Illinois State Water Survey Division
HYDROLOGY DIVISION

SWS Contract Report 496

GROUND-WATER QUALITY INVESTIGATION AND MONITORING PROGRAM DESIGN FOR THE LAKE CALUMET AREA OF SOUTHEAST CHICAGO

by
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Prepared for the
Illinois Environmental Protection Agency

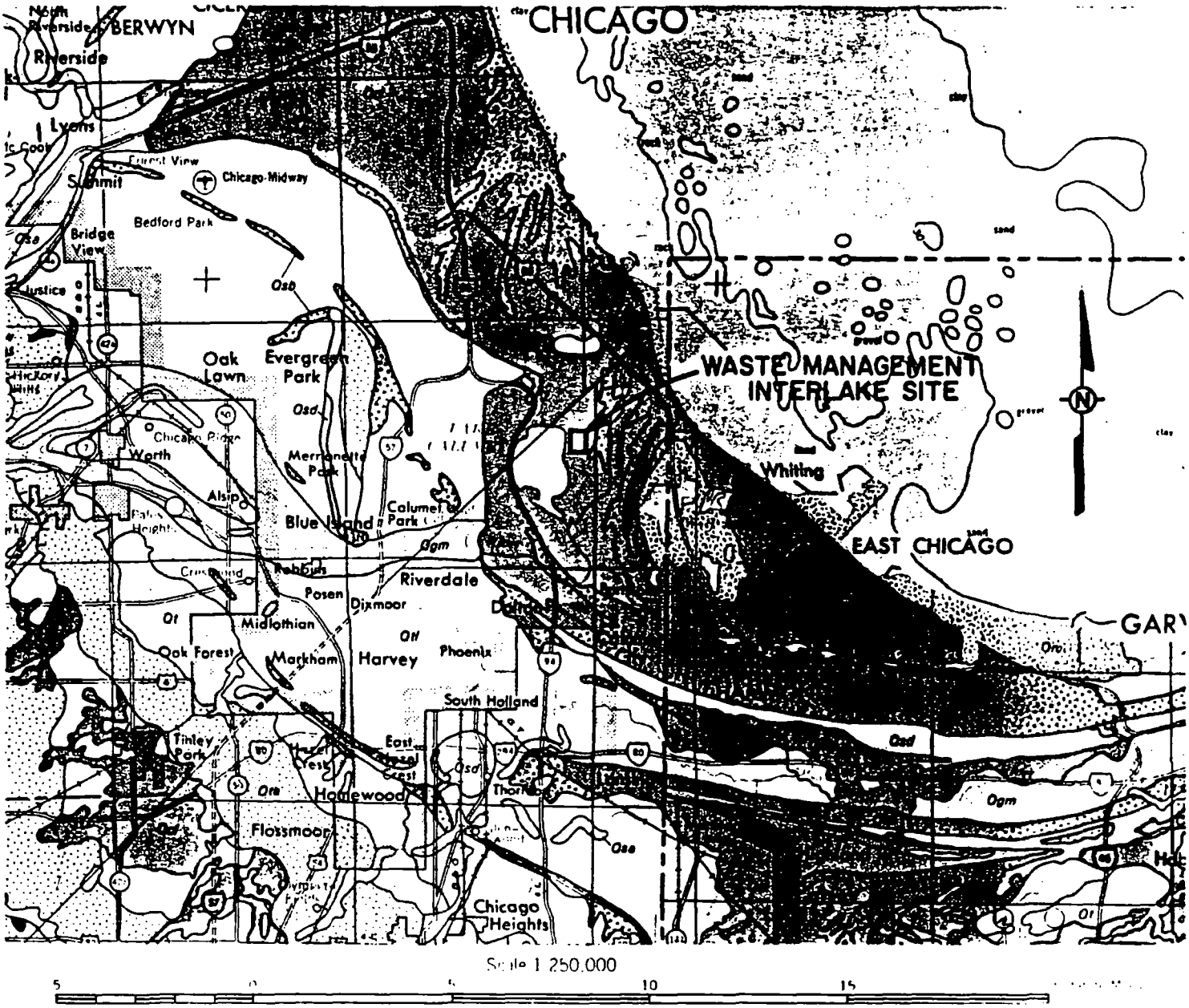
Champaign, Illinois

September 1990

Illinois Department of Energy and Natural Resources

EPA Region 5 Records Ctr.
343481

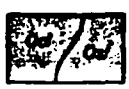
APPENDIX B
ILLINOIS WATER SURVEY REPORT



Surrounding Unconsolidated Deposits

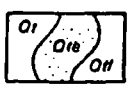
Sand and gravel

Beach and shoreline deposits in bars, spits, deltas and beaches. Includes some dune sand. Atherton Formation in Indiana



Clay, silt, and sand

Lacustrine deposits. Qcl, mostly clay and silt; Qsl, mostly sand. Lacustrine facies of Atherton Formation in Indiana



Till

Includes some ice-contact stratified drift. Qt, mainly ground-moraine deposits. Qte, mainly end-moraine deposits. Qtl, wave-scoured lake-bottom till. Mostly Lagro Formation in Indiana

PORTIONS OF DNR
GEOLOGIC MAP NO. 4
CHICAGO SHEET, PART B
1970

FIGURE 6
Surface Geology
Interlake Site
Chicago, Illinois

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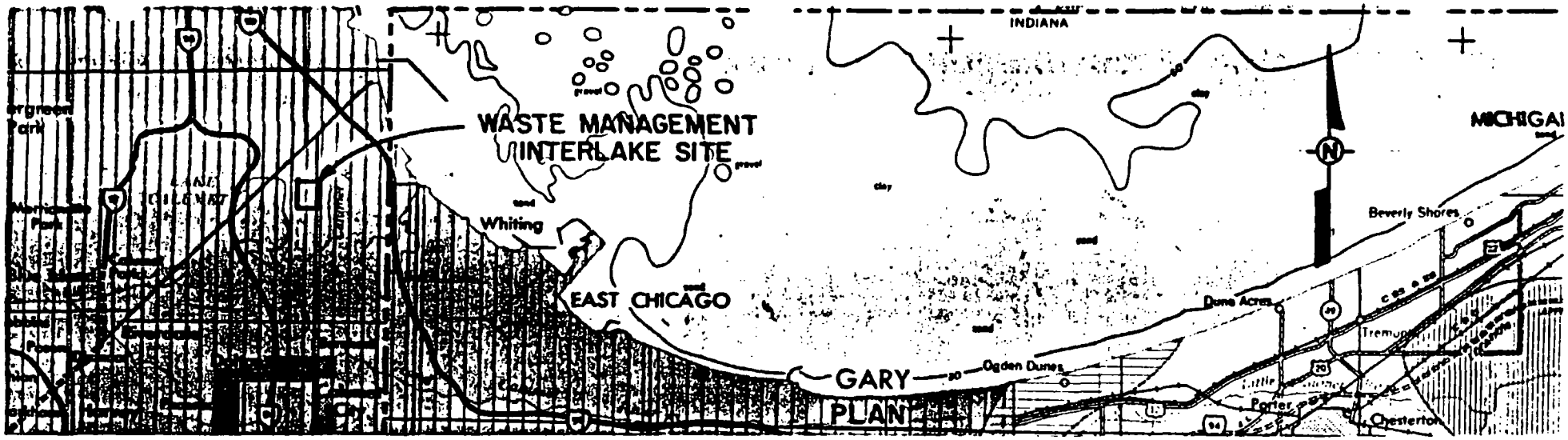

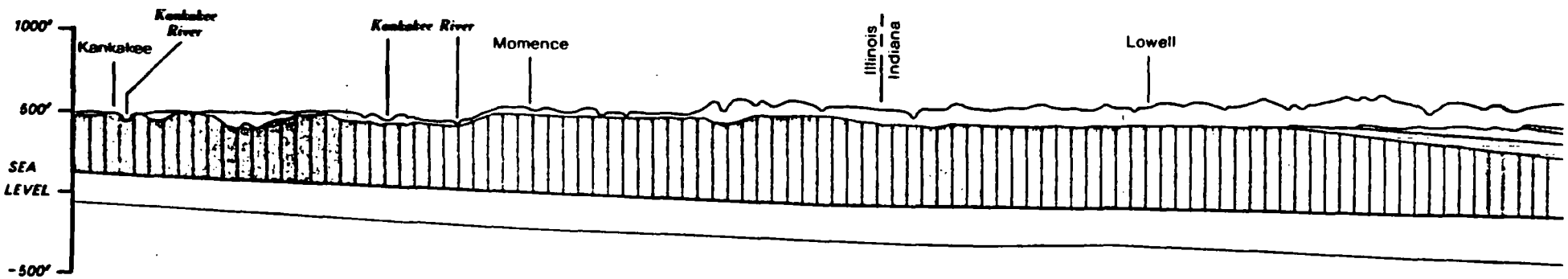

PROFILE ORIENTATION GENERALLY NE-SW - SHOWING REGIONAL DIP TO EAST.

PORTIONS OF DNR GEOLOGIC MAP NO. 4, CHICAGO SHEET PART A. 1970

Bedrock Units

DEVONIAN AND MISSISSIPPIAN — DM
Ellsworth Shale
Green shale with black shale in lower part

DEVONIAN — D_1
Traverse and Detroit River Formations
Mostly limestone and dolomite

DEVONIAN — D_2
Antrim Shale
Black shale with gray shale and limestone in lower part

SILURIAN — S
Niagaran Series
Dolomite, cherty limestone, and some shale

FIGURE 7
Regional Bedrock Geology
Interlake Site
Chicago, Illinois

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TABLE 1
SUMMARY OF FIELD
DRILLING DATA

BORING OR PIEZOMETER NUMBER	GROUND SURFACE ELEVATION[1]	PIEZOMETER TYPE AND DIAMETER	TOP OF METAL CASING ELEVATION	DEPTH TO WATER SURFACE (FT.)[2]	WATER SURFACE ELEVATION[3]	BEDROCK OR REFUSAL ELEVATION
ST-1D	587.3	2" PVC	589.70	31.5	558.2	486.2
ST-1S	587.3	4" PVC	590.22	5.0	585.2	
ST-2D	584.5	2" PVC	587.29	15.5	571.8	543.5
ST-2S	584.4	4" PVC	587.00	3.9	583.1	
ST-3D	586.3	2" PVC	588.22	19.3	568.9	500.3
ST-3S	586.2	4" PVC	588.40	4.6	583.8	
ST-4D	590.0	2" PVC	592.13	31.6	560.5	502.0
ST-4S	589.8	4" PVC	592.55	11.0	581.6	
SS-1D	587.3	4" SS	589.74	33.6	556.1	486.3
SS-2D	583.3	4" SS	585.14	19.9	565.2	501.3
B-1	588.8					484.3
B-2	586.6					488.1
B-3	588.3					494.3
B-4	583.9					522.4
B-5	585.5					526.0
B-6	584.7					556.2
B-7	587.5					562.5
B-8M	585.3	2" PVC	587.84	20.0	567.8	522.6
B-9	584.5					510.5
B-10	586.2					498.7
B-11	584.7					499.2
B-12M	583.9	2" PVC	586.99	13.6	573.4	500.9
B-13	588.4					
B-13M	588.1	2" PVC	591.21	18.6	572.6	507.9
B-14	585.7					507.7
B-15	589.0					503.0
B-16	589.9					498.9
B-17M1	588.4	2" PVC	590.99	7.4	583.6	
B-17M2	589.3	2" PVC	591.74	9.1	582.6	495.1
B-17S	589.4	4" PVC	591.70	7.3	584.4	
B-18	586.2					491.9
B-19	586.5					488.5
B-19S	586.5	4" PVC	589.49	5.6	583.9	
B-20	586.4					489.4
B-21	Not Drilled					
B-22	587.3					528.3
B-22S	587.8	4" PVC	589.57			
B-23S	586.5	4" PVC	589.46	6.6	582.9	522.0
B-24	592.9					505.4
B-25	Not Drilled					
B-26	587.9					494.4
B-26S	587.4	4" PVC	590.10	7.8	582.3	

LEGEND

PVC . . . Threaded Polyvinyl Chloride Riser Pipe and Screen
SS . . . Threaded Stainless Steel Riser Pipe and Screen

NOTES:

1. Benchmark - Nail in utility pole 100'± W. of the SW corner of the project site. Established by Waste Management as Elevation 592.80.

2. Depth measured from top of casing.

3. Elevations of water surface as measured on 5/12/82.

TABLE 2

SUMMARY OF SOIL PARAMETERS

PARAMETERS	TINLEY TILL		VALPARAISO TILL	
	Avg.	Range	Avg.	Range
Natural Moisture (%)	19	12-27	16	8-27
Liquid Limit (%)	31	25-45	25	18-36
Plasticity Index (%)	9	0-21	6	0-20
Percent Fines (%)	82	61-99	76	46-99
Dry Unit Weight (pcf)	101	88-112	122	120-125
Permeability[1] (x 10^{-8} cm/sec)	1.5	0.7-3.0	2.1	0.5-5.0
USCS Classification[2]	CL	ML-CL	CL-ML	ML-CL
CEC (meq/100g)	9.0	3.6-11.9	7.7	4.2-15.9
pH	7.8	7.6-8.0	7.7	7.5-8.0
Calcium Carbonate Equivalent (%)	24.2	18.3-28.5	27.4	22.4-35.9

1 Permeability testing does not include test on a clayey sand lense in Tinley Till which yielded k = 5 x 10^{-5} cm/sec.

2 Granular lenses not included.

NOTE: The reported parameters are based on the actual tests performed in this investigation and may not be representative of the overall soil deposits and the range of values.

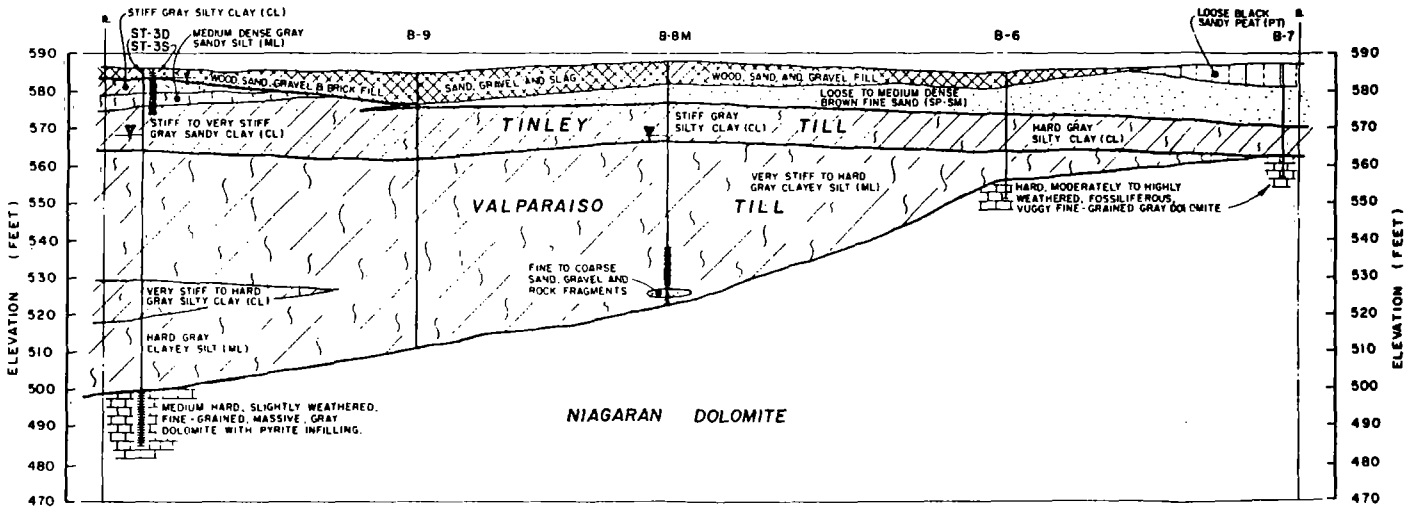
TABLE 3

SUMMARY OF GROUND WATER QUALITY TESTING

Location	Temp. ° C	Conductivity µmho's	pH	CONCENTRATIONS (ppm)				
				CALCIUM	CHLORIDE	CYANIDE	BENZENE	PHENOL
Drinking Water Standards				NA[3]	250	0.20	NA	0.001
ST-1S	16.0	1750	11.5	100.0	99.1	0.19	0.91	0.067
ST-2S	13.6	1100	8.4	139.0	179.0	1.29	0.54	BDL[2]
ST-3S	14.0	2020	9.0	28.8	795.0	3.67	0.41	0.044
ST-4S	14.5	2420	8.5	126.0	319.0	0.14	0.72	BDL
ST-1D	15.5	355	8.5	17.6	53.7	0.45	0.90	BDL
ST-2D	17.5	800	7.2	77.7	56.9	2.96	BDL	BDL
ST-3D	15.0	610	8.6	25.9	112.0	0.14	0.79	BDL
ST-4D	14.0	880	7.8	78.0	160.0	0.24	0.74	BDL
SS-1D	15.0	800	11.3	5.1	48.1	0.11	0.62	BDL
SS-2D	13.5	402	11.2	18.2	27.7	0.22	0.77	BDL
Potable Drilling Water[1]	20.0	208	7.8	32.5	13.3	0.10	0.53	BDL

1 Drilling water was obtained from the fire hydrant at Helen's Truck Stop.
2 BDL = Below Detection Limits (0.010 ppm)
3 NA = Not Applicable or Unavailable

Note: pH, temperature, and conductivity were measured at the well during sampling. The remaining values were provided from laboratory tests as listed in Appendix B.

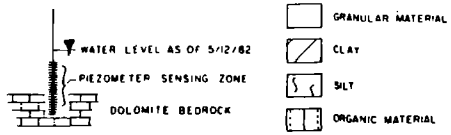


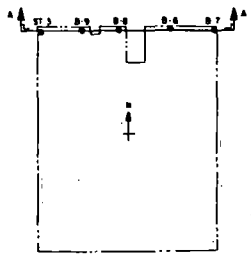
PROFILE A-A

HORIZONAL SCALE 200 0 200 ft

VERTICAL SCALE 20 0 20 ft

LEGEND





SITE PLAN

NOTES

THE BORING LOGS AND RELATED INFORMATION DEPICT SUBSURFACE CONDITIONS ONLY AT THE SPECIFIC LOCATIONS INDICATED. SOIL CONDITIONS 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.

THE DEPTH AND THICKNESS OF THE SUBSURFACE STRATA INDICATED ON THE PROFILES WERE GENERALIZED FROM AND INTERPOLATED BETWEEN THE TEST BORINGS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION OF THE TEST BORINGS AND IT IS POSSIBLE THAT SUBSURFACE CONDITIONS BETWEEN THE TEST BORINGS MAY VARY FROM THOSE INDICATED.

THE NIAGARAN DOLOMITE SURFACE HAS BEEN INTERPRETED FROM CORING INFORMATION AND REFUSAL TO SOIL DRILLING METHODS IN OUR BORINGS. REFUSAL TO SOIL DRILLING METHODS CAN BE CAUSED BY BEDROCK, BOULDERS, AND "FLOATING" ROCK SLABS. ALSO, DOLOMITE ROCK SURFACES CAN VARY ERRATICALLY BETWEEN BORINGS.

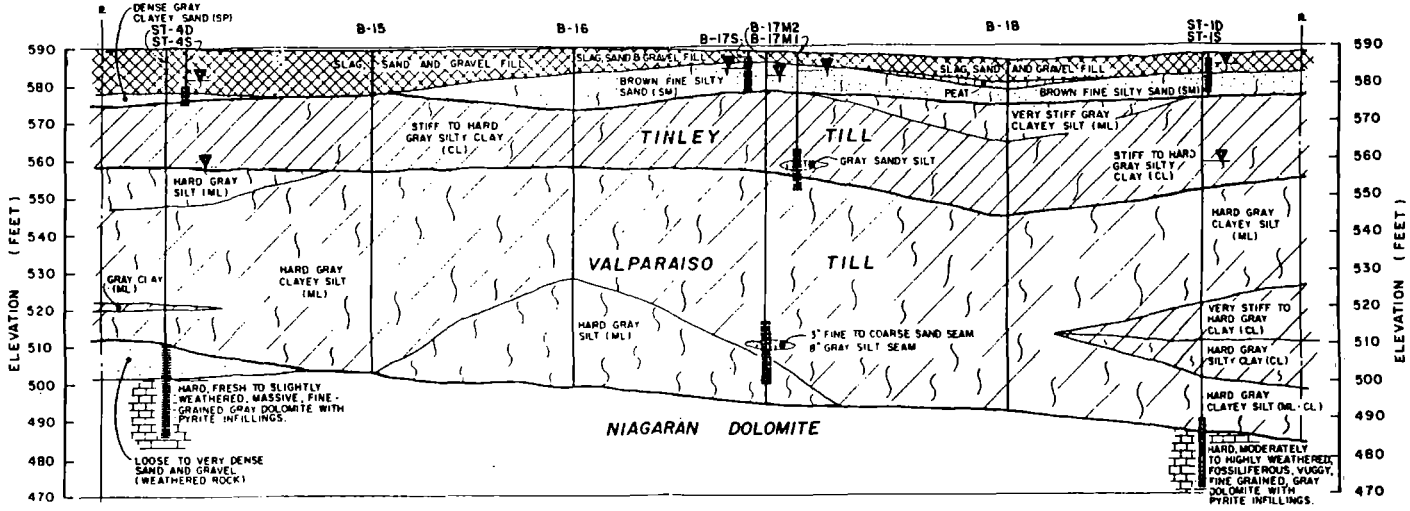
GENERALIZED SITE PROFILE A-A
INTERLAKE SITE
CHICAGO, ILLINOIS
PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Canonie Engineers

DATE: 5/27/82 | FIGURE 14 | DRAWING NUMBER

DRAWN BY	R.J.N. 5/27/82	CHECKED BY		DRAWING NUMBER 81-099 E6
		APPROVED BY		

DRAWN BY	R.J.N.	CHECKED BY		DRAWING NUMBER	81-099 E 7
	5/28/82	APPROVED BY			

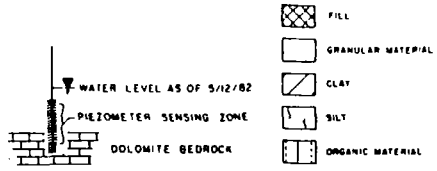


PROFILE B - B

HORIZONAL SCALE 200 0 200 ft

VERTICAL SCALE 20 0 20 ft

LEGEND



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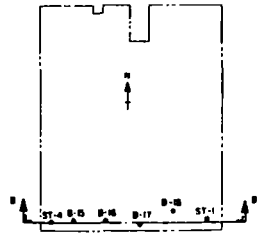
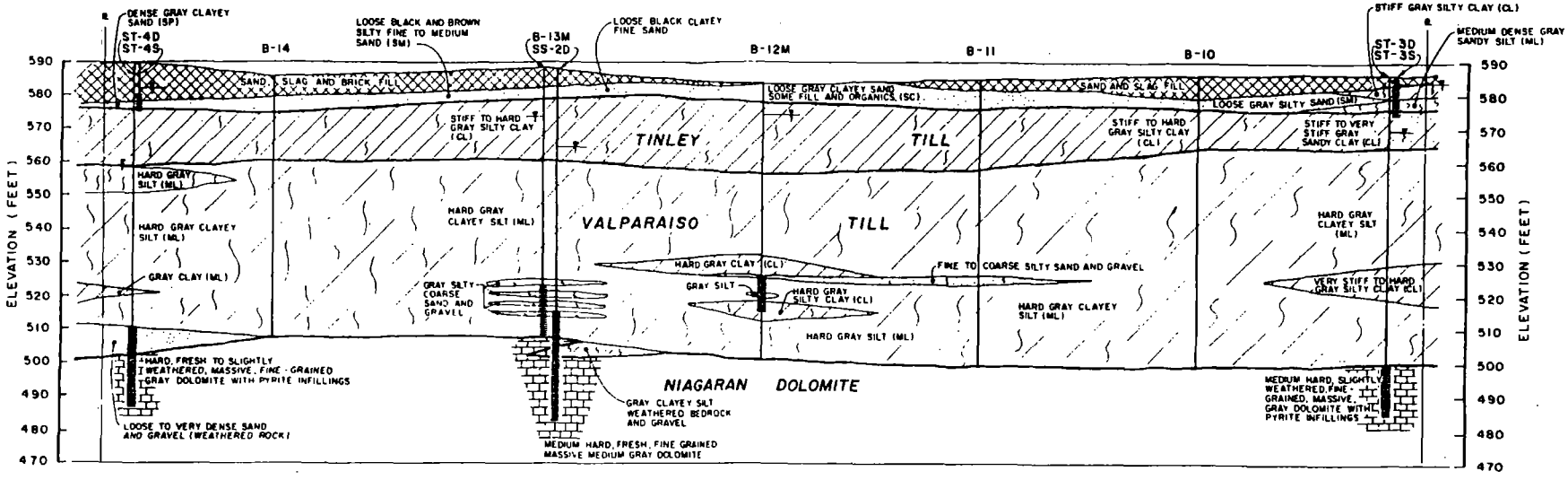


