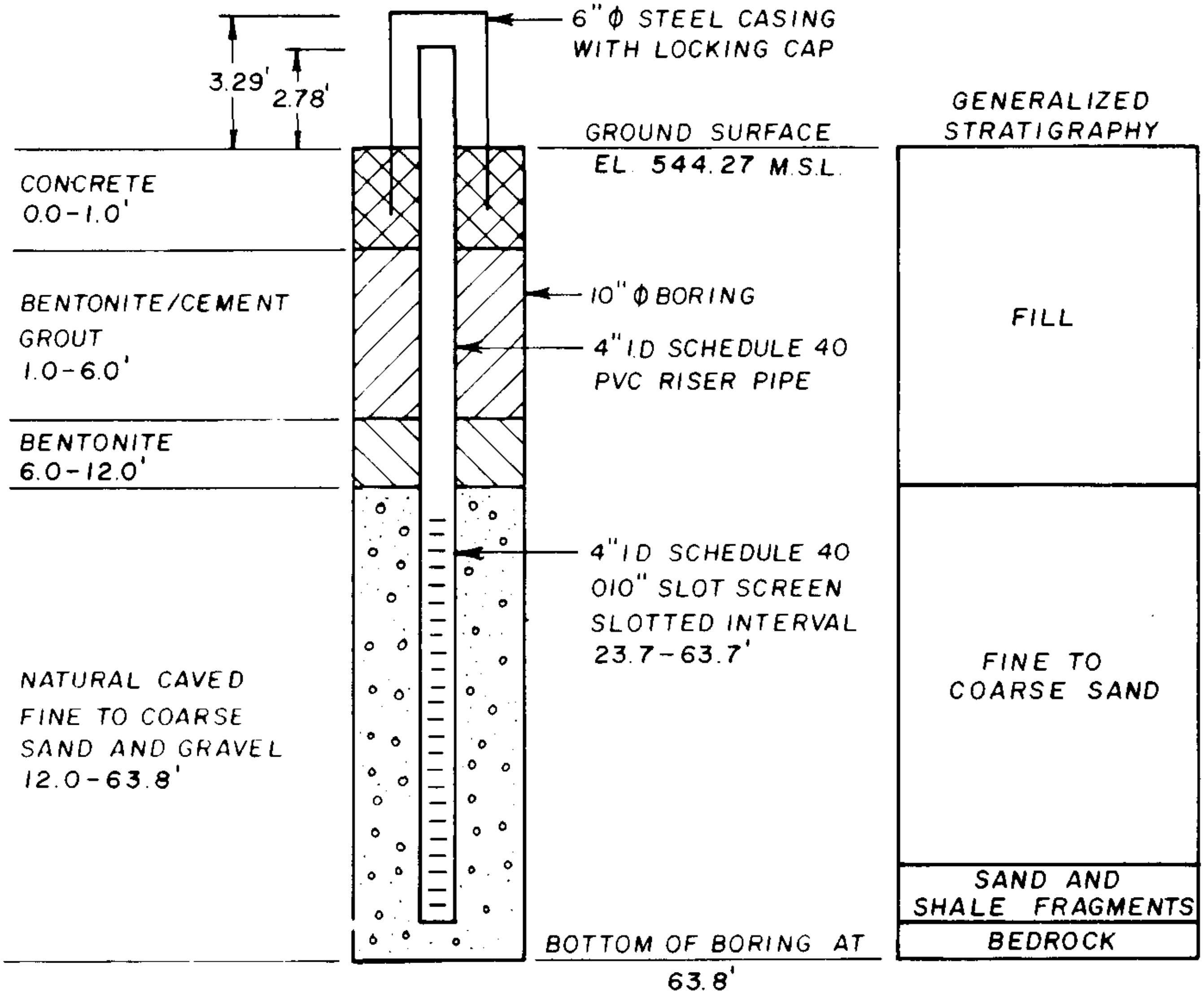
INSTALLATION DETAILS
MONITORING WELL MW-13

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY	RW 10-30-84	CHECKED BY	TMJ	11-8-84	DRAWING NUMBER 831625-A 62
		APPROVED BY	JLH	1-25-85	



NOTES

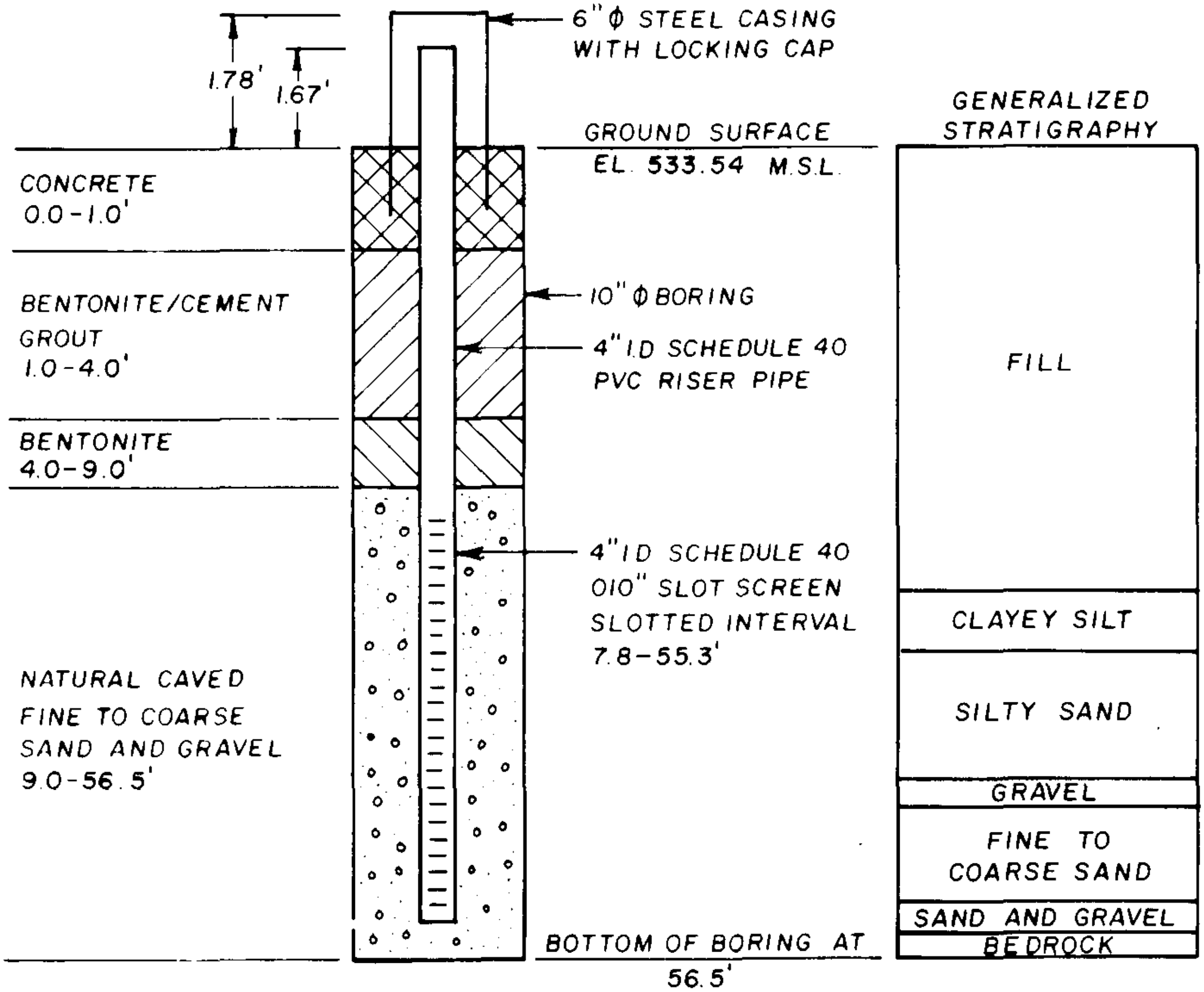
1. ELEVATION OF TOP OF RISER PIPE, 547.05 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84, 518.84 MSL.
3. DEPTH DATUM IS GROUND SURFACE
4. DRAWING NOT TO SCALE
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-14 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-14

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



DRAWN BY	RW	CHECKED BY	TMJ	11-8-84	DRAWING NUMBER 831625-A 63
	10-30-84	APPROVED BY	JLH	1-25-85	

NOTES

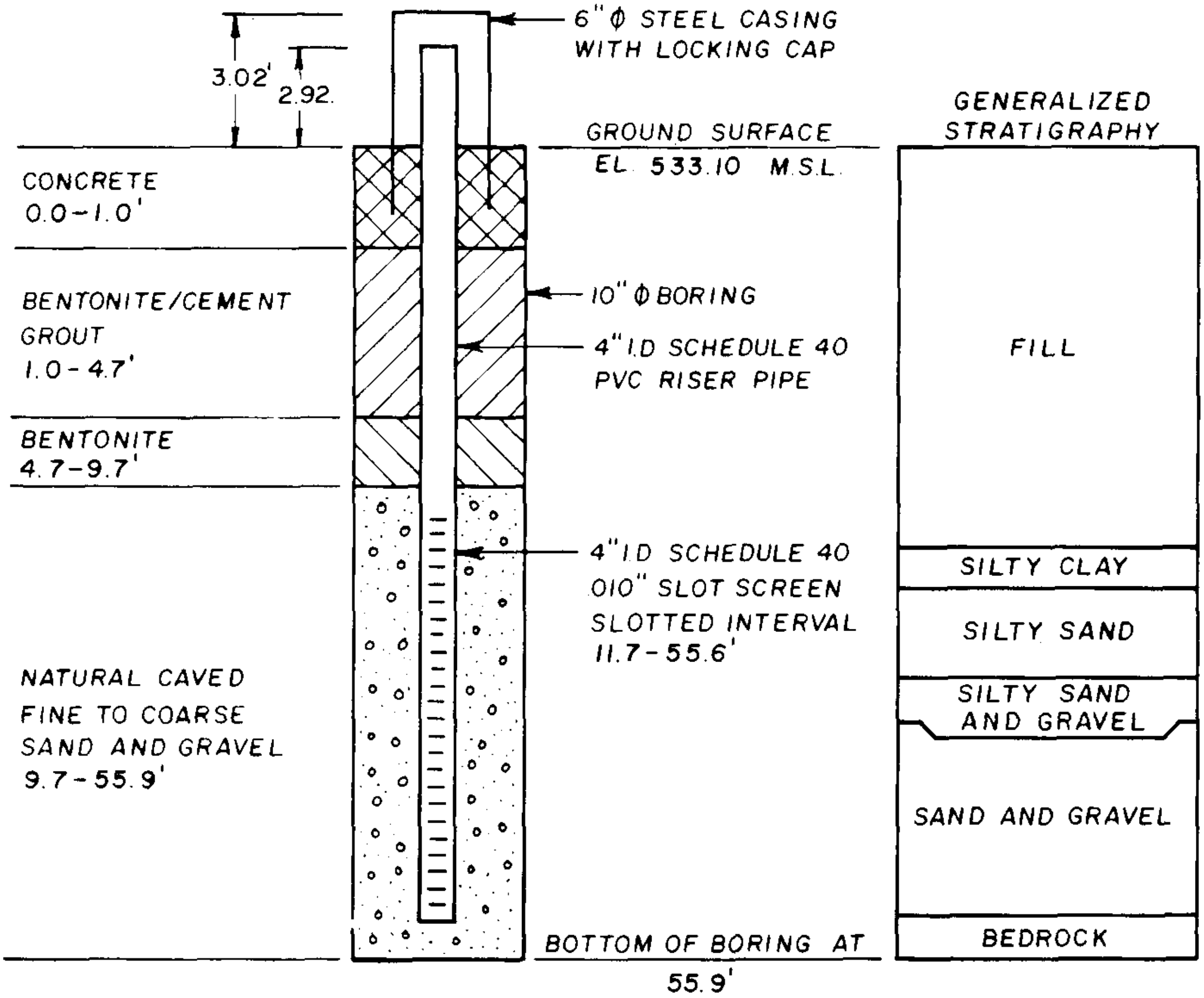
1. ELEVATION OF TOP OF RISER PIPE; 535.21 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 516.04 MSL
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-15 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-15

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION



DRAWN BY RW 10-30-84 | CHECKED BY TMJ 11-8-84 | APPROVED BY JLH 1-25-85 | DRAWING NUMBER 831625-A64

NOTES:

1. ELEVATION OF TOP OF RISER PIPE; 536.02 MSL.
2. ELEVATION OF GROUND WATER ON 10/3/84; 516.63 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-16 (APPENDIX F).

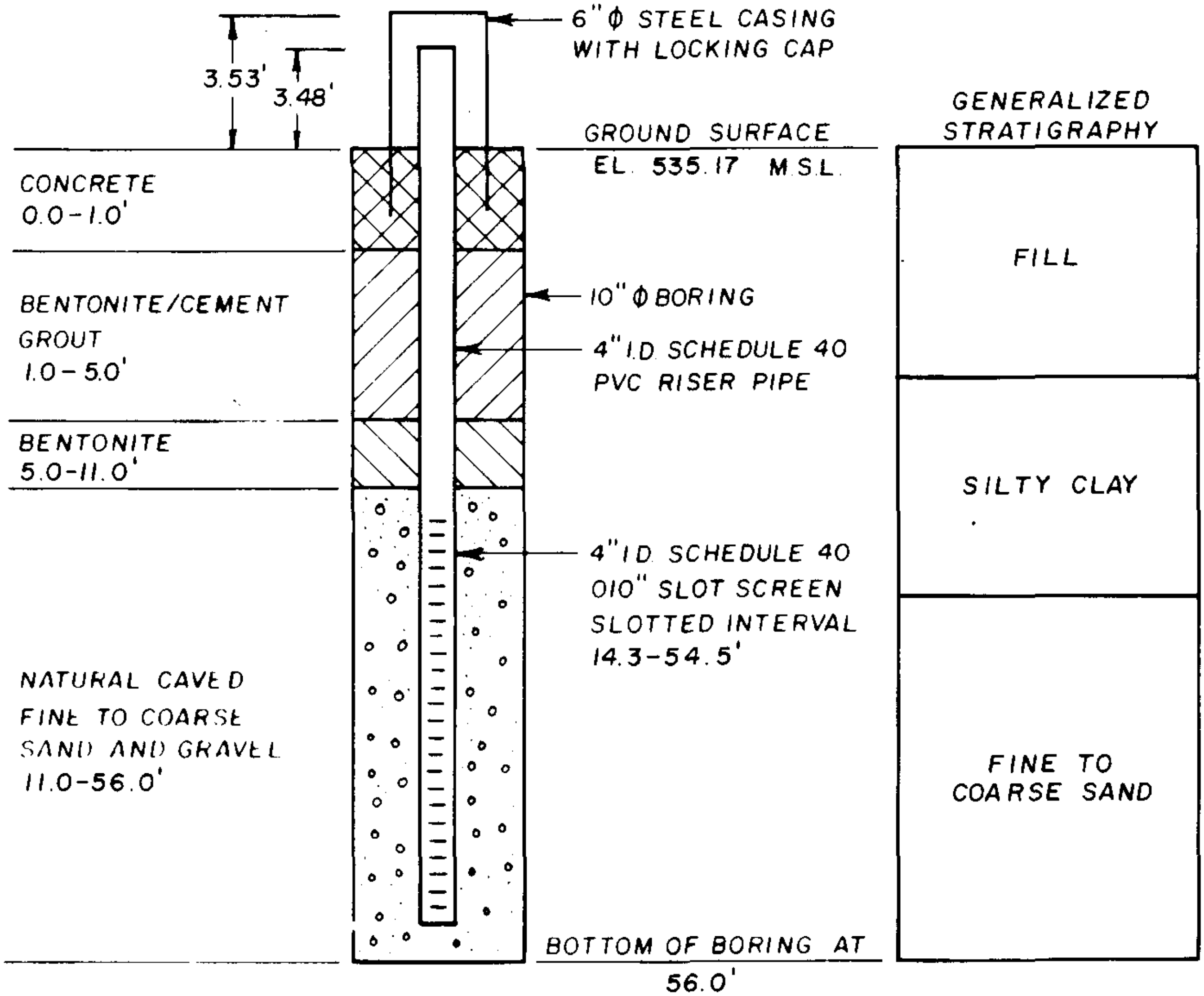
INSTALLATION DETAILS
MONITORING WELL MW-16

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY	RW	CHECKED BY	TMT	11-8-84	DRAWING NUMBER 831625-A 65
	10-30-84	APPROVED BY	JLH	1-25-85	



NOTES:

1. ELEVATION OF TOP OF RISER PIPE, 538.65 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84, 518.46 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-17 (APPENDIX F).

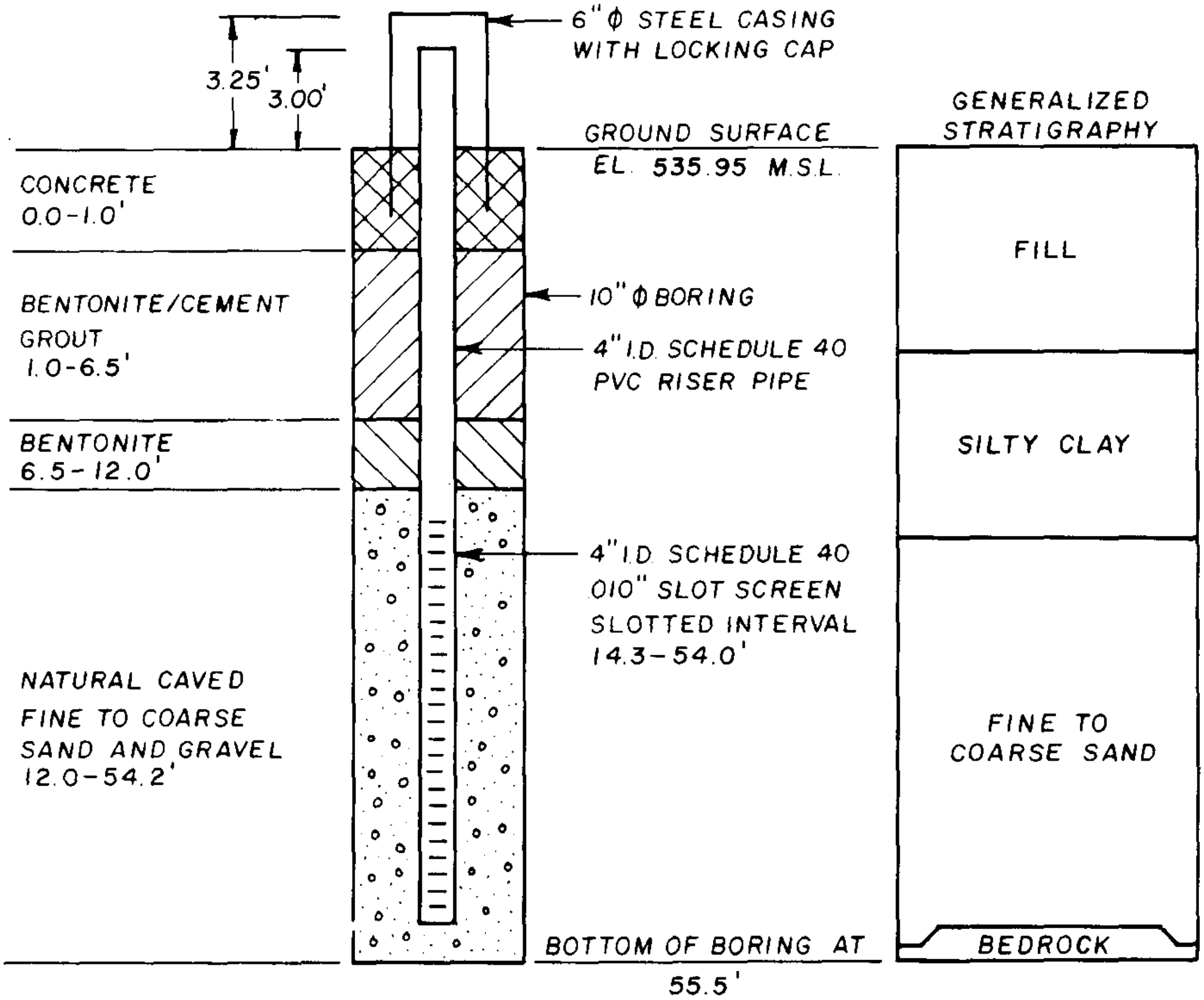
INSTALLATION DETAILS
MONITORING WELL MW-17

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWN BY	RW 10-30-84	CHECKED BY / APPROVED BY	TMJ / JLH	11-8-84 / 1-25-85	DRAWING NUMBER 831625-A66



NOTES

1. ELEVATION OF TOP OF RISER PIPE; 538.95 MSL
2. ELEVATION OF GROUND WATER ON 10/3/84; 518.87 MSL.
3. DEPTH DATUM IS GROUND SURFACE.
4. DRAWING NOT TO SCALE.
5. FOR DETAILED STRATIGRAPHIC DESCRIPTION SEE BORING LOG MW-18 (APPENDIX F).

INSTALLATION DETAILS
MONITORING WELL MW-18

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

19 1253 HERCULENE ARB SMITH CO PGH PA

APPENDIX
H

APPENDIX H

BORING LOGS

Symbols to be used for designation of subsurface materials on all boring logs and subsurface sections

OVERBURDEN

- GLACIAL TILL
- GRAVEL
- SAND
- SILT
- CLAY
- ORGANIC MATTER
- ROOTS

SEDIMENTARY ROCKS

- LIMESTONE
- SILTSTONE
- SANDSTONE
- MASSIVE MUDSTONE OR CLAYSTONE
- SHALE
- COAL
- DOLOMITE
- CONGLOMERATE
- ROCK FRAGMENTS
- BRECCIA
- CRYSTALLINE LIMESTONE
- CHALK
- MARBLE
- BEDDED CHERT
- GYPSUM
- ANHYDRITE
- SALT
- LIMESTONE CONTAINING NODULES OF CHERT OR FLINT

METAMORPHIC & IGNEOUS ROCKS

- SCHISTOSE OR GNEISSOID GRANITE
- GRANITE
- GNEISS
- QUARTZITE
- SCHIST
- BASIC LAVA FLOW
- BEDDED TUFF

MISCELLANEOUS

- SLAG
- FILL
- CONCRETE
- VOID (INDICATES SIZE OF VOID)
- WATER
- APPROXIMATE EXISTING GROUND
- APPROXIMATE TOP OF ROCK

2" O D SPLIT BARREL SAMPLE

75/0 5' PENETRATION REFUSAL RESISTANCE AND FRACTIONAL INCREMENT DRIVEN IN FEET

1-8-81 GROUND WATER LEVEL AND DATE

U S C S UNIFIED SOIL CLASSIFICATION SYSTEM (CAPITAL LETTERS INDICATE LAB TEST CLASSIFICATION, LOWER CASE LETTERS INDICATE VISUAL FIELD CLASSIFICATION)

SAMPLE NUMBER
3" UNDISTURBED SAMPLE (SHELBY TUBE)
RECOVERY INCHES

(60) RQD (ROCK QUALITY DESIGNATION - PERCENT) (LENGTH OF NUMBER OF PIECES GREATER THAN 4 INCHES DIVIDED BY THE LENGTH OF THE CORE RUN)

90 INDICATES PERCENT OF CORE RECOVERED (LENGTH OF CORE RECOVERED DIVIDED BY LENGTH OF CORE RUN)

DRILLING FLUID LOSS ___%

DRILLING FLUID REGAINED ___%

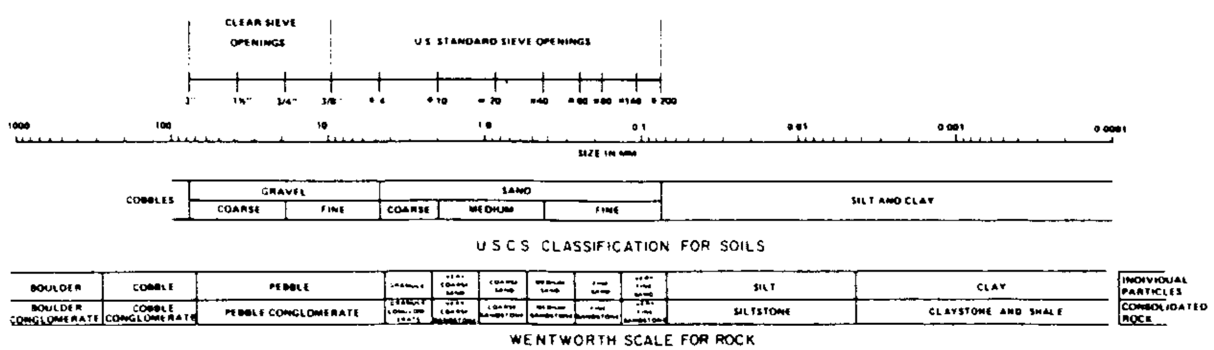
TRACE – INDICATES PRESENCE OF 5 TO 12% OF SUBJECT MATERIAL BY WEIGHT
SOME – INDICATES PRESENCE OF 12 TO 30% OF SUBJECT MATERIAL BY WEIGHT
AND – INDICATES APPROXIMATELY EQUAL PORTIONS OF SUBJECT MATERIAL BY WEIGHT

CONSISTENCY OF COHESIVE SOILS

CONSISTENCY	UNCONFINED COMPRESSIVE STRENGTH TONS PER SQUARE FOOT
VERY SOFT	LESS THAN 0 25
SOFT	0 25 TO 0 50
MEDIUM STIFF	0 50 TO 1 0
STIFF	1 0 TO 2 0
VERY STIFF	2 0 TO 4 0
HARD	MORE THAN 4 0

DENSITY OF GRANULAR SOILS

DESIGNATION	BLOWS PER FOOT
VERY LOOSE	0-4
LOOSE	5-10
MEDIUM DENSE	11-30
DENSE	31-50
VERY DENSE	OVER 50



STANDARD PENETRATION RESISTANCE IS THE NUMBER OF BLOWS REQUIRED TO DRIVE A 2 INCH O. D. SPLIT BARREL SAMPLER 12 INCHES USING A 140 POUND HAMMER FALLING FREELY THROUGH 30 INCHES. THE SAMPLER WAS DRIVEN 18 INCHES AND THE NUMBER OF BLOWS RECORDED FOR EACH 6 INCH INTERVAL. THE RESISTANCE TO PENETRATION IS INDICATED ON THE DRAWING AS BLOWS PER FOOT.