SITE PLAN

GENERALIZED SITE PROFILE B-B
INTERLAKE SITE
CHICAGO, ILLINOIS
PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Canonie Engineers

DATE 5/28/82	FIGURE 15	DRAWING NUMBER 81-099-E7
SCALE: AS SHOWN		

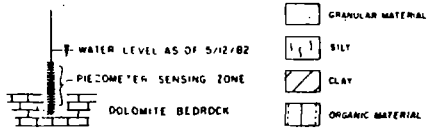


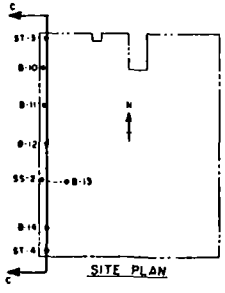
PROFILE C-C

HORIZONAL SCALE 100 0 200 ft

VERTICAL SCALE 20 0 20 ft

LEGEND





SITE PLAN

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GENERALIZED SITE PROFILE C-C
INTERLAKE SITE
CHICAGO, ILLINOIS
PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

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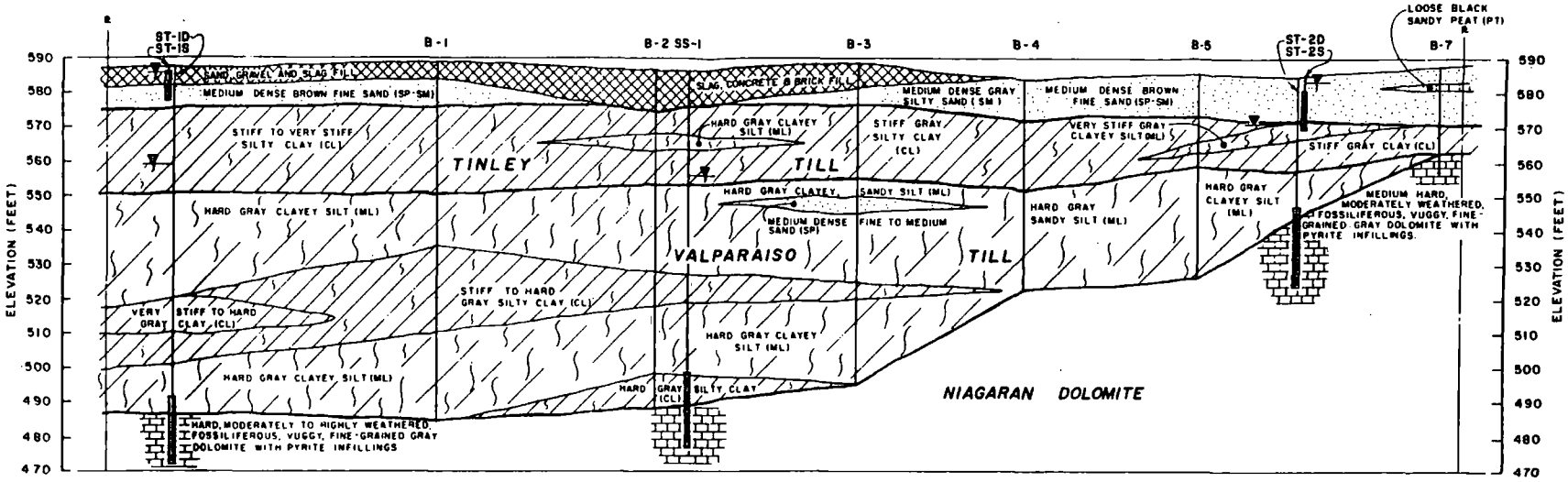
DATE: 5/28/82	FIGURE 16	DRAWING NUMBER
SCALE: AS SHOWN		81-099-E8

DRAWN BY	R.J.N.	CHECKED BY	APPROVED BY	DRAWING NUMBER 81-099 E8
	5/28/82			

DRAWN BY	R.G.D.	CHECKED BY		DRAWING NUMBER
	6/4/82	APPROVED BY		81-099-E9

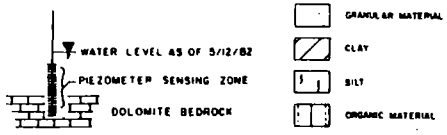


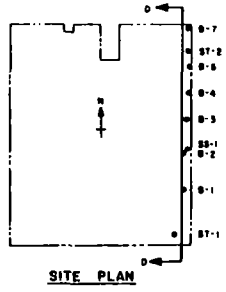
PROFILE D-D

HORIZONTAL SCALE 200 0 200 ft

VERTICAL SCALE 20 0 20 ft

LEGEND





SITE PLAN

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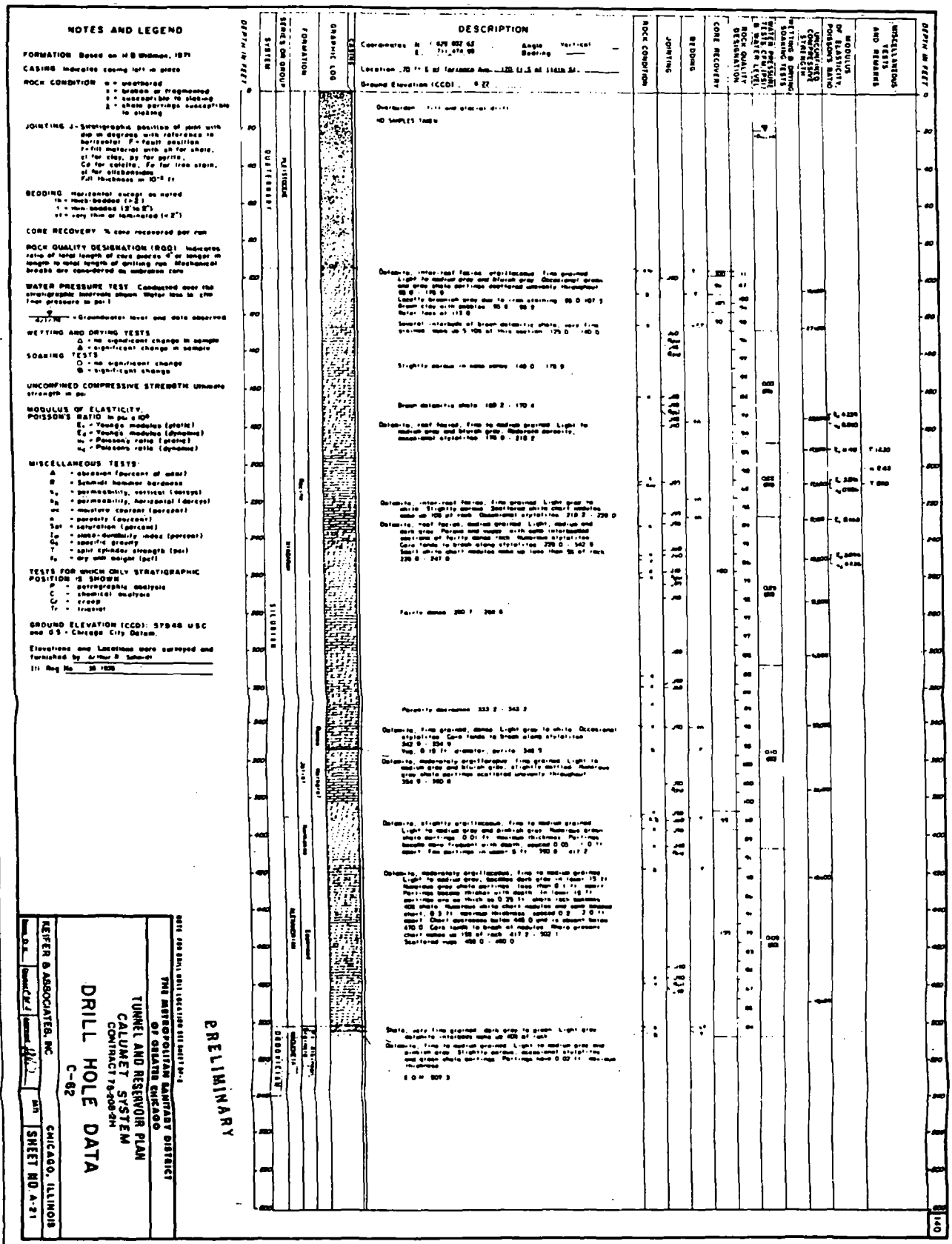
GENERALIZED SITE PROFILE D-D
INTERLAKE SITE
CHICAGO, ILLINOIS
PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Canonie Engineers

DATE 6/4/82	FIGURE 17	DRAWING NUMBER
SCALE AS SHOWN		81-099-E9



For Boring Location See Figure 5

Ground Elevation: Chicago City Datum
Vertical Scale

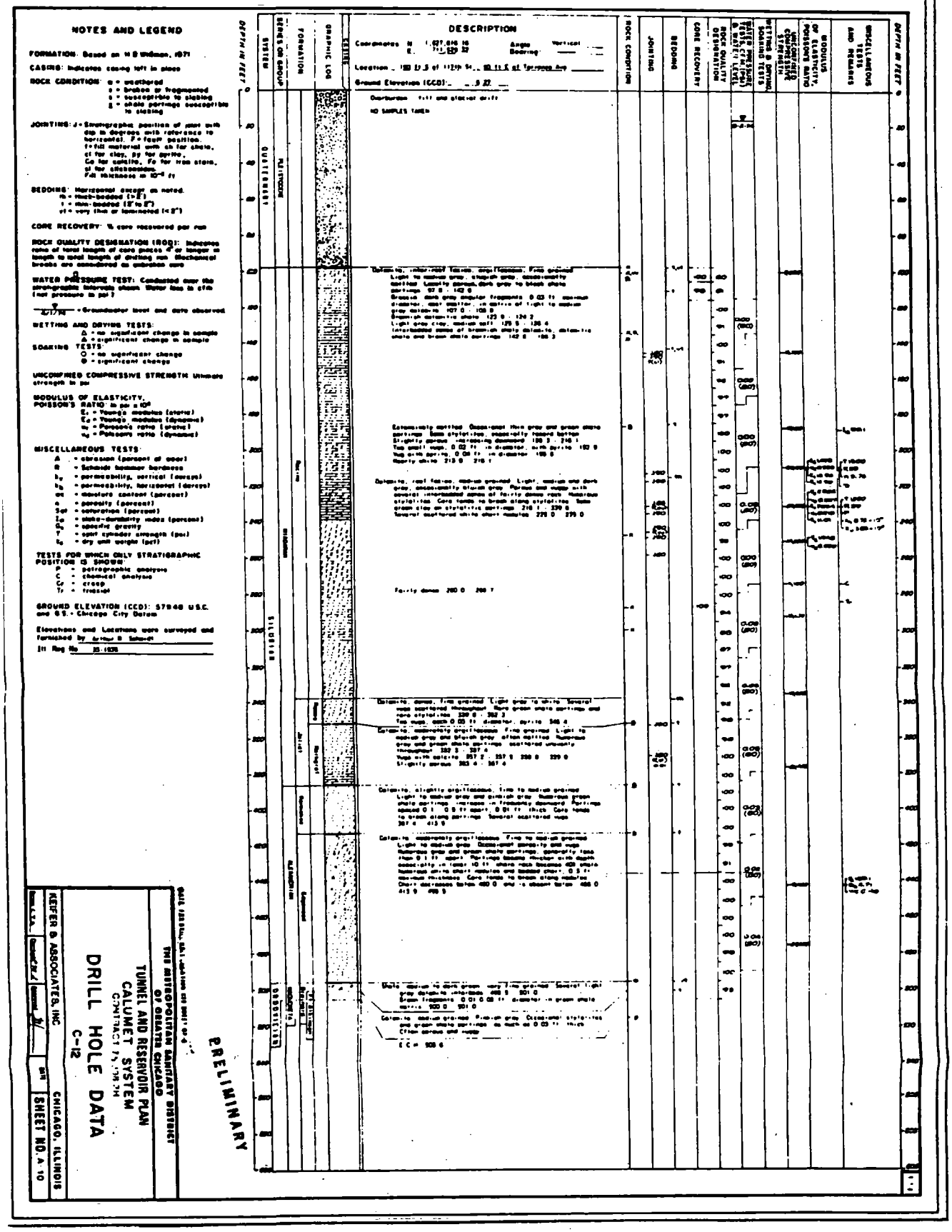
0 20 40 60 80 100

Reference: From "Preliminary Design Report for the Calumet System of the Tunnel and Reservoir Plan", prepared for the Metropolitan

Figure 18

Chicago Deep Tunnel Boring Log
Interlake Site
Chicago, IL

Canonie Engineers



For Boring Location See Figure 5

Ground Elevation: Chicago City Datum
Vertical Scale

0 20 40 60 80 100

Reference: From "Preliminary Design Report for the Calumet System of the Tunnel and Reservoir Plan", prepared for the Metropolitan

Figure 19

Chicago Deep Tunnel Boring Log
Interlake Site
Chicago, IL

Canonie Engineers

Interlake Wells

Attachment to May 25, 1989 Letter
to Timothy Murphy

Shallow Wells, 4" PVC	Well Depth from Ground Surface
ST-1S	10.5 feet
ST-2S	15 feet
ST-3S	12 feet
ST-4S	15 feet
B-17S	11.2 feet
B-22S	12.0 feet
B-23S	13 feet
B-26S	15 feet
Deep Wells, 2" PVC	
x ST-1D	115.5 feet
x ST-2D	60.5 feet
x ST-3D	101.5 feet
x ST-4D	103.5 feet
Deep Wells, 4" PVC	
x SS-1D	111 feet
x SS-2D	100 feet

FIGURE 3

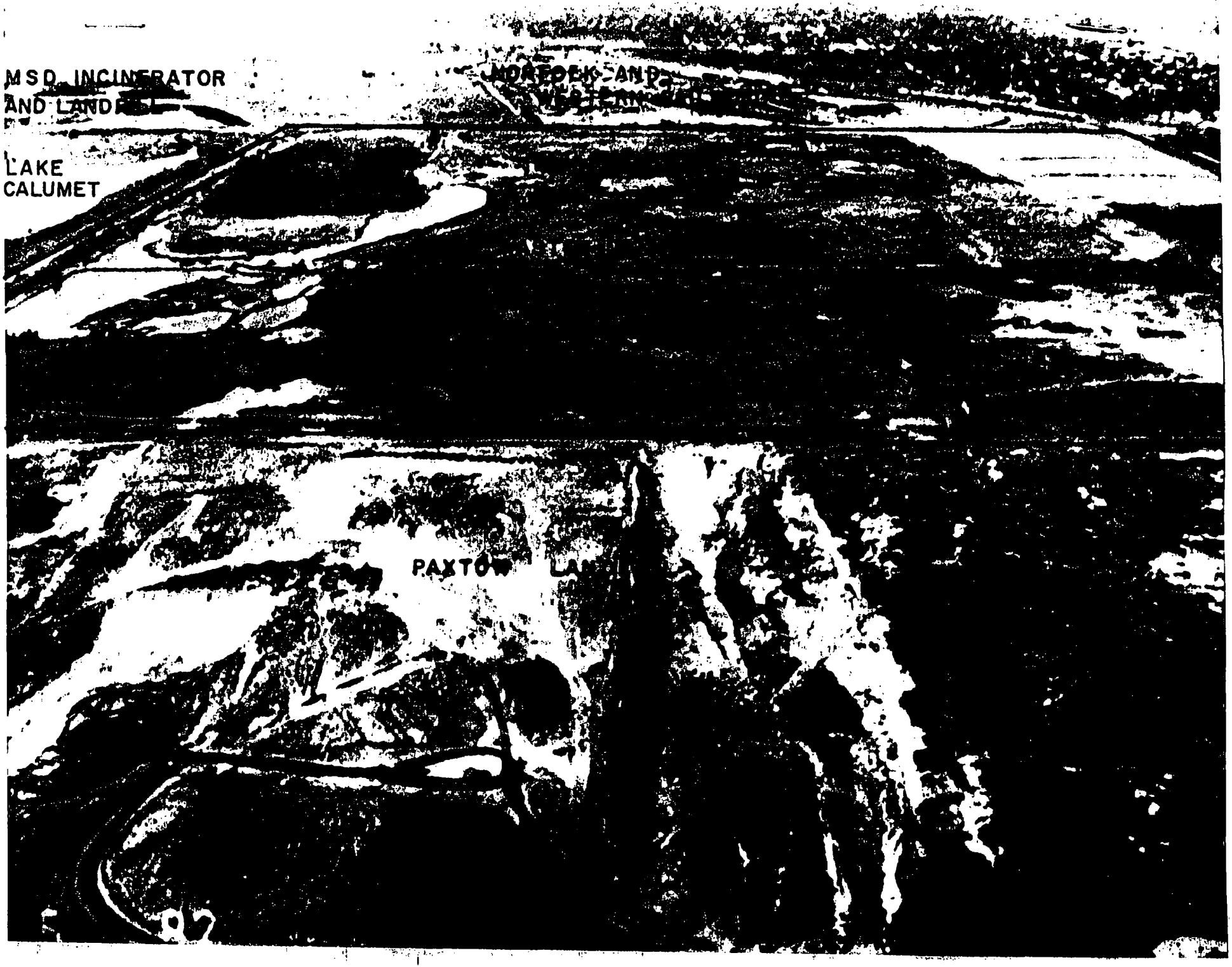
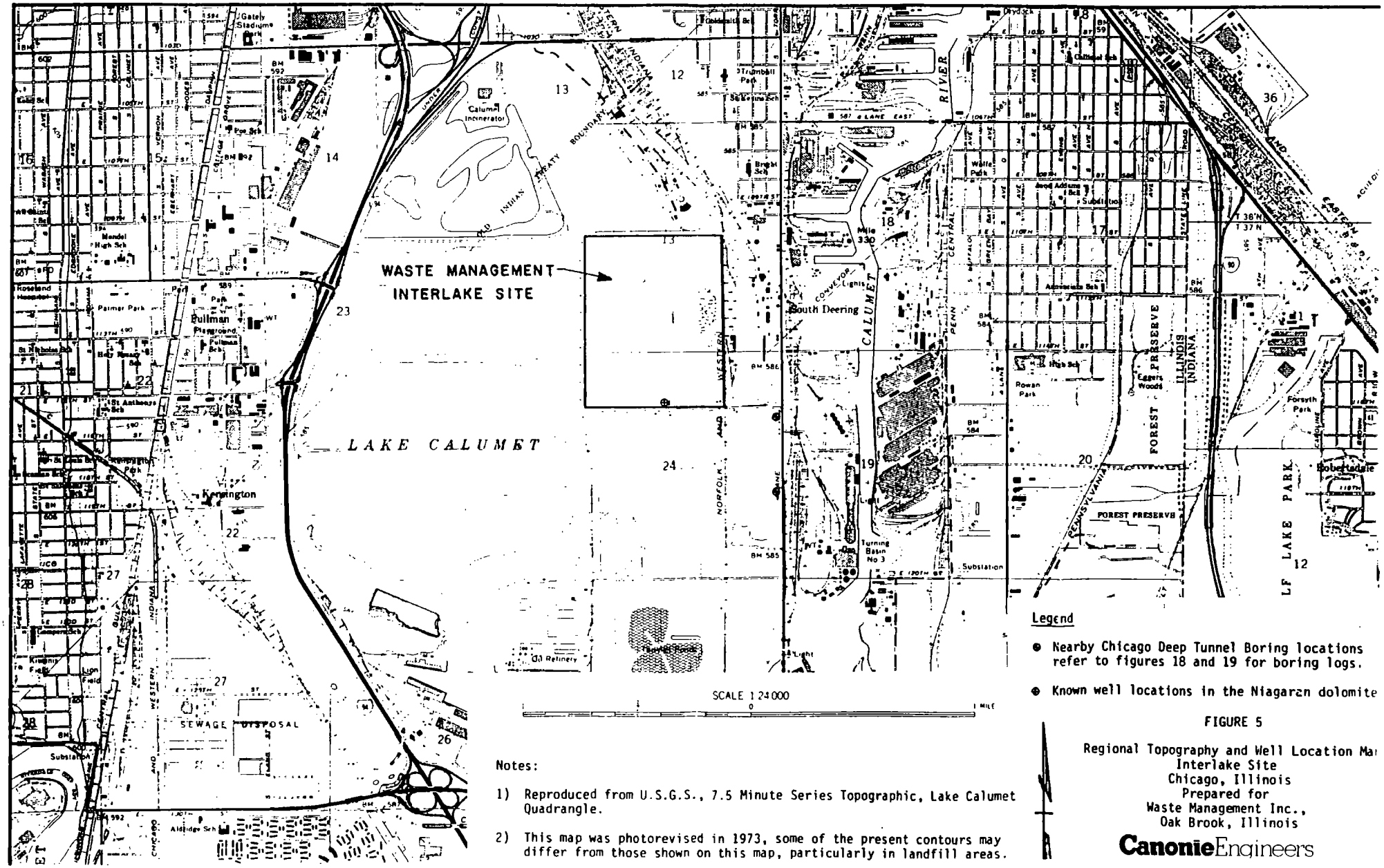


FIGURE 4



Legend

- Nearby Chicago Deep Tunnel Boring locations refer to figures 18 and 19 for boring logs.
- Known well locations in the Niagaran dolomite

Notes:

1) Reproduced from U.S.G.S., 7.5 Minute Series Topographic, Lake Calumet Quadrangle.

2) This map was photorevised in 1973, some of the present contours may differ from those shown on this map, particularly in landfill areas.

FIGURE 5

Regional Topography and Well Location Ma
Interlake Site
Chicago, Illinois
Prepared for
Waste Management Inc.,
Oak Brook, Illinois

Canonie Engineers

APPENDIX C

PHYSICAL SOIL TESTING OPERATIONS

- Physical Soil Testing Procedures
- Test Results
    - Summary Sheets
    - Grain Size Test
    - Compaction Test
    - Permeability Test

LABORATORY TESTING PROCEDURES

Soil Classification

Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply his past experience to current problems. In our investigations, samples obtained during drilling operations were examined in our laboratory and visually classified by an engineer or geologist. The soils were classified according to consistency (based on number of blows from standard penetration tests), color, and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary, grain size tests and plasticity tests. Using these test results, the soil can be classified according to the AASHO or Unified Classification Systems (ASTM D-2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Grain Size Tests

Grain Size Tests are performed to determine the soil classification and the grain size distribution. The soil samples are prepared for testing according to ASTM D-421 (dry preparation) or ASTM D-2217 (wet preparation). The grain size distribution of soils coarser than a number 200 sieve (0.074 mm opening) is determined by passing the samples through a standard set of nested sieves. Materials passing the number 200 sieve are suspended in water and the grain size distribution calculated from the measured settlement rate. These tests are conducted in accordance with ASTM D-422.

Plasticity Tests

Plasticity tests are performed to determine the soil classification and plasticity characteristics. The soil plasticity characteristics are defined by the Plastic Index (PI) and the Liquid Limit (LL). The PI is related to the volume changes which occur in confined soils beneath foundations. The PI and LL are determined in accordance with ASTM D-424 and D-423, respectively.

Physical Soil Properties

The in-place physical properties are described by the specific gravity, wet unit weight, moisture content, dry unit weight, void ratio, and percent saturation of the soil. The specific gravity and moisture content are determined according to ASTM D-854 and D-2216, respectively. The wet unit weight is found by obtaining a known volume of the soil and dividing the wet sample weight by the known volume. The dry unit weight, void ratio, and percent saturation are calculated values.

Compaction Tests

Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil, and decrease the permeability of the soil.

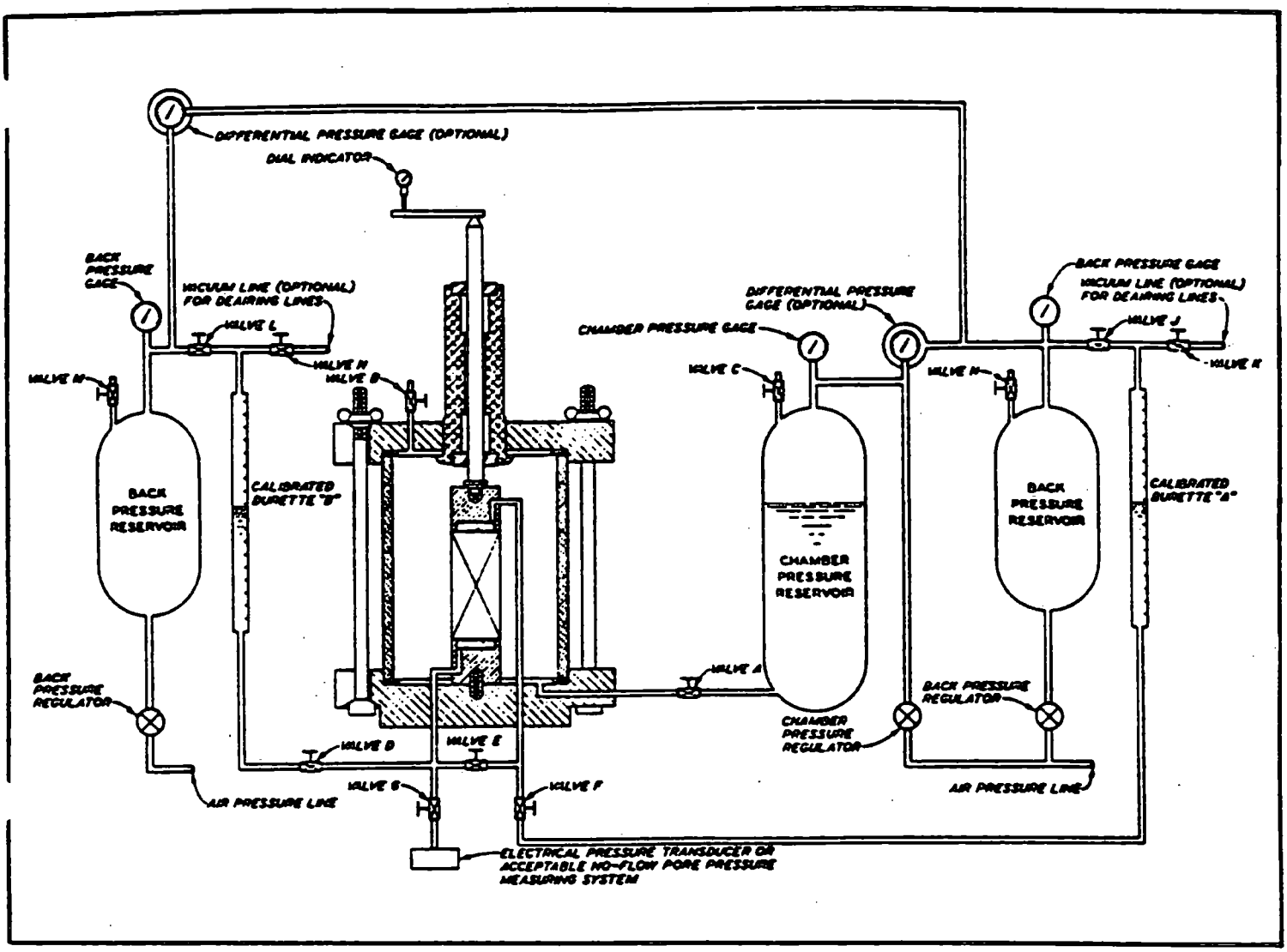
The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM Specifications D-698 and D-1557, respectively. For conditions and expected loadings for this project, we have run the Modified Proctor compaction test. These tests were run on composite samples from the Valparaiso and

Tinley tills. The Modified Proctor test procedure consists of preparing the sample by sieving through the No. 4 sieve and placing it in a four-inch diameter mold in five layers. Each layer is compacted with 25 blows from a 10-pound hammer falling 18 inches. The density and moisture contents are then determined. This test is rerun for varying moisture contents and the resulting curves are presented on the following compaction test results forms.

Permeability Tests

Constant-head permeability tests with back pressure were conducted as part of this investigation. This test is conducted in a triaxial cell and allows variation in the confining pressure to model in situ conditions, back pressure saturation of fine-grained soils, and variation in the permeant driving head through the sample. Our experience indicates this permeability testing procedure provides the most reliable results for fine-grained soils of low permeability.

The standard reference for this testing procedure is the Army Corps of Engineers' Laboratory Soils Testing Manual, 1970, Appendix VII, Method 7. A generalized schematic diagram of the testing apparatus is shown on the following page.



Reference: Army Corps of Engineers, 1970, Laboratory Soils Testing Manual, EM1110-2-1906

GENERALIZED SCHEMATIC DIAGRAM OF THE CONSTANT-HEAD PERMEABILITY TESTING APPARTUS WITH BACK PRESSURE CAPABILITY

VALPARAISO TILL
PHYSICAL SOIL DATA SUMMARY SHEET
WASTE MANAGEMENT - INTERLAKE SITE
CES 81-099

Boring No.	Sample Depth (ft.)	Sample Type	Unified Soil Classification	Unit Weight pcf		% Finer No. 200	Specific Gravity	Void Ratio	Natural Moisture %	Atterberg Limits		Permeability (cm/sec)	Other Tests
				Wet	Dry					L.L.	P.I.		
ST-1	78.5-80.0	SS	ML-CL	--	--	82	--	--	14	29	8	--	G.S.
ST-3	53.5-55.0	SS	ML-CL	--	--	69	--	--	13	24	6	--	G.S.
ST-4	63.5-64.0	ST	ML-CL	137	120	89	--	--	15	21	7	5.0×10^{-9}	G.S. P.
ST-4	68.5-70.0	SS	ML	--	--	--	--	--	21	28	4	--	--
SS-1	54.0-54.5	ST	ML	139	125	89	--	--	12	23	3	9.0×10^{-9}	G.S. P.
B-1	55.0-56.5	SS	ML	--	--	88	--	--	17	31	5	--	G.S.
B-2	65.0-66.5	SS	CL	--	--	90	--	--	22	36	13	--	G.S.
B-3	65.0-66.5	SS	CL	--	--	71	--	--	18	27	10	--	G.S.
B-5	38.5-40.0	SS	ML-CL	--	--	71	--	--	12	24	6	--	G.S.

G.S. - See GRAIN SIZE SUMMARY SHEET
P. - See PERMEABILITY SUMMARY SHEET
C. - See COMPACTION TEST RESULTS

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VALPARAISO TILL
PHYSICAL SOIL DATA SUMMARY SHEET
WASTE MANAGEMENT - INTERLAKE SITE
CES 81-099

Boring No.	Sample Depth (ft.)	Sample Type	Unified Soil Classification	Unit Weight pcf		% Finer No. 200	Specific Gravity	Void Ratio	Natural Moisture %	Atterberg Limits		Permeability (cm/sec)	Other Tests
				Wet	Dry					L.L.	P.I.		
B-8	33.5-35.0	SS	ML-CL	--	--	67	--	--	15	23	6	--	G.S.
B-8	38.5-40.0	SS	ML-CL	--	--	69	--	--	15	23	5	--	G.S.
B-9	23.5-25.0	SS	ML	--	--	64	--	--	14	23	N.P.	--	G.S.
B-9	48.5-50.0	SS	ML-CL	--	--	74	--	--	15	25	5	--	G.S.
B-12	68.5-70.0	SS	CL	--	--	89	--	--	18	36	17	--	G.S.
B-12	73.5-75.0	SS	ML	--	--	90	--	--	19	25	N.P.	--	G.S.
B-13	53.5-55.0	SS	ML	--	--	91	--	--	21	20	N.P.	--	G.S.
B-13	63.5-65.0	SS	CL	--	--	95	--	--	13	27	10	--	G.S.
B-14	60.0-61.5	SS	ML	--	--	97	--	--	24	25	1	--	G.S.

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Boring No.	Sample Depth (ft.)	Sample Type	Unified Soil Classification	Unit Weight pcf		% Finer No. 200	Specific Gravity	Void Ratio	Natural Moisture %	Atterberg Limits		Permeability (cm/sec)	Other Tests
				Wet	Dry					L.L.	P.I.		
B-15	33.5-35.0	SS	ML	--	--	69	--	--	17	19	N.P.	--	G.S.
B-15	43.5-45.0	SS	CL	--	--	73	--	--	14	26	11	--	G.S.
B-15	68.5-70.0	SS	ML-CL	--	--	71	--	--	12	25	6	--	G.S.
B-16	63.5-65.0	SS	ML	--	--	89	--	--	21	23	N.P.	--	G.S.
B-17	33.5-35.0	SS	ML	--	--	82	--	--	--	--	N.P.	--	G.S.
B-17M2	83.5-84.3	SS	ML	--	--	95	--	--	17	33	10	--	G.S.
B-19	33.5-35.0	SS	ML-CL	--	--	66	--	--	12	21	3	--	G.S.
B-20	33.5-35.0	SS	ML	--	--	99	--	--	--	--	N.P.	--	G.S.
B-20	68.5-70.0	SS	GM	--	--	46	--	--	8	22	6	--	G.S.

G.S. - See GRAIN SIZE SUMMARY SHEET
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VALPARAISO TILL
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WASTE MANAGEMENT - INTERLAKE SITE
CES 81-099

Boring No.	Sample Depth (ft.)	Sample Type	Unified Soil Classification	Unit Weight pcf		% Finer No. 200	Specific Gravity	Void Ratio	Natural Moisture %	Atterberg Limits		Permeability (cm/sec)	Other Tests
				Wet	Dry					L.L.	P.I.		
B-22	53.5-54.3	SS	ML	--	--	53	--	--	9	18	N.P.	--	G.S.
B-23	18.5-20.0	SS	ML	--	--	81	--	--	18	33	5	--	G.S.
B-23	23.5-25.0	SS	ML	--	--	69	--	--	16	30	6	--	G.S.
B-23	43.5-45.0	SS	ML-CL	--	--	68	--	--	13	25	5	--	G.S.
B-24	48.5-50.0	SS	ML-CL	--	--	71	--	--	12	25	8	--	G.S.
B-24	68.5-70.0	SS	ML-CL	--	--	74	--	--	27	22	4	--	G.S.
B-26	48.5-50.0	SS	ML	--	--	73	--	--	12	24	3	--	G.S.
B-13 B-17	--	SS	ML-CL	136	120	78	--	--	13	23	4	5.0×10^{-8}	G.S. P.,C.

G.S. - See GRAIN SIZE SUMMARY SHEET
P. - See PERMEABILITY SUMMARY SHEET
C. - See COMPACTION TEST RESULTS

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TINLEY TILL
PHYSICAL SOIL DATA SUMMARY SHEET
WASTE MANAGEMENT - INTERLAKE SITE
CES 81-099

Boring No.	Sample Depth (ft)	Sample Type	Unified Soil Classification	Unit Weight pcf		% Finer No. 200	Specific Gravity	Void Ratio	Natural Moisture %	Atterberg Limits		Permeability (cm/sec)	Other Tests
				Wet	Dry					L.L.	P.I.		
ST-1	33.9-34.4	ST	CL	122	98	97	-	-	24	44	20	1.5×10^{-8}	G.S. P.
ST-1	34.5-35.0	ST	CL	122	97	97	-	-	27	44	20	3.0×10^{-8}	G.S. P.
ST-2	13.5-15.0	SS	ML	-	-	72	-	-	17	26	4	-	G.S.
ST-2	24.6-25.1	ST	CL with SM pocket in sample	134	108	73	-	-	24	-	-	5.0×10^{-5}	G.S. P.
ST-3	18.5-20.0	SS	CL	-	-	82	-	-	19	34	14	-	G.S.
B-2	20.0-21.5	SS	ML	-	-	83	-	-	23	29	N.P.	-	G.S.
B-4	23.5-25.0	SS	ML	-	-	87	-	-	22	35	4	-	G.S.
B-6	18.5-20.0	SS	ML-CL	-	-	72	-	-	12	26	5	-	G.S.
B-7	23.5-25.0	SS	ML-CL	-	-	66	-	-	12	25	6	-	G.S.

G.S. - See GRAIN SIZE SUMMARY SHEET
P. - See PERMEABILITY SUMMARY SHEET
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TINLEY TILL
PHYSICAL SOIL DATA SUMMARY SHEET
WASTE MANAGEMENT - INTERLAKE SITE
CES 81-099

Boring No.	Sample Depth (ft.)	Sample Type	Unified Soil Classification	Unit Weight pcf		% Finer No. 200	Specific Gravity	Void Ratio	Natural Moisture %	Atterberg Limits		Permeability (cm/sec)	Other Tests
				Wet	Dry					L.L.	P.I.		
B-12	8.5-10.0	SS	CL	-	-	75	-	-	18	28	10	-	G.S.
B-15	19.7-20.2	ST	CL	117	88	99	-	-	19	45	21	9.0×10^{-9}	G.S. P.
B-18	13.5-15.0	SS	ML-CL	-	-	84	-	-	18	27	5	-	G.S.
B-18	23.5-25.0	SS	CL	-	-	61	-	-	13	26	7	-	G.S.
B-22	23.5-25.0	SS	CL	-	-	90	-	-	23	36	17	-	G.S.
B-24	18.5-20.0	SS	ML-CL	-	-	80	-	-	21	32	8	-	G.S.
B-13 & B-17	-	SS	CL	130	112	93	-	-	17	32	9	6.6×10^{-9}	G.S. P.,C.

G.S. - See GRAIN SIZE SUMMARY SHEET
P. - See PERMEABILITY SUMMARY SHEET
C. - See COMPACTION TEST RESULTS

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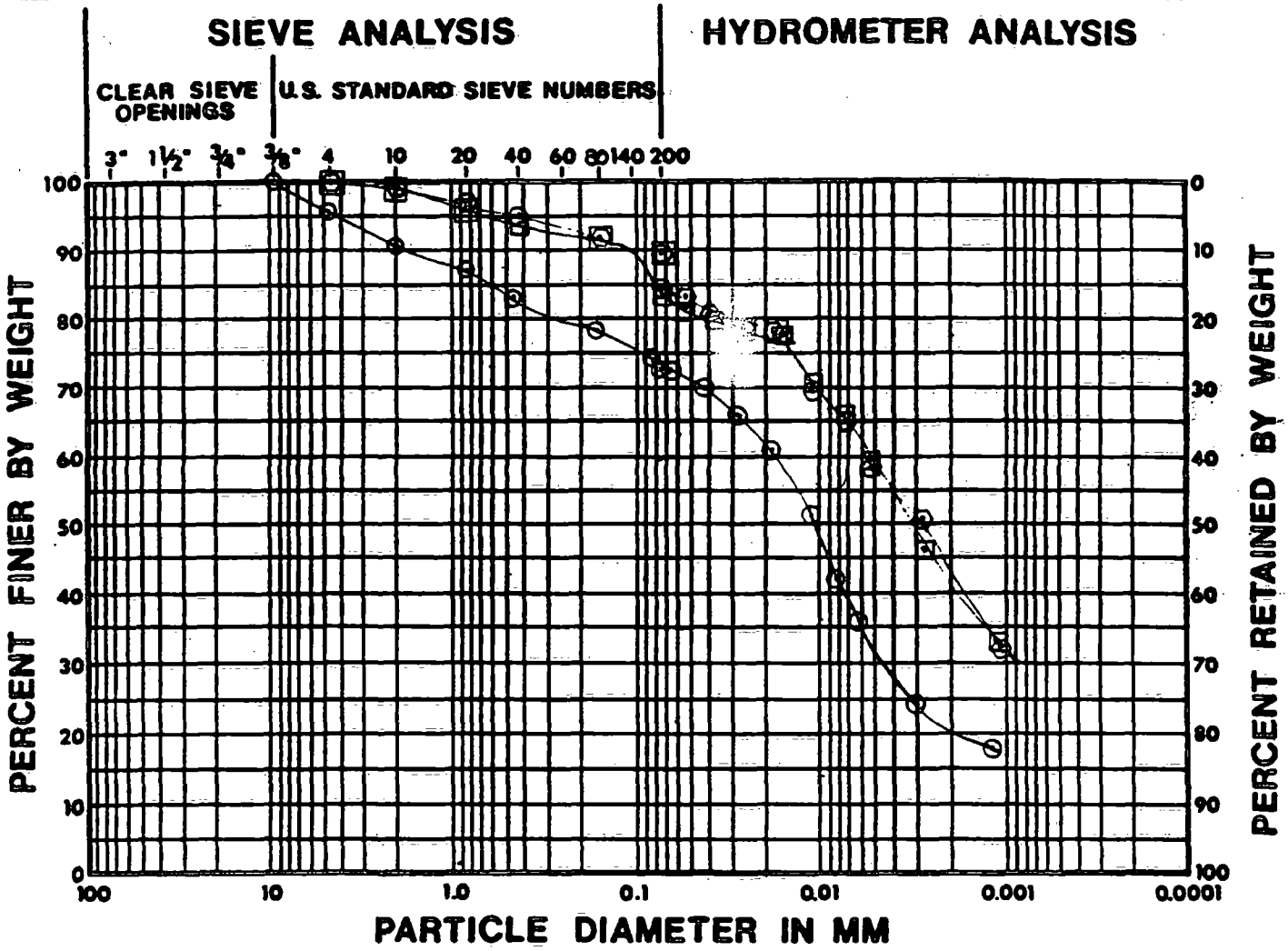

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	SS-1	S-2	54.0 to 54.5	Gray clayey silt w/Tr. sand	ML	22.9	19.5	11.8
⊖	ST-4	S-12	55.5 to 60.0	Gray clayey silt w/Tr. sand	ML	--	--	19.7
⊡	ST-1	S-6	28.5 to 30.0	Gray silty clay w/Tr. sand	CL	--	--	19.2

NOTES:

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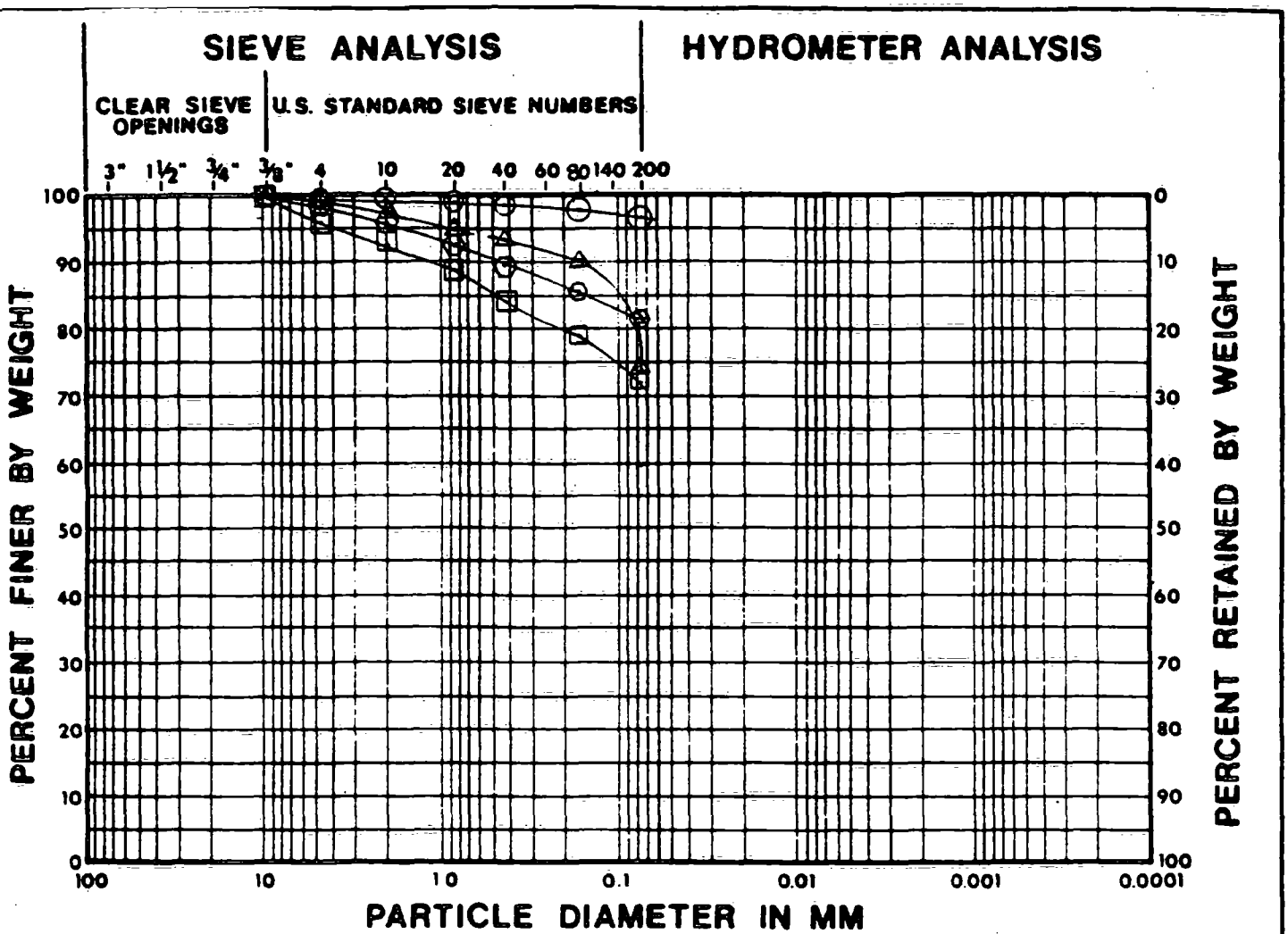

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W.%
⊙	ST-1	S-7A	33.9 to 34.4	Grey silty clay w/Tr sand & grvl	CL	43.5	23.2	23.8
⬡	ST-1	S-16	78.5 to 80.0	Grey clayey silt w/Tr sand & grvl	CL-ML	29.2	20.8	14.2
⊡	ST-2	S-3	13.5 to 15.0	Grey clayey silt w/Tr sand & grvl	ML	26.3	22.6	17.0
△	ST-2	S-5	24.6 to 25.1	Grey clayey silt w/some snd & gvl	CL	N.P.	N.P.	14.8

NOTES:

N.P. (Non-Plastic)