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS AND DATES INDICATED SOIL CONDITIONS AND WATER LEVELS AT OTHER LOCATIONS MAY DIFFER FROM CONDITIONS OCCURRING AT THESE BORING LOCATIONS ALSO THE PASSAGE OF TIME MAY RESULT IN A CHANGE IN THE CONDITIONS AT THESE BORING LOCATIONS

TERMS USED TO DESCRIBE THE RELATIVE DEGREES OF ROCK CORE HARDNESS

DESCRIPTIVE TERMS	DEFINING CHARACTERISTICS
VERY SOFT	CRUSHES UNDER PRESSURE OF FINGERS AND/OR THUMB
SOFT	CRUSHES UNDER PRESSURE OF PRESSED HAMMER
MEDIUM HARD	BREAKS EASILY UNDER SINGLE HAMMER BLOW BUT WITH CRUMBLY EDGES
HARD	BREAKS UNDER ONE OR TWO STRONG HAMMER BLOWS BUT WITH RESISTANT SHARP EDGES
VERY HARD	BREAKS UNDER SEVERAL STRONG HAMMER BLOWS BUT WITH VERY RESISTANT SHARP EDGES AND MAY SPALL LEAVING CONCHOIDAL FRACTURES

THE SPACING OF THE DISCONTINUITIES IN THE ROCK MAY BE DESCRIBED BY ONE OF THE FOLLOWING TERMS

DESCRIPTIVE TERMS	SPACING
VERY BROKEN	LESS THAN 1 IN
BROKEN	1 IN TO 3 IN
SLIGHTLY BROKEN	3 IN TO 6 IN
UNBROKEN	6 IN AND GREATER

GENERAL NOTES AND LEGEND

PREPARED FOR

ALLIED CORPORATION
MORRISTOWN, NEW JERSEY

IT CORPORATION

DRAWING NUMBER 831625-B58
CHECKED BY TMT 1-25-85
APPROVED BY JLH 1-25-85
DRAWN BY mel 10-9-84

DEEP GEOTECHNICAL BORING LOGS

DATE BEGAN 6-14-84

DATE FINISHED 6-17-84

GROUND SURFACE EL. 555.70

BORING NO. B-1

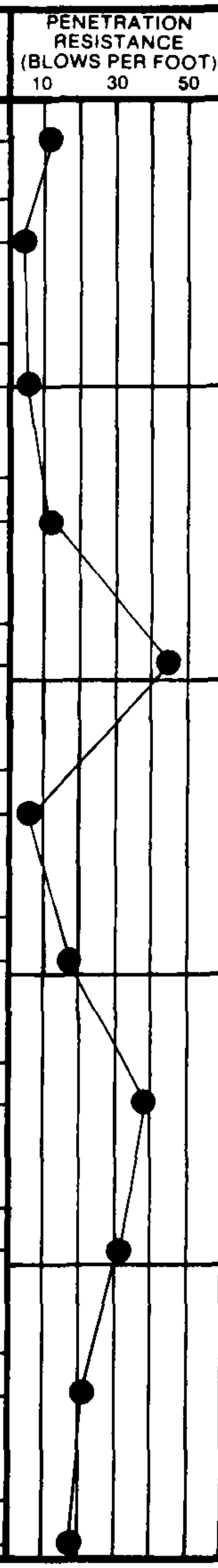
N 184745.962 **E** 1952809.451

FIELD ENGINEER TMJ/DPH

CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
		S 1	MEDIUM STIFF-DARK BROWN-SILTY CLAY-TRACE SAND-DRY 2.5'	cl	
550.0	5	S 2	LOOSE-BROWN-MEDIUM TO COARSE SAND-SOME FINE TO MEDIUM GRAVEL-MOIST	sw	
	10	S 3	LOOSE-BROWN TO GRAY-MEDIUM TO COARSE SAND-SOME FINE TO MEDIUM GRAVEL-MOIST	sw	BORING CAVED IN APPROXIMATELY AT THIS DEPTH. BEGAN USING CASING ADVANCER AT 13'
540.0	15	S 4	MEDIUM DENSE-BROWN-MEDIUM TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST	sw	
	20	S 5	DENSE-BROWN TO GRAY-MEDIUM TO COARSE SAND-SOME FINE TO MEDIUM GRAVEL-MOIST	sw	
530.0	25	S 6	LOOSE-BROWN TO GRAY-MEDIUM TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST 27.0'	sw	
	30	S 7	MEDIUM DENSE-DARK GRAY-FINE TO MEDIUM GRAVEL-SOME MEDIUM TO COARSE SAND-MOIST 32.0'	gw	
520.0	35	S 8	DENSE-BROWN-FINE TO COARSE SAND-TRACE FINE TO MEDIUM GRAVEL-MOIST	sw	
6-17-84 (water level)					
	40	S 9	DENSE-BROWN-FINE TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST	sw	
510.0	45	S 10	MEDIUM DENSE-BROWN-FINE TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST	sw	
	50	S 11	MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-TRACE FINE GRAVEL-MOIST TO WET	sw	

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

DATE BEGAN 6-14-84

DATE FINISHED: 6-17-84

GROUND SURFACE EL.: 555.70

BORING NO. B-1

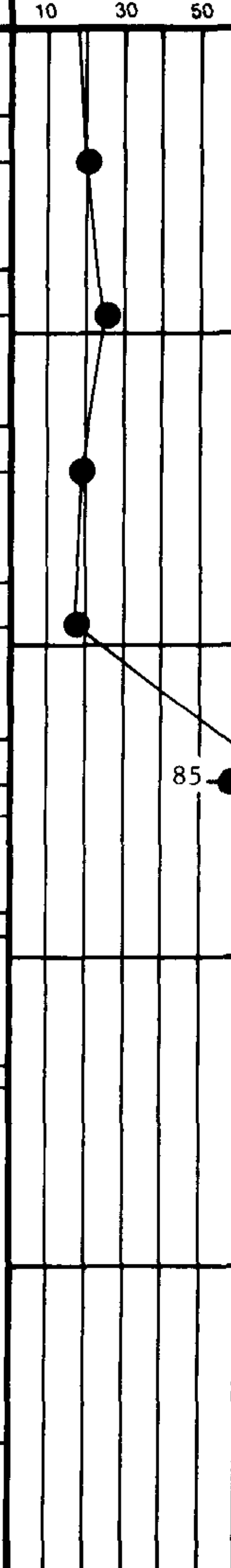
N 184745.962 E 1952809.451

FIELD ENGINEER TMJ/DPH

CHECKED BY: D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S	REMARKS
500.0	55	S 12	MEDIUM DENSE-BROWN-FINE TO COARSE SAND-SOME FINE TO MEDIUM GRAVEL-MOIST TO WET	SW	REDDISH BROWN COLORATION IN TIP OF S-12
	60	S 13	MEDIUM DENSE-BROWN AND GRAY-FINE TO COARSE SAND-SOME FINE TO MEDIUM GRAVEL-WET 62.0'	SW	GRAVEL ENCOUNTERED AT 75' ATTEMPTED TO CORE FROM 75.5' TO 78.5' ASSUMING BED-ROCK-RATHER THAN GRAVEL
490.0	65	S 14		SW	
	70	S 15	MEDIUM DENSE-GRAY-FINE TO MEDIUM SAND-WET 72.0'	SW	TRICONE BIT LOCKED IN GRAVEL. PULLED CASING TO RETRIEVE BIT
480.0	75	S 16	VERY DENSE-GRAY-FINE TO MEDIUM SAND-TRACE FINE TO MEDIUM GRAVEL MOIST 75.0'	SW	
	80	N/A 33	VERY DENSE-GRAY AND BROWN-GRAVEL AND COBBLES-WET (APPROXIMATE TOP TO ROCK) 79.5'	GW	ADVANCED BORING FROM APPROXIMATE TOP OF ROCK (79.5') TO 82.1' WITH CASING ADVANCER AND BEGAN CORING ROCK
		(73)	SHALE-DARK GRAY-VERY THINLY BEDDED-SOFT-BROKEN TO VERY BROKEN-SLIGHTLY WEATHERED 83.5'		
470.0	85		INTERBEDDED SANDSTONE AND SILTSTONE-LIGHT GRAY-MEDIUM GRAINED-THINLY BEDDED-HARD-SLIGHTLY BROKEN 84.3'		SPLIT INNER CORE BARREL USED FROM 82.1' - 98.7'
	90	98 (100)			SOLID CORE BARREL USED BELOW 98.7'
460.0	95		SANDSTONE-LIGHT GRAY-FINE TO MEDIUM GRAINED-MASSIVE-HARD-UNBROKEN 100% 95.7'		
	100	98 (96)	AS BELOW		

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

DATE BEGAN 6-14-84
DATE FINISHED 6-17-84
GROUND SURFACE EL. 555.70

BORING NO. B-1

N 184745.962 **E** 1952809.451

FIELD ENGINEER IMJ/DPH
CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
450.0	105			SHALE-LIGHT TO DARK GRAY-MICRO-LAMINATED-HARD-UNBROKEN-OCCASSIONAL LAYERS (< 2") OF LIGHT GRAY SILTY SHALE			
	110	96 (69)		(GRADES TO:) 109.5' 50%			
440.0	115			SILTY CLAYSTONE-LIGHT TO MEDIUM GRAY-MEDIUM TO THICK BEDDED-SOFT TO HARD-VERY BROKEN TO UNBROKEN 116.4'			50% DRILL WATER RETURN AT 110'
	120	99 (100)		COAL-BLACK-THIN BEDDED-MEDIUM HARD-UNBROKEN-SLIGHTLY CLEATED 100% 116.5'			
430.0	125	100 (73)		INTERBEDDED SANDSTONE AND SILTSTONE-GRAY-FINE TO MEDIUM GRAINED-LAMINATED TO MICROLAMINATED-HARD-UNBROKEN (GRADES TO:) 120.5'			TOTAL LOSS OF WATER FROM START OF CORING OPERATION
				SILTSTONE-MEDIUM GRAY-MICRO LAMINATED-HARD-UNBROKEN (GRADES TO:) 127.7'			
	130			COAL-DARK GRAY TO BLACK-LAMINATED TO MICROLAMINATED -HARD-SLIGHTLY BROKEN-WITH SHALY STRINGERS 128.2'			
				CLAYSTONE-LIGHT TO MEDIUM GRAY-MICROLAMINATED-HARD TO SOFT-BROKEN TO UNBROKEN 130.3'			
421.80	133.9	100		COAL-GRAY TO BLACK-MICRO LAMINATED TO VERY THIN BEDDED -MEDIUM HARD-UNBROKEN-WITH CLAY STRINGERS 130.6'			NOTE: WATER LOSS DURING CORING WAS PROBABLY AROUND CASING AND INTO SAND AND GRAVEL
				SHALE-BLACK-MICROLAMINATED-MEDIUM HARD-UNBROKEN-CARBONACEOUS 130.9'			
				CLAYSTONE-LIGHT TO MEDIUM GRAY THICK BEDDED-MEDIUM HARD-SLIGHTLY BROKEN TO UNBROKEN 132.3'			
				COAL-BLACK-MEDIUM BEDDED-MEDIUM HARD-BROKEN TO SLIGHTLY BROKEN 132.8'			
				CLAYEY SILTSTONE-MEDIUM GRAY-MEDIUM-BEDDED-MEDIUM HARD-UNBROKEN-CARBONACEOUS			

BOTTOM OF BORING AT 133.9'

PROJECT NO. 831625

BORING NO. B-1
SHEET 3 OF 3

DATE BEGAN: 6-18-84
DATE FINISHED: 6-26-84
GROUND SURFACE EL.: 558.41

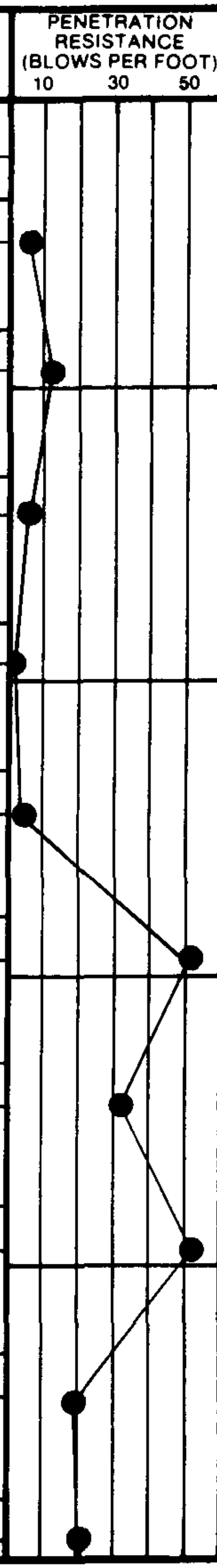
BORING NO. B-2

N 184954.051 E 1953120.853

FIELD ENGINEER: DPH/TMJ
CHECKED BY: D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
		N/A	FILL: SILTY SAND WITH SLAG-BROWN-FINE TO MEDIUM SAND-FINE TO COARSE GRAVEL 2.5'	NA	SAMPLE FROM 0.0' - 1.5' OBTAINED FROM AUGER CUTTINGS
	5	S 1	100% FILL: LOOSE-DARK GRAY TO BLACK-SILTY SAND-SOME FINE GRAVEL-MOIST	sp	
550.0	10	S 2	FILL: MEDIUM DENSE-DARK BROWN TO BLACK AND BROWN-SILTY SAND-SOME CLAY AND FINE TO COARSE GRAVEL-MOIST	sp	THIN (OIL?) FILM; LIGHT DIFFRACTION COLORATION APPARENT ON SAMPLE S-1
	15	S 3	FILL: LOOSE-LIGHT BROWN TO DARK BROWN-SILTY SAND-TRACE FINE TO COARSE GRAVEL-MOIST 16.5'	sp	THIN (OIL?) FILM; LIGHT DIFFRACTION COLORATION APPARENT ON SAMPLE S-2
540.0	20	S 4	FILL: LOOSE-BROWNISH BLACK TO BLACK-FINE TO COARSE SAND-SOME FINE GRAVEL-MOIST 21.5'	sp	
	25	S 5	FILL: LOOSE-BROWN-SILTY SAND-TRACE CLAY AND FINE TO COARSE GRAVEL-MOIST 26.0'	sp	LOWER 3" OF SAMPLE S-3 IS RELATIVELY CLEAN SAND
530.0	30	S 6	DENSE-LIGHT BROWN-MEDIUM TO COARSE SAND AND FINE GRAVEL-MOIST	sw	SOME OF THE GRAVEL IN S-4 APPEARS TO BE COKE OR CINDERS
	35	S 7	DENSE-BROWN-MEDIUM TO COARSE SAND AND FINE GRAVEL-MOIST	sw	APPROXIMATE CONTACT AT 26.0'
520.0	40	S 8	VERY DENSE-BROWN-MEDIUM TO COARSE SAND AND FINE GRAVEL-MOIST	sw	DRILLING CONDITIONS SUGGEST GRAVELLY MATERIAL AT 36.5'
	45	S 9	MEDIUM DENSE-BROWN-MEDIUM TO COARSE SAND AND FINE GRAVEL-MOIST	sw	
510.0	50	S 10	MEDIUM DENSE-BROWN MEDIUM TO COARSE SAND-SOME FINE GRAVEL-MOIST	sw	

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

DATE BEGAN 6-18-84

DATE FINISHED 6-26-84

GROUND SURFACE EL. 558.41

BORING NO. B-2

N 184954.051 **E** 1953120.853

FIELD ENGINEER DPH/TMJ

CHECKED BY D. E. B.

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT)
	55	S 11	MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-TRACE FINE GRAVEL-MOIST 56.5'	sw	
500.0	60	S 12	MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-MOIST	sp	
	65	S 13	MEDIUM DENSE-BROWN-MEDIUM TO COARSE SAND-MOIST 66.5'	sp	
490.0	70	S 14	MEDIUM DENSE-GRAYISH BROWN-FINE TO COARSE SAND-TRACE FINE GRAVEL-MOIST	sp	
	75	S 15	DENSE-GRAYISH BROWN-FINE TO MEDIUM SAND-TRACE COARSE GRAVEL-MOIST	sp	
480.0	80	S 16	DENSE BROWN GRAY-MEDIUM TO COARSE SAND-SOME FINE TO COARSE GRAVEL-TRACE COAL-MOIST	sp	61
	85	S-17	*VERY DENSE-BROWN-GRAY-MEDIUM TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST	sp	150/0.2
			(APPROXIMATE TOP OF ROCK) 87.5'		200/0.1
470.0	90	S-18 (98)	SILTY SANDSTONE-LIGHT GRAY-FINE GRAINED-THICK BEDDED-HARD-UNBROKEN 90.4'		
		98	SANDSTONE-LIGHT GRAY-MEDIUM TO COARSE GRAINED-LAMINATED TO THICK BEDDED-HARD-UNBROKEN 94.2'		
	95	(95)	40% CLAYSTONE-DARK GRAY-LAMINATED-SOFT-BROKEN 94.8'		
460.0	100		SHALE-DARK GRAY TO BLACK-LAMINATED TO THINLY LAMINATED-HARD-UNBROKEN		

REMARKS

MAY HAVE RUN CASING THROUGH COARSE GRAVEL AND CLAY LAYER 66'

*DENSITY OF S-17 IS SUSPECT SINCE SPLIT BARREL WAS OVERPACKED DUE TO NUMEROUS DROPS OF ROD AND SPOON TO REGAIN 83.0' DEPTH AFTER SAND BLEW INTO CASING

POSSIBLE 1' GRAVEL LAYER AT 76' FROM DRILLING CONDITIONS

* ENCOUNTERED A BLACK OILY LIQUID WHEN THE FIRST CORE RUN WAS RETRIEVED. THE LIQUID IS PROBABLY IN THE OVERLYING GRAVEL LAYER AND LEAKING INTO THE BORING AROUND THE CASING. WATER SAMPLE B-2G-W WAS TAKEN AS A COMPOSITE OF THE WATER COLUMN IN THE BORING.

SANDSTONE CONTAINS CARBONACEOUS STREAKS FROM 90.4' TO 91.3'

BLACK OILY FLUID IS RETURNING WITH DRILLING FLUIDS.

DATE BEGAN 6-18-84

DATE FINISHED: 6-26-84

GROUND SURFACE EL.: 558.41

BORING NO. B-2

N 184954.051 E 19353120.853

FIELD ENGINEER DPH/TMJ

CHECKED BY D. E. B.

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				AS ABOVE 101.0'			
	105	98 (93)		SANDSTONE-LIGHT GRAY-FINE GRAINED-THICK BEDDED-HARD-UNBROKEN 103.3'			
450.0	110			SHALE-DARK GRAY-LAMINATED TO THINLY BEDDED-HARD-UNBROKEN 113.1'			
	115	101 (80)		LIMESTONE-DARK TO LIGHT GRAY-VERY FINE TO FINE GRAINED-THICKLY BEDDED-HARD-BROKEN 113.7'			
440.0				SILTSTONE-LIGHT GRAY-THICKLY BEDDED-HARD-UNBROKEN 115.5'			
	120			CLAYSTONE-LIGHT TO DARK GRAY-VERY THIN TO LAMINATED BEDDING-MEDIUM HARD-BROKEN TO SLIGHTLY BROKEN-COAL LAMINATIONS 118.8'			
430.0	125, 130	101 (90)		SILTSTONE-LIGHT TO DARK GRAY-LAMINATED TO MICROLAMINATED-HARD-UNBROKEN 129.9'			
				COAL-BLACK-THINLY LAMINATED-MEDIUM HARD-BROKEN 130.6'			
	135	98 (65)		CLAYSTONE-DARK TO LIGHT GRAY-THICK BEDDED-MEDIUM HARD-BROKEN 132.9'			
				INTERBEDDED CLAYSTONE AND COAL-LIGHT GRAY TO BLACK-THINLY LAMINATED TO LAMINATED-MEDIUM HARD-BROKEN 133.4'			
				COAL-BLACK-THINLY LAMINATED TO MICROLAMINATED-MEDIUM HARD TO HARD-BROKEN 135.1'			
419.71	138.7	102		SILTSTONE-LIGHT TO DARK GRAY-THICK BEDDED-HARD-UNBROKEN			
				BOTTOM OF BORING B-2 AT 138.7 FEET			

PROJECT NO. 831625

BORING NO. B-2

DATE BEGAN 6-27-84
DATE FINISHED: 6-30-84
GROUND SURFACE EL.: 532.70

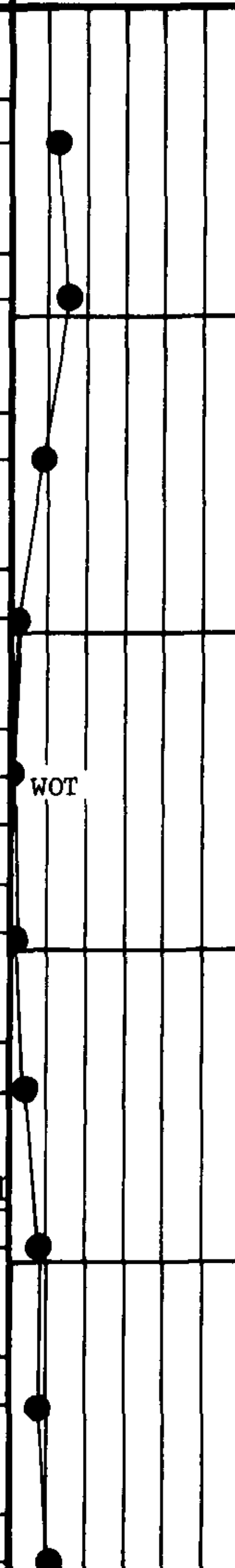
BORING NO. B-3

N 183942.920 E 1955564.256

FIELD ENGINEER D. P. HOLZMAN
CHECKED BY: D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.
530.0		N/A	50% FILL: BROWN-FINE TO COARSE SLAG AND FINE TO MEDIUM SAND-SOME SILT-DRY 2.0'	
	5	S-1	90% FILL: MEDIUM STIFF-BROWN-CLAYEY SILT-FINE TO MEDIUM SAND AND FINE GRAVEL-MOIST (3" CINDER LAYER ON TOP OF CLAYEY SILT) 6.5'	NA
	10	S-2	FILL: MEDIUM DENSE-GRAY TO BLACK-FINE TO COARSE SLAG-SOME FINE TO MEDIUM CINDERS-TRACE SILT	NA
520.0	15	S-3	FILL: LOOSE-BLACK-FINE TO MEDIUM SLAG-SOME MEDIUM SAND-TRACE FINE GRAVEL AND COAL-WET	NA
	20	S-4	FILL: VERY LOOSE- BLACK-FINE TO COARSE SLAG-TRACE FINE GRAVEL-WET 21.0'	NA
510.0	25	S-5	100% VERY SOFT-BROWN-CLAYEY SILT-SOME FINE SAND-TRACE FINE GRAVEL-MOIST 26.0'	ml
	30	S-6	VERY LOOSE-BROWN-SILTY FINE TO COARSE SAND-TRACE FINE GRAVEL AND ROOT FIBERS-MOIST	sm
500.0	35	S-7	LOOSE-BROWN TO BLACK-SILTY MEDIUM SAND AND FINE TO COARSE SLAG-TRACE COARSE GRAVEL-MOIST GRADES TO: 34.0'	sm
			LOOSE-BROWN-SILTY FINE TO MEDIUM SAND-MOIST GRADES TO: 38.3'	sm
	40	S-8	LOOSE-BROWN-FINE TO COARSE GRAVEL-SOME FINE TO COARSE SAND-TRACE SILT-MOIST 41.5'	gw
490.0	45	S-9	LOOSE-BROWN-FINE TO COARSE SAND-TRACE COARSE GRAVEL-MOIST	sw
	50	S-10	MEDIUM DENSE-BROWN-FINE TO COARSE SAND-TRACE COARSE GRAVEL-MOIST	sw

PENETRATION RESISTANCE (BLOWS PER FOOT)



REMARKS

DRILLING FLUIDS WERE RETURNING THROUGH THE GROUND SURFACE IN A 10' RADIUS ABOUT THE BORING UNTIL DRILLERS INSTALLED SURFACE CASING