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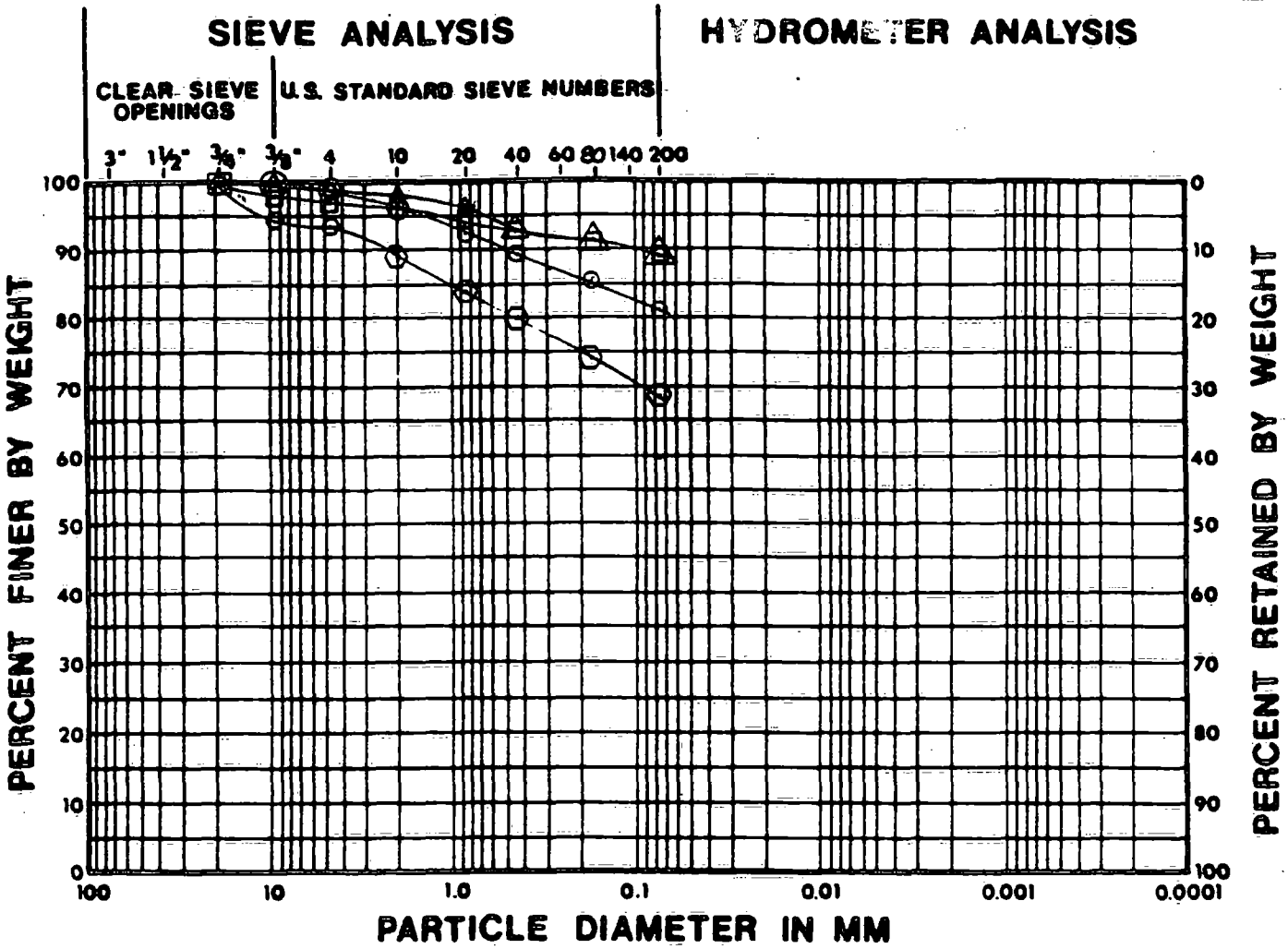

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	ST-3	S-4	18.5 to 20.0	Grey silty clay w/Tr. sand	CL	33.8	19.7	19.4
⊙	ST-3	S-11	53.5 to 55.0	Grey clayey silt w/Tr sand & grvl	CL-ML	24.3	17.9	12.9
⊡	ST-4	S-13	63.5 to 64.0	Grey clayey silt w/Tr sand & grvl	CL-ML	27.9	21.1	14.5
△	ST-4	S-14B	68.5 to 70.0	Grey clayey silt w/Tr. sand	ML	27.7	23.5	20.8

NOTES:

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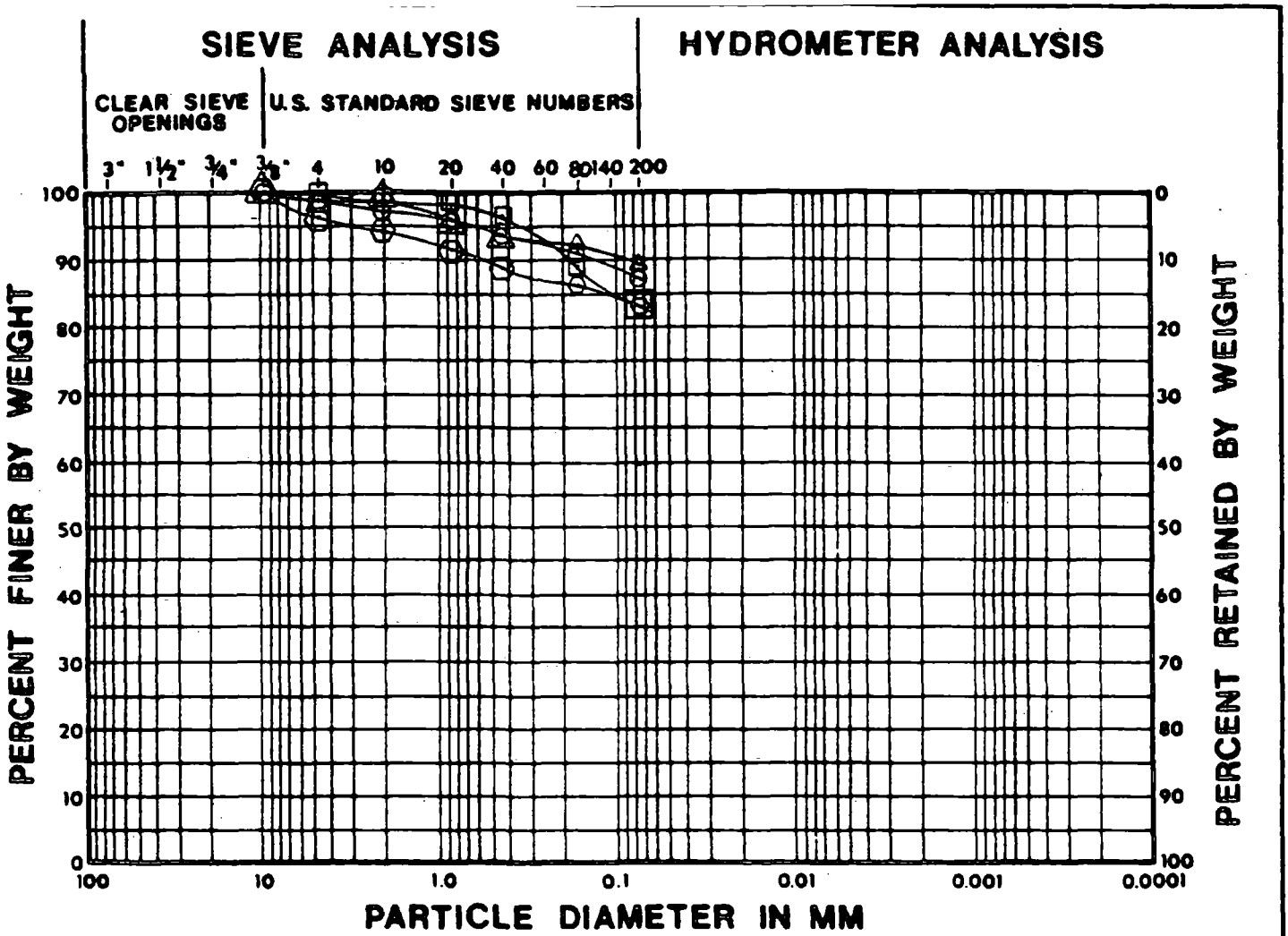

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W.%
⊙	B-1	S-11	55.0 to 56.5	Brn & gry silty clay w/Tr. sand	ML	30.7	25.4	16.8
⊙	B-1	S-12	60.0 to 61.5	Gray clayey silt w/Tr. sand	ML	29.1	22.7	17.5
⊡	B-2	S-4	20.0 to 21.5	Gray silt w/Tr. sand & Tr. clay	ML	29.1	N.P.	23.0
△	B-2	S-13	65.0 to 66.5	Gray silty clay w/Tr. sand	CL	35.9	22.6	22.1

NOTES:

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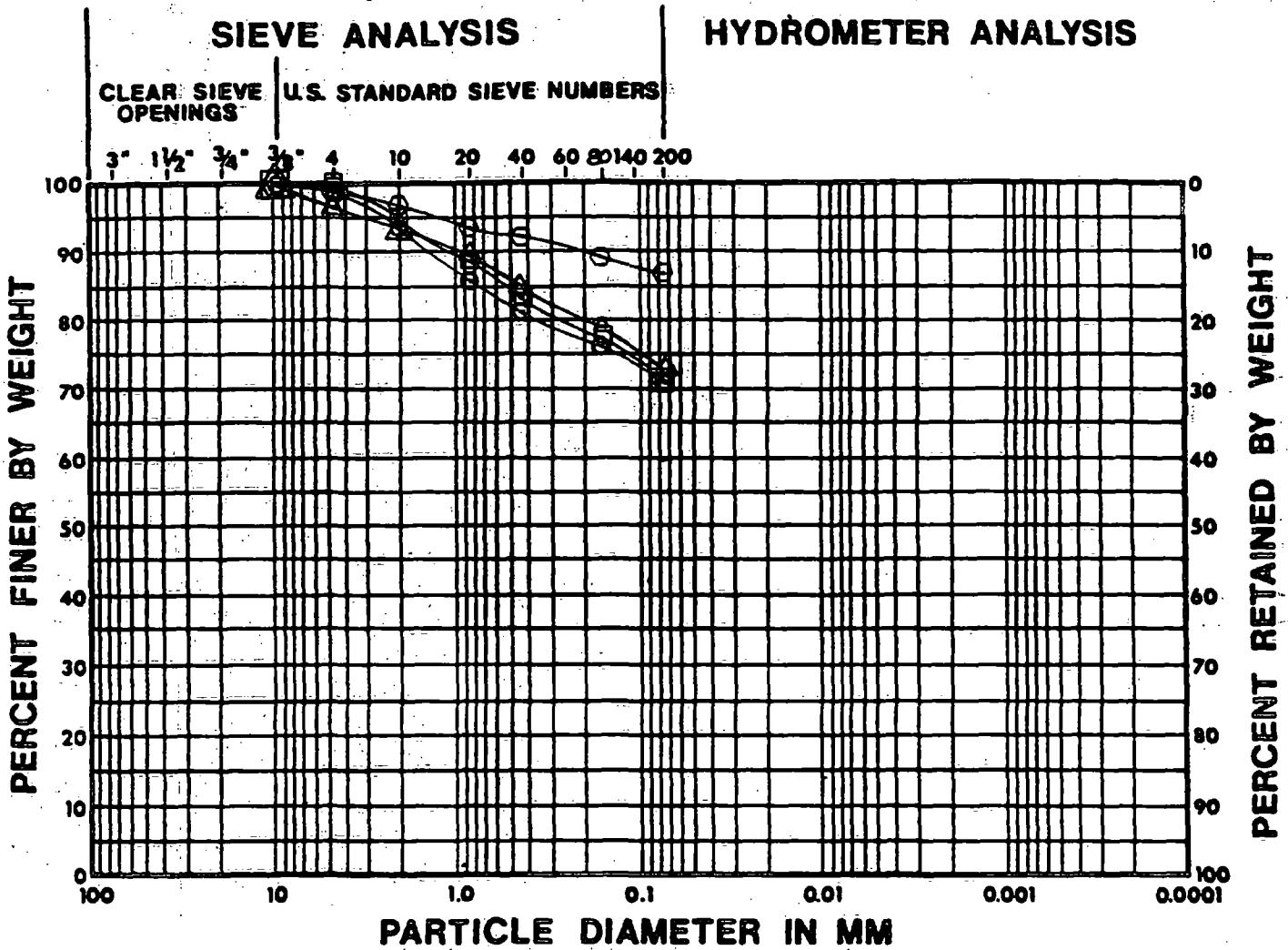

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	B-3	S-13	65.0 to 66.5	Grey silty clay w/Tr. sand	CL	26.8	17.3	17.6
⬡	B-4	S-5	23.5 to 25.0	Grey silty clay w/Tr. sand	ML	34.8	30.7	22.4
⊡	B-5	S-8	38.5 to 40.0	Grey clayey silt w/some sand	CL-ML	23.5	17.9	12.1
△	B-6	S-4	18.5 to 20.0	Grey clayey silt w/some sand	CL-ML	25.8	20.5	11.6

NOTES:

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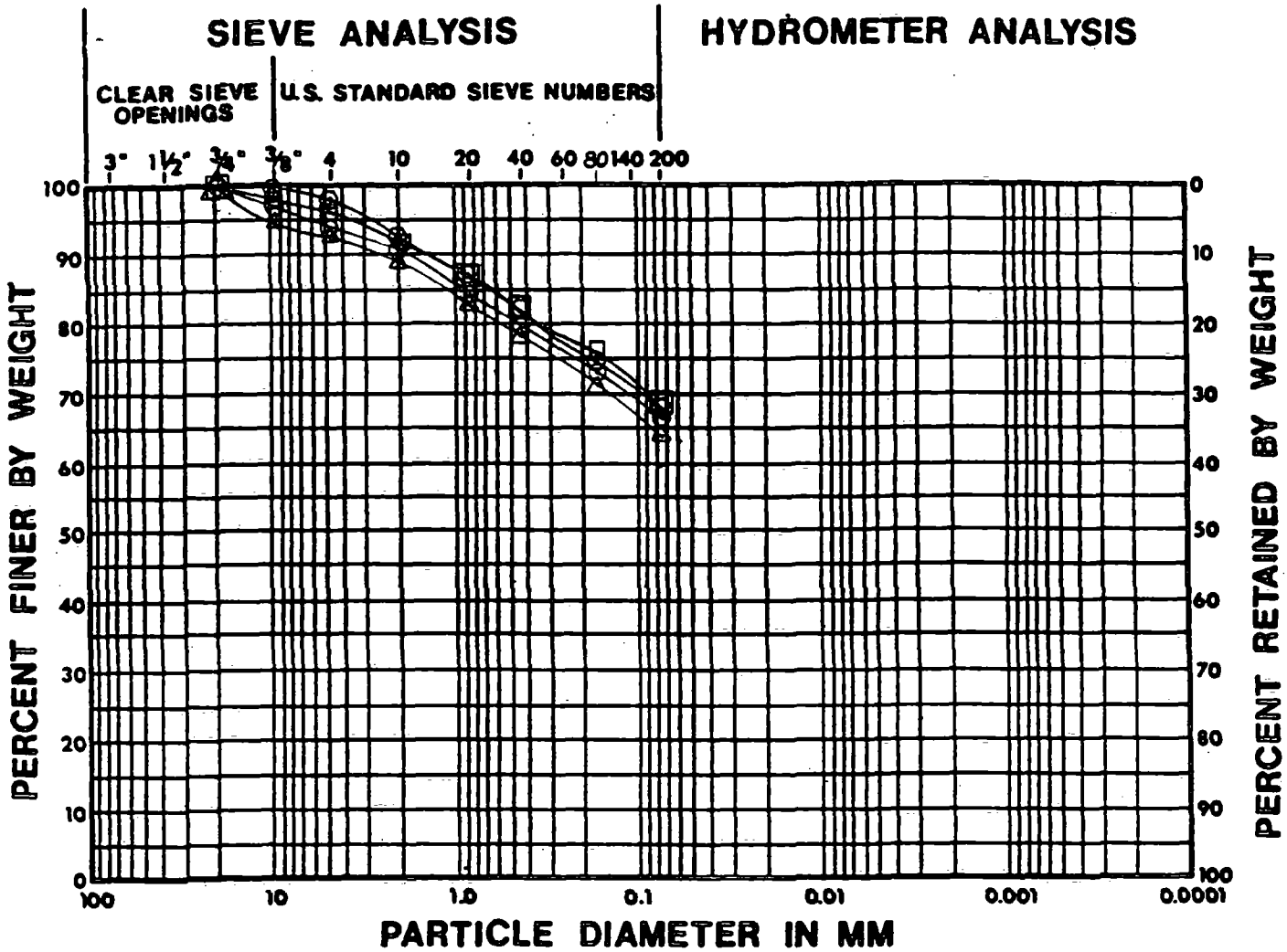

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	B-7	S-4	23.5 to 25.0	Grey clayey silt w/some snd & gvl	CL-ML	25.4	19.8	11.8
⊙	B-8	S-7	33.5 to 35.0	Grey silt & clay w/some sand	CL-ML	23.3	17.2	14.8
⊡	B-8	S-8	38.5 to 40.0	Grey clayey silt w/some snd & gvl	CL-ML	23.4	18.3	14.8
△	B-9	S-5	23.5 to 25.0	Grey silt w/some snd & grvl & w/tr. clay	ML	23.2	22.5	14.3

NOTES:

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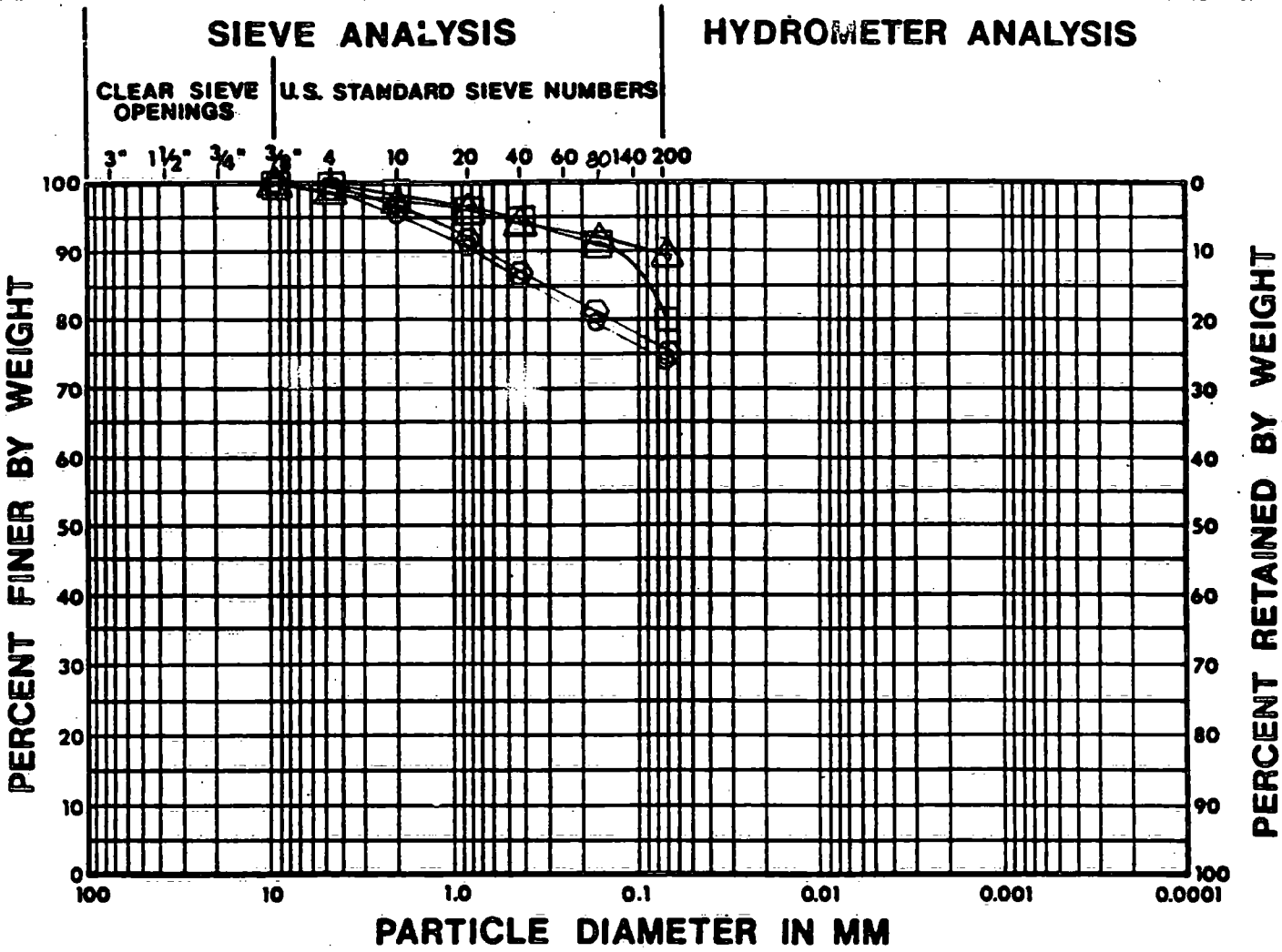

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	B-9	S-10	48.5 to 50.0	Gray clayey silt w/some sand	CL-ML	25.2	20.3	14.6
⊙	B-12	S-2	8.5 to 10.0	Gray silty clay w/some sand	CL	28.3	17.9	18.4
⊡	B-12	S-14	68.5 to 70.0	Gray silty clay w/Tr. of sand	CL	36.0	18.7	17.6
△	B-12	S-15	73.5 to 75.0	Gray silt w/Tr. sand	ML	24.5	23.1	19.4

NOTES:

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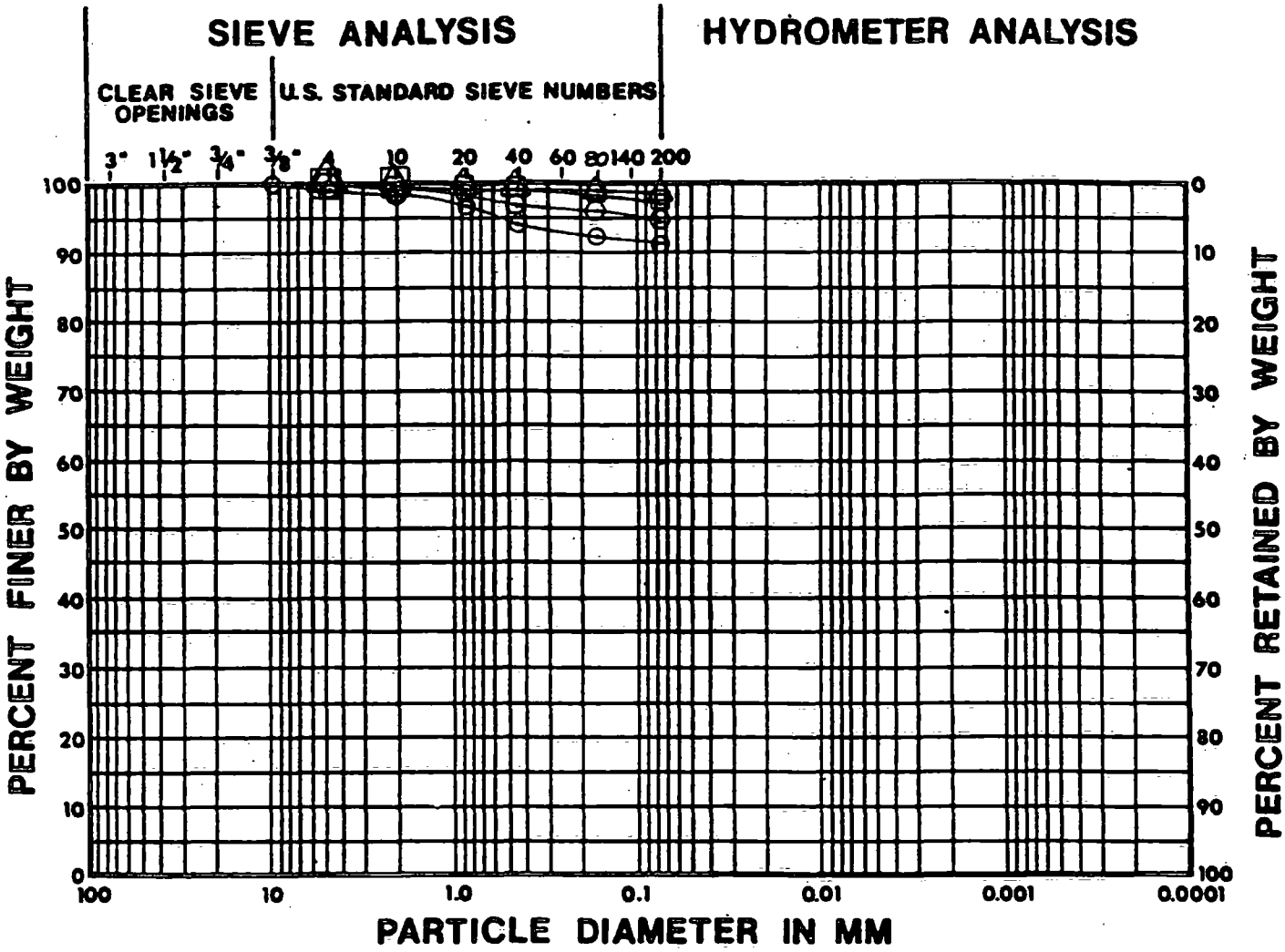