TAR-LIKE ODOR IN S-4

APPROXIMATE DEPTH OF TOP OF CLAYEY SILT (SAMPLE S-5) AT 21.0'

SAMPLE S-5 SPLIT SPOON DROPPED 18" BY WEIGHT OF HAMMER (NO BLOW COUNT)

APPROXIMATE DEPTH OF TOP OF SILTY SAND (SAMPLE S-6) AT 26.0'

DATE BEGAN 6-27-84
DATE FINISHED 6-30-84
GROUND SURFACE EL.: 532.70

BORING NO. B-3

N 183942.920 **E** 1955564.256

FIELD ENGINEER D. P. HOLZMAN
CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
			AS ABOVE 52.0'			
480.0	55	S-11	VERY DENSE-BROWN-FINE TO COARSE SAND AND FINE TO COARSE GRAVEL-TRACE SILT AND CLAY-MOIST (APPROXIMATE TOP OF ROCK) 57.6'	GW/SW	69	CASING ADVANCED TO 58.8' (APPROXIMATELY 1.2' INTO ROCK)
	60	S-12	CLAYSTONE-MEDIUM GRAY-THINLY LAMINATED TO LAMINATED-MEDIUM HARD-UNBROKEN-MODERATELY WEATHERED. 58.8'		100/0.3'	
470.0	65	61 (75)	SHALE-MEDIUM GRAY-MASSIVE-MEDIUM HARD-UNBROKEN GRADES TO: 63.7'			RUN 1 - SOLID CORE BARREL USED TO CORE ROCK. CORE BARREL WAS PRESSURIZED TO REMOVE CORE CAUSING SOME CORE BREAKAGE. CORE RECOVERY AND RQD ARE ESTIMATED FOR RUN No. 1
	70	86 (95)				
460.0	75					
	80	100 (100)	SHALE-MEDIUM GRAY TO LIGHT GRAY-VERY THINLY LAMINATED TO LAMINATED-HARD-UNBROKEN			DRILL RIG DOWN FOR REPAIR FROM 18:30 on 6/28/84 TO 15:00 ON 6/30/84
450.0	85					
	90	100 (92)				
440.0	95					
	100	100 (90)				

PROJECT NO. 831625

BORING NO. B-3
SHEET 2 OF 3

DATE BEGAN 6-27-84

DATE FINISHED: 6-30-84

GROUND SURFACE EL.: 532.70

BORING NO. B-3

N 183942.920 **E** 1955564.256

FIELD ENGINEER D. P. HOLZMAN

CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
430.0	105	100 (61)		AS ABOVE 102.4'			
				SILTSTONE - LIGHT GRAY - THICK BEDDED - HARD - UNBROKEN 102.7'			BLACK CARBONACEOUS STREAKS FROM 106.5' TO 107.8'
				SHALE - MEDIUM GRAY - MICROLAMINATED - HARD - SLIGHTLY BROKEN 103.7'			
424.00	108.7	80		COAL 104.0'			
				SHALE - MEDIUM GRAY - MICROLAMINATED - HARD - SLIGHTLY BROKEN 104.9'			
				COAL - BLACK - VERY THINLY LAMINATED - HARD - BROKEN 105.0'			
				SHALE - MEDIUM GRAY - MICROLAMINATED - HARD - SLIGHTLY BROKEN 105.2'			
				COAL 105.3'			
				SHALE - MEDIUM GRAY - MICROLAMINATED - SOFT - BROKEN - SLIGHT WEATHERING 106.5'			
				SILTSTONE - LIGHT GRAY TO BLACK - THICK BEDDED - HARD - UNBROKEN 107.8'			
				CORE LOSS			
				BOTTOM DEPTH OF BORING 108.7'			

PROJECT NO. 831625

BORING NO. B-3

DATE BEGAN 7-3-84
DATE FINISHED 7-9-84
GROUND SURFACE EL. 532.81

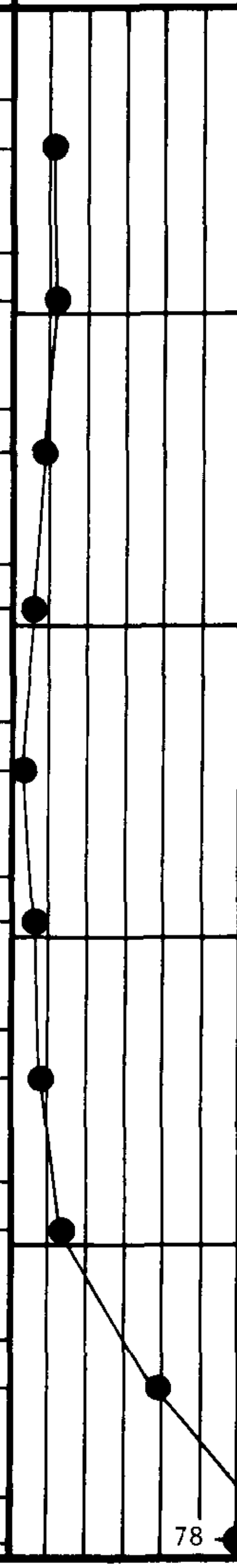
BORING NO. B-4

N 185008.679 **E** 1955474.193

FIELD ENGINEER D. HOLZMAN
CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
530.0		N/A	100% FILL: BROWN-CLAYEY SILT-SOME FINE SAND-TRACE FINE GRAVEL-MOIST 2.5'	NA	GRAB-SAMPLE FROM 0.0'-2.0' OBTAINED FROM AUGER CUTTINGS. DRILLING FLUIDS LOST THROUGH OUTER LAGOON DIKE DURING DRILLING
	5	S 1	FILL: SOFT-BROWN-SILTY CLAY-TRACE COARSE SAND-MOIST 6.5'	NA	
	10	S 2	FILL: MEDIUM DENSE-BLACK TO TAN-SILTY SAND-SOME COARSE SLAG-MOIST	NA	
520.0	15	S 3	FILL: LOOSE-BLACK-SILTY FINE TO COARSE SAND-SOME FINE TO COARSE GRAVEL AND SLAG-TRACE CLAY-MOIST 16.5'	NA	
	20	S 4	SOFT-BROWN-SILTY CLAY-TRACE FINE SAND AND GRAVEL-MOIST 21.5'	cl	
510.0	25	S 5	VERY LOOSE-BROWN-SILTY SAND-TRACE CLAY-MOIST	sp	
	30	S 6	31.5'	sp	
500.0	35	S 7	LOOSE-BROWN TO GRAY-SILTY FINE TO COARSE SAND AND GRAVEL-TRACE ORGANIC MATERIAL-MOIST	gw/sw	S-7 CONTAINS ORANGE RED MATERIAL WITHIN SAMPLE; UNKNOWN ORIGIN OR TYPE
	40	S 8	MEDIUM DENSE-BROWN-FINE TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST	sw	S-8 GRADES FINER DOWNWARD
490.0	45	S 9	DENSE-BROWN-FINE TO COARSE SAND AND GRAVEL-TRACE SILT-MOIST	sw	
	50	S 10	VERY DENSE-LIGHT BROWN-FINE TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST	sw	

PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50



PROJECT NO. 831625

BORING NO. B-4
SHEET 1 OF 2

DATE BEGAN 7-3-84

DATE FINISHED 7-9-84

GROUND SURFACE EL. 532.81

BORING NO. B-4

N 185008.679 **E** 1955474.193

FIELD ENGINEER D. HOLZMAN

CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
480.0	55	S 11		MEDIUM DENSE-BROWN-FINE TO COARSE SAND-SOME FINE TO COARSE GRAVEL-MOIST (APPROXIMATE TOP OF ROCK) 55.3'	sp		INSUFFICIENT RECOVERY IN S-12 TO DESCRIBE FRACTURE OR WEATHERING OF SAMPLE
475.81	57.0	S-12		CLAYSTONE-SHALE-LIGHT GRAY-THINLY BEDDED-VERY SOFT		100/0.2'	
				BOTTOM OF BORING B-4 57.0 FEET			

PROJECT NO. 831625

BORING NO. B-4
SHEET 2 OF 2

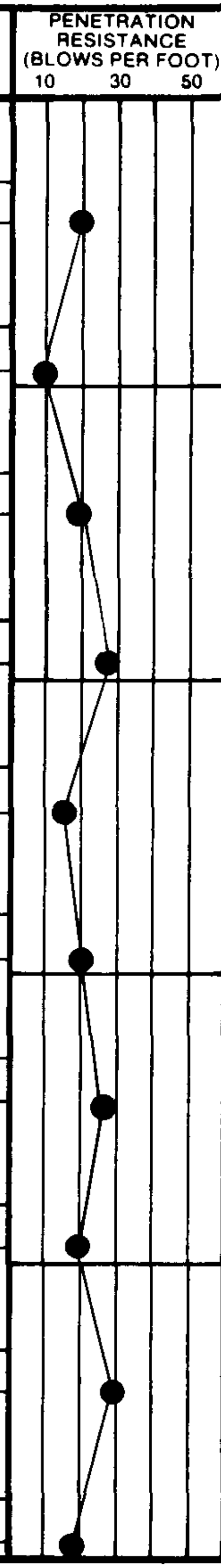
DATE BEGAN 7-9-84
DATE FINISHED 7-10-84
GROUND SURFACE EL. 558.51

BORING NO. B-5

N 183887.061 **E** 1954766.515

FIELD ENGINEER D. HOLZMAN
CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
		N/A	100% FILL: BLACK-FINE COAL-TRACE SLAG AND ORGANIC MATERIAL 3.0'		
	5	S 1	FILL: LOOSE-BROWN TO GRAY-FINE TO COARSE SLAG-SOME FINE GRAVEL AND COAL-TRACE SILT-DRY	NA	SAMPLE FROM 1.0' TO 2.5' OBTAINED FROM AUGER CUTTINGS
550.0	10	S 2	FILL: LOOSE-PINK-GRAY-AND BLACK-COARSE SLAG-DRY 11.5'	NA	
	15	S 3	MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-SOME FINE TO COARSE GRAVEL-TRACE SILT-MOIST	sp	
540.0	20	S 4	MEDIUM DENSE-BROWN-FINE TO COARSE SAND-SOME FINE GRAVEL-MOIST	sp	
	25	S 5	LOOSE-BROWN-FINE TO MEDIUM SAND-TRACE FINE GRAVEL-MOIST	sw	
530.0	30	S 6	MEDIUM DENSE-BROWN-GRAVELLY-FINE TO COARSE SAND-MOIST	sw	
	35	S 7	MEDIUM DENSE-BROWN-FINE TO COARSE SAND-TRACE FINE TO COARSE GRAVEL-MOIST	sw	
520.0	40	S 8	MEDIUM DENSE-BLACK-FINE TO 25% COARSE SAND-SOME FINE GRAVEL-MOIST.	sw	SAMPLE S-8 HAS A COAL TAR PRODUCTS ODOR-OILY BLACK COLOR
	45	S 9	MEDIUM DENSE-TAN TO BLACK-FINE TO COARSE SAND-TRACE COARSE GRAVEL-MOIST	sw	PORTIONS OF SAMPLE S-9 HAVE COAL TAR PRODUCTS ODOR
510.0	50	S 10	MEDIUM DENSE-DARK GRAY TO BLACK-FINE SAND-TRACE FINE GRAVEL-MOIST	sp	



DATE BEGAN 7-9-84
DATE FINISHED 7-10-84
GROUND SURFACE EL. 558.51

BORING NO. B-5

N 183887.061 **E** 1954766.515

FIELD ENGINEER D. HOLZMAN
CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
			AS ABOVE 51.0'			
			~95%			
	55	S 11	MEDIUM DENSE-DARK BROWN TO GRAY BROWN-FINE TO COARSE SAND-TRACE SILT-MOIST	SW		SAMPLE S-11 HAS COAL TAR PRODUCTS ODOR (ANAEROBIC)
500.0	60	S 12		SW		
			61.5'			
	65	S 13	MEDIUM DENSE-BROWN TO DARK BROWN TO GRAY BROWN-FINE TO COARSE SAND-TRACE FINE GRAVEL-MOIST	SW		
490.0	70	S 14	DENSE-DARK BROWN-FINE TO COARSE SAND-TRACE FINE TO COARSE GRAVEL-MOIST	SW		
			60%			
	75	S 15	MEDIUM DENSE-DARK GREENISH BROWN-FINE TO COARSE SAND-SOME FINE GRAVEL AND ROCK FRAGMENTS-MOIST	SW		NO SAMPLE RECOVERED IN S-16 PROBABLY DROVE GRAVEL AHEAD OF SPLIT SPOON
480.0	80	S 16	(NO RECOVERY) 79.2'			
			GRAVEL AND COBBLES (APPROXIMATE TOP OF ROCK) 81.5'			
476.21	82.3	S-17	CLAYSTONE-LIGHT GRAY 81.8'		135/0.6'	
			COAL-BLACK 89.9'			
			SHALE-GRAY-LAMINATED			

BOTTOM OF BORING AT 82.3 FEET

PROJECT NO. 831625

BORING NO. B-5

DATE BEGAN 7-11-84

DATE FINISHED 7-12-84

GROUND SURFACE EL. 559.20

BORING NO. B-6

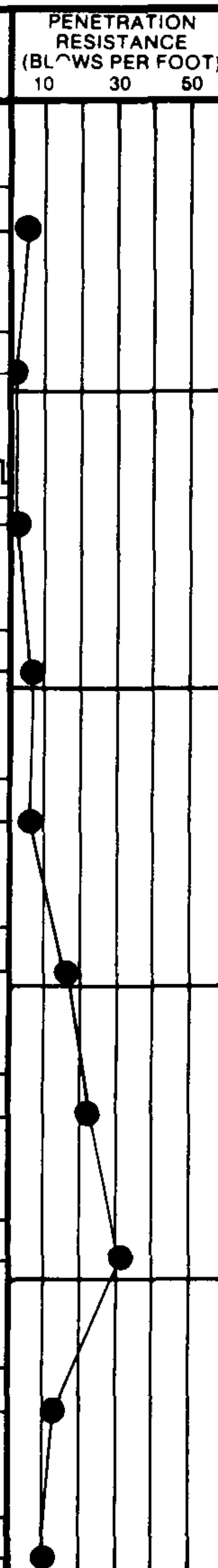
N 185185.518 E 1955105.698

FIELD ENGINEER D. HOLZMAN

CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.
		N/A	FILL: BLACK-FINE TO MEDIUM SAND-TRACE COAL-DRY	
			30%	
	5	S 1	FILL: VERY LOOSE-BROWN TO DARK BROWN-GRAVELLY FINE TO COARSE SAND-TRACE SILT AND COAL-MOIST 6.0'	NA
			100%	
550.0	10	S 2	VERY LOOSE-BROWN TO WHITE TO GREEN-FINE TO COARSE GRAVEL-TRACE FINE TO MEDIUM SAND-MOIST 11.5'	gp
			VERY SOFT-BROWN-CLAYEY SILT-SOME FINE SAND-TRACE COARSE GRAVEL-MOIST 13.5'	ml
	15	S 3	VERY LOOSE-BROWN TO DARK BROWN-GRAVELLY FINE TO COARSE SAND-TRACE SILT-MOIST 16.5'	sp
540.0	20	S 4	SOFT-LIGHT BROWN TO REDDISH BROWN-MOTTLED-SILTY CLAY-TRACE FINE SAND-MOIST	cl
	25	S 5	SOFT-LIGHT BROWN TO REDDISH BROWN-MOTTLED-SILTY CLAY-TRACE ORGANICS-AND FINE SAND-MOIST	cl
530.0	30	S 6	MEDIUM STIFF-BROWN TO REDDISH BROWN-MOTTLED-SILTY CLAY-TRACE FINE SAND-MOIST 31.5'	cl
	35	S 7	MEDIUM DENSE-BROWN-FINE TO COARSE SAND-TRACE FINE GRAVEL-MOIST	sw
520.0	40	S 8	DENSE-BROWN-GRAVELLY FINE TO COARSE SAND-TRACE SILT-MOIST	sp
	45	S 9	MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-TRACE SILT AND ORGANICS-MOIST	sp
510.0	50	S 10	LOOSE-BROWN-FINE TO MEDIUM SAND-TRACE FINE GRAVEL-MOIST	sw

PENETRATION RESISTANCE (BLOWS PER FOOT)



REMARKS

SAMPLE FROM 1.0'-1.5' OBTAINED WITH SHOVEL ADJACENT TO BORING B-6

1 BLOW DROVE SAMPLER 22" FOR S-2. ONLY 1" RECOVERY OF GRAVELS

6 BLOWS FOR FIRST 6" OF S-3 PROBABLY DUE TO DRIVING ON COARSE GRAVEL FOUND IN UPPER PART OF SAMPLE

S-4 MAY BE SAMPLE OF ORIGINAL CITY OF IRONTON FLOOD WALL

PROJECT NO. 831625

BORING NO. B-6

SHEET 1 OF 3

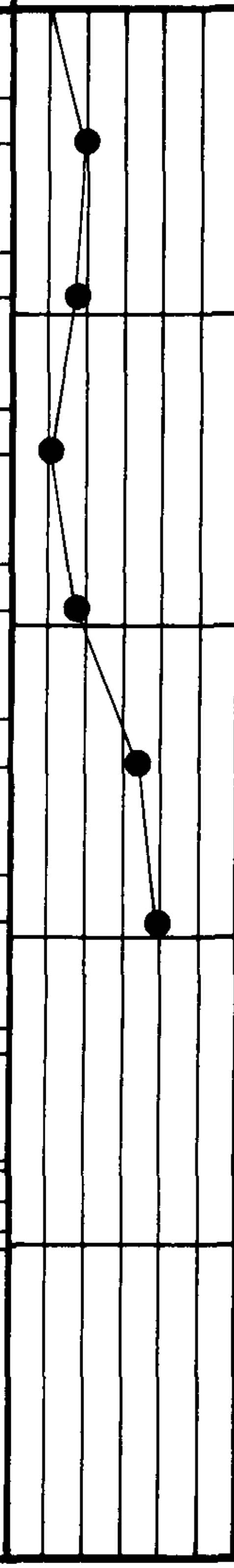
DATE BEGAN 7-11-84
DATE FINISHED 7-12-84
GROUND SURFACE EL. 559.20

BORING NO. B-6

N 185185.518 **E** 1955105.698

FIELD ENGINEER D. HOLZMAN
CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	55	S 11		MEDIUM DENSE-BROWN-FINE TO COARSE-SAND-TRACE SILT-MOIST	sw		
500.0	60	S 12		MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-TRACE SILT-MOIST	sw		
	65	S 13		MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-TRACE FINE GRAVEL AND SILT-MOIST	sp		
490.0	70	S 14		MEDIUM DENSE-BROWN-FINE TO MEDIUM SAND-TRACE COARSE GRAVEL AND SILT-MOIST	sp		
	75	S 15		DENSE-LIGHT BROWN TO BROWNISH GRAY-FINE TO COARSE SAND-TRACE SILT-MOIST	sw		ENCOUNTERED POSSIBLE COBBLE LAYER AT 75.5'
480.0	80	S 16		DENSE-BROWN GRAVELLY-FINE TO COARSE SAND-TRACE SILT-MOIST	sw		
				(APPROXIMATE TOP OF ROCK) 82.5'			CASING ADVANCED TO 83.0'
	85	(70)	10%	SHALE-DARK TO LIGHT GRAY-MICROLAMINATED-MEDIUM HARD TO HARD-SLIGHTLY BROKEN TO BROKEN-SLIGHTLY WEATHERED 83.8'			
470.0	90	82 (81)	100%	SILTSTONE AND SHALE-LIGHT TO DARK GRAY-THICK BEDDED TO THINLY LAMINATED-HARD-SLIGHTLY BROKEN-SLIGHT-WEATHERING 87.3'			
				SHALE-LIGHT TO DARK GRAY-MICROLAMINATED-MEDIUM HARD-BROKEN-SLIGHT WEATHERING 87.6'			
	95			CORE LOSS 88.6'			
				INTERBEDDED SILTSTONE AND SHALE-LIGHT GRAY TO BLACK-THIN TO MICROLAMINATED-HARD-BROKEN TO UNBROKEN-SLIGHT WEATHERING 89.65			
460.0	100	97 (100)		SHALE-DARK GRAY-MICROLAMINATED HARD-SLIGHTLY BROKEN-SLIGHTLY WEATHERED 90.1'			
				AS BELOW			



PROJECT NO. 831625

BORING NO. B-6
SHEET 2 OF 3

DATE BEGAN 7-11-84

DATE FINISHED 7-12-84

GROUND SURFACE EL.: 559.20

BORING NO. B-6

N 185185.518 **E** 1955105.698

FIELD ENGINEER D. HOLZMAN

CHECKED BY D. E. B.

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				5%			
	105			SANDSTONE-LIGHT TO MEDIUM GRAY-FINE GRAINED-LAMINATED TO THICK BEDDED-HARD-UNBROKEN FRESH			
450.0	110	100 (89)					
	115			115.2'			
440.0	120	99 (64)		SHALE-MEDIUM TO DARK GRAY-MICROLAMINATED-MEDIUM HARD-VERY BROKEN TO UNBROKEN-SLIGHT TO MODERATE WEATHERING 120.9'			
				COAL-BLACK-MICROLAMINATED-MEDIUM HARD-BROKEN-SLIGHT WEATHERING 121.1'			
	125	96 (89)		SHALE-MEDIUM TO DARK GRAY-MICROLAMINATED-HARD-BROKEN TO UNBROKEN-SLIGHT WEATHERING 125.6'			
430.0	130			SILTSTONE-MEDIUM GRAY-THICK BEDDED-HARD-UNBROKEN 127.8'			
425.60	133.6	98		SHALE-MEDIUM TO DARK GRAY-THIN TO MICROLAMINATED-HARD-BROKEN TO UNBROKEN			
				BOTTOM OF BORING B-6 133.6 FEET			

PROJECT NO. 831625

BORING NO. B-6

TEST PIT LOGS

DATE BEGAN: 6/25/84
DATE FINISHED: 6/25/84
GROUND SURFACE EL.: 555.73

TEST PIT NO. TP-1

N 184912.979 E 1954578.163

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK, COKE, COAL, CINDER AND GRAVEL - SOME TIMBERS AND BRICK - MOIST 2.0'	BEGIN 14:00
	2.5		FILL: BROWN AND BLACK, SILTY CLAY - TRACE COAL FRAGMENTS - MOIST 4.0'	BLACK FILL FROM 4.0 to 6.5' IS FILL AROUND BURIED PIPELINE. THIS FILL IS NOT PRESENT ON OTHER WALL OF PIT. NORMAL DEPTH OF FILL IS APPARENTLY 4.0' BELOW GROUND SURFACE.
550.0	5.0		FILL: BLACK, FINE TO COARSE COAL, COKE AND CINDERS - MOIST 6.5'	
543.73	7.5 10.0 12.0		BROWN, SILTY FINE SAND - MOIST	END 16:00
			BOTTOM OF TEST PIT 12.0'	

PROJECT NO. 831625

TEST PIT TP-1
SHEET 1 OF 1

DATE BEGAN: 6-25-84

DATE FINISHED: 6-25-84

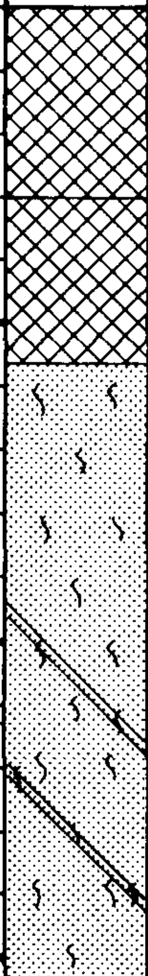
GROUND SURFACE EL.: 555.60

TEST PIT NO. TP-2

N 184821.800 E 1954543.643

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK, FINE TO MEDIUM SAND COKE AND COAL - SOME TAR - MOIST 1.5'	BEGIN 16:15
	2.5		FILL: BROWN, SILTY CLAY - OCCASIONAL COAL FRAGMENTS - MOIST 2.8'	
550.0	5.0		BROWN, SILTY FINE SAND - SOME LAYERS OF FINE SANDY SILT TO CLAYEY SILT - MOIST	
547.90	7.5 7.7			END 17:45
			BOTTOM OF TEST PIT 7.7'	

PROJECT NO. 831625

TEST PIT TP-2

SHEET 1 OF 1

DATE BEGAN: 6-26-84
DATE FINISHED: 6-26-84
GROUND SURFACE EL.: 555.70

TEST PIT NO. TP-3

N 184417.499 E 1854444.375

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: DARK RED, SILT - MOIST 0.5'	BEGIN 08:45
			FILL: YELLOW, MOTTLED SILTY CLAY TO CLAYEY SILT-MOIST 1.5'	
	2.5		YELLOW ORANGE, CLAYEY SILT - TRACE SAND - MOIST 3.0'	
550.0	5.0 7.5		ORANGE-BROWN TO TAN, SILTY FINE SAND TO MEDIUM SAND - TRACE FINE GRAVEL - MOIST	
547.70	8.0			END 10:15
			BOTTOM OF TEST PIT 8.0'	