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W.%
⊙	B-13	S-11	53.5 to 55.0	Gray clayey silt w/Tr. sand	ML	20.2	19.9	21.2
⬡	B-13	S-13	63.5 to 65.0	Gray silty clay w/Tr. sand	CL	26.9	16.7	13.4
⊡	B-14	S-12	60.0 to 61.5	Gray clayey silt w/Tr. sand	ML	24.5	23.3	23.7
△	B-15	S-4	19.7 to 20.2	Gray silty clay w/Tr. sand	CL	44.6	23.4	33.3

NOTES:

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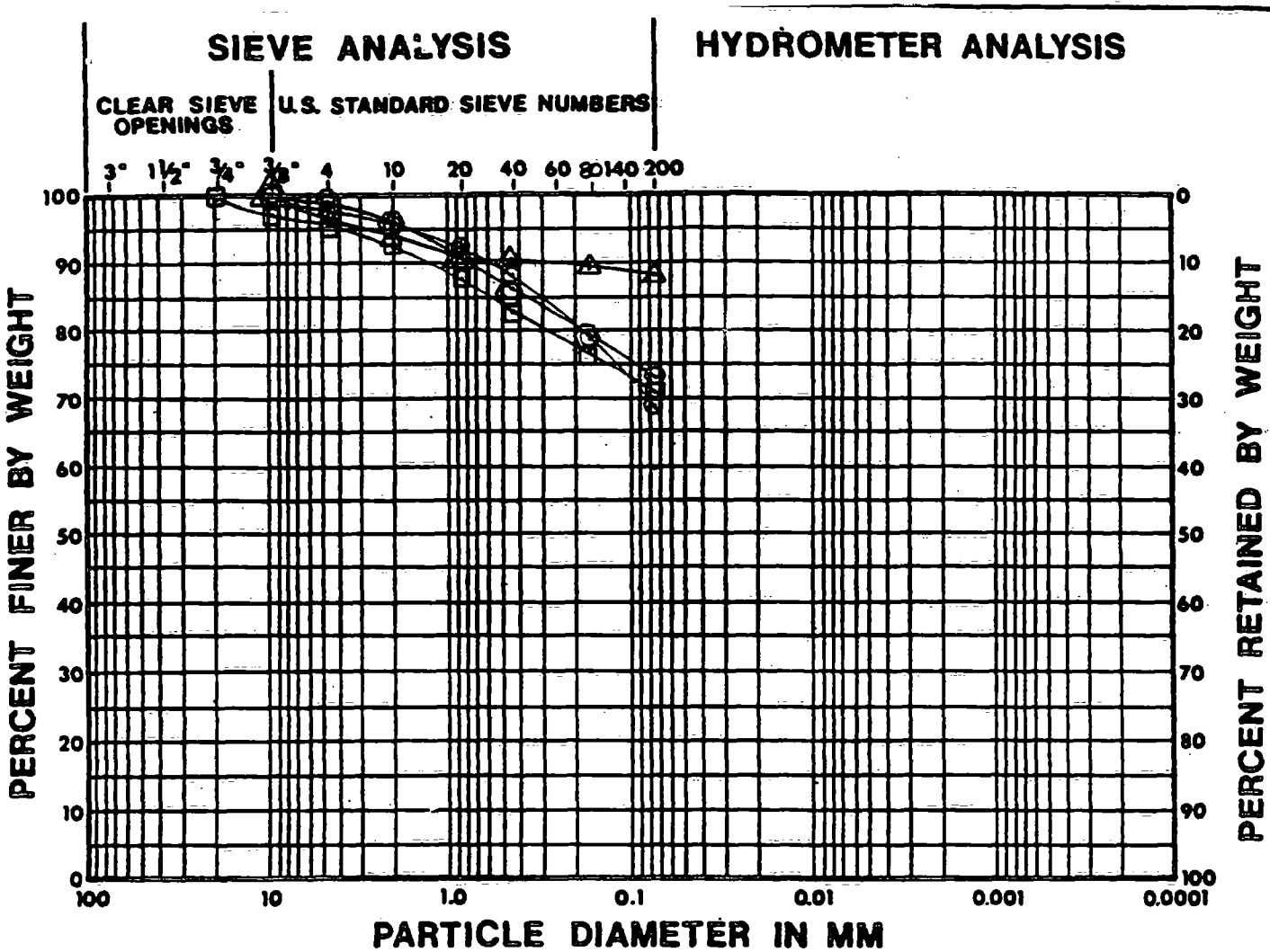

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	B-15	S-7	33.5 to 35.0	Gray silty clay w/some sand	ML	18.9	16.6	16.9
⊙	B-15	S-9	43.5 to 45.0	Gray silty clay w/some sand	CL	25.9	14.6	13.6
⊡	B-15	S-14	68.5 to 70.0	Gray clayey silt w/sm snd & grvl	CL-ML	25.0	18.7	11.9
△	B-16	S-13	63.5 to 65.0	Gray silt w/some sand	ML		N.P.	21.1

NOTES:

GRAIN SIZE DISTRIBUTION CURVE
INTERLAKE SITE
CHICAGO, ILLINOIS

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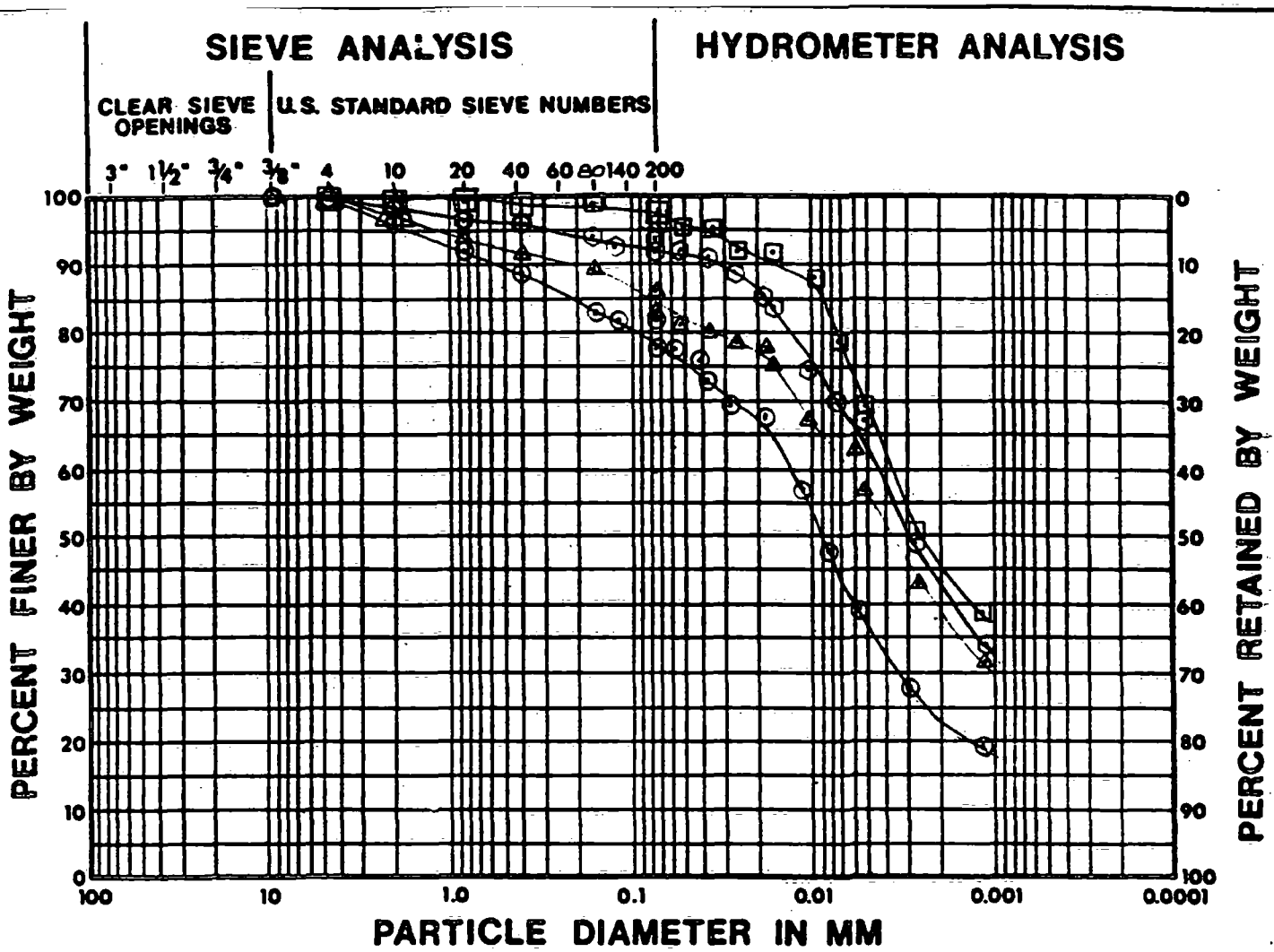
WASTE MANAGEMENT, INC.
OAK BROOK, IL

Canonie Engineers



COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	13&17	--	Varies	Clayey silt composite	ML-CL	22.9	18.6	13.1
⬡	13&17	--	Varies	Silty clay composite	CL	32.0	23.3	16.6
⊡	B-17M2	--	83.5 to 84.25	Gray silty clay w/Tr. fine sand	CL	33.4	23.5	22.1
△	B-15	S-5	23.5 to 25.0	Gray clay w/Tr. of silt	CL	--	--	22.6

NOTES:

GRAIN SIZE DISTRIBUTION CURVE
INTERLAKE SITE
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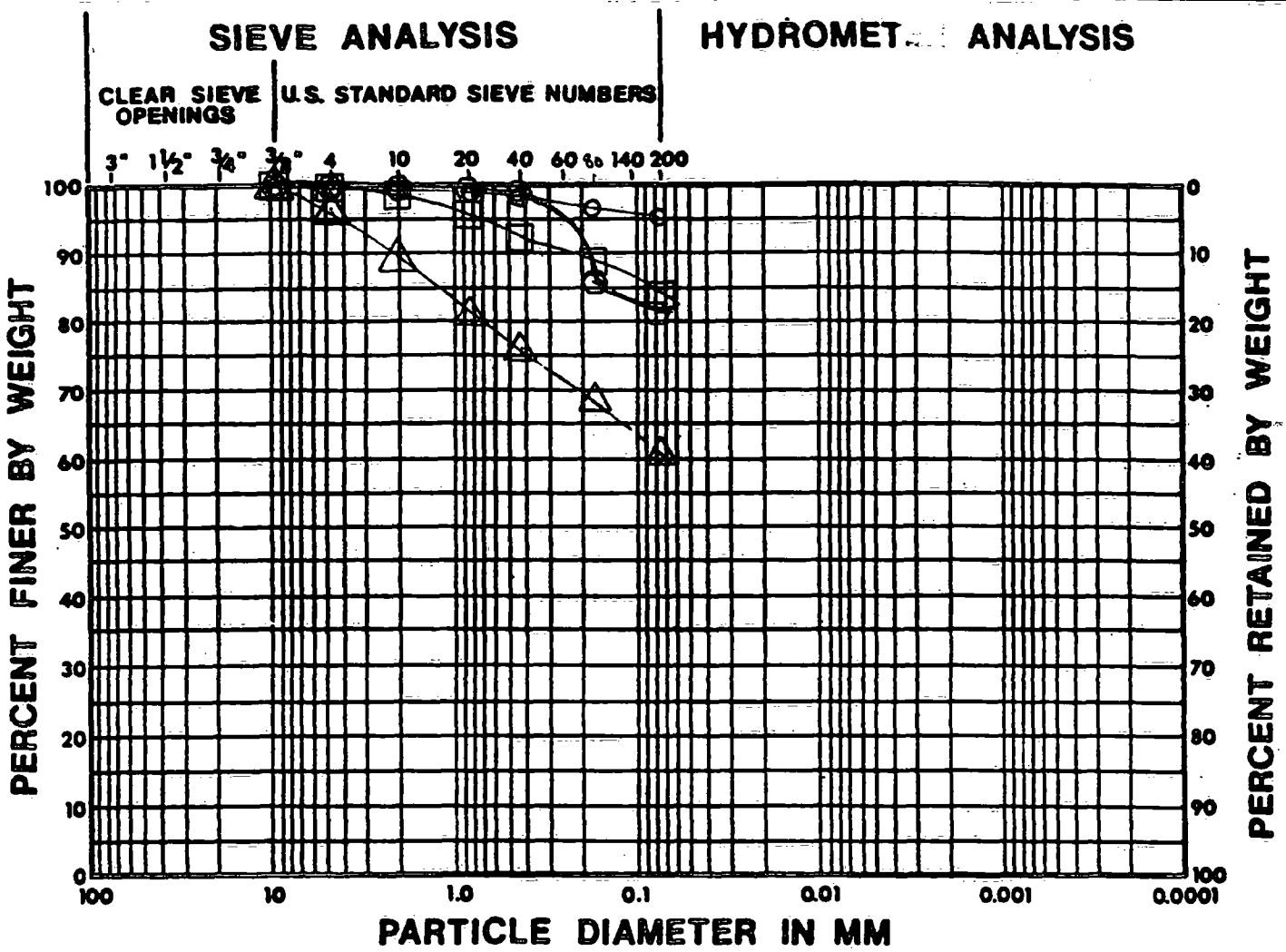

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W.%
⊙	B-17M2	—	83.5 to 84.25	Gray silty clay w/Tr. sand	CL	33.4	23.5	22.1
⊙	B-17	S-7	33.5 to 35.0	Gray silt w/Tr. clay & Tr. sand	ML		non-plastic	
⊡	B-18	S-3	13.5 to 15.0	Gray clayey silt w/Tr. sand	CL-ML	26.7	22.1	17.5
△	B-18	S-5A	23.5 to 25.0	Gray silty clay w/some sand	CL	25.9	17.3	13.0

NOTES:

GRAIN SIZE DISTRIBUTION CURVE
INTERLAKE SITE
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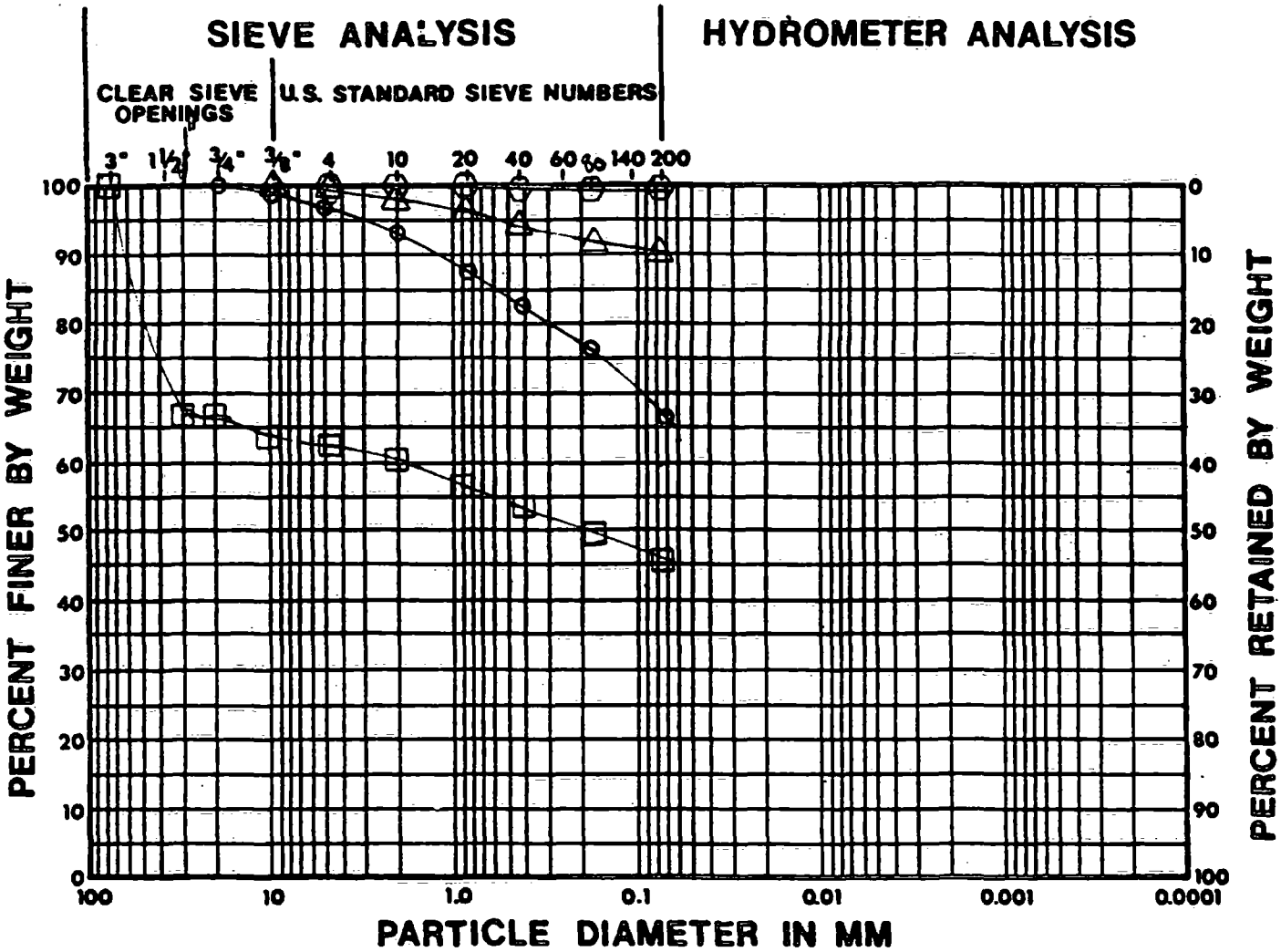

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W.%
⊙	B-19	S-7	33.5 to 35.0	Gry clayey slt & fn snd w/Tr grvl	CL-ML	21.4	18.4	12.1
⊙	B-20	S-3	33.5 to 35.0	Gray silt w/Tr. sand	ML	-	-	-
⊡	B-20	S-10	68.5 to 70.0	Gray silty, sandy gravel	GM	21.9	16.4	8.4
△	B-22	S-5	23.5 to 25.0	Gray silty clay w/Tr. sand & grvl	CL	35.9	19.2	22.6

NOTES:

GRAIN SIZE DISTRIBUTION CURVE
INTERLAKE SITE
CHICAGO, ILLINOIS

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OAK BROOK, IL

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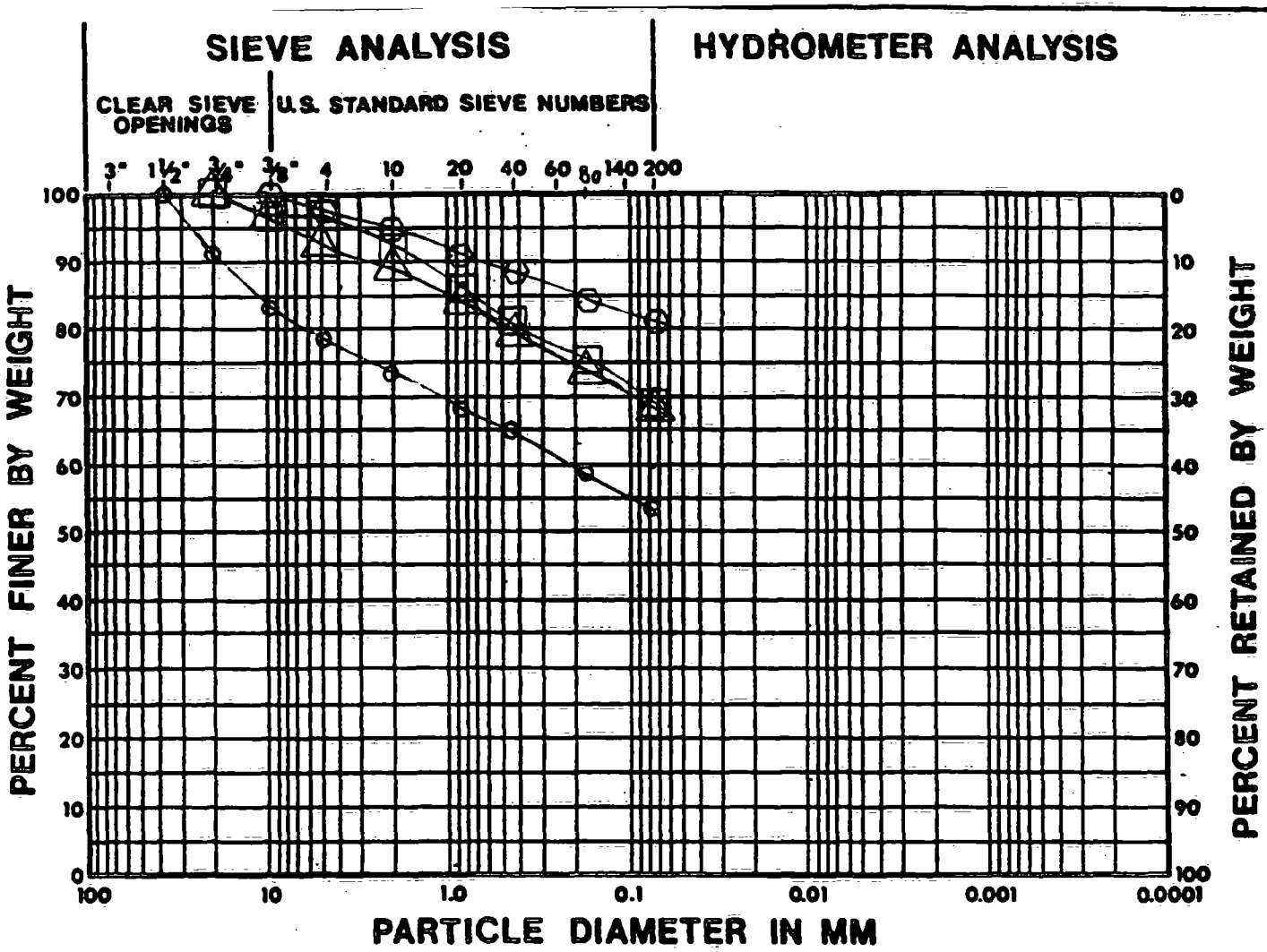

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	B-22	S-11	53.5 to 54.3	Gray clayey silt w/some snd & gvl	ML	17.7	14.5	9.4
⊙	B-23	S-4	18.5 to 20.0	Gray clayey silt w/Tr sand & grvl	ML	33.4	28.2	17.6
⊡	B-23	S-5	23.5 to 25.0	Gray clayey silt w/some snd & gvl	ML	30.2	24.5	16.0
△	B-23	S-9	43.5 to 45.0	Gray clayey silt w/some snd & gvl	ML-CL	24.6	20.0	12.8

NOTES:

GRAIN SIZE DISTRIBUTION CURVE
INTERLAKE SITE
CHICAGO, ILLINOIS

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OAK BROOK, IL

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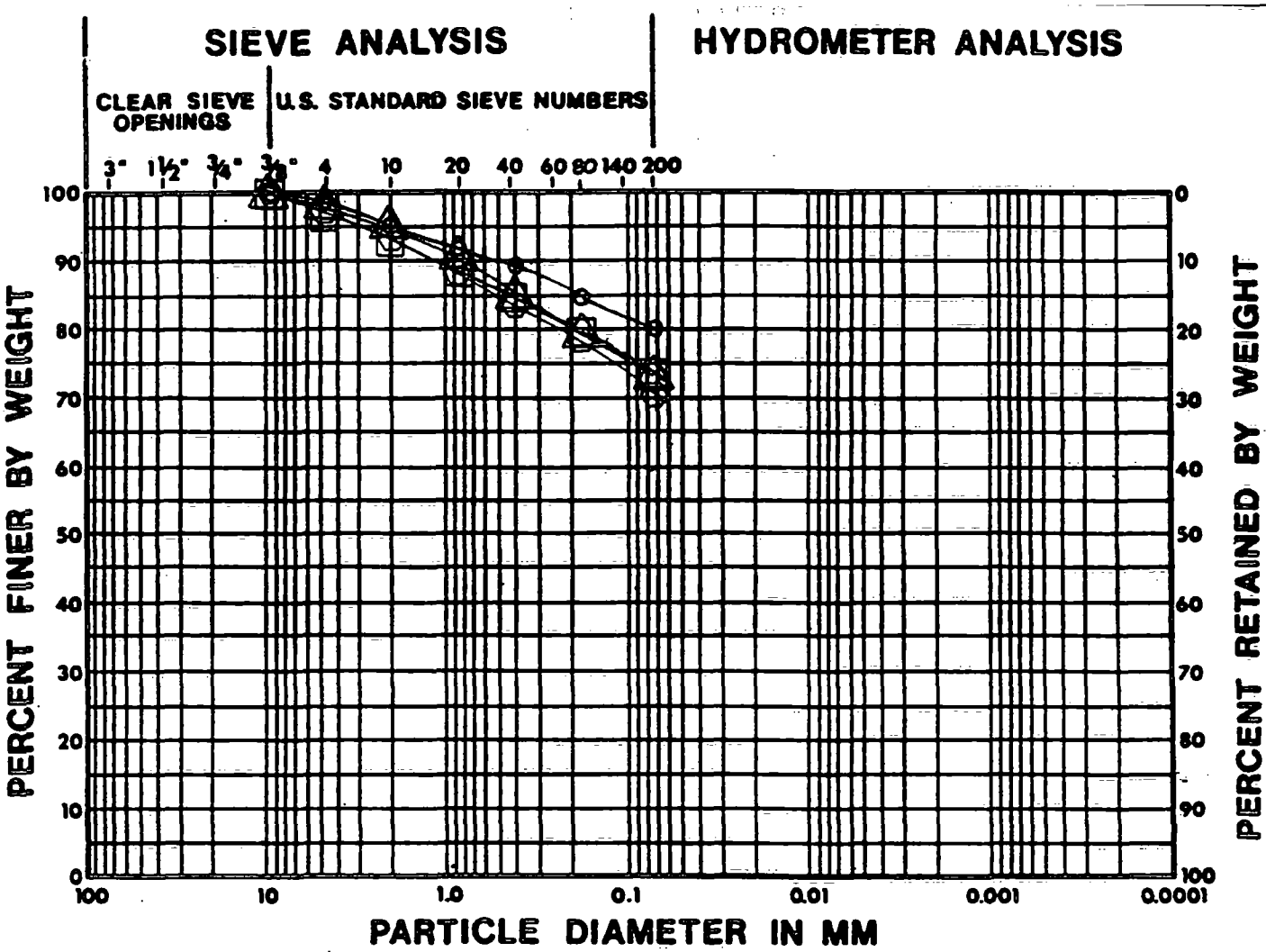

COBBLES	GRAVEL		SAND			SILT AND CLAY FRACTION
	coarse	fine	coarse	medium	fine	

SYMBOL	BORING	SAMPLE	DEPTH	SOIL DESCRIPTION	U.S.C.S.	L.L.	P.L.	W,%
⊙	B-24	S-14	18.5 to 20.0	Gray clayey silt w/Tr. sand	ML-CL	32.4	24.4	20.6
⊙	B-24	S-10	48.5 to 50.0	Gray silty clay w/Tr. sand & gryl	CL-ML	24.8	16.7	11.9
⊡	B-24	S-14	68.5 to 70.0	Gray silt & clay w/Tr. snd & gryl	CL-ML	22.3	17.9	27.4
△	B-26	S-10B	48.5 to 50.0	Hard gray clayey silt w/some sand & gravel	ML	24.3	21.5	11.5

NOTES:

GRAIN SIZE DISTRIBUTION CURVE
INTERLAKE SITE
CHICAGO, ILLINOIS

PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, IL

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COMPACTION TEST Data Sheet 9

Project WASTE MANAGEMENT Job No. CES 81-099

Location of Project INTERLAKE SITE Boring No. 13 & 17 Sample No. COMPOSITE

Description of Soil GRAY, CLAYEY SILT - VALPARAISO TILL

Test Performed By C.W. REINERT Date of Test 4-22-82

Blows/Layer 25 No. of Layers 5 Wt. of Hammer 10 lb

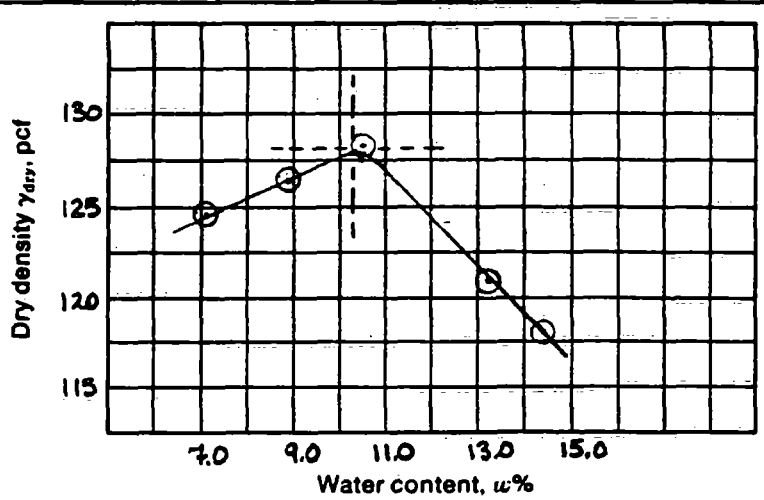
Mold dimensions: Diam. .33 ft Ht. .375 ft Vol. 1/30 = .033 cu ft

Water Content Determination

Sample no.	1	2	3	4	5	6
Moisture can no.	158	121	167	139	101	
Wt. of can + wet soil	201.63	151.05	186.53	169.70	193.34	
Wt. of can + dry soil	194.51	146.88	177.75	161.09	180.61	
Wt. of water	7.12	4.17	8.78	8.61	12.73	
Wt. of can	94.06	98.80	93.68	95.25	92.44	
Wt. of dry soil	100.45	48.08	84.07	65.84	88.17	
Water content, w%	7.1	8.7	10.5	13.1	14.4	

Density Determination

Assumed water content	7.5	9.0	11.0	13.0	15.0	
Water content, w%	7.1	8.7	10.5	13.1	14.4	
Wt. of soil + mold	6300.0	6360.0	6422.0	6339.0	6318.0	
Wt. of mold	4280.0	4280.0	4280.0	4280.0	4280.0	
Wt. of soil in mold	2020.0	2080.0	2142.0	2059.0	2038.0	
Wet density, pcf	133.6	137.5	141.6	136.1	134.8	
Dry density γ, pcf	124.7	126.5	128.2	120.4	117.8	



Optimum moisture = 10.2 % Maximum dry density = 128.0 pcf

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COMPACTION TEST Data Sheet 9

Project WASTE MANAGEMENT Job No. CES 81-099

Location of Project INTERLAKE SITE Boring No. 13 & 17 Sample No. COMPOSITE

Description of Soil GRAY SILTY CLAY - TINLEY TILL

Test Performed By C.W. REINERT Date of Test 4-30-82

Blows/Layer 25 No. of Layers 5 Wt. of Hammer 10 lb

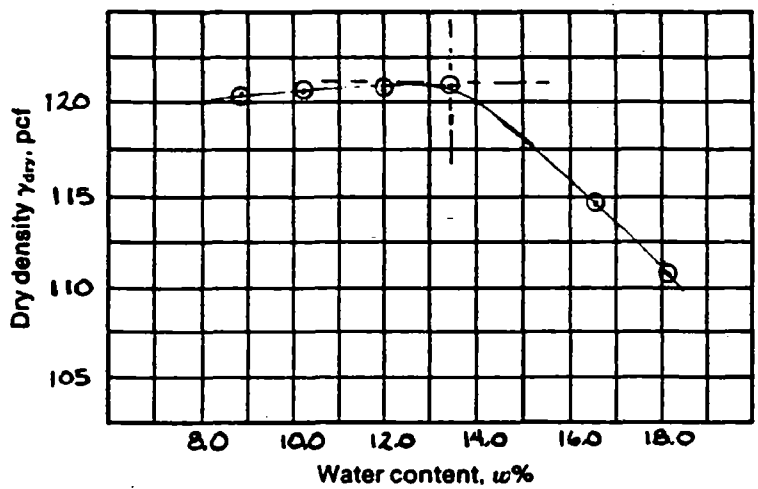
Mold dimensions: Diam. .33 ft Ht. .375 ft Vol. 1/30 = .033 cu ft

Water Content Determination

Sample no.	1	2	3	4	5	6	
Moisture can no.	111	164	109	156	155	142	113
Wt. of can + wet soil	174.06	144.22	136.52	152.90	190.17	160.59	172.84
Wt. of can + dry soil	167.58	139.57	132.00	145.66	176.22	150.54	161.05
Wt. of water	6.48	4.65	4.52	7.24	13.95	10.05	11.79
Wt. of can	95.01	95.16	94.46	92.16	91.98	95.64	95.16
Wt. of dry soil	72.57	65.89	37.54	53.50	84.24	54.90	65.89
Water content, w%	8.9	10.3	12.0	13.5	16.6	18.3	17.9

Density Determination

Assumed water content	8.5	10.0	12.0	14.0	16.0	18.0
Water content, w%	8.9	10.3	12.0	13.5	16.6	18.1
Wt. of soil + mold	6268.0	6296.0	6335.0	6371.0	6302.0	6269.0
Wt. of mold	4280.0	4280.0	4280.0	4280.0	4280.0	4280.0
Wt. of soil in mold	1988.0	2016.0	2055.0	2091.0	2022.0	1989.0
Wet density, pcf	131.4	133.3	135.9	138.3	133.7	131.5
Dry density γ, pcf	120.6	120.9	121.3	121.9	114.7	111.4



Optimum moisture = 13.5 % Maximum dry density = 121.9 pcf

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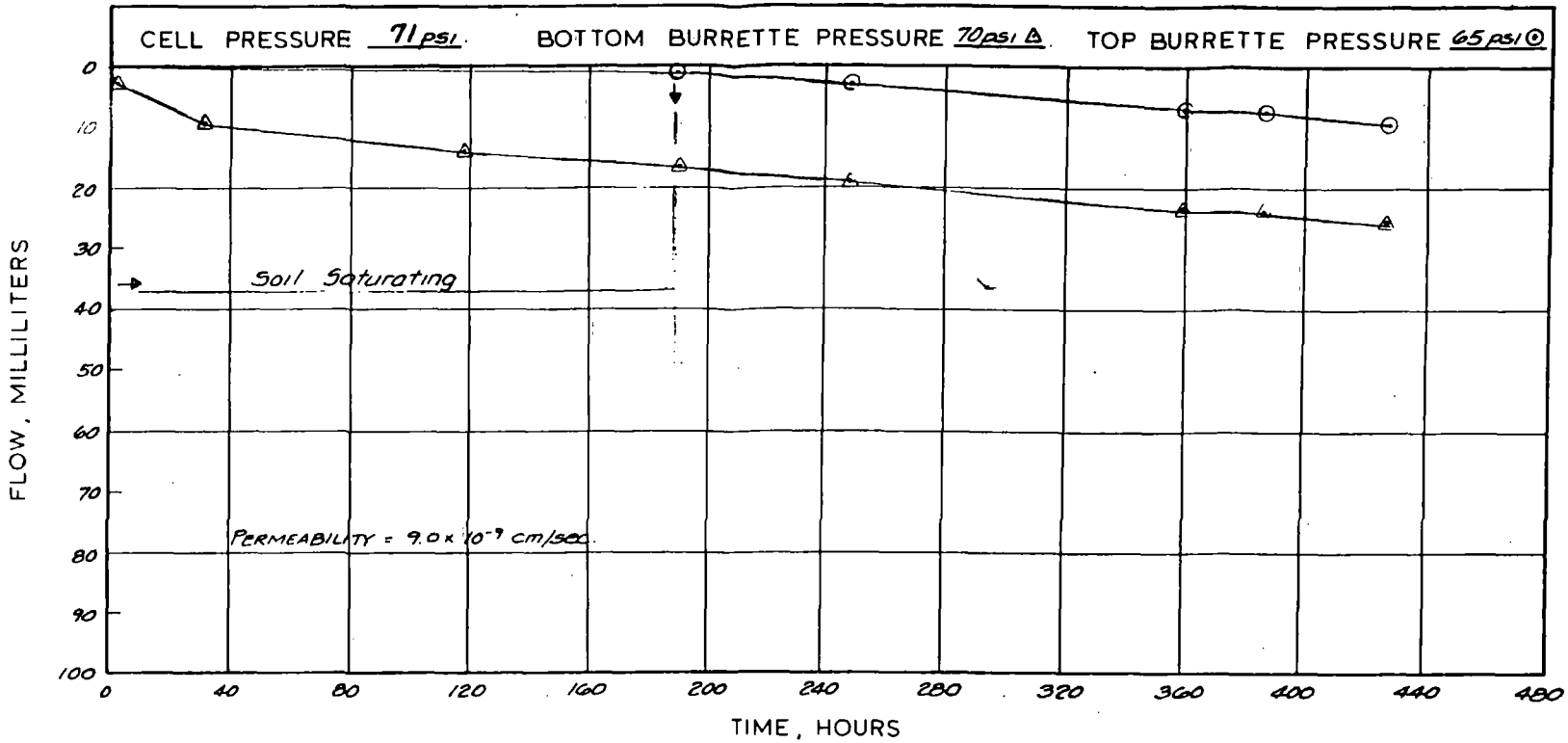
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Gray Silty Clay w/ Trace of Sand
USCS CLASSIFICATION	CL
ATTERBERG LIMITS	LL 44.6 PI 21.2
% BY WEIGHT OF SILT AND CLAY	99

SAMPLE PROPERTIES		
	BEFORE TEST	AFTER TEST
AVERAGE AREA	41.993 CM^2	40.694 CM^2
AVERAGE LENGTH	14.230 CM	14.315 CM
UNIT WEIGHT	87.67 PCF	100.59 PCF
WATER CONTENT	33.34 %	19.04 %
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING B-15 SAMPLE S-4
DEPTH 19.7-20.2 FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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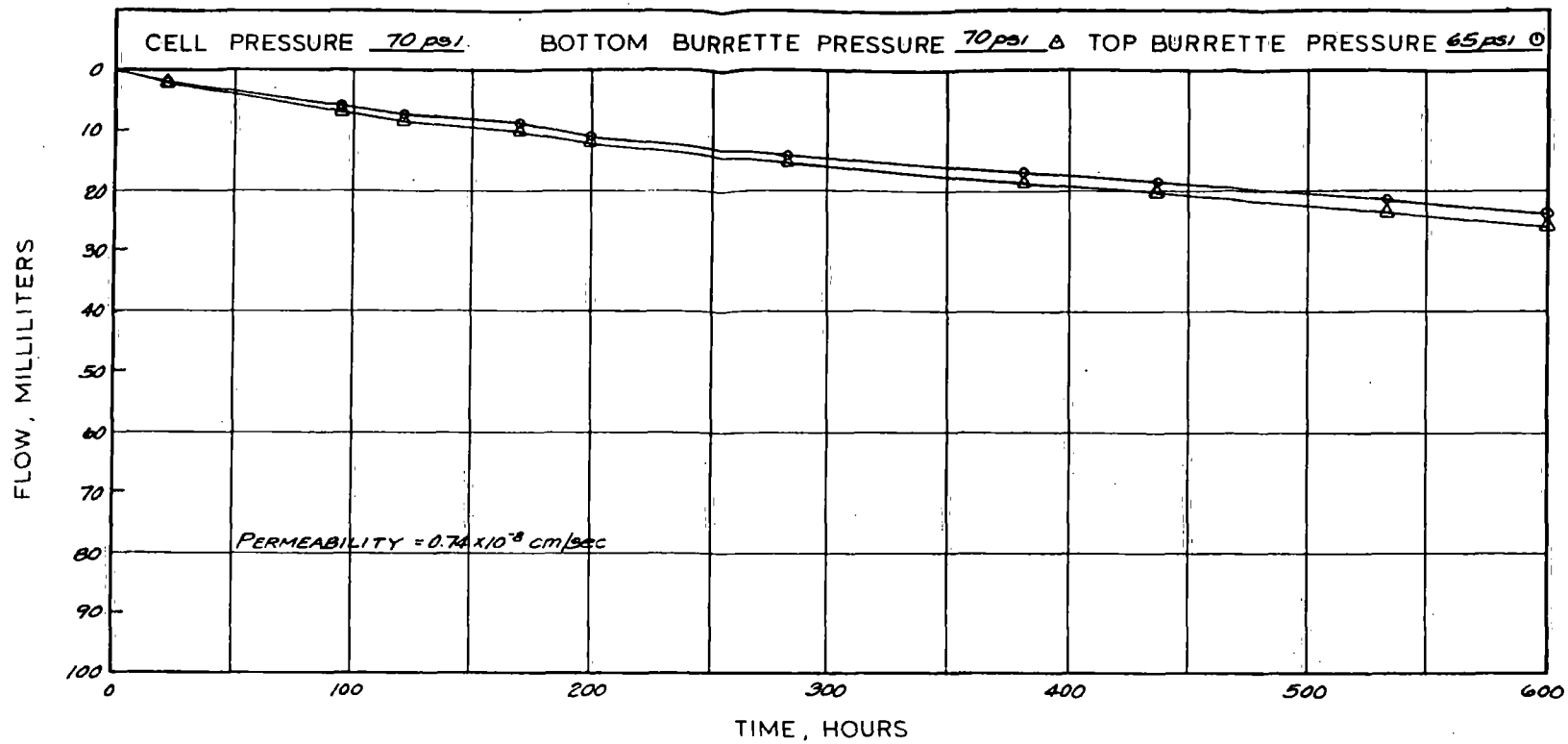
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Gray Clayey Silt w/ Trace of Sand & Gravel
USCS CLASSIFICATION	CL-ML
ATTERBERG LIMITS	LL 27.9 PI 6.8
% BY WEIGHT OF SILT AND CLAY	88.8

SAMPLE PROPERTIES		
	BEFORE TEST	AFTER TEST
AVERAGE AREA	41.993 cm²	41.068 cm²
AVERAGE LENGTH	8.915 cm	8.966 cm
UNIT WEIGHT	119.9 pcf	120.9 pcf
WATER CONTENT	14.5%	16.3%
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING ST-4 SAMPLE S-13
DEPTH 63.5-64.0 FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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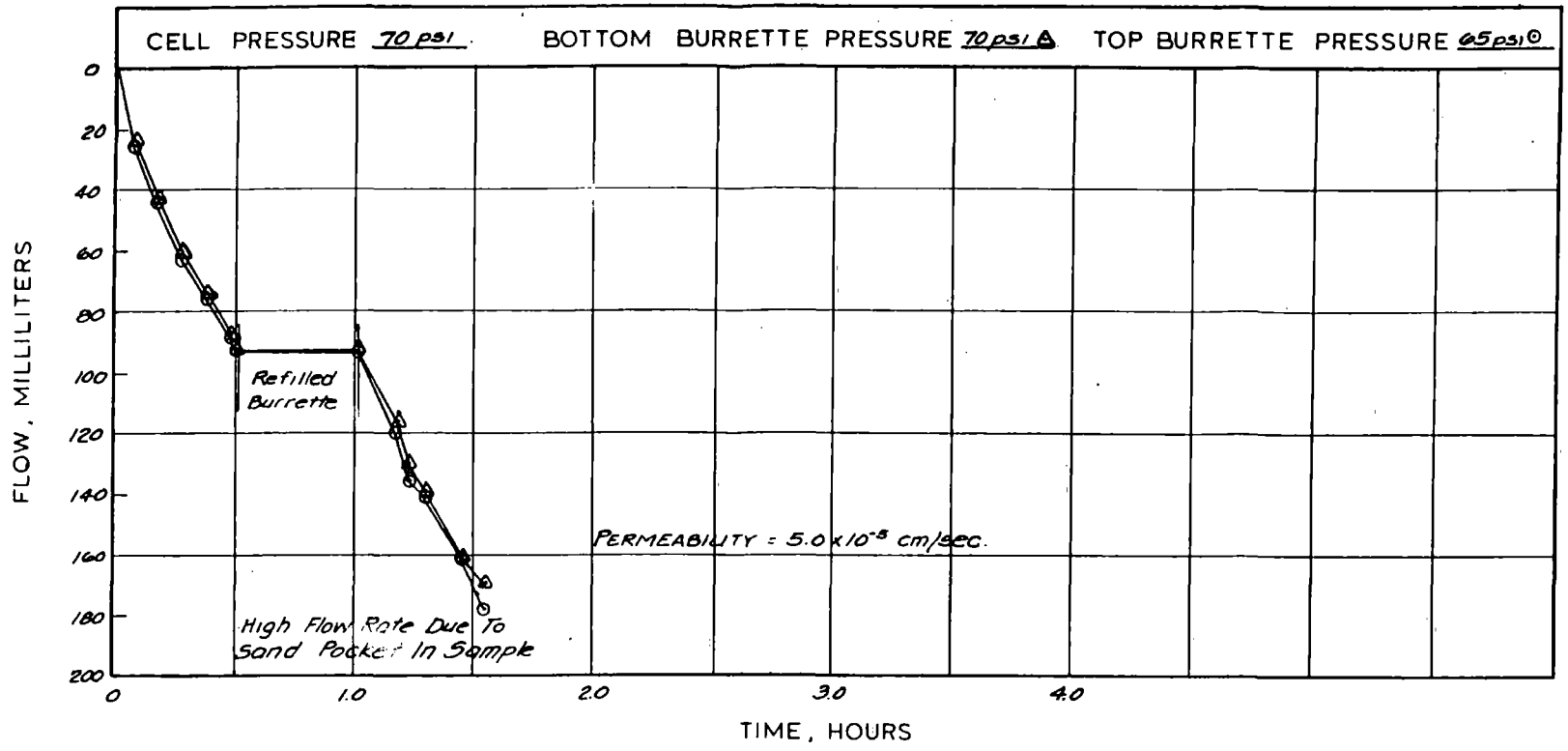
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Silty Clay w/ Sand Pocket
USCS CLASSIFICATION	Not Applicable
ATTERBERG LIMITS	LL – PI –
% BY WEIGHT OF SILT AND CLAY	