PROJECT NO. 831625

TEST PIT TP-3
SHEET 1 OF 1

DATE BEGAN: 6/26/84

DATE FINISHED: 6/26/84

GROUND SURFACE EL.: 556.85

TEST PIT NO. TP-4

N 183911.991 E 1954531.473

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: GRAY TO BLACK, MEDIUM TO COARSE SAND, GRAVEL, COAL, COKE AND SLAG - MOIST TO DRY 0.5'	
			FILL: TAR - HARD 1.0'	
	2.5		FILL: BLACK, FINE TO COARSE SAND, GRAVEL, COAL, COKE AND SLAG - MOIST 2.0'	
			ORANGE-BROWN, SILTY CLAY - MOIST 4.0'	
550.0	5.0 7.5		ORANGE-BROWN, FINE TO MEDIUM SAND - TRACE GRAVEL - MOIST 8.0'	
547.85	9.0		GRAY, MEDIUM TO COARSE SAND AND GRAVEL - MOIST	
			BOTTOM OF TEST PIT 9.0'	

PROJECT NO. 831625

TEST PIT TP-4
SHEET 1 OF 1

DATE BEGAN: 6/26/84
DATE FINISHED: 6/26/84
GROUND SURFACE EL.: 556.83

TEST PIT NO. TP-5

N 183977.714 E 1954497.804

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK, COAL, COKE, SAND, GRAVEL AND SLAG - MOIST TO DRY - SOME TAR 1.2'	
	2.5		LIGHT GRAY TO LIGHT BROWN, SILTY CLAY - MOIST 4.5'	
550.0	5.0 7.5		ORANGE-BROWN AND GRAY, MEDIUM SAND - TRACE FINE GRAVEL - MOIST	
548.83	8.0		BOTTOM OF TEST PIT 8.0'	PIT LOCATED AT LIGHT OILS LOADING AREA

PROJECT NO. 831625

TEST PIT TP-5
SHEET 1 OF 1

DATE BEGAN: 6/26/84
DATE FINISHED: 6/26/84
GROUND SURFACE EL.: 556.78

TEST PIT NO. TP-6

N 183842.997 E 1954565.544

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK, COAL, COKE, SAND, GRAVEL AND SLAG - SOME TAR - MOIST TO DRY 1.8'	
	2.5		GRAY, SILT - MOIST 3.2'	1" SAND AND GRAVEL LAYER AT 2.5'
550.0	5.0		ORANGE-BROWN, SILTY CLAY - TRACE FINE GRAVEL - MOIST (GRADES TO:) 7.0'	
	7.5		ORANGE-BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST 8.0'	
548.08	8.7		GRAY, MEDIUM TO COARSE SAND AND GRAVEL - MOIST	
			BOTTOM OF TEST PIT 8.7'	

PROJECT NO. 831625

DATE BEGAN: 6/27/84
DATE FINISHED: 6/27/84
GROUND SURFACE EL.: 556.78

TEST PIT NO. TP-7

N 183796.678 E 1954458.952

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK, COAL, COKE, CINDER, SAND, GRAVEL AND SLAG - DRY 1.5'	
	2.5		ORANGE-BROWN, SILTY CLAY - MOIST 3.5'	
550.0	5.0 7.5		ORANGE-BROWN, FINE TO MEDIUM SAND - TRACE FINE GRAVEL - MOIST	
547.78	9.0			
			BOTTOM OF TEST PIT 9.0'	

PROJECT NO. 831625

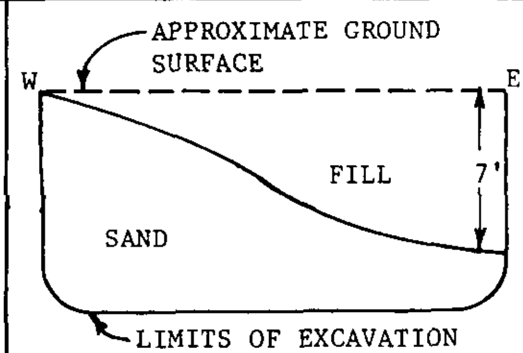
TEST PIT TP-7
SHEET 1 OF 1

DATE BEGAN: 6/27/84
DATE FINISHED: 6/27/84
GROUND SURFACE EL.: 537.07

TEST PIT NO. TP-8

N 183391.514 E 1954917.110

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5 5.0		FILL: BLACK, GRAY, RED AND YELLOW, COKE, COAL, SAND AND GRAVEL, BRICKS AND MISCELLANEOUS PLANT FILL (ELECTRIC CORD, CABLE, METAL, ETC.)-DRY TO MOIST 7.0'	SAMPLE TP-8I-S APPEARS TO BE PRIMARILY COAL FINES AT SURFACE SAMPLE TP-8H-S TAKEN FROM A LAYER OF WHITE MATERIAL (LIME SLUDGE ?) WITHIN THE FILL SAMPLES 8H and 8G COLLECTED IN BUCKET OF BACKHOE DUE TO CAVING IN TRENCH
530.0 528.07	7.5 9.0		LIGHT BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST	
			BOTTOM OF TEST PIT 9.0' NOTE: TEST PIT NO. 8 IS LOCATED SOUTH OF COKE PLANT LAGOON NO. 1 AND IS ORIENTED E-W. THE WEST END OF THE PIT IS UNDISTURBED NATURAL SAND. THE FILL BEGINS NEAR THE WEST END OF THE PIT AND THICKENS TO THE EAST AS SHOWN IN THE DIAGRAM TO THE RIGHT. THIS PIT PRESUMABLY INTERSECTS THE HIGH WALL OF THE OLD SAND PIT IN THIS AREA	 CROSS SECTION OF TP-8

PROJECT NO. 831625

DATE BEGAN: 6/27/84

DATE FINISHED: 6/27/84

GROUND SURFACE EL.: 534.50

TEST PIT NO. TP-9

N 183424.685 E 1955059.664

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5		FILL: BLACK COAL FINES, STIFF SANDY SLUDGE AND BRICKS - MISCELLANEOUS PLANT REFUSE - DRY TO MOIST	SAMPLE 9H WAS TAKEN FROM BLACK SANDY SLUDGE LAYER AT 4 FOOT DEPTH - MOIST TO WET
530.0	5.0		7.0'	
	7.5		LIGHT BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - POCKETS OF CLAYEY SAND AND GRAVEL - MOIST	SAMPLES 9H AND 9G OBTAINED WITH BACKHOE BUCKET DUE TO UNSTABLE WALL CONDITIONS
523.50	10.0 11.0			
			BOTTOM OF TEST PIT 11.0'	

PROJECT NO. 831625

TEST PIT TP-9
SHEET 1 OF 1

DATE BEGAN: 6/28/84
DATE FINISHED: 6/28/84
GROUND SURFACE EL.: 553.81

TEST PIT NO. TP-10

N 183479.030 E 1954733.223

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5		FILL: BLACK, FINE TO COARSE COAL AND COKE - BRICKS - TIMBER AND MISCELLANEOUS PLANT REFUSE - MOIST	ONLY 2 SAMPLES TAKEN FROM THIS TEST PIT DUE TO HOMOGENEITY OF FILL. BOTH SAMPLES OBTAINED WITH BACKHOE BUCKET DUE TO UNSTABLE PIT WALLS.
550.0	5.0			
	7.5		9.5'	
	10.0		LIGHT BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST	
542.81	11.0			
			BOTTOM OF TEST PIT 11.0'	

PROJECT NO. 831625

TEST PIT TP-10
SHEET 1 OF 1

DATE BEGAN: 6/28/84

DATE FINISHED: 6/28/84

GROUND SURFACE EL.: 539.60

TEST PIT NO. TP-11

N 183252.763 E 1954992.536

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5 / 5.0 / 7.5 / 10.0		FILL: BLACK, FINE TO MEDIUM COAL AND COKE - SOME MEDIUM SLAG - DRY NEAR SURFACE - MOIST WITH DEPTH	LANDOWNER REPORTS THAT FILL IN THIS AREA WAS DREDGED FROM COKE PLANT LAGOONS AND DEPOSITED AT THIS LOCATION TO INCREASE THE JUNKYARD ELEVATION. NOTE: SOME ROD PITCH LAYING ON GROUND SURFACE MIXED WITH THE FILL. SAMPLE 11H AND 11G COLLECTED IN BACKHOE BUCKET DUE TO UNSTABLE PIT WALLS.
530.0			10.5'	
527.60	12.0		GRAY, MOTTLED SILTY CLAY - OCCASIONAL ORGANIC MATERIAL AND WOOD FRAGMENTS - MOIST	PROBABLY ICE CREEK DEPOSITS BELOW 10.5'.
			BOTTOM OF TEST PIT 12.0'	

PROJECT NO. 831625

TEST PIT TP-11

SHEET 1 OF 1

DATE BEGAN: 6/28/84

DATE FINISHED: 6/28/84

GROUND SURFACE EL.: 556.98

TEST PIT NO. TP-12

N 183506.227 E 1954473.881

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: SILTY FINE SAND 2.0'	
	2.5		FILL: BLACK, MEDIUM TO COARSE COKE AND COAL - DRY 4.5'	FILL LAYER FROM 2.0' TO 4.5' APPEARS TO BE EITHER FROM AN OLD PIPELINE OR FILL USED FOR ORIGINAL PLANT GRADE.
550.0	5.0 7.5 10.0		FILL: LIGHT BROWN, MEDIUM TO GOARSE SAND TO SAND AND GRAVEL - MOIST	ONLY ONE SAMPLE OBTAINED FROM BOTTOM OF PIT DUE TO "CLEAN" AND HOMOGENEOUS NATURE OF MATERIAL ADJACENT TO THE TUNNEL. SAMPLE COLLECTED IN BACKHOE BUCKET DUE TO UNSTABLE PIT WALLS.
544.98	12.0			
			BOTTOM OF TEST PIT 12.0'	

PROJECT NO. 831625

TEST PIT TP-12
SHEET 1 OF 1

DATE BEGAN: 6/28/84

DATE FINISHED: 6/28/84

GROUND SURFACE EL.: 554.93

TEST PIT NO. TP-13

N 183417.691 E 1954440.283

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK, FINE TO MEDIUM COKE AND COAL - DRY 2.0'	
	2.5			
550.0	5.0		FILL: LIGHT BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST	ONLY ONE SAMPLE OBTAINED FROM BOTTOM OF PIT DUE TO "CLEAN" AND HOMOGENEOUS NATURE OF MATERIAL ADJACENT TO THE TUNNEL. SAMPLE COLLECTED USING BACKHOE BUCKET DUE TO UNSTABLE PIT WALLS.
	7.5			
	10.0			
	12.5			

PROJECT NO. 831625

DATE BEGAN: 6/28/84

DATE FINISHED: 6/28/84

GROUND SURFACE EL.: 554.93

TEST PIT NO. TP-13

N 183417.691 E 1954440.283

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
541.43	13.5		AS ABOVE	
			BOTTOM OF TEST PIT 13.5'	

PROJECT NO. 831625

DATE BEGAN: 6/29/84

DATE FINISHED: 6/29/84

GROUND SURFACE EL.: 558.24

TEST PIT NO. TP-14

N 183670.691 E 1954257.414

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5		FILL: YELLOW, BROWN AND BLACK, SILTY CLAY 3.5'	
	5.0 7.5		LIGHT TO DARK BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST	ABANDONED PHENOLIC WATER LINE (3"Ø) 90 DEGREE ELBOW AT DEPTH OF 2.0' - 2.3'. SAMPLE 14H COLLECTED IN BACKHOE BUCKET.
550.24	8.0			
			BOTTOM OF TEST PIT 8.0'	PHENOL ODOR IN PIT AROUND THE PIPE.

DATE BEGAN: 6/29/84
DATE FINISHED: 6/29/84
GROUND SURFACE EL.: 558.01

TEST PIT NO. TP-15

N 183619.311 E 1954287.947

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5		FILL: LIGHT BROWN AND BLACK, MOTTLED SILTY CLAY - MOIST 4.0'	SLAG AT SURFACE. ABANDONED PHENOLIC WATER LINE (3"Ø) AT DEPTH OF 3.0' - 3.3'.
	5.0		LIGHT BROWN, FINE SANDY SILT - MOIST 5.5'	
549.01	7.5 9.0		LIGHT TO DARK BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST	SAMPLE 15G COLLECTED IN BACKHOE BUCKET.
			BOTTOM OF TEST PIT 9.0'	

PROJECT NO. 831625

TEST PIT TP-15
SHEET 1 OF 1

DATE BEGAN: 6/29/84

DATE FINISHED: 6/29/84

GROUND SURFACE EL.: 562.93

TEST PIT NO. TP-16

N 183524.591 E 1954360.045

FIELD ENGINEER: TMJ

CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
560.0	2.5		FILL: LIGHT BROWN, YELLOW AND BLACK, MOTTLED SILTY CLAY - MOIST 4.3'	MEDIUM GRAY FINE SAND PACKED AROUND A PORTION OF THE PIPELINE. ABANDONED PHENOLIC WATER LINE (3"Ø) AT DEPTH OF 3.0' - 3.3'.
553.43	5.0 7.5 9.5		LIGHT BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST	
			BOTTOM OF TEST PIT 9.5'	PHENOLIC ODOR IN PIT AROUND THE PIPE.

PROJECT NO. 831625

TEST PIT TP-16

SHEET 1 OF 1

DATE BEGAN: 6/29/84
DATE FINISHED: 6/29/84
GROUND SURFACE EL.: 559.23

TEST PIT NO. TP-17

N 184487.982 E 1953593.254

FIELD ENGINEER: TMJ
CHECKED BY: PEN 7-24-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: SLAG 0.5'	
			FILL: BLACK, FINE TO MEDIUM SIZE COKE AND COAL-DRY 1.0'	
	2.5			FILL FROM 1.0' to 5.5' FOR SEWER LINE AT 4.0' TO 4.5' DEPTH (8"Ø TERRA COTTA)
			FILL: YELLOW AND GRAY, MOTTLED SILTY CLAY - MOIST	
	5.0		5.5'	SEWAGE ODOR FROM AROUND SEWER LINE
	7.5		MEDIUM TO LIGHT GRAY, FINE SAND - TRACE SILT - MOIST	
550.0				SAMPLE 17G OBTAINED WITH BACKHOE BUCKET
	10.0			
548.73	10.5			
			BOTTOM OF TEST PIT 10.5'	

PROJECT NO. 831625

TEST PIT TP-17
SHEET 1 OF 1

DATE BEGAN: 7/18/84
DATE FINISHED: 7/18/84
GROUND SURFACE EL.: 559.29

TEST PIT NO. TP-18

N 184375.553 E 1953663.155

FIELD ENGINEER: TMJ
CHECKED BY: DEB 8-2-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK, SILTY SAND AND SLAG - DRY 2.0'	OILY LIQUID WITH NAPHTHALENE/ CREOSATE ODOR SEEPING FROM BASE SLAG LAYER (SAMPLE TP-18I- S).
	2.5		FILL: BROWN TO RED-BROWN, MEDIUM TO COARSE SLAG - DRY TO WET - ONLY AT BASE 2.8'	
	5.0			
	7.5		GRAY TO YELLOW-BROWN, SILTY CLAY - MOIST 8.0'	
550.0			BROWN, FINE TO MEDIUM SAND - MOIST - WITH OILY SHEEN	SAMPLE TP-18G- S OBTAINED FROM BACKHOE BUCKET.
549.29	10.0			
			BOTTOM OF TEST PIT 10.0'	

PROJECT NO. 831625

DATE BEGAN: 7/19/84
DATE FINISHED: 7/19/84
GROUND SURFACE EL.: 559.43

TEST PIT NO. TP-19

N 184371.473 E 1953582.747

FIELD ENGINEER: TMJ
CHECKED BY: DEB 8-2-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5		FILL: DARK BROWN TO BLACK, SILT - SOME GRAVEL WITH BRICKS, SLAG, PITCH, CABLE, ETC. - DRY TO MOIST 2.8'	
			DARK REDDISH BROWN, SILT - TRACE CLAY - MOIST 3.5'	
	5.0		LIGHT BROWN, FINE SANDY SILT - TRACE CLAY - MOIST 7.0'	
550.0 549.43	7.5 10.0		LIGHT BROWN, FINE TO MEDIUM SAND - MOIST TO WET WITH CHEMICAL ODOR	SEEP OBSERVED IN SAND AT APPROXIMATELY 8'. CHEMICAL ODOR BUT NOT COAL TAR PRODUCT ODOR. SEEP WAS COLORLESS AND ODOR WAS NOT STRONG. SEEP MATERIAL CONTAINED IN SAMPLE TP-19G- S .
			BOTTOM OF TEST PIT 10.0'	

PROJECT NO. 831625

TEST PIT TP-19
SHEET 1 OF 1

DATE BEGAN: 7/19/84 DATE FINISHED: 7/19/84 GROUND SURFACE EL.: 559.53	TEST PIT NO. TP-20 N 184331.220 E 1953523.046	FIELD ENGINEER: TMI CHECKED BY: DEB 8-2-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
	2.5		FILL: BLACK AND GRAY, COARSE GRAVEL - WET	SAMPLED ONLY WATER IN PIT.
555.53	4.0			
			BOTTOM OF TEST PIT 4.0' NOTE: TEST PIT INTERSECTED GRAVEL DRAIN AND FILLED WITH WATER. WATER LEVEL APPROXIMATELY 2' BELOW GROUND SURFACE. STRATIGRAPHY BELOW 2' UNKNOWN. OFFSET APPROXIMATELY 5' NORTH AND DUG TEST PIT TP-20A.	

PROJECT NO. 831625

DATE BEGAN: 7/19/84

DATE FINISHED: 7/19/84

GROUND SURFACE EL.: 559.28

TEST PIT NO. TP-20A

N 184365.804 E 1953510.881

FIELD ENGINEER: TMJ

CHECKED BY: DEB 8-2-84

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			FILL: BLACK AND REDDISH BROWN, SILT - COARSE GRAVEL, SLAG AND BRICKS - DRY 2.0'	
	2.5 5.0		LIGHT BROWN, FINE SANDY SILT - TRACE CLAY - MOIST 7.0'	
550.0 548.78	7.5 10.0 10.5		LIGHT BROWN, MEDIUM TO COARSE SAND - SOME FINE GRAVEL - MOIST	SAMPLE TP-20G- S TAKEN WITH BACKHOE BUCKET.
			BOTTOM OF TEST PIT 10.5' NOTE: TEST PIT OFFSET APPROXIMATELY 5' NORTH OF TP-20 WHICH FILLED WITH WATER FROM GRAVEL DRAIN.	

PROJECT NO. 831625

DATE BEGAN: 8-29-84

DATE FINISHED: 8-29-84

GROUND SURFACE EL.: 557.19

TEST PIT NO. TP-21

N 184204.537 E 1954428.376

FIELD ENGINEER: T.M. JOHNSON

CHECKED BY: R. J. KARLS

ELEV (FEET)	DEPTH (FEET)	PROFILE	DESCRIPTION	REMARKS
			(FILL) BLACK AND BROWN SILTY CLAY, SOME FINE TO COARSE COAL, COKE, AND SLAG, MOIST 1.5'	
	2.5		LIGHT BROWN SILTY CLAY, MOIST 4.5'	
550.0	5.0		BROWN AND GRAY FINE TO MEDIUM SAND, TRACE FINE GRAVEL, MOIST TO WET 8.0'	SAND BECOMES WET AT 6.5'
549.19	8.0		BOTTOM OF TEST BORING 8.0'	SAMPLES AND DESCRIPTIONS OBTAINED FROM A HAND AUGER BORING LOCATED AT PHENOL LOADING AREA AT COKE PLANT

PROJECT NO. 831625

TEST BORING TP-21

LAGOON BORING LOGS

DATE BEGAN: 7-16-84
DATE FINISHED: 7-17-84
GROUND SURFACE EL.: 529.42

BORING NO. LB-1

N 1846665.407 E 1955323.946

FIELD ENGINEER: D.P. HOLZMAN
CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
	5	1 (5.0)		(FILL) BLACK FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, TRACE SILT AND CLAY, TRACE ORGANICS	N/A	SAMPLE LB-1G-WS FROM 4.0'-5.0' RETAINED FOR CHEMICAL ANALYSIS
520	10	2 (5.0)		10.5'		SAMPLE LB-1H-WS FROM 10.5' TO 11.0' RETAINED FOR CHEMICAL ANALYSIS
	15	3 (5.0)		SOFT GREENISH-BROWN SILTY CLAY, TRACE FINE SAND, TRACE ROOT FIBERS	cl	
				17.5'		
510	20	4 (5.0)		SOFT GREENISH-BROWN SANDY CLAY, TRACE SILT AND ORGANICS	cl	
507.42	22.0			BOTTOM OF BORING LB-1 AT 22.0'		

PROJECT NO. 831625

BORING NO. LB-1
SHEET 1 OF 1

DATE BEGAN: 7-17-84

DATE FINISHED: 7-17-84

GROUND SURFACE EL.: 534.42

BORING NO. LB-2

N 183662.904 **E** 1955072.312

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		1 / 2.0		(FILL) LOOSE BLACK FINE TO COARSE GRAVELLY SAND, SOME CINDERS, TRACE ORGANICS, DRY 4.5'	N/A	SAMPLE LB-2G-WS FROM 3.0'-3.5' RETAINED FOR CHEMICAL ANALYSIS
530	5	2		(FILL) BLACK SANDY TAR 5.0'	N/A	
		NR(1)		(FILL) LOOSE BLACK FINE TO COARSE GRAVELLY SAND, SOME CINDERS, TRACE COAL AND ORGANICS, TAR AND CINDERS 9.0'	N/A	SAMPLE LB-2H-WS FROM 4.5'-5.0' RETAINED FOR CHEMICAL ANALYSIS
		3		(FILL) BLACK TAR 9.5'	N/A	METAL DEBRIS RECOVERED; (WIRE, SHEET METAL) AT 9.0'
520	10 15	3.5 4 2.0		(FILL) LOOSE BLACK FINE TO COARSE GRAVELLY SAND, SOME CINDERS AND SLAG, MOIST 16.0'	N/A	
510	20	5 0.0 6		SOFT BROWN TO BLACK SANDY SILTY CLAY, SOME FINE TO COARSE GRAVEL AND SLAG AND COAL, MOIST	cl	DESCRIPTION OF MATERIALS FROM APPROXIMATELY 17.0' TO 27.0' FROM OFFSET BORING

PROJECT NO. 831625

DATE BEGAN: 7-17-84

DATE FINISHED: 7-17-84

GROUND SURFACE EL.: 534.42

BORING NO. LB-2

N 183662.904 **E** 1955072.312

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		0.0		GRADES TO: 26.5'		
		S-1 0.15'		BLACK FINE TO MEDIUM SAND, WET	sp	NO BLOW COUNTS RECORDED FOR S-1 OR S-2
	30	S-2		BLACK FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, WET	sw	SAMPLE LB-21-WS FROM 29.0'-31.0' RETAINED FOR CHEMICAL ANALYSIS
503.42	31.0	0.20'				
				BOTTOM OF BORING LB-2 AT 31.0'		
				(1) NR - NOT RECORDED.		