SAMPLE PROPERTIES	BEFORE TEST	AFTER TEST
AVERAGE AREA	41.99 cm²	38.11 cm²
AVERAGE LENGTH	14.23 cm	14.21 cm
UNIT WEIGHT	107.8 pcf	112.5 pcf
WATER CONTENT	24.0%	24.2%
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING ST-2 SAMPLE S-5
DEPTH 24.6-25.1 FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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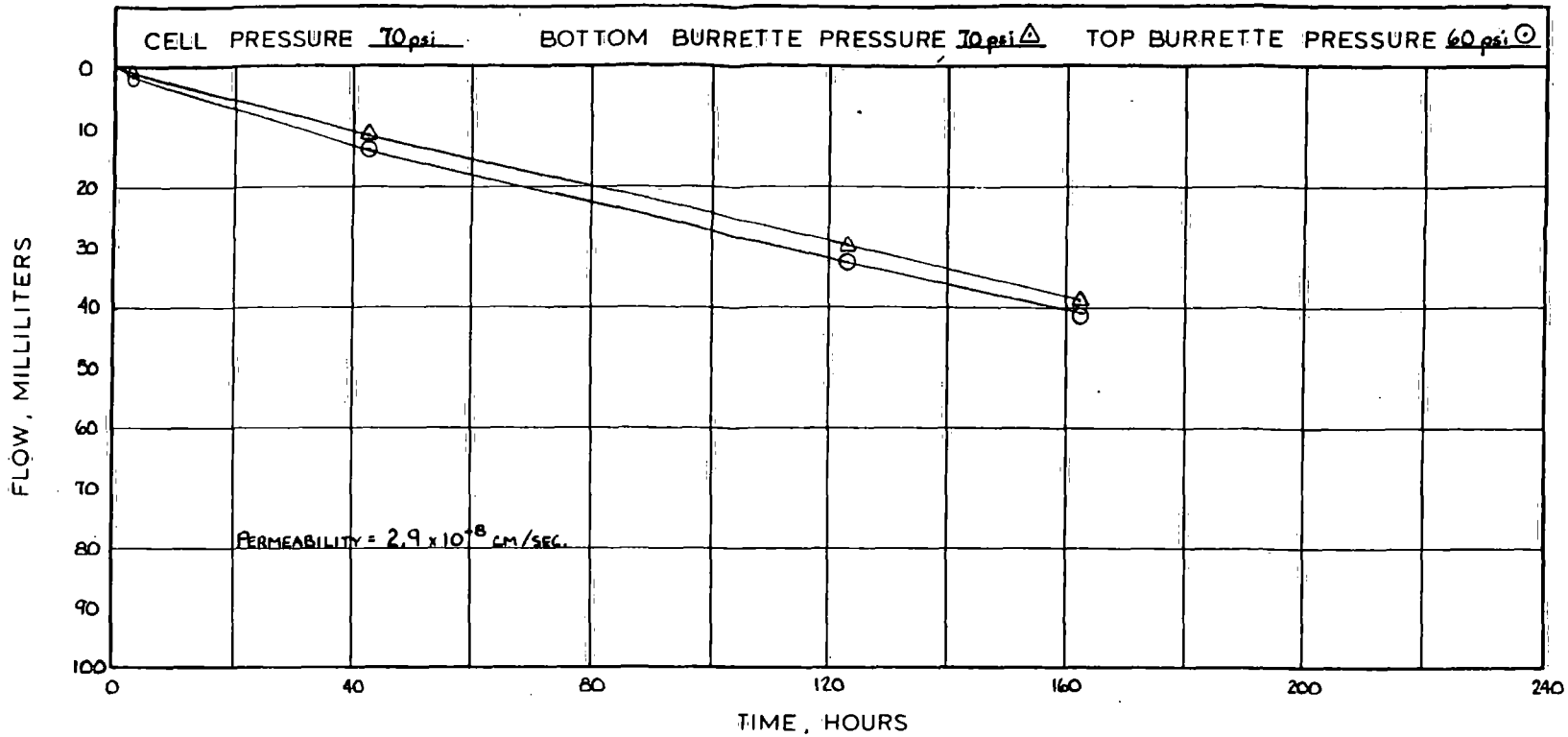
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Gray Silty Clay w/ Trace of Sand & Gravel
USCS CLASSIFICATION	CL
ATTERBERG LIMITS	LL 43.5 PI 20.3
% BY WEIGHT OF SILT AND CLAY	97

SAMPLE PROPERTIES		
	BEFORE TEST	AFTER TEST
AVERAGE AREA	41.993 cm^2	41.558 cm^2
AVERAGE LENGTH	14.230 cm	14.242 cm
UNIT WEIGHT	97.0 PCF	96.8 PCF
WATER CONTENT	25.5 %	27.4 %
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING ST-1 SAMPLE S-7B
DEPTH 34.5-35.0 FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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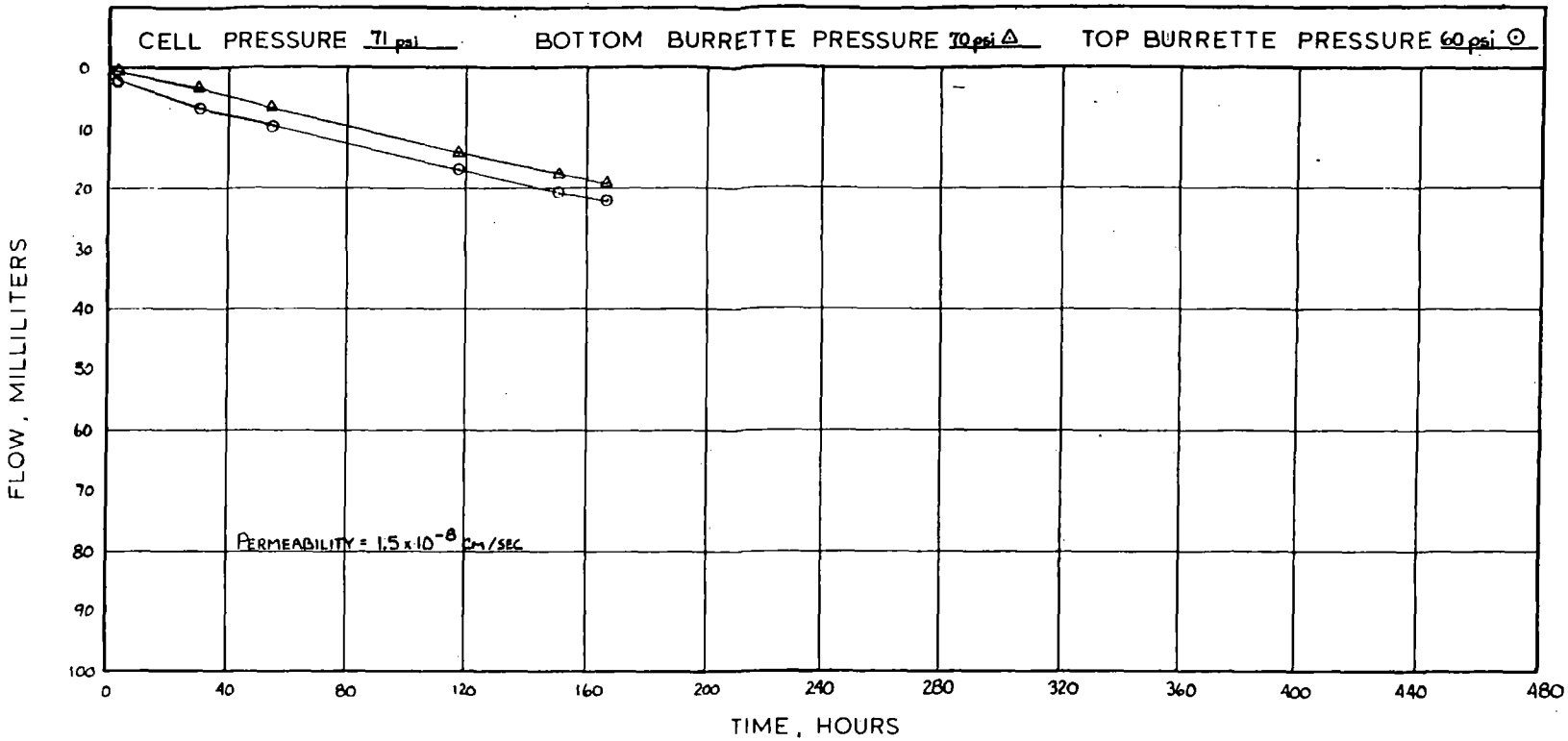
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Gray Silty Clay w/ Trace of Sand & Gravel
USCS CLASSIFICATION	CL
ATTERBERG LIMITS	LL 43.5 PI 20.3
% BY WEIGHT OF SILT AND CLAY	97

SAMPLE PROPERTIES	BEFORE TEST	AFTER TEST
AVERAGE AREA	41.993 cm^2	41.307 cm^2
AVERAGE LENGTH	14.230 cm	14.259 cm
UNIT WEIGHT	98.5 PCF	101.3 PCF
WATER CONTENT	23.8 %	25.1 %
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING ST-1 SAMPLE S-7A
DEPTH 33.9 - 34.4 FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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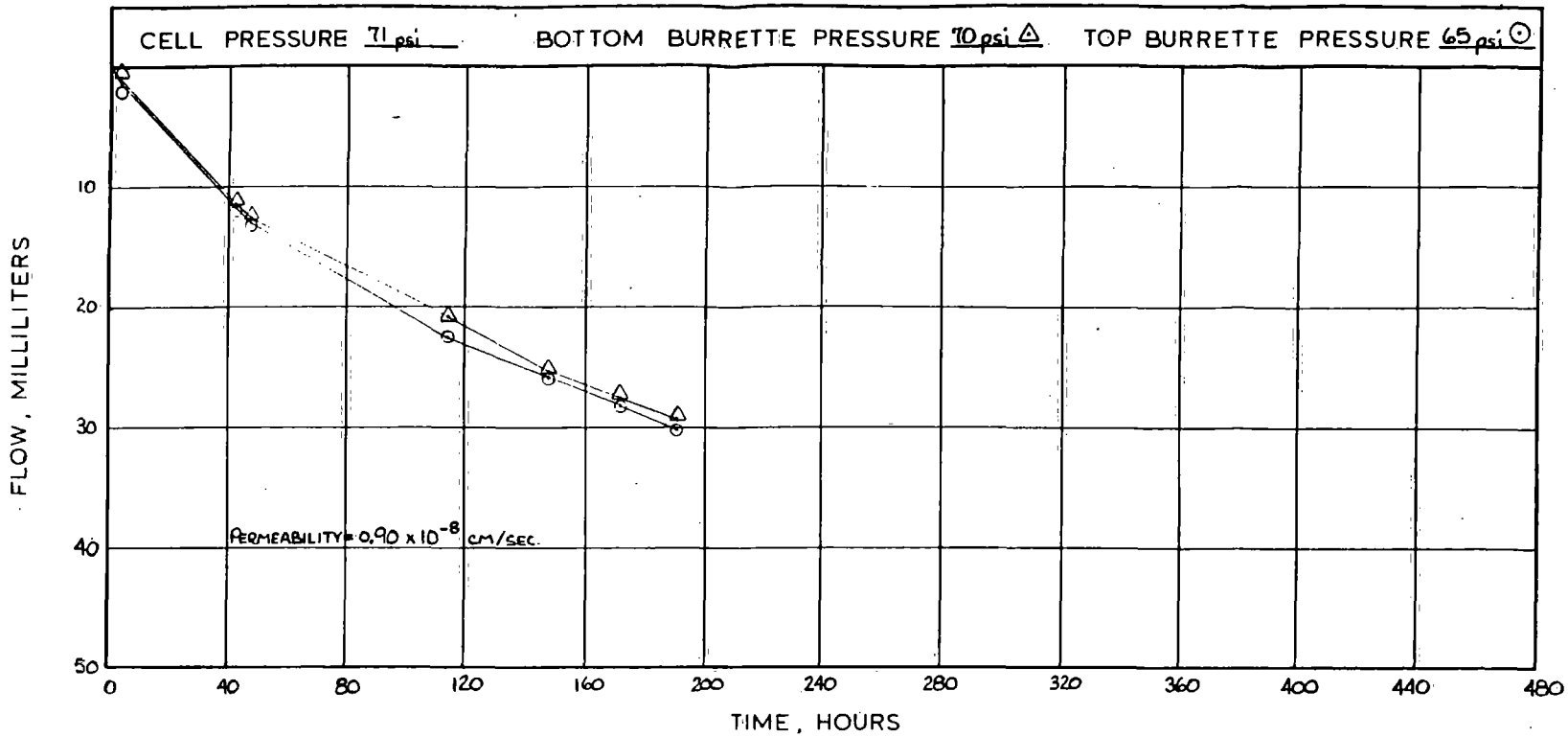
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Gray Clayey Silt w/ Some Sand
U.S.C.S. CLASSIFICATION	ML
ATTERBERG LIMITS	LL 22.9 PI 9.4
% BY WEIGHT OF SILT AND CLAY	73

SAMPLE PROPERTIES	BEFORE TEST	AFTER TEST
AVERAGE AREA	41.587 cm^2	41.431 cm^2
AVERAGE LENGTH	4.547 cm	4.516 cm
UNIT WEIGHT	125.4 PCF	126.1 PCF
WATER CONTENT	10.2 %	11.8 %
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING SS-1 SAMPLE S-2
DEPTH 54.0-54.5 FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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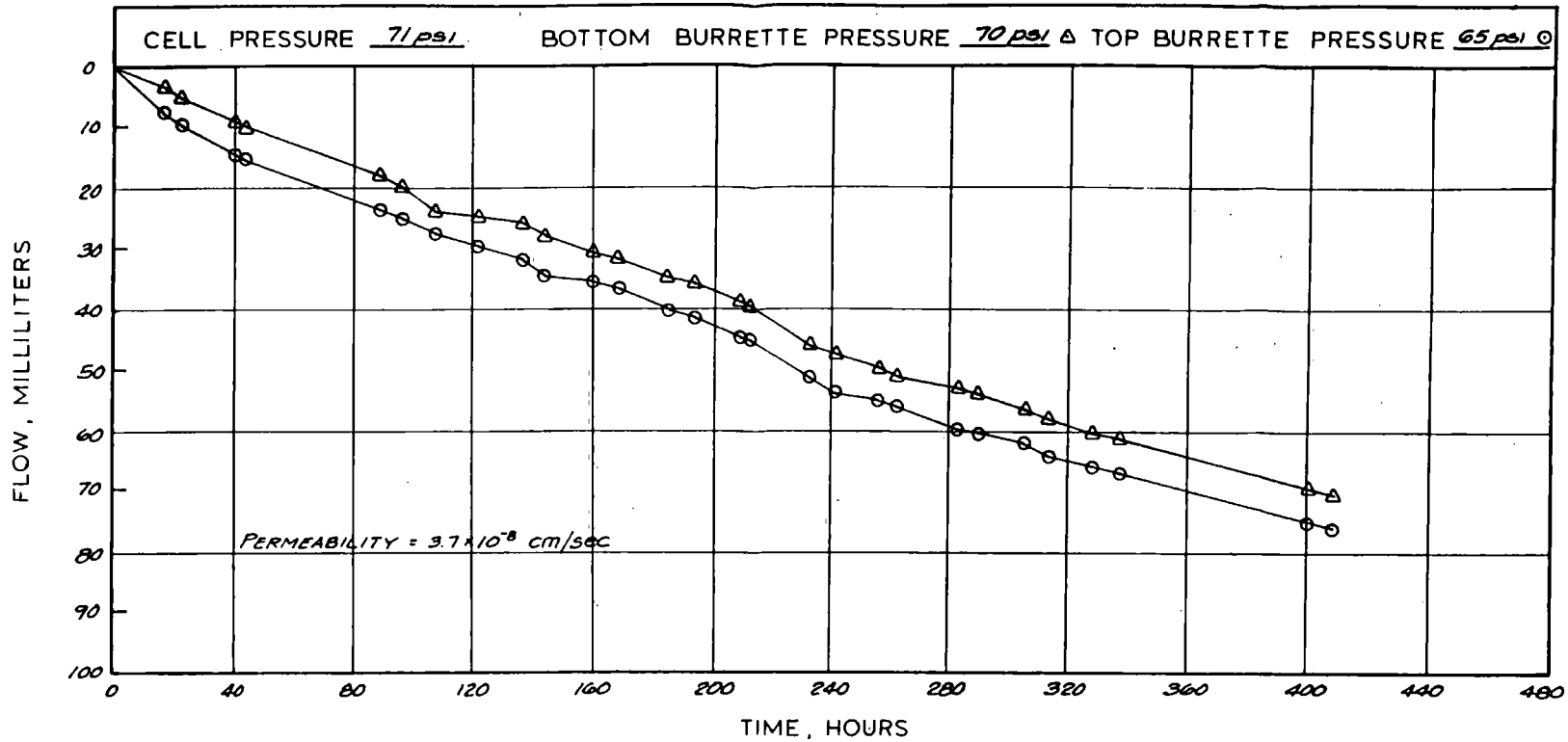
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Clayey Silt Composite
USCS CLASSIFICATION	ML-CL
ATTERBERG LIMITS	LL 22.9 PI 4.3
% BY WEIGHT OF SILT AND CLAY	77.8

SAMPLE PROPERTIES		
	BEFORE TEST	AFTER TEST
AVERAGE AREA	39.072 cm²	37.276 cm²
AVERAGE LENGTH	9.732 cm	9.569 cm
UNIT WEIGHT	120.4 pcf	123.4 pcf
WATER CONTENT	13.1 %	14.2%
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING 13 & 17 SAMPLE Composite
DEPTH Varies FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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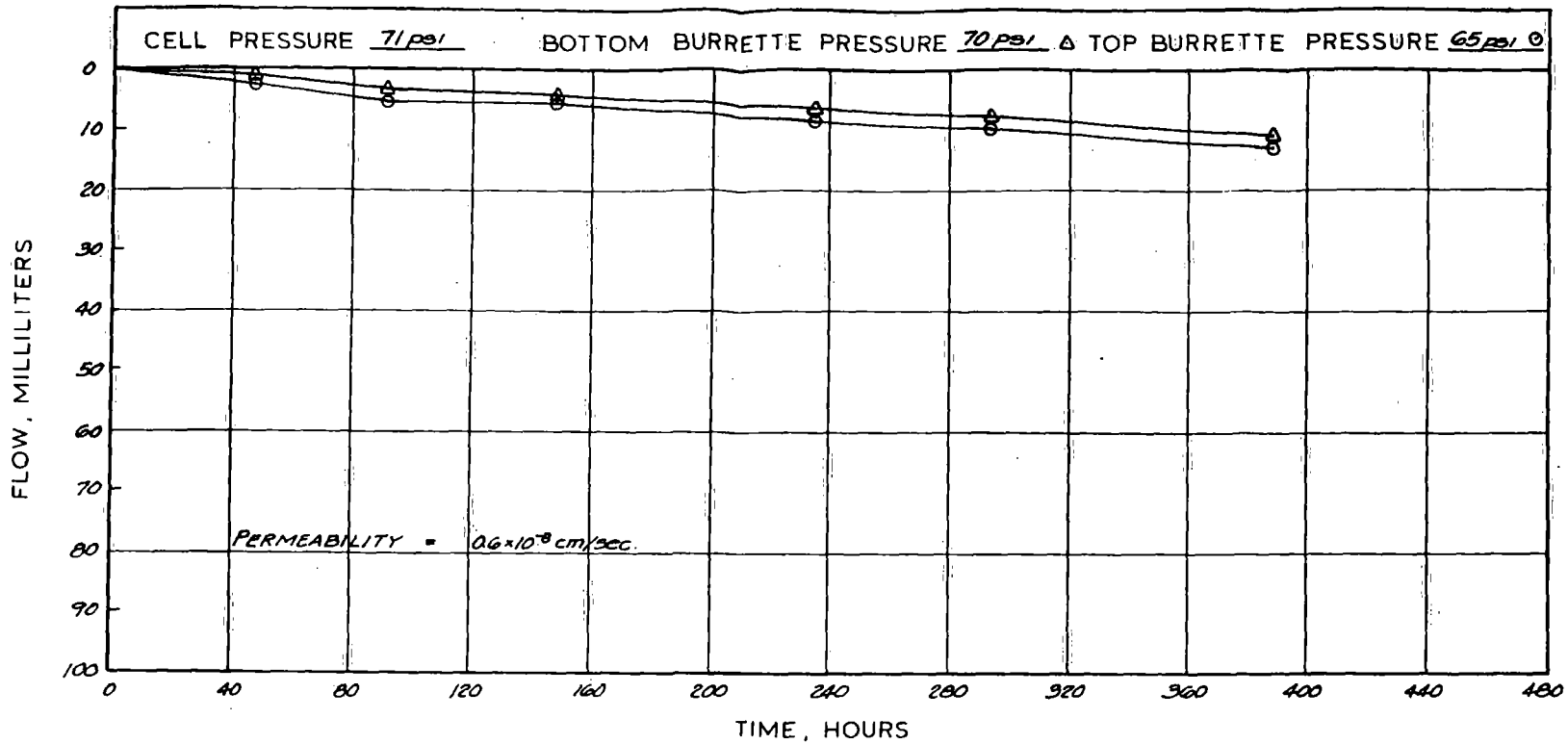
CONSTANT HEAD PERMEABILITY TEST



SOIL PARAMETERS	
DESCRIPTION	Silty Clay Composite
USCS CLASSIFICATION	CL
ATTERBERG LIMITS	LL 32.0 PI 8.7
% BY WEIGHT OF SILT AND CLAY	92.1

SAMPLE PROPERTIES		
	BEFORE TEST	AFTER TEST
AVERAGE AREA	39.650 cm²	39.166 cm²
AVERAGE LENGTH	11.580 cm	11.386 cm
UNIT WEIGHT	111.7 pcf	114.8 pcf
WATER CONTENT	16.6%	17.1%
PORE VOLUME		

LABORATORY TEST RESULTS
CONSTANT HEAD PERMEABILITY
BORING 13&17 SAMPLE Composite
DEPTH Varies FEET

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

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APPENDIX D

GEOCHEMICAL TESTING OPERATIONS

- Geochemical Characterization Report, Including Testing Methods and Results

TECHNICAL REPORT

GEOCHEMICAL CHARACTERISTICS OF SITE SOIL MATERIALS INTERLAKE LANDFILL SITE CHICAGO, ILLINOIS

CANONIE ENVIRONMENTAL SERVICES CORP.

CHESTERTON, INDIANA

PROJECT NO. 82-108

MAY 1982

Earth Sciences Consultants inc.
PITTSBURGH, PENNSYLVANIA

TECHNICAL REPORT

GEOCHEMICAL CHARACTERISTICS OF SITE SOIL MATERIALS INTERLAKE LANDFILL SITE CHICAGO, ILLINOIS

GEOCHEMICAL CHARACTERISTICS OF SITE SOIL MATERIALS INTERLAKE LANDFILL SITE CHICAGO, ILLINOIS

1.0 INTRODUCTION

This report presents the results of an investigation to determine and evaluate geochemical characteristics of soil materials present at the Interlake Landfill Site. The site is owned by Waste Management, Inc. of Chicago, Illinois and is located at 116th Street and Torrence Avenue in southeastern Chicago. This study was performed by Earth Sciences Consultants, Inc. (ESC) for Canonie Environmental Services Corp. (Canonie) as part of Canonie's hydrogeologic investigation.

The objectives of the ESC investigation follow:

- Identify and characterize geochemical and mineralogical properties of site soils important to landfill leachate containment and/or attenuation.
- Identify and conceptually discuss various mechanisms of leachate attenuation.
- Discuss the potential of site soils to attenuate landfill leachates based on determined geochemical and mineralogical properties.
- Address potential interactions between landfill leachates and site soils which could cause changes in physical, geochemical, or mineralogical properties of soils.

Chapter 2.0 identifies procedures utilized to select representative soil samples and Chapter 3.0 details geochemical and mineralogical analyses performed during this investigation. Results and conclusions germane to the study are presented in Chapter 4.0.

2.0 SOIL SAMPLE SELECTION

Representative samples of Interlake Landfill Site soils were selected for geochemical and mineralogical analyses from borings previously drilled by Canonie as part of the overall hydrogeological investigation. Sample selection was

based on the type and distribution of soils present at the site and conceptual landfill designs.

The field investigation performed by Canonie identified that the Interlake Landfill Site is underlain by dolomite at depths between approximately 30 and 100 feet below the ground surface. The dolomite is overlain by about 25 to 85 feet of silty and clayey glacial till which generally grades from silty clay to clayey silt with depth and contains lenses of silty sands and clays. Surface materials at the site include approximately 5 to 15 feet of sand or fill.

Based on subsurface site characteristics and conceptual landfill designs, it was determined that till would be the best available material for use in constructing a soil/clay liner and/or to serve as a medium to attenuate landfill leachates beneath the proposed facility. The lateral and vertical distribution of soils comprising the glacial till was evaluated by reviewing logs of numerous soil borings drilled by Canonie. Based on the soil materials present and drilling procedures utilized, six borings (Borings Nos. ST-1, ST-2, ST-3, ST-4, B-13A, and B-19) were selected for geochemical sampling. Borings in which drilling fluids (bentonite) were used were not considered because of the potential effects which this material can have on soil geochemical/mineralogical properties.

Sealed jars containing soil from the six borings were visually inspected and 24 samples were selected for geochemical analysis. Table 1 identifies sample numbers and depths.

3.0 LABORATORY ANALYSES

Laboratory analyses were selected to determine soil characteristics important to the attenuation of landfill leachates and to satisfy the regulatory requirements of the Illinois Environmental Protection Agency. Soil characteristics identified during the laboratory program included:

- pH
- Cation Exchange Capacity (CEC)
- Calcium carbonate equivalent
- Extractable cations (calcium, magnesium, sodium, potassium)
- Mineralogy

Soil pH indicates the hydrogen ion activity in materials and was measured on a 1:1 suspension (by weight) of soil and distilled water in accordance with procedures outlined by Black (1965). CEC is a measurement of soil's ability to adsorb cations and is important in evaluating the ability of materials to remove certain cations from landfill leachates. CEC was determined by sodium saturation and ammonium acetate extraction after procedures outlined by Black (1965).