PROJECT NO. 831625

DATE BEGAN: 7-17-84
DATE FINISHED: 7-17-84
GROUND SURFACE EL.: 516.91

BORING NO. LB-3

N 183620.195 **E** 1955162.161

FIELD ENGINEER: D.P. HOLZMAN
CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
				(FILL) GRAY-GREEN SILTY CLAY, MOIST 0.75'	N/A	
				(FILL) BLACK TO GRAY-GREEN MOTTLED SILTY CLAY, MOIST 2.2'	N/A	
		1		(FILL) VERY SOFT BLACK FINE TO COARSE SILTY CLAYEY SAND, MOIST 2.8'	N/A	SAMPLE LB-3G-WS FROM 3.0'-4.0' RETAINED FOR CHEMICAL ANALYSIS
	5			(FILL) BLACK TO GRAY-GREEN SILTY CLAY, SOME FINE SAND, WET 4.5'	N/A	
510		7.0		(FILL) SOFT GRAY-GREEN SILTY CLAY, TRACE FINE SAND, MOIST	cl	
505.71	11.2					
				BOTTOM OF BORING LB-3 AT 11.2'		

PROJECT NO. 831625

BORING NO. LB-3
SHEET 1 OF 1

DATE BEGAN: 7-18-84

DATE FINISHED: 7-18-84

GROUND SURFACE EL.: 526.31

BORING NO. LB-4

N 185118.708 E 1955308.122

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		1 (2.5)				SAMPLE LB-4G-WS FROM 1.0'-2.0' RETAINED FOR CHEMICAL ANALYSIS
520	5	2 (3.0)		(FILL) LOOSE BLACK FINE TO COARSE CINDERS, TRACE ORGANICS AND COAL, DRY 7.5'	N/A	
		3 (5.0)		BLACK SILTY MEDIUM SAND, WET 8.0'	sm	SAMPLE LB-4H-WS FROM 8.0'-8.5' RETAINED FOR CHEMICAL ANALYSIS
				VERY SOFT BLACK SILT, TRACE ORGANICS, MOIST 9.0'	ol	
	10			SOFT BLACK TO GRAY-GREEN FINE SANDY SILT 11.5'	mh	
510	15	4 (5.0)				SAMPLE LB-4I-WS FROM 14.0-14.7' CHEMICAL ANALYSIS
	20	5 (5.0)		SOFT BROWNISH-GREEN SILTY FINE TO MEDIUM SAND, TRACE CLAY, MOIST	sm	
503.81	22.5			BOTTOM OF BORING LB-4 AT 22.5'		

PROJECT NO. 831625

DATE BEGAN: 7-18-84

DATE FINISHED: 7-18-24

GROUND SURFACE EL.: 559.94

BORING NO. LB-5

N 184016.398 **E** 1954883.018

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		1 (3.0)				
	5	2 (3.5)				SAMPLE LB-5G-WS FROM 4.0'-4.5' RETAINED FOR CHEMICAL ANALYSIS
550	10	3 (3.4)		(FILL) BLACK FINE TO MEDIUM SAND AND COAL, TRACE TAR, ORGANICS, CONCRETE AND WOOD, MOIST	N/A	
	15	4 (3.8)				
540	20	5 (3.0)		21.7'		
				(FILL) HARD LIME SLUDGE (?) 22.2'	N/A	
				(FILL) BLACK FINE TO COARSE SAND AND TAR, SOME FINE TO COARSE COAL AND COKE, MOIST 24.3'	N/A	
				(FILL) HARD LIME SLUDGE (?) 24.8'	N/A	
	25			(FILL) HARD CONCRETE	N/A	

PROJECT NO. 831625

BORING NO. LB-5

DATE BEGAN: 7-18-84

DATE FINISHED: 7-18-84

GROUND SURFACE EL.: 559.94

BORING NO. LB-5

N 184016.398 E 1954883.018

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
				AS ABOVE 25.3		
		6 / 1.8				
530	30	7 / 3.5		(FILL) BLACK FINE TO COARSE COAL, SOME COKE, TRACE SILT AND WOOD FIBER, DRY TO MOIST	N/A	
				33.2'		
				(FILL) FIREBRICK (?) 33.5'	N/A	
	35	8 / 3.5		(FILL) BLACK FINE TO COARSE CINDERS, SOME FINE TO COARSE COAL, MOIST	N/A	
520	40	9 / NR(1)				SAMPLE LB-5H-WS FROM 40.0'-41.0' RETAINED FOR CHEMICAL ANALYSIS. SOME WATER ENCOUNTERED AT 41.5'
516.94	43.0					
				BOTTOM OF BORING LB-5 AT 43.0'		

(1) NR - NOT RECORDED.

PROJECT NO. 831625

DATE BEGAN: 7-19-84

DATE FINISHED: 7-19-84

GROUND SURFACE EL.: 546.82

BORING NO. LB-6

N 184063.329 **E** 1955044.653

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		1 (2.5)		TOPSOIL 0.5'	oh	
	5	2 (2.0)		(FILL) LOOSE BLACK FINE TO COARSE COAL AND SAND, SOME FINE TO COARSE COKE, TRACE LIME SLUDGE AND FIRE BRICK, MOIST 8.8'	N/A	SAMPLE LB-6G-WS FROM 2.0'-2.5' RETAINED FOR CHEMICAL ANALYSIS
540		3 (2.0)		(FILL) BLACK TAR 9.0'		
	10	4 (1.0)		(FILL) LOOSE BLACK FINE TO COARSE COAL AND SAND, SOME FINE TO COARSE COKE, TRACE LIME SLUDGE AND FIRE BRICK, MOIST 22.0'	N/A	SAMPLE LB-6H-WS FROM 20.0'-21.0' RETAINED FOR CHEMICAL ANALYSIS
530	15	5 (2.5)				
	20					
	25	6		(FILL) SOFT GRAY-GREEN INTERBEDDED SILTY CLAY AND BLACK FINE TO COARSE SAND AND COAL, TRACE TAR, WET	N/A	

PROJECT NO. 831625

DATE BEGAN: 7-19-84
DATE FINISHED: 7-19-84
GROUND SURFACE EL.: 546.82

BORING NO. LB-6

N 184063.329 **E** 1955044.653

FIELD ENGINEER: D.P. HOLZMAN
CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
520		3.0		AS ABOVE 28.5'	N/A	
	30	7		(FILL) BLACK TAR, SOME COAL FINES 29.0'	N/A	
		1.5		(FILL) BLACK TO GRAY-GREEN SILTY CLAY, SOME FINE TO COARSE COAL, TRACE TAR AND FINE COKE, WET 36.0'	N/A	
	35	8				
510		1.0		(FILL) MEDIUM STIFF GREENISH-BROWN TO BROWN SILTY CLAY, TRACE FINE SAND AND ORGANICS 37.0'	N/A	
		9		(FILL) BLACK TAR, SOME COAL FINES 37.3'		
	40			MEDIUM STIFF GREENISH-BROWN TO BROWN SILTY CLAY, TRACE FINE SAND AND ORGANICS	cl	SAMPLE LB-6I- S FROM 41.0'-42.0' RETAINED FOR CHEMICAL ANALYSIS
504.32	42.5	5.0				
				BOTTOM OF BORING LB-6 AT 42.5'		

DATE BEGAN: 7-19-84

DATE FINISHED: 7-19-84

GROUND SURFACE EL.: 523.93

BORING NO. LB-7

N 183502.925 **E** 1954931.374

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
		1 / 2.5	(FILL) LOOSE BROWN TO BLACK FINE TO COARSE GRAVEL AND SAND, SOME FINE TO COARSE COAL, TRACE TAR 2.0'	N/A	
520	5	2 / 3.8; 3 / 3.5	(FILL) LOOSE BLACK FINE TO COARSE GRAVELLY SAND, SOME FINE TO COARSE COAL 10.0'	N/A	SAMPLE LB-7G-WS FROM 6.0'-7.0' RETAINED FOR CHEMICAL ANALYSIS
510	10, 15		LOOSE BLACK FINE TO COARSE SAND, TRACE GRAVEL, WET 15.5'	sw	SAMPLE LB-7H-WS FROM 19.5'-20.0' RETAINED FOR CHEMICAL ANALYSIS
		S-1 / 8"	MEDIUM DENSE BLACK FINE TO MEDIUM SAND, MOIST	sp	PENETRATION RESISTANCE FOR SAMPLE S-1 = 29 BLOWS PER FOOT
		S-2 / 5"		sp	PENETRATION RESISTANCE FOR SAMPLE S-2 = 36 BLOWS PER FOOT
502.43	20, 21.5	S-3 / 6"		sp	PENETRATION RESISTANCE FOR SAMPLE S-3 = 43 BLOWS PER FOOT
			BOTTOM OF BORING LB-7 AT 21.5'		

PROJECT NO. 831625

BORING NO. LB-7
SHEET 1 OF 1

DATE BEGAN: 7-20-84

DATE FINISHED: 7-20-84

GROUND SURFACE EL.: 528.09

BORING NO. LB-8

N 183778.462 E 1955050.254

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		1 / 2.5		(FILL) BLACK FINE TO COARSE COAL AND COKE, SOME FINE TO COARSE CONCRETE FRAGMENTS, TRACE ORGANICS, MOIST 0.5'	N/A	
				(FILL) LIGHT TAN TO ORANGE-TAN LIME SLUDGE, MOIST 1.5'	N/A	
	5	2 / 2.8		(FILL) DARK BROWN TO BLACK SILT, SOME FINE TO COARSE SAND, TRACE COAL, MOIST 2.5'	N/A	
520	10	3 / 0.9		(FILL) DARK BROWN TO BLACK FINE TO COARSE COAL AND COKE, TRACE FIRE BRICK, TAR AND WOOD, MOIST GRADES TO 10.0'	N/A	
	15	4		(FILL) BLACK FINE TO MEDIUM COAL 15.0'	N/A	
510		5 / 3.0 6		(FILL) LOOSE BLACK SILTY FINE TO MEDIUM COAL AND SLAG, TRACE COARSE SLAG, WET 19.0'	N/A	RUN 5 (14.5'-17.5') HAS TAR ODOR SAMPLE LB-8G-WS FROM 16.0'-17.0' RETAINED FOR CHEMICAL ANALYSIS
				BLACK SILT, WET 19.5'	ml	
	20 25	3.2 7		BLACK FINE TO MEDIUM SAND, TRACE SILTY CLAY, MOIST	sp	

PROJECT NO. 831625

BORING NO. LB-8
SHEET 1 OF 2

DATE BEGAN: 7-20-84

DATE FINISHED: 7-20-84

GROUND SURFACE EL.: 528.09

BORING NO. LB-8

N 183778.462 E 1955050.254

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		3.3		(GRADES TO) 27.0'		BLOWS NOT RECORDED FOR S-3
500		S-3		BLACK SILTY FINE SAND, TRACE CLAY, MOIST	sm	SAMPLE LB-8H-WS FROM 27.5'-28.5' RETAINED FOR CHEMICAL ANALYSIS
498.59	29.5	NR (1)				
				BOTTOM OF BORING LB-8 AT 29.5'		
				(1) NR - NOT RECORDED.		

DATE BEGAN: 7-25-84
DATE FINISHED: 7-25-84
GROUND SURFACE EL.: 524.03

BORING NO. LB-9

N 184322.718 E 1955136.998

FIELD ENGINEER: D.P. HOLZMAN
CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		1 (2.5)		(FILL) BLACK FINE TO MEDIUM COAL, SOME SILT AND MEDIUM TO COARSE SLAG, TRACE ROOT FIBERS, MOIST (SLUDGE CONSISTENCY) 6.5'	N/A	
520	5	2 (4.3)				
				(FILL) BLACK TAR, TRACE FINE TO MEDIUM COAL ___ GRADES TO ___ 8.5'	N/A	WATER ENCOUNTERED AT APPROXIMATELY 9.0'
	10	3 (3.5)		(FILL) BROWN TO BLACK, FINE TO COARSE COAL AND SLAG, MOIST TO WET 11.5'	N/A	SAMPLE LB-9G-WS FROM 6.5'-7.5' RETAINED FOR CHEMICAL ANALYSIS
		4		MEDIUM STIFF GREEN-TAN TO BLACK MOTTLED SILTY CLAY, TRACE ORGANICS, MOIST 13.8'	cl	
510	15	(4.3)		GREEN-TAN, SILTY FINE TO MEDIUM SAND, TRACE SILTY CLAY, WET	sm	SAND BELOW 13.8' APPEARS "CLEAN" PENETRATION RESISTANCE FOR SAMPLE S-1 = 4 BLOWS PER FOOT SAMPLE LB-9H-S FROM 18.0-19.5' RETAINED FOR CHEMICAL ANALYSIS
504.53	19.5	S-1 (13")				
				BOTTOM OF BORING LB-9 AT 19.5'		

DATE BEGAN: 7-25-84

DATE FINISHED: 7-25-84

GROUND SURFACE EL.: 521.39

BORING NO. LB-10

N 184836.677 E 1955208.581

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
		1 (2.0)		(FILL) BLACK FINE TO COARSE COAL AND SLAG, TRACE SILT, MOIST — 3.0'	N/A	2.0' OF MATERIAL WAS BULLDOZED IN FROM NORTH END OF LAGOON DIKE TO CONSTRUCT ROAD FOR DRILLING RIG
	5	2 (3.8)		(FILL) MEDIUM STIFF GREEN-BROWN TO BLACK SILTY CLAY, SOME FINE TO COARSE COAL AND SLAG, TRACE ROOT FIBER, MOIST — 10.0'	N/A	SAMPLE LB-10G-WS FROM 4.0'-5.0' RETAINED FOR CHEMICAL ANALYSIS WATER ENCOUNTERED AT APPROXIMATELY 6.7' SAMPLE LB-10H-S FROM 11.0'-12.0' RETAINED FOR CHEMICAL ANALYSIS
510 509.39	10 12.0	3 (5.0)		MEDIUM STIFF TO STIFF BROWN SILTY CLAY, TRACE FINE SAND AND ROOT FIBER, MOIST — 12.0'	cl	DRILLED OFFSET BORING 8' NORTH OF FIRST BORING TO 12.0' TO OBTAIN GROUND WATER SAMPLES
				BOTTOM OF BORING LB-10 AT 12.0'		

PROJECT NO. 831625

DATE BEGAN: 7-26-84

DATE FINISHED: 7-26-84

GROUND SURFACE EL.: 522.48

BORING NO. LB-11

N 184408.509 E 1955478.996

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
520	5	1 — 2.0 2 — 3.0 3		(FILL) LOOSE DARK GRAY TO BLACK FINE TO COARSE COAL AND SLAG, TRACE SILTY CLAY AND ROOT FIBER, MOIST 9.0'	N/A	UPPER 2.5' FEET OF MATERIAL WAS BULLDOZED FROM ADJACENT INNER LABOON DIKE TO CONSTRUCT ROAD FOR DRILLING RIG SAMPLE LB-11G-WS FROM 4.0' - 6.0' RETAINED FOR CHEMICAL ANALYSIS
510	10 15	1.5 4		SOFT TO MEDIUM STIFF, GREENISH-BROWN SITLY CLAY, SOME FINE SAND, WET 15.5'	cl	
504.98	17.5	5.0		LOOSE GREENISH-BROWN SILTY SAND, TRACE ORGANICS, WET	sm	SAMPLE LB-11H-S FROM 16.5'-17.5' RETAINED FOR CHEMICAL ANALYSIS
				BOTTOM OF BORING LB-11 AT 17.5'		

PROJECT NO. 831625

DATE BEGAN: 7-26-84

DATE FINISHED: 7-26-84

GROUND SURFACE EL.: 523.98

BORING NO. LB-12

N 184321.997 E 1955398.680

FIELD ENGINEER: D.P. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	REMARKS
520	5	1 (2.5); 2 (3.0)		(FILL) LOOSE BLACK FINE TO COARSE COAL AND SLAG, DRY 6.5'	N/A	UPPER 2.5' OF MATERIAL WAS BULLDOZED FROM ADJACENT INNER LAGOON DIKE TO CONSTRUCT ROAD FOR DRILLING RIG DISCOLORED NATURAL MATERIAL BELOW 6.5'
	10	3 (4.5)		BLACK TO GREEN-BLACK SILT, TRACE CLAY AND FINE COAL AND SLAG, MOIST 9.5'	ml	
510	15	4		SOFT GREEN-BROWN SILTY CLAY, SOME FINE SAND, MOIST 16.5'		SAMPLE LB-12G-WS FROM 7.5'-8.5' RETAINED FOR CHEMICAL ANALYSIS
506.48	17.5	5.0		LOOSE GREEN-BROWN TO BROWN SILTY FINE SAND, WET	sm	SAMPLE LB-12H-S FROM 16.5' - 17.5' RETAINED FOR CHEMICAL ANALYSIS
				BOTTOM OF BORING LB-12 AT 17.5'		

ICE CREEK BORING LOGS

DATE BEGAN 7-29-84
DATE FINISHED: 7-29-84
GROUND SURFACE EL.: ~ 507'

BORING NO. ICB-1

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

DESCRIPTION	U.S.C.S.
VERY SOFT TO SOFT GREEN-BROWN SILT, SOME CLAY, TRACE FINE SAND, ORGANICS AND FINE GRAVEL, WET 12.8'	ml
LOOSE GREEN-BROWN SILTY FINE SAND, WET 12.9'	sm
(FILL) LOOSE GREEN-BROWN TO BLACK FINE TO COARSE SAND SIZE COAL AND SLAG 13.4'	N/A
MEDIUM STIFF TO STIFF BROWN SILTY CLAY, TRACE FINE SAND AND ORGANICS, MOIST 16.5'	cl
GRAY MEDIUM SAND, TRACE SILT, MOIST 16.6'	sp
GRAY SILTY CLAY, TRACE FINE SAND AND ORGANICS, MOIST 18.5'	cl
GRAY FINE TO MEDIUM SAND, TRACE SILT AND ORGANICS, WET 18.8'	sp
GRAY SILTY CLAY, TRACE FINE SAND AND ORGANICS, MOIST 24.5'	cl
MEDIUM DENSE BROWN FINE TO COARSE SAND, TRACE SILT, WET	sw

ELEV. (FEET): 500.0, 490.0

DEPTH (FEET): 2.5, 5.0, 7.5, 10.0, 12.5, 15.0, 17.5, 20.0, 22.5, 25.0

SAMPLE TYPE: 1 (4.5), 2 (4.5), 3 (3.8), 4 (5.0), 5 (1.2), S

PENETRATION RESISTANCE (BLOWS PER FOOT): 10 30 50

REMARKS:
CREEK DEPTH = 7.7'
ICB-1G-S FROM 0.0' - 4.5'
ICB-1H-S FROM 4.5' - 9.0'
ICB-1I-WS FROM 12.9' - 13.4'
ICB-1J-S FROM 9.0' - 14.0'
ICB-1K-S FROM 14.0' - 16.5'

PROJECT NO. 831625

DATE BEGAN 7-29-84
DATE FINISHED: 7-29-84
GROUND SURFACE EL.: ~507'

BORING NO. ICB-1

N N/A **E** N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
480.0 479.7	27.3	I S 2		MEDIUM DENSE BROWN FINE TO COARSE SAND, TRACE SILT, WET	SW	100/0.5'	
				BOTTOM OF BORING AT 27.3'			

NOTES:

(1) NR-NOT RECORDED

PROJECT NO. 831625

BORING NO. ICB-1
SHEET 2 OF 2

DATE BEGAN 7-30-84
DATE FINISHED 7-30-84
GROUND SURFACE EL.: ~507'

BORING NO. ICB-1A

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
							CREEK DEPTH = 7.7'
	5.0			SEE BORING LOG ICB-1 FOR DESCRIPTION FROM 0.0 - 17.0'			
500.0							
	10.0						
	15.0						
490.0				17.0'			
		ST-1 18		BROWN SILTY CLAY, TRACE TO SOME FINE TO MEDIUM SAND, MOIST	cl		
	20.0	ST-2 12			cl		
	25.0	ST-3 19			cl		
480.0'				28.0'			
	30.0			VERY DENSE BROWN TO GRAY-BROWN FINE TO MEDIUM SAND, SOME FINE TO COARSE GRAVEL, TRACE SILT AND CLAY, MOIST			
475.5	31.5	S 1			sp	76	
				BOTTOM OF BORING AT 31.5'			

PROJECT NO. 831625

BORING NO. ICB-1A
SHEET 1 OF 1

DATE BEGAN 7-31-84
DATE FINISHED 7-31-84
GROUND SURFACE EL.: ~513'

BORING NO. ICB-2

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
		1 (5.0)	VERY SOFT GREENISH BROWN SILT, TRACE CLAY, ORGANICS AND FINE SAND, WET	ml	CREEK DEPTH = 2.0' ICB-2G-S FROM 0.0'-5.0'
510.0	2.5				
	5.0	2 (2.2)	GRADES TO: ~5.5'		
	7.5		SOFT BROWN CLAYEY SILT, TRACE FINE SAND AND ORGANICS, MOIST 9.8'		ICB-2H-S FROM 5.0' - 8.0'
	10.0	3 (3.0)	MEDIUM DENSE BROWN FINE TO MEDIUM SAND, TRACE SILT AND ORGANICS, MOIST 10.7'		ICB-2I-S FROM 8.0 - 11.0'
		4 (4.0)	SOFT BROWN CLAYEY SILT, TRACE FINE SAND AND ORGANICS, MOIST 11.8'		
500.0	12.5		SOFT GRAY SILT SOME CLAY AND FINE SAND, MOIST 15.8'	ml	ICB-2J-S FROM 11.0' - 17.0'
	15.0	5 (5.0)	LOOSE GRAY FINE SILTY SAND, MOIST 16.2'	sm	
	17.5		MEDIUM STIFF TO STIFF BROWN SILTY CLAY, TRACE FINE SAND, MOIST GRADES TO: ~20.0'	cl	ICB-2K-S FROM 17.0' - 20.0'
	20.0	6 (3.3)	MEDIUM STIFF GREEN BROWN TO LIGHT GRAY SILTY CLAY, TRACE FINE SAND AND ORGANICS, MOIST	cl	ICB-2L-S FROM 21.5' - 25.0'
490.0	22.5				
	25.0		GRADES TO: ~25.0'		

PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50

PROJECT NO. 831625

DATE BEGAN 7-31-84

DATE FINISHED: 7-31-84

GROUND SURFACE EL.: ~513'

BORING NO. ICB-2

N N/A E N/A

FIELD ENGINEER D. HOLZMAN

CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	27.5	7			SW		
	30.0	1.5		MEDIUM DENSE GRAY TO BROWN FINE TO COARSE SAND, TRACE SILTY CLAY AND COARSE GRAVEL, WET			
480.0	32.5						
	35.0			35.0'			
477.13	35.87	S		DENSE GRAY TO BROWN FINE TO COARSE SAND AND GRAVEL, MOIST (TOP OF ROCK) 35.67'	SW	100/0.3'	ICB-2M-S FROM 35.0' - 35.9'
				BEDROCK: GRAY SHALE			
				BOTTOM OF BORING AT 35.87'			

PROJECT NO. 831625

BORING NO. ICB-2

DATE BEGAN 8-1-84
DATE FINISHED: 8-1-84
GROUND SURFACE EL.: ~513'

BORING NO. ICB-2A

N N/A **E** N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
510.0	5.0			SEE BORING LOG ICB-2 FOR DESCRIPTION FROM 0.0 - 15.0'			
500.0	10.0						
	15.0			15.0'			
		ST-1 27		MEDIUM STIFF GRAY SILT, SOME CLAY AND FINE SAND, MOIST ~18.0'	ml		
	20.0	ST-2 21		MEDIUM STIFF MOTTLED BROWN SILTY CLAY, TRACE FINE SAND, MOIST	cl		
490.0	23.0	ST-3 22.5			cl		
				BOTTOM OF BORING AT 23.0'			

PROJECT NO. 831625

BORING NO. ICB-2A
SHEET 1 OF 1

DATE BEGAN 8-8-84
DATE FINISHED 8-8-84
GROUND SURFACE EL. ~511.0'

BORING NO. ICB-3

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
510.0	5.0	1 / 4.8					ICB-3G-S FROM 0.0' - 5.0'
500.0	10.0	2 / 4.7		VERY SOFT TO SOFT GREENISH BROWN CLAYEY SILT, TRACE FINE SAND AND ORGANICS, WET TO MOIST	ml		ICB-3H-S FROM 5.0'- 10.0'
	15.0	3 / 4.7					ICB-3I-S FROM 10.0' - 15.0'
	20.0	4 / 4.8		GRADES TO: ~20.0'			CREEK DEPTH = 4.68'
490.0	25.0	5 / 5.0		MEDIUM DENSE GREENISH BROWN FINE TO COARSE SAND, TRACE SILT, ORGANICS AND COARSE GRAVEL, MOIST 23.0'	sw		
481.0	30.0	6 / 5.0		STIFF GREENISH BROWN TO BROWN SILTY CLAY, TRACE ORGANICS AND FINE SAND, MOIST	cl		
				BOTTOM OF BORING AT 30.0'			

PROJECT NO. 831625

BORING NO. ICB-3
SHEET 1 OF 1

DATE BEGAN 8-10-84
DATE FINISHED 8-10-84
GROUND SURFACE EL. ~511.5'

BORING NO. ICB-4

N N/A **E** N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
510.0		1		VERY SOFT GREENISH BROWN CLAYEY SILT, TRACE FINE SAND AND ORGANICS, WET 1.0'	ml		ICB-4G-S FROM 0.0' - 3.0'
	2.5	2.5		SOFT TO MEDIUM STIFF GREENISH BROWN TO MOTTLED BROWN SILTY CLAY, TRACE ORGANICS, MOIST GRADES TO: 4.0'	cl		CREEK DEPTH = 4.2'
	5.0	2		MEDIUM STIFF BROWN AND GRAY MOTTLED SILTY CLAY, MOIST	cl		ICB-4H-S FROM 3.0' - 9.0'
	7.5	5.3		8.5'			
500.0	10.0			BROWN FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE SILT, WET	sw		
	12.5	S 1				(1)	
497.0	14.5	S 2				(1)	ICB-4I-S FROM 13.0 - 14.5'
				BOTTOM OF BORING AT 14.5'			

NOTE:
(1) NOT RECORDED

PROJECT NO. 831625

BORING NO. ICB-4
SHEET 1 OF 1

DATE BEGAN 8-10-84

DATE FINISHED 8-10-84

GROUND SURFACE EL ~511.5'

BORING NO. ICB-4A

N N/A **E** N/A

FIELD ENGINEER D. HOLZMAN

CHECKED BY P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
510.0				SEE BORING ICB-4 FOR DESCRIPTION FROM 0.0 - 2.0' 2.0'			CREEK DEPTH = 4.2'
		ST-1 18		MEDIUM STIFF, GREENISH BROWN TO BROWN SILTY CLAY, MOIST	cl		
	5.0	ST-2 14		4.0'	cl		
505.5	6.0			MEDIUM STIFF, BROWN AND GRAY MOTTLED SILTY CLAY, MOIST			
				BOTTOM OF BORING AT 6.0'			

PROJECT NO. 831625

BORING NO. ICB-4A

DATE BEGAN 8-11-84
DATE FINISHED: 8-11-84
GROUND SURFACE EL. ~513.0'

BORING NO. ICB-5

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY: P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
510.0	5.0	S 1, S 2, S 3, S 3, S 4, I 0.70		VERY LOOSE TO MEDIUM DENSE BROWN FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE COAL AND SILT, WET	sw, sw, sw, sw, cl		CREEK DEPTH ~ 2.0' ICB-5G-S FROM 0.0' - 5.5'
500.0	10.0, 15.0	S 5, S 5				(1)	ICB-5H-S FROM 5.5' - 16.5'
496.5	16.5						
				BOTTOM OF BORING AT 16.5' NOTE: (1) N/A - NOT APPLICABLE			

PROJECT NO. 831625

BORING NO. ICB-5
SHEET 1 OF 1

DATE BEGAN 8-12-84

DATE FINISHED: 8-12-84

GROUND SURFACE EL.: 511.7'

BORING NO. ICB-6

N N/A E N/A

FIELD ENGINEER D. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	WATER CONTENT (PERCENT) 20 40
		1		SOFT GREENISH BROWN CLAYEY SILT, TRACE TAR-LIKE MATERIAL, MOIST 0.5'	cl		ICB-6G-S FROM 0.0' - 3.9'
510.0				LAYERED, COMPACTED LEAVES SOME SILT, TRACE TAR-LIKE MATERIAL, MOIST 0.9'	N/A		CREEK DEPTH = 4.2'
	2.5			TAR-LIKE MATERIAL AND SILT TRACE FINE SAND, MOIST 1.1'	N/A		ENTIRE LENGTH OF RUN NO. 1 SMELLS LIKE TAR OR TAR-RELATED MATERIAL
		3.0		SOFT GREENISH BROWN SANDY-SILT, TRACE ORGANICS, MOIST 1.6'	N/A		
	5.0	2		SOFT GREENISH BROWN SILT AND ORGANICS, TRACE FINE SAND, MOIST 2.4'	ml		ICB-6H-S FROM 3.9' - 7.4'
		3.0		SOFT GREENISH BROWN CLAYEY SILT, TRACE FINE SAND AND TAR-LIKE MATERIAL, MOIST 2.9'	ml		0.04' OF TAR-LIKE MATERIAL AND SILT LAYER AT 4.9'
	7.5	3		SOFT GREENISH BROWN INTERLAYERED FINE TO MEDIUM SAND AND CLAYEY SILT, TRACE ORGANICS AND TAR-LIKE MATERIAL GRADES TO: 7.5'	sm/ml		THIN FILM TAR-LIKE MATERIAL AT 5.9'
500.0	10.0	4.5		VERY LOOSE TO LOOSE, BROWN AND GRAY-BROWN FINE TO COARSE SAND, TRACE SILT, ORGANICS AND SILTY CLAY, MOIST TO WET	sp		ICB-6I-S FROM 7.4' - 12.5'
	12.5	S 1					COLORATION OF SAMPLE CHANGES FROM GRAY-BROWN TO BROWN AT 11.5'
	15.0	S 2					ICB-6J-S FROM 13.0' - 16.0'
495.7	16.0			BOTTOM OF BORING AT 16.0'			

PROJECT NO. 831625

BORING NO. ICB-6

SHEET 1 OF 1

DATE BEGAN 8-12-84
DATE FINISHED 8-12-84
GROUND SURFACE EL. ~511.7'

BORING NO. ICB-6A

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
510.0		ST-1 24		GREENISH BROWN TO DARK BROWN CLAYEY SILT, SOME FINE SAND AND ORGANICS, MOIST	ml		CREEK DEPTH = 4.2'
	5.0			~5.5'			
502.28	9.42	ST-2 17		GRAY BROWN FINE TO COARSE SAND, TRACE ORGANICS AND SILTY CLAY	sp		
				BOTTOM OF BORING AT 9.42'			

PROJECT NO. 831625

BORING NO. ICB-6A
SHEET 1 OF 1

DATE BEGAN 8-13-84
DATE FINISHED 8-13-84
GROUND SURFACE EL. ~509.7'

BORING NO. ICB-7

N N/A **E** N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	0–2.5	1 (0.8)	(FILL)VERY LOOSE DARK BROWN FINE TO COARSE SILTY SAND, SOME COARSE SAND SIZE COAL AND FINE GRAVEL SIZE COKE FRAGMENTS, TRACE ORGANICS AND COARSE GRAVEL, WET	N/A		CREEK DEPTH = 6.2' ICB-7G-S FROM 0.0' - 6.0'
	2.5–5.0	2 (0.7)				
	5.0–6.5	3 (0.9)				ICB-7H-S FROM 6.0' - 10.5'
	6.5–8.0	4 (0.5)	GRADES TO: ~8.0'			
500.0	10.0	5 (1.0)	SOFT GREENISH BROWN SILTY CLAY, SOME FINE TO COARSE GRAVEL, TRACE ORGANICS AND FINE SAND, MOIST GRADES TO: ~10.5'	cl		
	10.5–13.0	6 (3.5)	LOOSE DARK GRAY FINE TO COARSE SAND, TRACE FINE GRAVEL AND SILT, WET 13.0'	sw		ICB-7I-S FROM 10.5' - 18.0'
	13.0–13.2		LOOSE GREENISH BROWN SILTY SAND, TRACE CLAY, WET 13.2'	sm		
	13.2–15.0		SOFT GREENISH BROWN SILTY CLAY, TRACE FINE TO MEDIUM SAND, FINE TO COARSE GRAVEL AND ORGANICS, MOIST 15.0'	cl		
	15.0–15.5		LOOSE LIGHT GRAY COARSE SAND, TRACE SILT, WET 15.5'	sp		
	15.5–17.2	S 2	MEDIUM DENSE FINE GRAVEL, SOME FINE TO COARSE SAND, WET 17.2'	gp		
491.7	17.2–18.0		MEDIUM DENSE BROWN MEDIUM SAND, SOME FINE GRAVEL, WET	sw	●	

BOTTOM OF BORING AT 18.0'

PROJECT NO. 831625

BORING NO. ICB-7
SHEET 1 OF 1

DATE BEGAN 8-13-84
DATE FINISHED 8-13-84
GROUND SURFACE EL. ~509.7'

BORING NO. ICB-7A

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	5.0			SEE BORING LOG ICB-7 FOR DESCRIPTION FROM 0.0 - 8.0' 8.0'			CREEK DEPTH = 6.2'
500.0	10.0	ST-1 O		SOFT GREENISH BROWN SILTY CLAY, SOME FINE TO COARSE GRAVEL, TRACE ORGANICS AND FINE SAND ~11.5'	cl		
494.7	15.0	ST-2 O		LOOSE GREENISH BROWN SILTY SAND AND SILTY CLAY	sm/cl		
				BOTTOM OF BORING AT 15.0'			

PROJECT NO. 831625

DATE BEGAN: 8-14-84

DATE FINISHED: 8-14-84

GROUND SURFACE EL.: ~ 509.9'

BORING NO. ICB-8

N N/A **E** N/A

FIELD ENGINEER: D. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	2.5, 5.0	1 (3.0), 2 (1.9)	SOFT GREENISH BROWN SILTY CLAY, TRACE FINE SAND AND TAR-LIKE MATERIAL, MOIST 6.0'	cl		CREEK DEPTH = 6.0' ICB-8G-S FROM 0.0' - 3.9'
	7.5	S, 1	LOOSE GREENISH BROWN FINE TO MEDIUM SAND, TRACE SILT, MOIST 6.1'	sp cl		ICB-8H-S FROM 3.9' - 10.9'
		S, 2	VERY SOFT GREENISH BROWN SILTY CLAY, TRACE FINE SAND, WET 7.5'	sp sp		
500.0	10.0	S, 3	LOOSE BROWN FINE TO MEDIUM SAND, TRACE SILT, WET 7.9'	sw		
	12.5		VERY LOOSE DARK GRAY FINE TO COARSE SAND, WET 13.0'			ICB-8I-S FROM 13.0' - 16.0'
		S, 4	(FILL) FINE GRAVEL SIZE SLAG, TRACE COAL, WET 13.3'	N/A cl		
	15.0	S, 5	VERY SOFT GREENISH BROWN TO BROWN SILTY CLAY, SOME FINE TO MEDIUM SAND, MOIST 14.8'	sp		
493.9	16.0		LOOSE GRAY FINE TO COARSE SAND, TRACE SILTY CLAY, WET			

BOTTOM OF BORING AT 16.0'

DATE BEGAN 8-15-84
DATE FINISHED 8-15-84
GROUND SURFACE EL. ~ 509.9'

BORING NO. ICB-8A

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	USCS	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		ST-1 25		GREENISH BROWN SILTY CLAY, TRACE FINE TO MEDIUM SAND, MOIST	cl		CREEK DEPTH = 6.0'
504.9	5.0	ST-2 24			cl		
				BOTTOM OF BORING AT 5.0'			

PROJECT NO. 831625

BORING NO. ICB-8A
SHEET 1 OF 1

DATE BEGAN 8-15-84

DATE FINISHED 8-15-84

GROUND SURFACE EL. ~514.0'

BORING NO. ICB-9

N N/A **E** N/A

FIELD ENGINEER D. HOLZMAN

CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
	2.5	1	(FILL) VERY SOFT GREENISH BROWN SILT AND SLAG, SOME FINE TO MEDIUM SAND AND ORGANICS, TRACE FINE SAND SIZE COAL, WET 3.2'	N/A	RUN 1 - HAS TAR ODOR THROUGHOUT SAMPLE ICB-9G-S FROM 0.0' - 5.8'
510.0	5.0	2.3	VERY SOFT GREENISH BROWN CLAYEY SILT, TRACE FINE TO MEDIUM SAND AND SLAG FRAGMENTS AND ORGANICS, WET GRADES TO: 9.5'	ml	CREEK DEPTH = 1.9'
	7.5	2	DARK GRAY TO DARK BROWN SILTY CLAY, SOME FINE SAND, MOIST 10.0'		RUN 2 HAS TAR ODOR ICB-9H-S FROM 5.8' - 12.5'
		2.2	DARK GRAY TO BLACK FINE TO MEDIUM SAND, TRACE SILT, WET 10.2		
	10.0	3	SOFT GREENISH BROWN SILTY CLAY, TRACE ORGANICS AND FINE SAND, MOIST 10.3'	cl / sp	RUN 3 HAS TAR ODOR IN UPPER 8" OF SAMPLE
			DARK GRAY INTERBEDDED SILTY SAND AND ORGANICS, MOIST 11.0'	cl / sm	
	12.5	3.3	SOFT GREENISH BROWN SILTY CLAY, TRACE FINE SAND, MOIST 14.5'	cl	11.0 TO 14.5' SILTY CLAY HAS IRREGULARLY SPACED LAYERS OF BLACK MATERIALS
500.0		4	LOOSE DARK GRAY TO BLACK FINE TO COARSE SAND AND SAND SIZE SLAG, SOME FINE GRAVEL, TRACE ORGANICS, MOIST ~15.0'		
	15.0	3.0	SOFT GREENISH BROWN SILTY CLAY, MOIST ~16.5'	cl	OILY FILM OBSERVED ON SURFACE OF SAMPLE RETRIEVED IN RUN 4
	17.5	5	LOOSE DARK GRAY FINE TO MEDIUM SAND, TRACE SILT, WET 17.9'	sp	
			LOOSE DARK GRAY FINE TO COARSE SAND, SOME FINE GRAVEL, TRACE COARSE GRAVEL, WET 19.0'	sw	ICB-9I-S FROM 12.5' - 20.5'
	20.0	2.8	SOFT GREENISH BROWN SILTY CLAY AND FINE TO MEDIUM SAND, MOIST 19.8'	sc	SAND AND SLAG GRADE FROM FINE TO COARSE WITH INCREASING DEPTH AT 14.5'
		6	LOOSE BROWN FINE TO COARSE SAND, SOME SLAG, TRACE SILT, WET 20.0'	sp	
	22.5		LOOSE BROWN FINE TO MEDIUM SAND, TRACE SILT, WET GRADES TO: ~21.0'	sw	ICB-9J-S FROM 20.5' - 25.5'
490.0	25.0	1.8	MEDIUM DENSE BROWN FINE TO COARSE SAND AND FINE GRAVEL, TRACE COARSE GRAVEL, MOIST GRADES TO: ~24.0' AS BELOW	sp	

PROJECT NO. 831625

BORING NO. ICB-9

DATE BEGAN 8-15-84
DATE FINISHED 8-15-84
GROUND SURFACE EL. 514.0'

BORING NO. ICB-9

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
488.5	25.5			MEDIUM DENSE BROWN FINE TO MEDIUM SAND, MOIST 25.1'	sp		
				MEDIUM DENSE BROWN FINE TO MEDIUM SAND, SOME SILTY CLAY, TRACE FINE GRAVEL, MOIST			
				BOTTOM OF BORING AT 25.5'			

PROJECT NO. 831625

DATE BEGAN 8-15-84
DATE FINISHED 8-15-84
GROUND SURFACE EL. ~ 514.0'

BORING NO. ICB-9A

N N/A E N/A

FIELD ENGINEER D. HOLZMAN
CHECKED BY P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				VERY SOFT GREENISH BROWN CLAYEY SILT, MOIST			CREEK DEPTH = 1.9'
510.0	5.0	ST-1 / 23			cl		
	10.0			~11.0'			
500.0	15.0			SOFT GREENISH BROWN SILTY CLAY AND FINE TO MEDIUM SAND, MOIST			
497.0	17.0	ST-2 / N/A			sc		
				BOTTOM OF BORING AT 17.0'			

PROJECT NO. 831625

BORING NO. ICB-9A
SHEET 1 OF 1

DATE BEGAN: 8-16-84
DATE FINISHED: 8-16-84
GROUND SURFACE EL.: ~ 512.0'

BORING NO. ICB-10

N N/A **E** N/A

FIELD ENGINEER: D. HOLZMAN
CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		1		LOOSE GREENISH BROWN SILTY FINE TO MEDIUM SAND, WET 0.2'	sp		
510.0	2.5	3.0		MEDIUM STIFF GREENISH BROWN SILTY CLAY, TRACE ORGANICS AND FINE SAND, MOIST	cl		ICB-10G-S FROM 0.0' - 3.0' CREEK DEPTH = 4.0'
		2		GRADES TO: ~4.5'			
	5.0			SOFT GREENISH BROWN SILTY CLAY, SOME FINE SAND, MOIST 7.4'	cl		ICB-10H-S FROM 3.0' - 8.0'
	7.5	3.7					
	10.0	3		LOOSE GREENISH BROWN SILTY FINE SAND 12.0'	sm		
500.0	12.5	(1)					
499.0	13.0			LOOSE GRAY SILTY SAND SOME ORGANICS (LEAVES), MOIST	sm		

BOTTOM OF BORING AT 13.0'

NOTE:

(1) NR - NOT RECORDED

PROJECT NO. 831625

BORING NO. ICB-10
SHEET 1 OF 1

DATE BEGAN 8-16-84

DATE FINISHED: 8-16-84

GROUND SURFACE EL.: ~511.4'

BORING NO. ICB-11

N N/A E N/A

FIELD ENGINEER D. HOLZMAN

CHECKED BY: P. E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
510.0		1		VERY SOFT DARK GREENISH GRAY SANDY SILT, SOME ORGANICS, WET 0.5'	pt		CREEK DEPTH = 4.6'
				VERY LOOSE DARK GREENISH BROWN SILTY SAND, SOME ORGANICS, WET 0.8'	ml		
	2.5	2.8		SOFT GREENISH BROWN SILTY CLAY, TRACE FINE SAND, MOIST GRADES TO: ~4.0'	cl		ICB-11G-S FROM 0.0'-7.8'
		2					
	5.0						
	7.5	2.7					
		3					
	10.0			LOOSE TO MEDIUM DENSE BROWN FINE TO MEDIUM SAND, SOME SILT AND FINE TO COARSE GRAVEL, TRACE CLAY, WET	sp		ICB-11H-S FROM 7.8' - 17.8'
500.0							
	12.5	1.6					
		4					
	15.0						
	17.5	2.7					
493.6	17.8'			BOTTOM OF BORING AT 17.8'			

PROJECT NO. 831625

BORING NO. ICB-11

DATE BEGAN: 8-30-84
DATE FINISHED: 8-30-84
GROUND SURFACE EL.: 516'

BORING NO. ICB-12

N N/A E N/A

FIELD ENGINEER D.P.H./T.M.J.
CHECKED BY: P.E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
515.0	2.5	1 / 3.0		LOOSE, BLACK FINE SAND, SLAG AND COAL, SOME ORGANICS AND SILT, MOIST 2.5'	N/A		WATER ENCOUNTERED AT 0.2' ICB-12G-S FROM 0.0'-3.0'
510.0 / 506.5	5.0 / 7.5 / 9.5	2 / 3.0 / 3 / 3.5		MEDIUM STIFF TO STIFF, GREENISH BROWN SILTY CLAY TO CLAY, SOME SILT, TRACE ORGANICS AND FINE SAND, MOIST	cl		WATER SAMPLE ICB-12G-W OBTAINED AT APPROXIMATELY 3.0' ICB-12H-S FROM 5.0'-6.0' ICB-12I-S FROM 8.5-9.5'

BOTTOM OF BORING AT 9.5'

NOTE: BORING DRILLED WITH BUCKET-TYPE HAND AUGER ON ICE CREEK FLOOD PLAIN

PROJECT NO. 831625

BORING NO. ICB-12
SHEET 1 OF 1

MONITORING WELL BORING LOGS

DATE BEGAN 7-14-84

DATE FINISHED 7-16-84

GROUND SURFACE EL.: 548.04

BORING NO. MW-1

N 184775.015 **E** 1952627.695

FIELD ENGINEER D.P. HOLZMAN

CHECKED BY: P.E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		G-1	(FILL) BLACK FINE TO COARSE SAND AND COAL, TRACE COARSE GRAVEL, MOIST	NA	(1)	GRAB-1 OBTAINED WITH A SHOVEL.
	5	S 1	(FILL) VERY LOOSE DARK BROWN TO BLACK SILTY SAND, SOME SLAG AND COAL, MOIST 6.5'	NA		
540.0						
	10	S 2	VERY SOFT BROWN SILTY CLAY, TRACE FINE SAND, MOIST 12.0'	cl		
	15	S 3		sp		
530.0						
	20	S 4		sp		SAMPLE MW-1G-S FROM 19.0 - 20.0 RETAINED FOR CHEMICAL ANALYSIS
	25	S 5		sp		
520.0						
	30	S 6	LOOSE TO VERY DENSE BROWN TO GRAY-BROWN FINE TO COARSE SAND, SOME TO TRACE FINE TO COARSE GRAVEL, TRACE SILT, MOIST TO WET	sw		ENCOUNTERED GROUND WATER AT APPROXIMATELY 29.2'
	35	S 7		sw		SAMPLE MW-1H-S FROM 29.0'-30.0' RETAIN FOR CHEMICAL ANALYSIS
510.0						
	40	S 8		sp		
	45	S 9		sp		
500.0						
	50	S 10		sw		

PROJECT NO. 831625

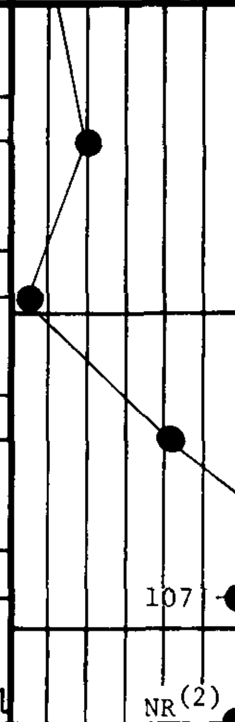
DATE BEGAN: 7-14-84
DATE FINISHED: 7-16-84
GROUND SURFACE EL.: 548.04'

BORING NO. MW-1

N 184775.015 E 1952627.695

FIELD ENGINEER: D.P. HOLZMAN
CHECKED BY: P.E. NEMANIC

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	55	S 11			sp		TRACE ORGANICS IN SAMPLE S-13
490.0	60	S 12		LOOSE TO VERY DENSE BROWN TO GRAY-BROWN FINE TO COARSE SAND, SOME TO TRACE FINE TO COARSE GRAVEL, TRACE SILT, MOIST TO WET	sp		DRILLING CONDITIONS INDICATE COBBLES OR LARGE GRAVEL AT APPROXIMATELY 64.5'
	65	S 13			sp		DRILLING CONDITIONS INDICATE 1' COBBLE LAYER BETWEEN S-14 AND S-15
480.0	70	S 14			sp	107	SAMPLE MW-1I-S FROM 72.5' - 73.0' RETAINED FOR CHEMICAL ANALYSIS
475.06	72.98	S-15		(APPROXIMATE TOP OF ROCK) 72.3'	sp	NR(2)	
				WEATHERED BEDROCK			



BOTTOM OF BORING
72.98'

NOTES:
1. NA - NOT APPLICABLE.
2. NR - NOT RECORDED.

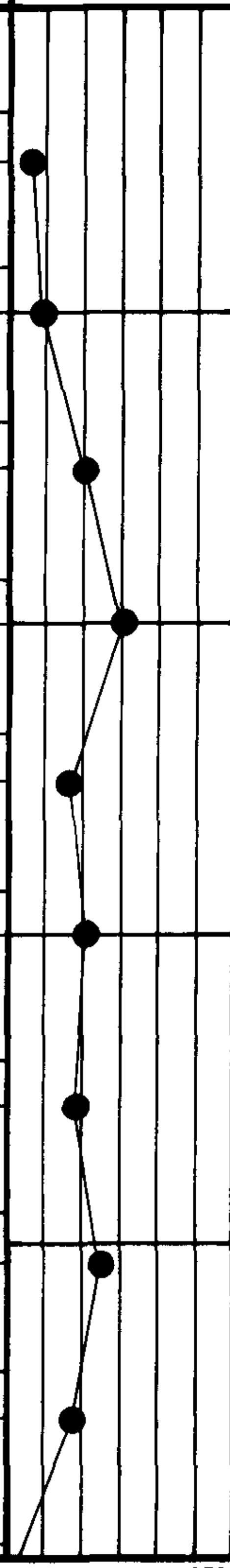
DATE BEGAN: 7/16/84
DATE FINISHED: 7/17/84
GROUND SURFACE EL.: 559.00'

BORING NO. MW-2

N 185178.898 E 1952964.956

FIELD ENGINEER: D. P. Holzman
CHECKED BY: P. E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				LOOSE BROWN SILTY FINE SAND, TRACE ORGANICS, MOIST			
	5	S 1			sp		
				6.5'			
550.0	10	S 2		LOOSE BROWN FINE TO MEDIUM SAND, TRACE SILT, TRACE ORGANICS	sw		
				11.5'			
	15	S 3			sp		SAMPLE MW-2G-S FROM 18.5 - 20.0 RE-TAINED FOR CHEMICAL ANALYSIS
540.0	20	S 4			sp		
	25	S 5			sp		
530.0	30	S 6		VERY LOOSE TO DENSE BLACK TO DARK BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL, SILT AND ORGANICS, MOIST TO WET	sw		
	35	S 7			sp		SAMPLE MW-2H-S FROM 39.0 - 40.5
520.0 / 7/17/84 ▼	40	S 8			sw		
	45	S 9			sw		
510.0	50	S					



PROJECT NO. 831625

BORING NO. MW-2
SHEET 1 OF 2

DATE BEGAN: 7/16/84
DATE FINISHED: 7/17/84
GROUND SURFACE EL.: 559.00'

BORING NO. MW-2

N 185178.898 E 1952964.956

FIELD ENGINEER: D. P. Holzman
CHECKED BY: P. E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		10		VERY LOOSE TO DENSE BROWN TO DARK BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL, SILT AND ORGANICS, MOIST TO WET	sw		
	55	S 11			sw		
				57.5'			
500.0	60	S 12			sp		TRACE ORGANICS IN SAMPLE S-12
							DRILLING CONDITIONS INDICATE GRAVELY ZONE FROM APPROXIMATELY 77.0' TO 78.5'
	65	S 13			sp		
490.0	70	S 14		LOOSE TO DENSE GRAY FINE TO MEDIUM SAND, TRACE FINE GRAVEL, WET	sp		
	75	S 15			sp		GRAVELY ZONE FROM APPROXIMATELY 82' TO TOP OF ROCK
480.0	80	S 16			sp		STRONG CHEMICAL ODOR AND BLACK OILY SUBSTANCE IN S-17
473.5	85.5	S-17		(APPROXIMATE TOP OF ROCK) 85.2'	sp	100/0.2'	
				WEATHERED BEDROCK			
				BOTTOM OF BORING AT 85.5'			

PROJECT NO. 831625

BORING NO. MW-2
SHEET 2 OF 2

DATE BEGAN 7/18/84

DATE FINISHED 7/19/84

GROUND SURFACE EL. 559.12'

BORING NO. MW-3

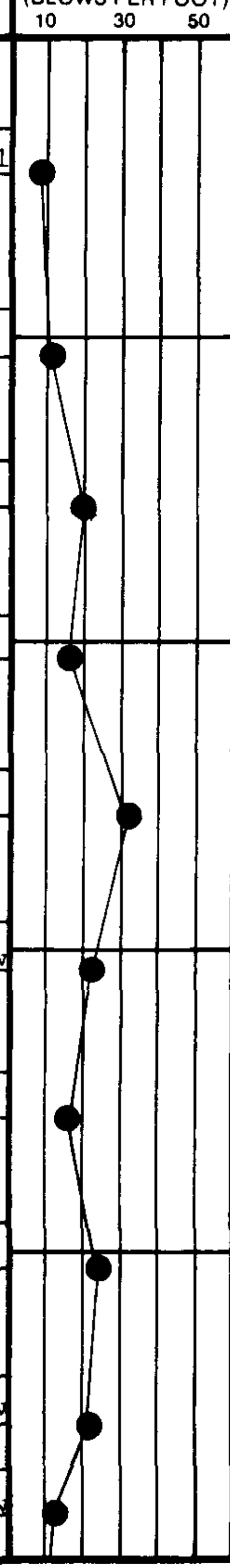
N 184623.087 **E** 1953346.268

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
	5	S 1	MEDIUM STIFF LIGHT BROWN SILTY CLAY TO CLAYEY SILT, MOIST	ml/cl	
			7.0'		
550.0	10	S 2	LOOSE TO MEDIUM DENSE LIGHT BROWN TO YELLOW BROWN FINE TO COARSE SAND, TRACE TO SOME FINE TO COARSE GRAVEL, MOIST	sp	
	15	S 3		sp	
540.0	20	S 4		sp	
	25	S 5		sp	SAMPLE MW-3G-S FROM 19.0-20.5' RETAINED FOR CHEMICAL ANALYSIS
			27.5'		
530.0	30	S 6	MEDIUM DENSE LIGHT BROWN FINE SAND AND FINE TO COARSE GRAVEL, MOIST	sp/gw	
			32.0'		
	35	S 7	LOOSE TO MEDIUM DENSE LIGHT BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL, MOIST TO WET	sp	
520.0					GROUND WATER ENCOUNTERED AT 39.9'
7/19/84 ▼	40	S 8		sw	
			42.0'		SAMPLE MW-3H-S FROM 44.0'-45.0 RETAINED FOR CHEMICAL ANALYSIS
	45	S 9	MEDIUM DENSE LIGHT BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, WET	sw/gw	
510.0	50	S 10		sw/gw	

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

BORING NO. MW-3

SHEET 1 OF 2

DATE BEGAN 7/18/84

DATE FINISHED 7/19/84

GROUND SURFACE EL. 559.12'

BORING NO. MW-3

N 184623.087 **E** 1953346.268

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
			MEDIUM DENSE LIGHT BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, WET 51.5'			
	55	S 11		sp		
500.0	60	S 12		sp		
	65	S 13	LOOSE TO MEDIUM DENSE LIGHT BROWN TO GRAY FINE SAND, WET	sp		SOME TO TRACE MEDIUM TO COARSE SAND AND TRACE FINE GRAVEL IN S-14
490.0	70	S 14		sp/ sw		ORGANIC LAYER FROM APPROXIMATELY 79.7 80.0 SLIGHT ODOR
	75	S 15	75.5'	sp/ gw		
480.0	80	S 16	VERY DENSE GRAY FINE TO COARSE GRAVEL, SOME FINE SAND, WET 83.0'	gw	155	
	85	S 17	GRAY VERY DENSE FINE TO COARSE GRAVEL AND COBBLES, SOME TO TRACE FINE TO COARSE SAND, WET	gw		
472.62	86.5		(TOP OF ROCK) 86.4'			
			WEATHERED BEDROCK: STIFF GRAY CLAYSTONE			
			BOTTOM OF BORING AT 86.5'			

PROJECT NO. 831625

BORING NO. MW-3

DATE BEGAN: 7/20/84
DATE FINISHED: 7/26/84
GROUND SURFACE EL.: 556.18'

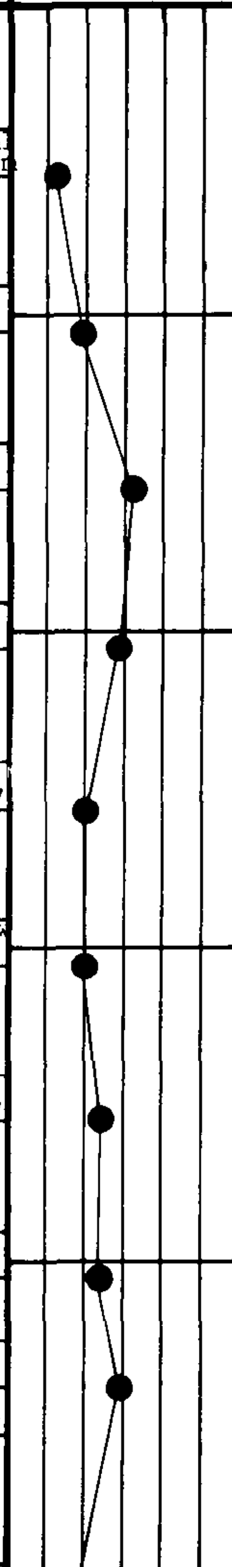
BORING NO. MW-4

N 183776.021 **E** 1954551.451

FIELD ENGINEER: P.E. Nemanic
CHECKED BY: P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
	0.5'		FILL (SLAG AND COAL FINES, GRAVEL)		
	4.5'		MEDIUM STIFF ORANGISH BROWN SILTY SANDY CLAY, MOIST		
550.0	5	S-1	MEDIUM DENSE ORANGE BROWN FINE SILTY SAND, SOME FINE GRAVEL, MOIST (to 7.0')	sp/ml sm/gm	
	10	S-2	MEDIUM DENSE YELLOW TO LIGHT BROWN FINE SAND AND FINE TO COARSE GRAVEL, TRACE MEDIUM TO COARSE SAND, TRACE SILT, MOIST (to 19.0')	sp/gw	
540.0	15	S-3		sp/gw	SAMPLE MW-4G-S FROM 19.0 - 20.5 RETAINED FOR CHEMICAL ANALYSIS
	20	S-4	MEDIUM DENSE YELLOW TO LIGHT BROWN FINE TO COARSE SAND, TRACE TO SOME FINE GRAVEL, MOIST (to 27.0')	sp/gw	
530.0	25	S-5		sp/gw	
			MEDIUM DENSE FINE GRAVEL, SOME FINE TO COARSE SAND, MOIST (to 29.7')	sp/gw	
	30	S-6	MEDIUM DENSE YELLOW FINE SAND TRACE GRAVEL, MOIST (to 32.0')	sp	
520.0	35	S-7	MEDIUM DENSE YELLOW AND GRAY FINE SAND AND FINE GRAVEL, MOIST (to 35.2')	sp/gw	SOIL TURNS BLACK AT 35.2'
7/25/84 (water level)					
	40	S-8	MEDIUM DENSE BLACK FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, TRACE SILT, WET (to 47.5')	sp/gw	SAMPLE MW-4H-S FROM 39.0' - 40.5' RE-TAINED FOR CHEMICAL ANALYSIS
		S-9		--	
510.0	45	S-9B		sp/gw	FAINT TAR-LIKE ODOR AT TIP OF S-9B
	50	S	MEDIUM DENSE BLACK FINE SAND, TRACE SILT, WET		

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

BORING NO. MW-4
SHEET 1 OF 2

DATE BEGAN 7/20/84

DATE FINISHED: 7/26/84

GROUND SURFACE EL.: 556.18'

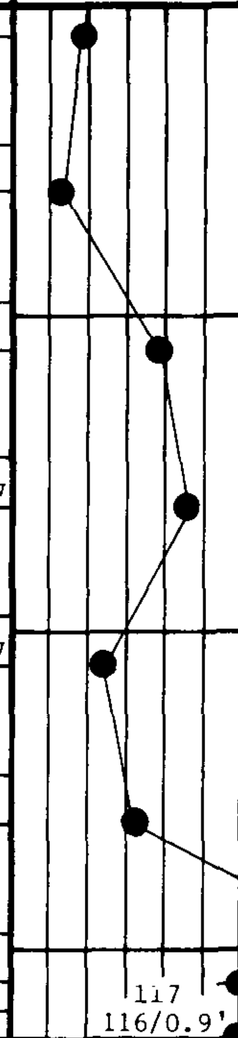
BORING NO. MW-4

N 183776.021 E 1954551.451

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		10		sp		S-10: ODOR
500.0	55	S 11	MEDIUM DENSE BLACK FINE SAND, TRACE SILT, WET	sp		
	60	S 12		sp		S-12: STRONG ASPHALT ODOR
			63.0'			
490.0	65	S 13		sp/gw		S-13: STRONG ASPHALT ODOR
	70	S 14	MEDIUM DENSE TO DENSE BLACK FINE SAND, TRACE TO SOME FINE TO COARSE GRAVEL, TRACE TO SOME MEDIUM TO COARSE SAND, TRACE SILT, WET	sp/gw		S-14: ODOR
			73.0'			
480.0	75	S 15	VERY DENSE BROWN FINE TO COARSE GRAVEL AND COBBLES, SOME FINE TO COARSE SAND, TRACE SILT, WET	gw		
	80	S 16	(TOP OF ROCK) 81.3'	gw	117	S-17: SAMPLE MW-4I-S FROM 82.0-82.9' RETAINED FOR CHEMICAL ANALYSIS
473.28	82.9	S-17	WEATHERED BEDROCK: GRAY-WHITE CLAYSTONE	NA	116/0.9'	
			BOTTOM OF BORING AT 82.9'			



PROJECT NO. 831625

BORING NO. MW-4

SHEET 2 OF 2

DATE BEGAN 7/27/84
DATE FINISHED 7/28/84
GROUND SURFACE EL.: 539.36'

BORING NO. MW-5

N 181166.305 **E** 1955394.364

FIELD ENGINEER P.E. Nemanic
CHECKED BY: P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	0–5.0'		(FILL): MEDIUM DENSE BLACK COAL FINES, MOIST			7'-8.5': DRILLING CONDITIONS INDICATE BROKEN COBBLE
	5	S 1	(FILL): BROWN MEDIUM DENSE SILTY SAND, TRACE CLAY, MOIST / FINE SAND, TRACE MEDIUM TO COARSE 7.0'	NA		
530.0	10	S 2	(FILL): VERY LOOSE BROWN FINE TO COARSE SAND, TRACE COAL FINES, TRACE MEDIUM GRAVEL SIZE SLAG, TRACE SILT, MOIST 12.0'	NA		
	15	S 3	SOFT TO MEDIUM STIFF LIGHT BROWN CLAYEY SILT TO SILTY CLAY, TRACE TO SOME VERY FINE SAND, MOIST	ml/cl		HIGHER CLAY CONTENT IN S-4 VERSUS S-3
520.0	20	S 4	22.0'	ml/cl		
	25	S 5	SOFT VERY FINE SANDY CLAY, TRACE TO SOME SILT, MOIST	cl/sc		1/4" FINE SAND LAYERS BETWEEN 24.0' AND 25.0'
510.0 7/27/84 ▼	30	S 6	32.0'	cl/sc		GROUND WATER SAMPLE MG-5G-W COLLECTED AT 31.0' RETAINED FOR CHEMICAL ANALYSIS
	35	S 7	SOFT DARK GRAY CLAY, TRACE TO SOME VERY FINE SAND, WET	cl		NOTE: 1/4" FINE SAND LAYERS APPROXIMATELY EVERY 6" FROM 24.0'-52.0'
		S 8		cl		
500.0	40	S 9	42.0'	cl		S-9 GRADES FROM CLAY TO SANDY CLAY OVER APPROXI-MATELY 6" INTERVALS
	45	S 10	MEDIUM STIFF DARK GRAY FINE SANDY CLAY, WET	cl/sc		
490.0	50	S		cl/sc		

PROJECT NO. 831625

BORING NO. MW-5
SHEET 1 OF 2

DATE BEGAN 7/27/84

DATE FINISHED 7/28/84

GROUND SURFACE EL.: 539.36'

BORING NO. MW-5

N 181166.305 E 1955394.364

FIELD ENGINEER P. E. Nemanic

CHECKED BY P. E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		11		MEDIUM STIFF DARK GRAY FINE SANDY CLAY, WET 52.0'			
	55	S 12		LOOSE TO DENSE DARK GRAY FINE SAND, WET	sp		4" LAYER OF LEAVES AND WOOD IN TIP OF S-12
480.0	60	S 13		60.4'	sp		
		S-14		DENSE DARK GRAY FINE SAND AND FINE TO COARSE GRAVEL, WET			
476.06	63.3			(TOP OF ROCK) 62.7'	NA	133/0.6'	
				WEATHERED BEDROCK (GRAY FINE GRAINED SILTY SANDSTONE)			
				BOTTOM OF BORING AT 63.3'			

PROJECT NO. 831625

BORING NO. MW-5

SHEET 2 OF 2

DATE BEGAN: 7/30/84
DATE FINISHED: 7/31/84
GROUND SURFACE EL.: 551.44'

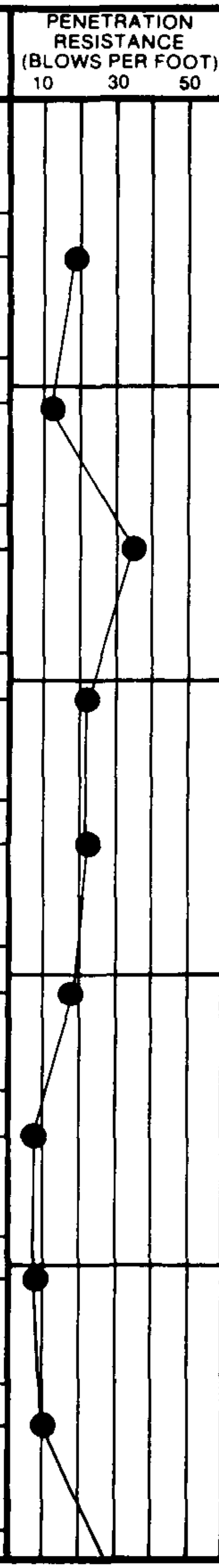
BORING NO. MW-6

N 186181.358 E 1954534.045

FIELD ENGINEER: P.E. Nemanic
CHECKED BY: P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
550.0			(FILL): COAL 0.5'		
			(FILL): CINDERS 1.5'		
			(FILL): GREENISH GRAY SILTY CLAY 2.5'		
	5	S 1		cl/ml	
	10	S 2	STIFF ORANGE BROWN AND GRAY MOTTLED WITH BLACK SPECKS, SILTY CLAY, DRY TO MOIST	cl/ml	APPROXIMATELY 1' OF COBBLES AT TOP OF S-3
540.0			13.5'		
	15	S 3		sp/sp	SAMPLE MW-6G-S FROM 19.0'-20.5' RETAINED FOR CHEMICAL ANALYSIS
	20	S 4	MEDIUM DENSE TO DENSE LIGHT BROWN FINE SAND, TRACE TO SOME FINE GRAVEL, TRACE MEDIUM GRAVEL MOIST	sp/gp	
530.0			24.2'		
	25	S 5		sw/gw	
	30	S 6	MEDIUM DENSE LIGHT BROWN FINE TO COARSE SAND AND FINE TO COARSE GRAVEL, MOIST	sw/gw	GROUND WATER ENCOUNTERED AT 32.7'
520.0			32.0'		
7/30/84 (water level)					
	35	S 7	LOOSE LIGHT BROWN FINE SAND, TRACE SILT, WET	sp	
	40	S 8		sw/gp	
510.0			42.0'		
	45	S 9	LOOSE TO MEDIUM DENSE LIGHT BROWN FINE SAND, TRACE TO SOME MEDIUM TO COARSE SAND, TRACE TO SOME FINE TO COARSE GRAVEL, WET	sp/gp	
	50	S	50.0'	sp	

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

DATE BEGAN: 7/30/84
DATE FINISHED: 7/31/84
GROUND SURFACE EL.: 551.44

BORING NO. MW-6

N 186181.358 E 1954534.045

FIELD ENGINEER: P.E. Nemanic
CHECKED BY: P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
500.0		10					
	55	S 11			sp		
	60	S 12			sp		
490.0				MEDIUM DENSE GRAY FINE SAND, TRACE FINE GRAVEL, WET			NO GRAVEL FROM 64.0-71.0'
	65	S 13			sp		SAMPLE MW-6I-S FROM 74.0-74.3' RETAINED FOR CHEMICAL ANALYSIS
	70	S 14			sp		
480.0				71.0'		115	
				VERY DENSE GRAY FINE SAND AND FINE TO COARSE GRAVEL AND COBBLES, WET 73.8'			
477.14	74.3	S-15		(TOP OF ROCK) WEATHERED BEDROCK: GRAY CLAY SHALE	NA	100/0.2	

BOTTOM OF BORING AT 74.3'

DATE BEGAN: 8/1/84
DATE FINISHED: 8/2/84
GROUND SURFACE EL.: 538.32'

BORING NO. MW-7

N 181344.362 **E** 1956562.590

FIELD ENGINEER: P.E. Nemanic
CHECKED BY: P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
			TOP SOIL 0.5'			
	5	S 1	(FILL): MEDIUM STIFF GRAY TO OLIVE BROWN SILTY CLAY, SOME BROKEN BRICK, CERAMICS, COAL FINES, COARSE SAND, MOIST 7.5'	NA		1/4" FINE SAND LAYERS APPROXIMATELY EVERY 6" FROM 14.8'-23.8'
530.0	10	S 2		cl/ml		SAMPLE MW-7G-S FROM 18.5-20.0' RETAINED FOR CHEMICAL ANALYSIS
	15	S 3	STIFF LIGHT BROWN SILTY CLAY, TRACE VERY FINE SAND, TRACE ORGANICS, DRY TO MOIST	cl/ml		
520.0	20	S 4	19.8'	cl/ml		
			STIFF ORANGE BROWN SILT, SOME CLAY, MOIST TO DRY 21.5'			SANDY CLAY LAYER FROM 24.5-24.7'
8/1/84 (water level)	25	S 5	LOOSE GRAY FINE TO COARSE SAND, TRACE SILT, WET 27.0'	sw		ENCOUNTERED GROUND WATER AT 25.5'
510.0	30	S 6	MEDIUM STIFF GRAY SILTY CLAY, TRACE FINE TO COARSE GRAVEL, WET 29.2'	cl/ml		SAMPLE MW-7H-S FROM 28.5-30.0' RETAINED FOR CHEMICAL ANALYSIS
			MEDIUM STIFF ORANGE SILT, SOME CLAY, TRACE FINE TO COARSE GRAVEL, MOIST 32.0'			
	35	S 7		sp/sm		CLAY LAYER FROM 39.7-39.9'
500.0	40	S 8	MEDIUM DENSE ORANGE BROWN TO BROWN FINE TO MEDIUM SAND, TRACE FINE GRAVEL, TRACE TO SOME SILT, WET	sp		
	45	S 9	47.0'	sp		
490.0	50	S	MEDIUM DENSE BROWN FINE TO COARSE GRAVEL, SOME FINE TO COARSE SAND, WET	gw		

PROJECT NO. 831625

BORING NO. MW-7
SHEET 1 OF 2

DATE BEGAN 8/1/84

DATE FINISHED 8/2/84

GROUND SURFACE EL. 538.32

BORING NO. MW-7

N 181344.362 **E** 1956562.590

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		10		MEDIUM DENSE BROWN FINE TO COARSE GRAVEL, SOME FINE TO COARSE SAND, WET 52.0'			
	55	S 11		DENSE TO VERY DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE FINE GRAVEL, TRACE TO SOME COBBLES, WET	sp		
480.0	60	S 12			sp		
		S-13		(TOP OF ROCK) 61.3'	NA		
476.42	61.9			WEATHERED BEDROCK: GRAY CLAY SHALE			
				BOTTOM OF BORING AT 61.9'			

PROJECT NO. 831625

BORING NO. MW-7

DATE BEGAN 8/8/84

DATE FINISHED: 8/9/84

GROUND SURFACE EL.: 539.25'

BORING NO. MW-8

N 182645.992 E 1954690.164

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
	0–2.0'		(FILL): SILTY CLAY WITH GRAVEL 2.0'		
	5	S 1	MEDIUM STIFF TO STIFF BROWN SILTY CLAY, SOME VERY FINE SAND, TRACE COARSE SAND, TRACE ORGANICS, MOIST 12.0'	cl/ ml	
530.0	10	S 2		cl/ ml	SILTY CLAY LAYER FROM 13.5-14.5'
	15	S 3	MEDIUM DENSE BROWN FINE SAND AND FINE TO COARSE GRAVEL, SOME SILT, MOIST 17.0'	sp/ gw	
520.0 (8/9/84, water level)	20	S 4	LOOSE TO VERY DENSE BROWN FINE SAND, TRACE TO SOME MEDIUM TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, WET	sp	TRACE SILT IN S-4; SAMPLE MW-8G-S FROM 19.0-20.5' RETAINED FOR ANALYSIS
	25	S 5		sw	
510.0	30	S 6		sp	SAND TURNS BLACK WITH SOME SILT FROM 29.5-34.0'
	35	S 7		sp/ sw	
500.0	40	S 8		sp	
	45	S 9		sp	TRACE FINE COAL FRAGMENT EVIDENT IN WASH MATERIAL AT 49.0'
490.0	50	S		sp	

PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50

DATE BEGAN 8/8/84
DATE FINISHED 8/9/84
GROUND SURFACE EL 539.25'

BORING NO. MW-8

N 182645.992 **E** 1954690.164

FIELD ENGINEER P.E. Nemanic
CHECKED BY P.E. Nemanic

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	55	S 11		LOOSE TO VERY DENSE BROWN FINE SAND, TRACE TO SOME MEDIUM TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, WET 57.0'	sp		SAMPLE MW-8H-S FROM 60.0-60.5 RETAINED FOR CHEMICAL ANALYSIS
480.0				VERY DENSE BROWN FINE TO COARSE GRAVEL AND FINE SAND AND COBBLES TRACE MEDIUM TO COARSE SAND, WET	gw/sp		
478.75	60.5	S 12		(TOP OF ROCK) 60.0'		127	
				BEDROCK: VERY HARD FINE GRAINED SANDSTONE	NA		
				BOTTOM OF BORING AT 60.5'			

PROJECT NO. 831625

BORING NO. MW-8
SHEET 2 OF 2

DATE BEGAN 8/10/84

DATE FINISHED 8/11/84

GROUND SURFACE EL. 557.25'

BORING NO. MW-9

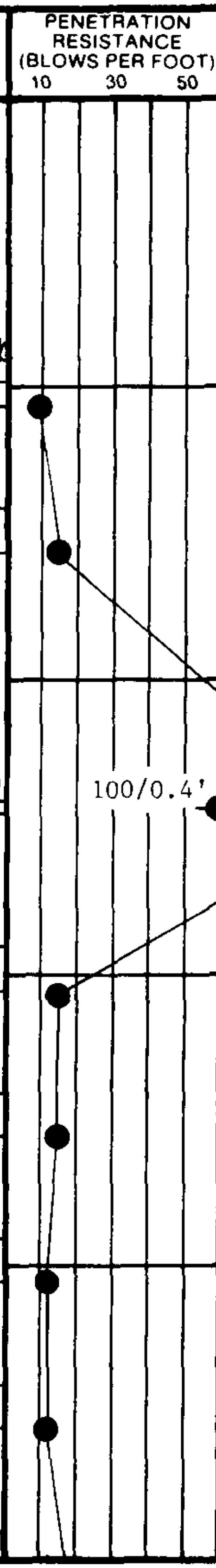
N 185647.634 **E** 1953130.362

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S	REMARKS
550.0	5, 10	S-1 (10)	MEDIUM STIFF GREEN GRAY BROWN AND BLACK MOTTLED SILTY CLAY, MOIST 9.8'	cl ml	BACKHOE EXCAVATED TO APPROXIMATELY 8.0' TO LOCATE COKE OVEN GAS LINE. FIRST DESCRIPTION OF MATERIALS FROM S-1
			MEDIUM DENSE GREEN GRAY BROWN AND BLACK MOTTLED FINE CLAYEY SAND, MOIST 12.0'	sc	STRONG ORGANIC ODOR IN SOIL FROM 0.0-38.5' (WATER TABLE)
540.0	15, 20	S-2 (15)	MEDIUM DENSE GREEN GRAY FINE SAND SOME FINE GRAVEL, TRACE COARSE GRAVEL, MOIST 20.0'	sp	SAMPLE MW-9G-S FROM 14.0-15.5' RETAINED FOR CHEMICAL ANALYSIS
	25	S-3 (24.3)	VERY DENSE BLACK FINE TO COARSE CLAYEY SAND AND FINE GRAVEL, MOIST 24.3'	sc/gp	OBSTRUCTION PREVENTED SAMPLE COLLECTION FROM 19.0-20.5'
530.0	30	S-4 (30)	MEDIUM DENSE, GRAY TO YELLOW FINE SAND, SOME FINE GRAVEL, TRACE MEDIUM TO COARSE SAND, MOIST 32.0'	sp/gp	BLACK STAINED LAYERS APPROXIMATELY 1/4" THICK AT 29.8 AND 30.2' STRONG ODOR
520.0	35	S-5 (35)	MEDIUM DENSE YELLOW FINE TO COARSE SAND AND FINE GRAVEL, TRACE COARSE GRAVEL, MOIST 37.0'	sw/gp	
8/11/84 (water level)	40, 45, 50	S-6 (40), S-7 (45), S (50)	MEDIUM DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET	sp	ENCOUNTERED GROUND WATER AT 38.5'
510.0					

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

BORING NO. MW-9

SHEET 1 OF 2

DATE BEGAN 8/10/84

DATE FINISHED 8/11/84

GROUND SURFACE EL 557.25'

BORING NO. MW-9

N 185647.634 **E** 1953130.362

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
			MEDIUM DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET 52.0'			SAND CONTENT MAY BE GREATER THAN THAT INDICATED FROM 52.0-62.0' DUE TO POOR RECOVERY IN S-9 and S-10
	55	S 9		sp/gw		
500.0			MEDIUM DENSE BROWN FINE SAND AND MEDIUM TO COARSE GRAVEL, TRACE MEDIUM TO COARSE SAND, WET			
	60	S 10	62.0'	sp/gw		
	65	S 11		sp/sw		
490.0						TRACE COBBLES IN S-12
	70	S 12	MEDIUM DENSE BROWN FINE SAND, SOME MEDIUM TO COARSE SAND, TRACE TO SOME FINE TO COARSE GRAVEL, WET	sp/gw		
	75	S 13	77.0'	sp/gw		
480.0						DESCRIPTION OF MATERIALS FROM 77.0-83.5' BASED ON DRILLING CONDITIONS
	80	S 14	VERY DENSE BROWN COBBLES, SAND AND GRAVEL	sp/gw	73	
473.15	84.1	S-15	(TOP OF ROCK) 83.5'	NA	100/0.1'	
			BEDROCK: GREEN GRAY FINE GRAINED SANDSTONE			
			BOTTOM OF BORING AT 84.1'			

PROJECT NO. 831625

DATE BEGAN 8/12/84
DATE FINISHED 8/13/84
GROUND SURFACE EL. 536.82'

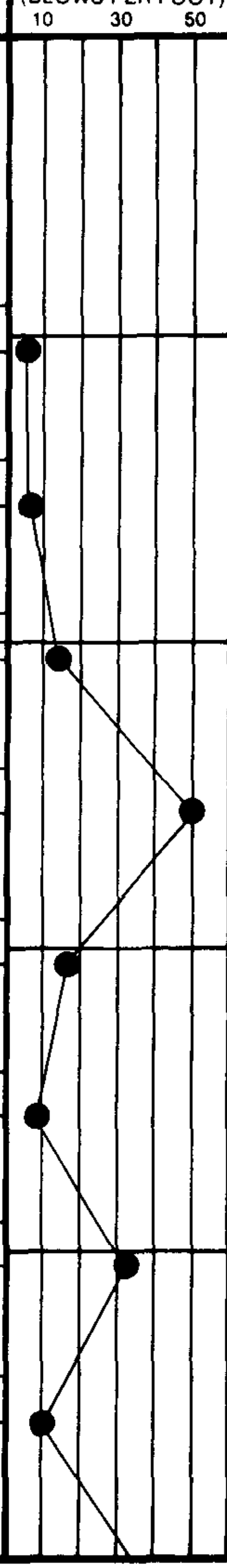
BORING NO. MW-10

N 180935.518 **E** 1956215.680

FIELD ENGINEER P.E. Nemanic
CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
	5				BACKHOE EXCAVATED NEAR SURFACE MATERIAL TO LOCATE COKE OVEN GAS LINE
530.0					
	10	S 1	STIFF GRAY TO GREEN GRAY CLAY, TRACE TO SOME SILT, TRACE FINE SAND, MOIST	cl	
	15	S 2		cl	
520.0					FINE SAND LAYER FROM 18.5 to 19.5'
	20	S 3	20.0'	cl / gc	
8/12/84 (water level)	25	S 4	DENSE ORANGE BROWN CLAYEY FINE TO COARSE GRAVEL AND FINE SAND, MOIST	gc	
510.0			27.0'		
	30	S 5		sm	
	35	S 6		sp	
500.0			LOOSE TO DENSE ORANGE BROWN TO BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE FINE TO COARSE GRAVEL, TRACE TO SOME SILT, WET		
	40	S 7		sp	
	45	S 8		sp	
490.0			47.0'		
	50		VERY LOOSE BROWN FINE SAND, SOME SILT		

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

BORING NO. MW-10
SHEET 1 OF 2

DATE BEGAN 8/12/84

DATE FINISHED 8/13/84

GROUND SURFACE EL. 536.82'

BORING NO. MW-10

N 180935.518 **E** 1956215.680

FIELD ENGINEER P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
	55			VERY LOOSE BROWN FINE SAND, SOME SILT			DESCRIPTION FROM 47.0-58.5' BASED ON MATERIAL WASHED OUT OF AUGERS
480.0				58.5'			
476.32	60.5	S 9		VERY DENSE LIGHT BROWN COBBLES AND FINE TO COARSE GRAVEL AND FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE TO SOME SILT, WET (TOP OF ROCK)	gw/sp	101	
				BEDROCK: CLAYSHALE			
				BOTTOM OF BORING AT 60.5'			

PROJECT NO. 831625

BORING NO. MW-10

SHEET 2 OF 2

DATE BEGAN 8/14/84
DATE FINISHED 8/15/84
GROUND SURFACE EL. 556.61'

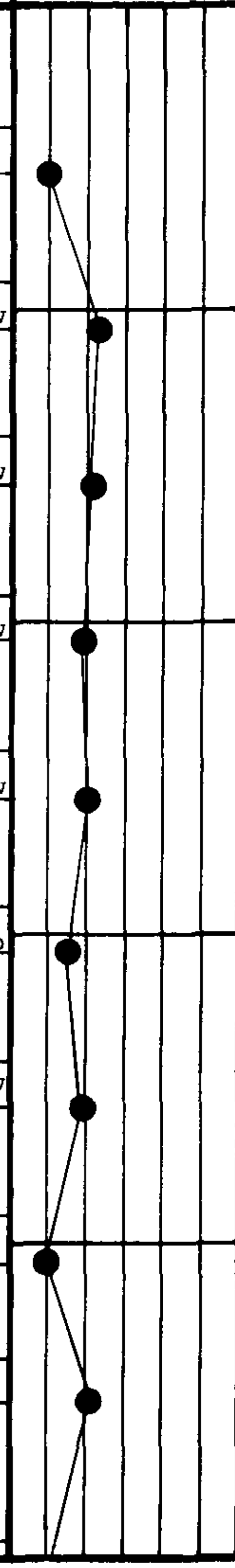
BORING NO. MW-11

N 183293.594 **E** 1954284.910

FIELD ENGINEER K. Feller/P.E. Nemanic
CHECKED BY P.E. Nemanic

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
			(FILL): BROKEN COAL AND COAL FINES 0.3'		
	5	S 1	REDDISH BROWN SILTY CLAYEY FINE SAND, TRACE FINE GRAVEL, MOIST 2.5'	sp	SAMPLE MW-11G S FROM 19.0-20.5' RETAINED FOR CHEMICAL ANALYSIS
550.0	10	S 2	LOOSE REDDISH BROWN FINE SAND, SOME MEDIUM SAND, TRACE TO SOME FINE GRAVEL, MOIST 7.0'	sp/gw	
	15	S 3	MEDIUM DENSE LIGHT BROWN FINE SAND AND FINE TO COARSE GRAVEL TRACE MEDIUM SAND, MOIST 12.0'	sp/gw	
540.0	20	S 4	MEDIUM DENSE YELLOW BROWN TO BROWN FINE SAND, TRACE TO SOME MEDIUM TO COARSE SAND, TRACE TO SOME FINE TO COARSE GRAVEL, MOIST	sp/gw	BLACK COLORATION FROM 24.5-25.5'
	25	S 5	27.0'	sp/gw	
530.0	30	S 6	MEDIUM DENSE BROWN FINE GRAVEL, SOME MEDIUM GRAVEL, SOME MEDIUM TO COARSE SAND, MOIST 32.0'	sp/sp	SAMPLE MW-11H-S FROM 34.0-35.5' RETAINED FOR CHEMICAL ANALYSIS
	35	S 7	MEDIUM DENSE BROWN FINE TO MEDIUM SAND AND GRAVEL, TRACE COARSE GRAVEL, MOIST 37.0'	sp/gw	
520.0 8/14/84 ▼	40	S 8	MEDIUM DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET	sw	
	45	S 9		sw	
510.0	50	S			

PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50



PROJECT NO. 831625

BORING NO. MW-11
SHEET 1 OF 2

DATE BEGAN 8/14/84

DATE FINISHED: 8/15/84

GROUND SURFACE EL.: 556.61'

BORING NO. MW-11

N 183293.594 **E** 1954284.910

FIELD ENGINEER K.Feller/P.E. Nemanic

CHECKED BY P.E. Nemanic

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		10		sw		
500.0	55	S 11	MEDIUM DENSE BROWN FINE SAND, TRACE MEDIUM TO COARSE SAND, TRACE SILT, WET	sw		2" SEAM OF MEDIUM GRAVEL AT 60.9'
	60	S 12	63.0'	gp		
490.0	65	S 13	MEDIUM DENSE BROWN TO BLACK FINE TO COARSE GRAVEL, TRACE FINE TO MEDIUM SAND, MOIST 68.0'	gp		DRILLING CONDITIONS INDICATE COBBLES AT 73'
	70	S 14	MEDIUM DENSE GREENISH GRAY TO BLACK FINE TO COARSE SAND, TRACE SILT, SOME FINE GRAVEL, WET 73.0'	sw		1/4" COAL LAYER AT 75.3'
480.0	75	S 15	VERY DENSE GREENISH GRAY, WHITE, BLACK, YELLOW AND RED FINE TO MEDIUM SAND AND FINE TO COARSE GRAVEL, WET	sp/gw	125	SAMPLE MW-11J-S FROM 74.5-76.0' RETAINED FOR CHEMICAL ANALYSIS
479.61	77.0		75.8' (TOP OF ROCK)			
			BEDROCK: SANDSTONE			
			BOTTOM OF BORING AT 77.0'			

PROJECT NO. 831625

BORING NO. MW-11

DATE BEGAN 8/16/84

DATE FINISHED 8/16/84

GROUND SURFACE EL. 559.07'

BORING NO. MW-12

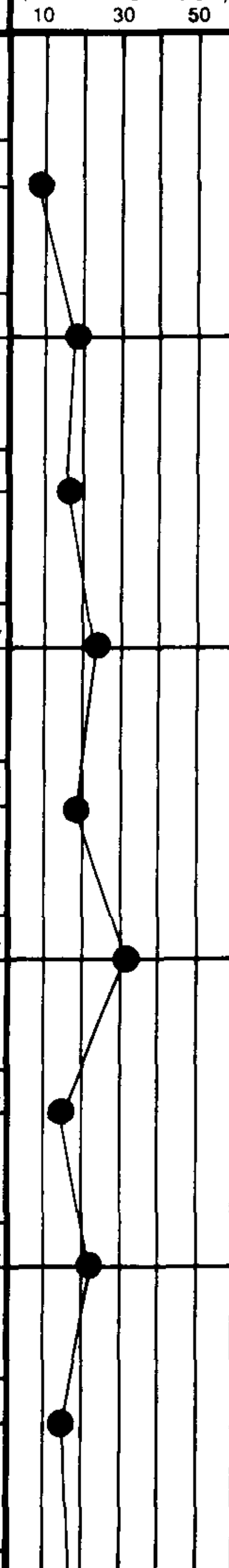
N 185075.304 E 1952622.186

FIELD ENGINEER K. Feller

CHECKED BY P. E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
	5	S 1	STIFF RED CLAYEY SILT, SOME GREENISH FINE SAND, DRY	cl	
550.0	10	S 2	9.0'	sw	SOME BLACK STAINING AND VERY SLIGHT ODOR IN SAMPLE S-2
	15	S 3	MEDIUM DENSE GREEN FINE TO COARSE SAND, TRACE FINE TO MEDIUM GRAVEL, DRY TO MOIST	sw	SAMPLE MW-12G-S FROM 18.5-20.0' RETAINED FOR CHEMICAL ANALYSIS
540.0	20	S 4	17.0'	sw/gw	
	25	S 5		gw/sw	GROUND WATER ENCOUNTERED AT 43.5'. GROUND WATER SAMPLE MW-12G-W OBTAINED FOR CHEMICAL ANALYSIS
530.0	30	S 6	MEDIUM DENSE GREEN TO YELLOW BROWN FINE TO MEDIUM GRAVEL AND FINE TO COARSE SAND, DRY TO MOIST	gw/sw	
	35	S 7		gw/sw	TAR ODOR IN SAMPLE S-10
520.0	40	S 8		sw/gw	TAR ODOR IN SAMPLE S-11
8/16/84 ▼			43.5'		TAR ODOR IN SAMPLE S-12
	45	S 9	MEDIUM DENSE BROWN FINE TO COARSE GRAVEL, SOME FINE TO COARSE SAND, WET	gw	
510.0	50	S	48.0'	sw	

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

BORING NO. MW-12

SHEET 1 OF 2

DATE BEGAN 8/16/84
DATE FINISHED 8/16/84
GROUND SURFACE EL. 559.07'

BORING NO. MW-12

N 185075.304 **E** 1952622.186

FIELD ENGINEER K. Feller
CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		S-10					STRONG TAR ODOR IN SAMPLE S-13
	55	S-11			SW		TAR ODOR IN SAMPLE S-14
500.0	60	S-12		MEDIUM DENSE TO VERY DENSE BROWN TO BLACK FINE TO COARSE SAND, TRACE TO SOME FINE TO MEDIUM GRAVEL, TRACE COARSE GRAVEL, WET	SW		STRONG TAR ODOR IN SAMPLE S-15
	65	S-13			SW		DRILLING CONDITIONS INDICATE COBBLES AT 76.0'
490.0	70	S-14			SW		
	75	S-15		76.0'	SW	72	SAMPLE MW-121 S FROM 79.0-79.8' RETAINED FOR CHEMICAL ANALYSIS
480.0	80	S-16		VERY DENSE GREENISH GRAY COARSE GRAVEL AND SANDSTONE, SOME FINE TO COARSE SAND, MOIST	SP/SW	161/0.8'	
				(TOP OF ROCK) 81.0'			
477.07	82.0			BEDROCK: SANDSTONE			

BOTTOM OF BORING AT 82.0'

PROJECT NO. 831625

DATE BEGAN 8/26/84
DATE FINISHED: 8/26/84
GROUND SURFACE EL.: 544.90'

BORING NO. MW-13

N 182253.739 **E** 1955252.471

FIELD ENGINEER D.P. Holzman
CHECKED BY P.E. Nemanic

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				TOPSOIL 0.5'	NA		
540.0	5	G-1		(FILL): LOOSE BLACK TO BROWN FINE TO COARSE SAND, SOME FINE TO COARSE GRAVEL, TRACE ORGANICS, COAL FINES, MOIST 5.0'	NA		SAMPLES G-1 AND G-2 OBTAINED FROM AUGER CUTTINGS. DESCRIPTION FROM 0-24' FROM AUGER CUTTINGS
	10						
530.0	15	G-2		MEDIUM STIFF BROWN TO GRAY TO LIGHT TAN MOTTLED SILTY CLAY, TRACE FINE SAND AND ORGANICS, MOIST	cl		
	20						
520.0	25	S-1		27.0'	cl		
8/26/84	30	S-2		LOOSE BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL AND SILT, WET 32.0'	sw		GROUND WATER ENCOUNTERED AT APPROXIMATELY 29.0'
510.0	35	S-3		MEDIUM STIFF BROWN TO ORANGE TO GRAY MOTTLED SILTY CLAY, TRACE FINE TO MEDIUM SAND AND FINE GRAVEL, MOIST 35.2'	cl		
	40	S-4			sw		
500.0	45	S-5		MEDIUM DENSE LIGHT BROWN TO BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL AND SILT, MOIST	sw		ORGANIC MATERIAL PRESENT IN S-5
	50	S			sp		

PROJECT NO. 831625

BORING NO. MW-13

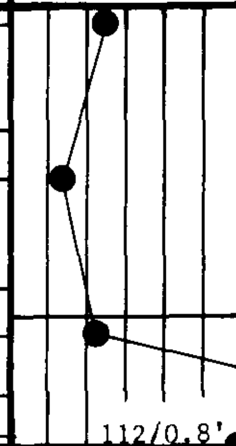
DATE BEGAN 8/26/84
DATE FINISHED 8/26/84
GROUND SURFACE EL. 544.90

BORING NO. MW-13

N 182253.739 **E** 1955252.471

FIELD ENGINEER D.P. Holzman
CHECKED BY P.E. Nemanic

ELEV (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		6					S-6 SLIGHTLY DARKER, NO GRAVEL
490.0	55	S 7		MEDIUM DENSE LIGHT BROWN TO BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL AND SILT, MOIST	sp		S-7: INTERBEDDED BLACK SAND
	60	S 8			NR		
480.90	64.0	S 9		63.8'	sw	112/0.8'	
				BEDROCK			
				BOTTOM OF BORING AT 64.0'			



PROJECT NO. 831625

BORING NO. MW-13
SHEET 2 OF 2

DATE BEGAN 8/27/84

DATE FINISHED 8/27/84

GROUND SURFACE EL 544.27'

BORING NO. MW-14

N 184361.745 **E** 1952964.482

FIELD ENGINEER D.P. Holzman

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
540.0	5	S-1	(FILL): LOOSE TO MEDIUM DENSE BLACK TO BLACKISH BROWN FINE SAND, SOME FINE SAND SIZE COAL, TRACE FINE GRAVEL SIZE SLAG, TRACE ORGANICS, MOIST	NA	
	10	S-2	GRADES TO: 12.0'	NA	
530.0	15	S-3		SW	
	20	S-4	LOOSE TO MEDIUM DENSE BROWN FINE TO COARSE SAND, TRACE TO SOME FINE GRAVEL, TRACE SILT, TRACE COARSE GRAVEL, MOIST	SW	S-4: DARKER COLOR
520.0	25	S-5		SW	LESS DENSE AND LESS COARSE GRAVEL FROM 12.0-29.0'
8/27/84 (water level)					
	30	S-6	32.0'	SW	SAMPLE MW-14G-S FROM 29.0-30.5' RETAINED FOR CHEMICAL ANALYSIS
510.0	35	S-7		SP	
	40	S-8	MEDIUM DENSE BROWN FINE TO MEDIUM SAND, TRACE SILT, MOIST	SP	OILY SHEEN OBSERVED ON SURFACE OF RETURN DRILLING FLUIDS
500.0	45	S-9		SP	
	50	S			

PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50

PROJECT NO. 831625

BORING NO. MW-14

SHEET 1 OF 2

DATE BEGAN 8/27/84

DATE FINISHED 8/27/84

GROUND SURFACE EL. 544.27'

BORING NO. MW-14

N 184361.745 E 1952964.482

FIELD ENGINEER D.P. Holzman

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		S 10			sp		S-10: CONTAINS COARSE SAND AND SOME FINE GRAVEL
490.0	55			MEDIUM DENSE BROWN FINE TO MEDIUM SAND, TRACE SILT, MOIST			
		S 11		58.0'	sp		SAMPLE MW-14H-S FROM 49.5-51.0' RETAINED FOR CHEMICAL ANALYSIS
	60	S 12		VERY DENSE INTERBEDDED BLACK COARSE SHALE FRAGMENTS AND BROWN FINE TO MEDIUM SAND, MOIST	sp	89/0.7'	
480.47	63.8			(APPROXIMATE TOP OF ROCK) 62.0'			
				WEATHERED BEDROCK			
				BOTTOM OF BORING AT 63.8'			

PROJECT NO. 831625

BORING NO. MW-14

DATE BEGAN 8/28/84
DATE FINISHED: 8/28/84
GROUND SURFACE EL. 535.17'

BORING NO. MW-17

N 183510.327 E 1953754.979

FIELD ENGINEER D.P. Holzman
CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
				(FILL): LOOSE DARK BROWN TO BLACK FINE TO MEDIUM SAND, TRACE FINE COAL, TRACE ORGANICS, MOIST 4.0'	NA		S-1: TRACE ORGANICS BELOW 4.0'
530.0	5	S 1			cl		
	10	S 2			cl		
520.0	15	S 3		SOFT BROWN SILTY CLAY, TRACE FINE SAND, MOIST	cl		S-3: NO SAND PRESENT
	20	S 4		22.0'	cl		S-5: LOOSE(?) SAND, NO GRAVEL PRESENT
510.0	25	S 5			sw		SAMPLE MW-17G-S FROM 23.5-25.0' RETAINED FOR CHEMICAL ANALYSIS
	30	S 6			sw		
500.0	35	S 7		MEDIUM DENSE BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL, MOIST	sp		S-7: NO COARSE SAND OR GRAVEL
	40	S 8			sp		S-9: SOME FINE TO COARSE GRAVEL
490.0	45	S 9			sw		SAMPLE MW-17H-S FROM 44.5-46.0' RETAINED FOR ANALYSIS
	50	S					

PROJECT NO. 831625

BORING NO. MW-17
SHEET 1 of 2

DATE BEGAN 8/28/84

DATE FINISHED: 8/28/84

GROUND SURFACE EL.: 535.17'

BORING NO. MW-17

N 183510.327 **E** 1953754.979

FIELD ENGINEER D.P. Holzman

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		10		MEDIUM DENSE BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL, MOIST	sp		S-11: VERY DENSE SAND SAMPLE MW-17I-S FROM 54.5 TO 56.0' RETAINED FOR ANALYSIS
480.0	55	S					
479.17	56.0			(APPROXIMATE TOP OF ROCK)	sp	94	
				BOTTOM OF BORING AT 56.0			

PROJECT NO. 831625

BORING NO. MW-17
SHEET 2 OF 2

DATE BEGAN 8/29/84

DATE FINISHED 8/29/84

GROUND SURFACE EL. 535.95'

BORING NO. MW-18

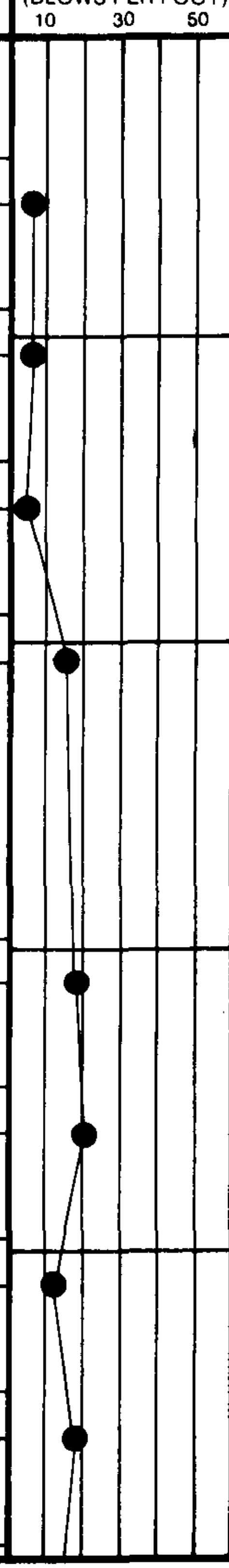
N 183784.382 **E** 1953458.464

FIELD ENGINEER T.M. Johnson

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	DESCRIPTION	U.S.C.S.	REMARKS
	0–4.2		(FILL): BLACK SILT, TRACE MEDIUM SAND AND SLAG, MOIST — 4.2'	NA	0.0-4.0' LOGGED FROM AUGER CUTTINGS
530.0	5	S 1	MEDIUM STIFF TO STIFF BROWN SILTY CLAY, TRACE FINE TO MEDIUM SAND, MOIST	cl	S-1: LIGHT BROWN MOTTLING PRESENT
	10	S 2		cl	S-2: NO SAND PRESENT
520.0	15	S 3	— 17.5'	cl	
8/29/84 (water level)	20	S 4	MEDIUM DENSE BROWN MEDIUM TO COARSE SAND, TRACE FINE GRAVEL AND SILT, WET	sw	GROUND WATER ENCOUNTERED AT 19.0'
510.0	25				GRAVELLY MATERIAL ENCOUNTERED AT 23.0'
	30	S 5		sw	S-5 AND S-6: NO GRAVEL PRESENT
500.0	35	S 6		sw	
	40	S 7		sw	
490.0	45	S 8		sw	
	50	S			

PENETRATION RESISTANCE (BLOWS PER FOOT)



PROJECT NO. 831625

BORING NO. MW-18

SHEET 1 OF 2

DATE BEGAN 8/29/84

DATE FINISHED 8/29/84

GROUND SURFACE EL. 535.95'

BORING NO. MW-18

N 183784.382 **E** 1953458.464

FIELD ENGINEER T.M. Johnson

CHECKED BY P.E. Nemanic

ELEV. (FEET)	DEPTH (FEET)	SAMPLE TYPE	PROFILE	DESCRIPTION	U.S.C.S.	PENETRATION RESISTANCE (BLOWS PER FOOT) 10 30 50	REMARKS
		9		MEDIUM DENSE BROWN MEDIUM TO COARSE SAND, TRACE FINE GRAVEL AND SILT, WET 52.5'	SW		
480.45	55.5	S 10		VERY DENSE BROWN FINE TO COARSE SAND, TRACE FINE GRAVEL, WET 55.1' (TOP OF ROCK)	SW	137	
				BEDROCK: SANDSTONE			
				BOTTOM OF BORING AT 55.5'			

PROJECT NO. 831625

BORING NO. MW-18