Calcium carbonate equivalent denotes the calcium and/or magnesium carbonate content in soils. This property is important since carbonate-rich soils have the ability to neutralize or buffer acidic leachates. The calcium carbonate equivalent of samples was determined in accordance with procedures of Jackson (1956). Extractable cations were determined for four of the 24 samples. This is a measure of the type and abundance of cations present in soil exchange sites and can be used to consider potential interreactions between exchangeable cations and leachate constituents which could result in changes in soil physical properties. Extractable cations were determined by ammonium acetate extraction and atomic absorption spectrophotometry in accordance with procedures of Black (1965). Results of geochemical analyses are presented in Tables 1 and 2.

The mineralogy of four soil samples was determined by X-ray diffraction. X-ray diffraction was performed on bulk soil samples and on the clay fraction (less than 2 microns) of the materials. The samples were pretreated to remove iron oxide, carbonates, and organic matter and to saturate the exchange complex with potassium or magnesium in accordance with procedures outlined by Jackson (1956). Before pretreatment, randomly mounted slides were prepared for bulk sample analysis after procedures of Brindley (1961) and following pretreatment, oriented slides of the clay fraction were prepared in accordance with procedures of Drever (1973). X-ray diffraction was performed with a Rigaku Geigerflex X-ray Diffractometer at 40 kV and 20 ma using a copper target and graphite filter. Diffraction patterns were inspected and analyzed to identify the type and relative abundance of minerals present. Tables 3 and 4 contain the results of these analyses.

4.0 RESULTS AND CONCLUSIONS

The pH of the 24 samples ranged from 7.5 to 8.0 indicating that all the soils tested were slightly to moderately alkaline. The calcium carbonate equivalent of samples analyzed ranged from 18.3 to 35.9 percent by weight demonstrating the presence of significant quantities of calcium and/or magnesium carbonate. CEC values ranged from 3.62 to 15.91 milliequivalents per 100 grams (meq/100 g); as expected, soils with higher clay contents generally exhibited higher CEC's. The extractable cations in the soils analyzed were predominantly calcium with lesser quantities of magnesium, potassium, and sodium. The abundance of calcium in the cation exchange sites suggests that calcite ($CaCO_3$) is the dominant carbonate present.

X-ray diffraction results of the bulk soil samples indicate that quartz is the most abundant mineral present in the four samples analyzed. Illite, kaolinite, and calcite are present in moderate quantities and minor amounts of smectite, interstratified minerals and chlorite, chloritized vermiculite, and feldspar were detected in some samples. These results confirm the presence of significant quantities of calcite in the soils as suggested by the results of the geochemical analyses.

Clay fraction X-ray diffraction analyses indicate that illite and kaolinite are the dominant clay minerals present. Approximately 70 to 80 percent of the clay fraction in each analyzed sample was illite and kaolinite. Quartz comprised about 10 percent of this fraction. Minor amounts (less than 15 percent) of chlorite, smectite, chloritized vermiculite, and interstratified minerals were detected in some samples.

In considering utilization of site soils as a compacted liner underneath the landfill at the subject location, typical mechanisms by which aqueous components of leachates generated by the landfill can be attenuated must be addressed. In this situation, the most likely mechanisms will include adsorption by clay or organic materials in the soil, precipitation at the leachate/soil liner interface as a result of changed geochemical conditions, and reaction/precipitation when leachates mix with pore water of differing chemistry. Pore water may be present in the liner as either a result of initial placement or subsequently from groundwater entry prior to leachate formation.

The geochemical characteristics of the glacial till materials analyzed at the Interlake Landfill Site are similar in character to many unconsolidated materials in Illinois. Cartwright, et al (1977) report that many unconsolidated surficial materials in Illinois are carbonate rich and have calcium as the dominant cation on the exchange complex. Griffin, et al (1976) report that relatively pure kaolite and illite clays in Illinois typically have CEC's of 15 and 20 meq/100 g, respectively. Table 5 indicates cation exchange capacities for various types of pure clay minerals.

By comparing the CEC of relatively pure clay samples to the texture and mineralogy of the analyzed samples, it is evident that the measured CEC values reflect the abundance of illite and kaolinite in the soils. Although the measured CEC values are lower than those for soils with high montmorillonite contents, the CEC of site soils should be sufficient to attenuate most heavy metals and many organics found in municipal landfill leachates (Cartwright, et al, 1977) provided a sufficient thickness of soil is utilized in liner construction. Cartwright, et al (1977) advocate the use of thick liners with lower CEC values over thin liners with higher CEC values as optimal liners for leachate attenuation.

The alkaline nature and abundance of calcite in the soils analyzed are beneficial characteristics, should acidic leachates occur at the site. In addition to neutralization of acidity, the presence of carbonate and bicarbonate ions could cause precipitation of various metallic carbonates which may cause permeability reduction by filling available void spaces in the soil. Available data regarding area groundwater chemistry suggest significant concentrations of calcium, magnesium, and bicarbonate ions. If these ions are important components of the aqueous phase present in compacted liner materials (soils) prior to contact with leachates, they may also cause precipitation reactions to occur.

In summary, the soils evaluated for this investigation appear to be suitable for use as compacted liners for a municipal landfill site. If you have any questions regarding data or discussions presented in this report, please contact us.

Respectfully submitted,

Alan F. Bilzi
Executive Vice President

Harry L. Crouse
President

HLC:lms

Project No. 82-108
May 25, 1982

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REFERENCES

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TABLES

TABLE 1
GEOCHEMICAL CHARACTERISTICS OF SOIL MATERIALS
INTERLAKE LANDFILL SITE

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (feet)	pH	CATION EXCHANGE CAPACITY (milliequivalents/100 grams)	CALCIUM CARBONATE EQUIVALENT (%)
ST-1	S-4	18.5 - 20.0	7.9	11.12	18.7
ST-1	S-9	43.5 - 45.0	7.6	6.72	25.1
ST-1	S-12	58.5 - 60.0	7.7	8.51	25.8
ST-1	S-14	68.5 - 70.0	7.9	15.91	28.7
ST-1	S-18	88.5 - 90.0	7.5	4.21	35.9
ST-2	S-4	18.5 - 20.0	7.8	10.70	26.1
ST-2	S-7	33.5 - 35.0	7.7	6.45	24.4
ST-3	S-3	13.5 - 15.0	7.6	4.39	18.3
ST-3	S-5	23.5 - 25.0	7.6	8.11	20.0
ST-3	S-8	38.5 - 40.0	7.7	6.35	22.4
ST-3	S-10	48.5 - 50.0	7.8	4.30	25.7
ST-3	S-15	73.5 - 75.0	7.8	7.20	31.7
ST-4	S-4	18.5 - 20.0	7.9	3.62	27.6
ST-4	S-6	28.5 - 30.0	7.9	10.86	26.8
ST-4	S-8	38.5 - 40.0	7.7	6.99	23.9

TABLE 1
(Continued)

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (feet)	pH	CATION EXCHANGE CAPACITY (milliequivalents/100 grams)	CALCIUM CARBONATE EQUIVALENT (%)
ST-4	S-11	53.5 - 55.0	7.6	3.88	28.1
ST-4	S-15	73.5 - 75.0	7.7	8.09	30.2
B-13A	-(1)	35.5 - 36.25	7.6	6.38	24.8
B-13A	-	51.75 - 52.5	7.8	5.09	26.5
B-13A	-	61.5 - 62.0	8.0	13.65	31.7
B-19	S-4	18.5 - 20.0	8.0	11.91	28.5
B-19	S-6	28.5 - 30.0	8.0	11.31	27.2
B-19	S-11	53.5 - 55.0	7.8	12.17	29.8
B-19	S-14	68.5 - 70.0	7.7	7.59	23.4

(1) Dash indicates continuous sampling was performed; therefore, no sample numbers were assigned in the field for discrete sample intervals.

TABLE 2
RESULTS OF EXTRACTABLE CATION ANALYSES
INTERLAKE LANDFILL SITE

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (feet)	EXTRACTABLE CATIONS (milliequivalents/100 grams)			
			CALCIUM	MAGNESIUM	SODIUM	POTASSIUM
ST-1	S-4	18.5 - 20.0	15.97 (7.83)[1]	2.78	0.20	0.31
ST-1	S-12	58.5 - 60.0	15.06 (5.82)	2.02	0.33	0.34
ST-3	S-8	38.5 - 40.0	16.46 (3.55)	2.12	0.26	0.42
ST-3	S-15	73.5 - 75.0	17.47 (4.45)	2.12	0.32	0.31

[1] Calcium values in parentheses are closer to true "exchangeable" concentrations. These values were determined by subtracting the sum of the milliequivalents per 100 grams of magnesium, sodium, and potassium from the total cation exchange capacity as shown in Table 1. This removes the influence of calcium carbonate dissolution by ammonium acetate.

TABLE 3
X-RAY DIFFRACTION RESULTS
BULK SOIL SAMPLES
INTERLAKE LANDFILL SITE

BORING NO.	SAMPLE NO.	SAMPLE DEPTH (feet)	MINERAL COMPOSITION (%)							
			SMECTITE	INTERSTRATIFIED MINERAL AND CHLORITE	CHLORITIZED VERMICULITE	ILLITE	KAOLINITE	QUARTZ	CALCITE	FELDSPAR
ST-1	S-4	18.5 - 20.0	-(1)	8	-	24	16	30	18	4
ST-1	S-12	58.5 - 60.0	-	5	-	22	13	50	10	-
ST-3	S-8	38.5 - 40.0	TR(2)	-	10	30	15	45	-	-
ST-3	S-15	73.5 - 75.0	-	5 - 10	-	27	22	36	10	-

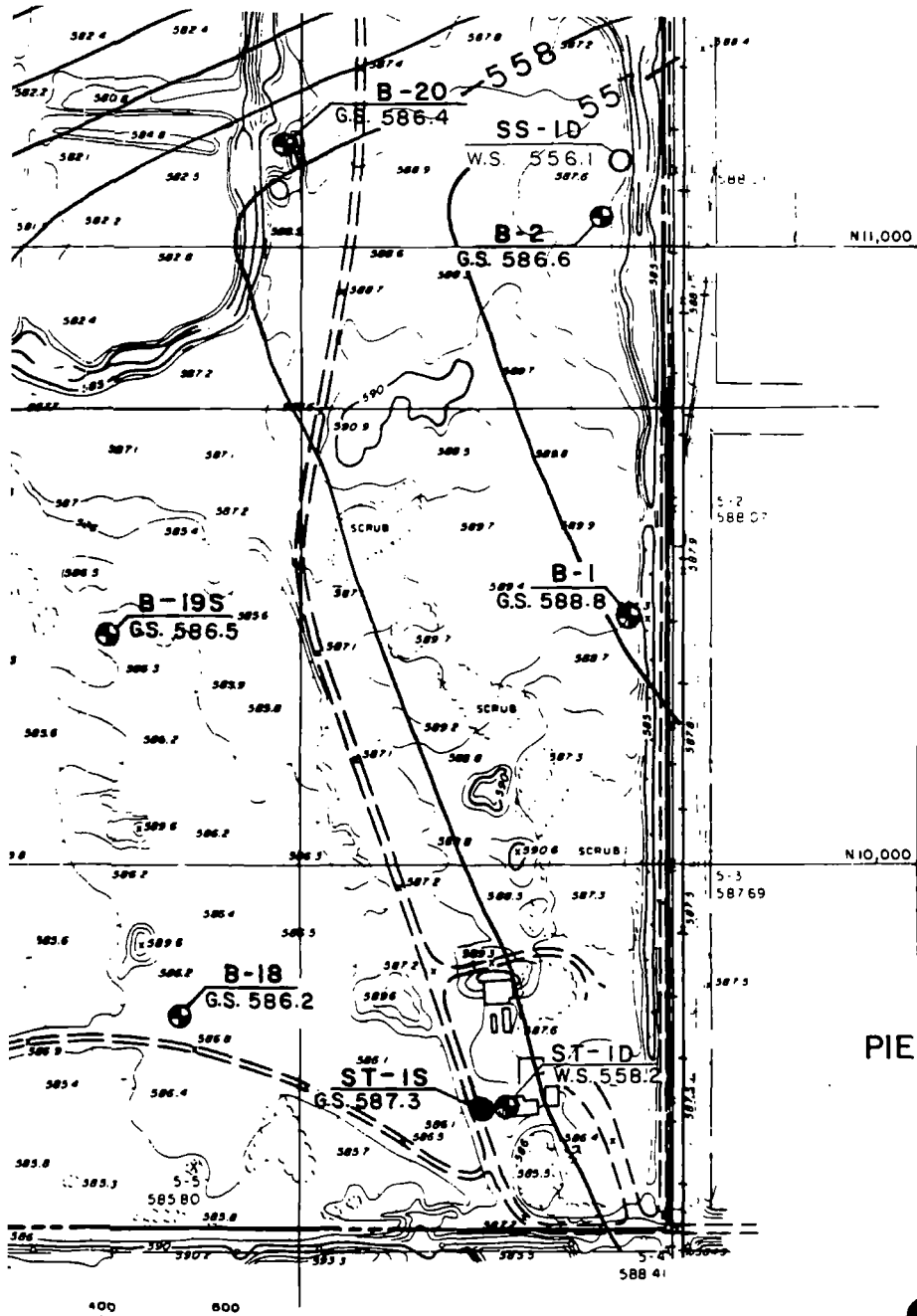
(1) Dash indicates none detected.

(2) TR = Trace detected.

TABLE 5
CATION EXCHANGE CAPACITY OF CLAY MINERALS

MINERAL	CATION EXCHANGE CAPACITY (meq/100 g)
Kaolinite	3 - 15
Halloysite $2H_2O$	5 - 10
Halloysite $4H_2O$	10 - 40
Montmorillonite	80 - 150
Illite	10 - 40
Vermiculite	100 - 150
Chlorite	10 - 40
Sepiolite-Attapulgite	20 - 30

SOURCE: Grim, Ralph E., 1962, Applied Clay Mineralogy, McGraw-Hill Book Co., Inc., New York, 422 pp.



AQUIFER.

M PIEZOMETER SCREENED IN SAND OR SILT SEAM.

NOTES

1. BORING AND PIEZOMETER LOCATIONS ARE APPROXIMATE.
2. PIEZOMETRIC CONTOURS ARE BASED ON THE WIDELY SPACED ELEVATIONS SHOWN IN GREEN, AND OUR INTERPRETATION. THE CONTOURS ARE INTENDED TO ILLUSTRATE GENERAL TRENDS, NOT TO LOCATE SPECIFIC VALUES. THESE LEVELS MAY FLUCTUATE SEVERAL FEET WITH THE SEASONS, AND MAY FLUCTUATE SIGNIFICANTLY DUE TO AREA PUMPING RATE VARIATIONS.
3. THESE CONTOURS ARE BASED ON READINGS TAKEN DURING MAY, 1982.
4. THIS DRAWING HAS BEEN REPRODUCED FROM AN UNNUMBERED DRAWING SUPPLIED BY WASTE MANAGEMENT ON MAY 6, 1982. THE DRAWING INCLUDED THE SURFACE TOPOGRAPHY (FROM AIRPHOTOGRAPHY TAKEN DEC., 1981), PROPERTY LINES, AND ASSUMED COORDINATE SYSTEM.

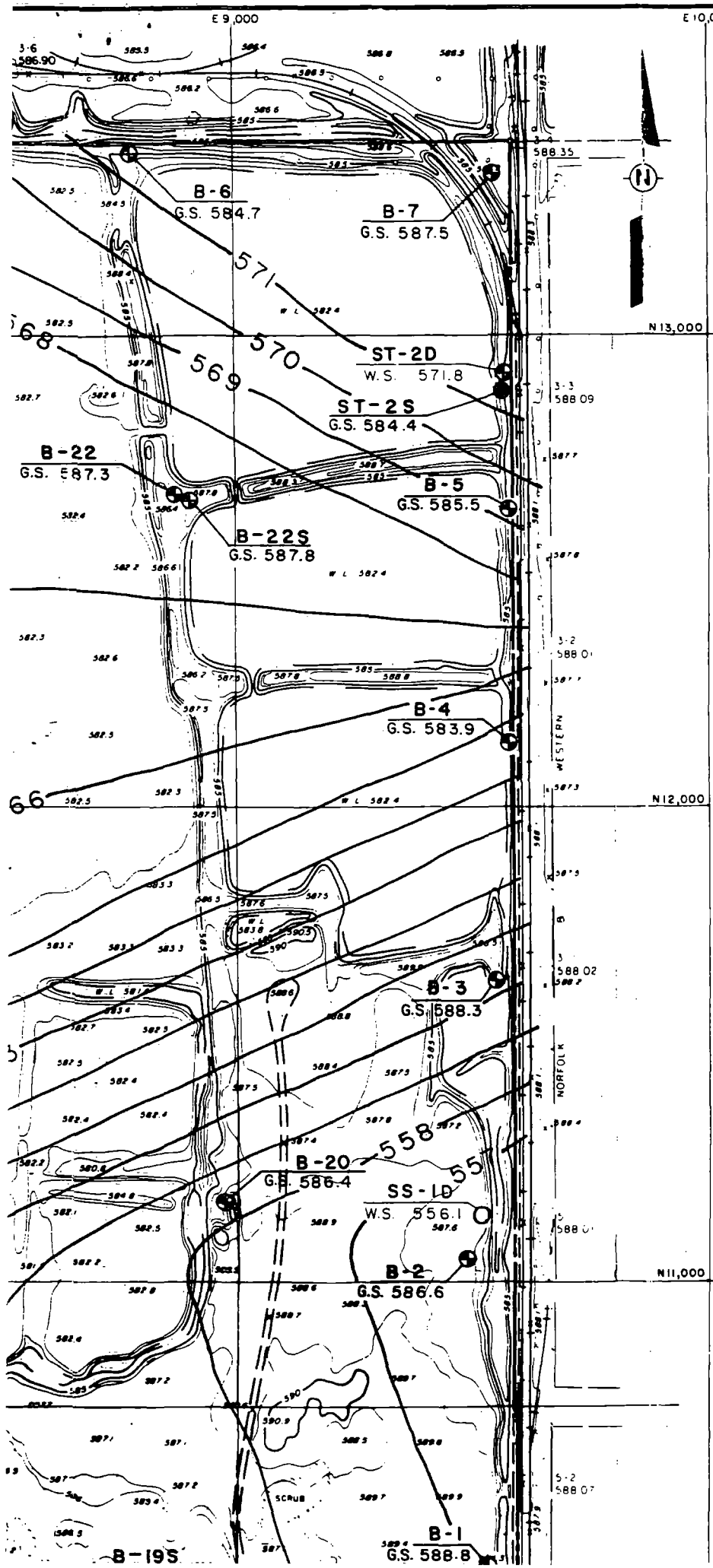
PIEZOMETRIC SURFACE CONTOURS
ROCK AQUIFER
INTERLAKE SITE
CHICAGO, ILLINOIS

PREPARED FOR

WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Canonie Environmental

DATE: 5/19/82	FIGURE 13	DRAWING NUMBER
SCALE: AS SHOWN		81-099 E 4



LEGEND

- PIEZOMETER SCREENED IN THE ROCK AQUIFER.
- SOIL TEST BORING OR SHALLOWER PIEZOMETER.
- AUGERED BORING WITH SHALLOWER PIEZOMETER.
- ST-1S — BORING NUMBER; RELATIVE PIEZOMETER SCREEN DEPTH; G.S. 587.3 — GROUND SURFACE ELEVATION (MSL)
- ST-1D — W.S. 558.2 — WATER SURFACE ELEVATION USED TO DEVELOP CONTOURS.
- 566 — ROCK AQUIFER PIEZOMETRIC SURFACE ELEVATION CONTOUR (MSL), 1.0 FOOT INTERVAL.

ABBREVIATIONS:

- ST — BORING DRILLED DURING PRELIMINARY EXPLORATION.
- B — BORING DRILLED DURING MAIN EXPLORATION.
- SS — STAINLESS STEEL PIEZOMETER.
- S — PIEZOMETER SCREENED IN NEAR SURFACE AQUIFER.
- D — PIEZOMETER SCREENED IN ROCK AQUIFER.
- M — PIEZOMETER SCREENED IN SAND OR SILT SEAM.

NOTES

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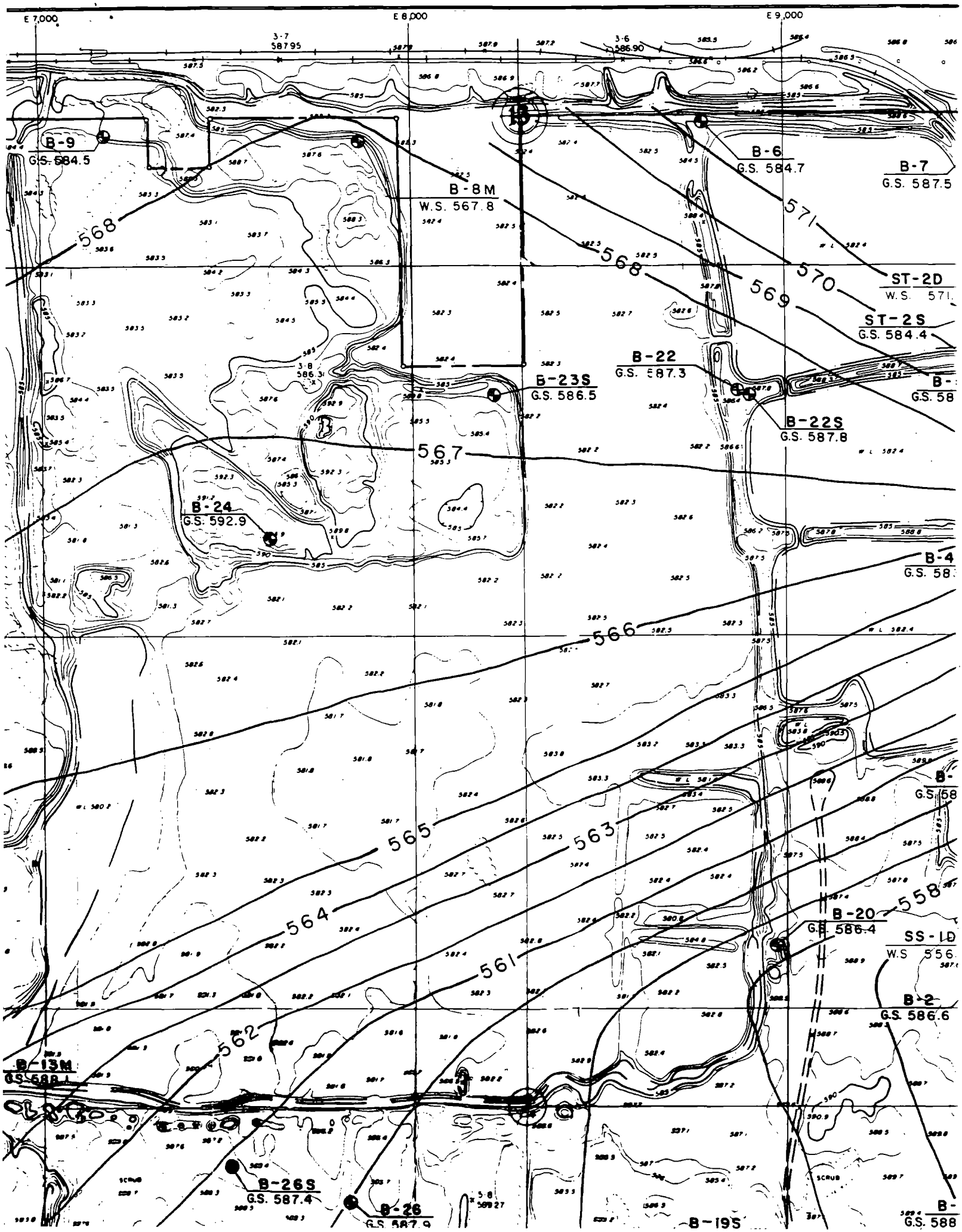
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ST-2S
G.S. 584.4
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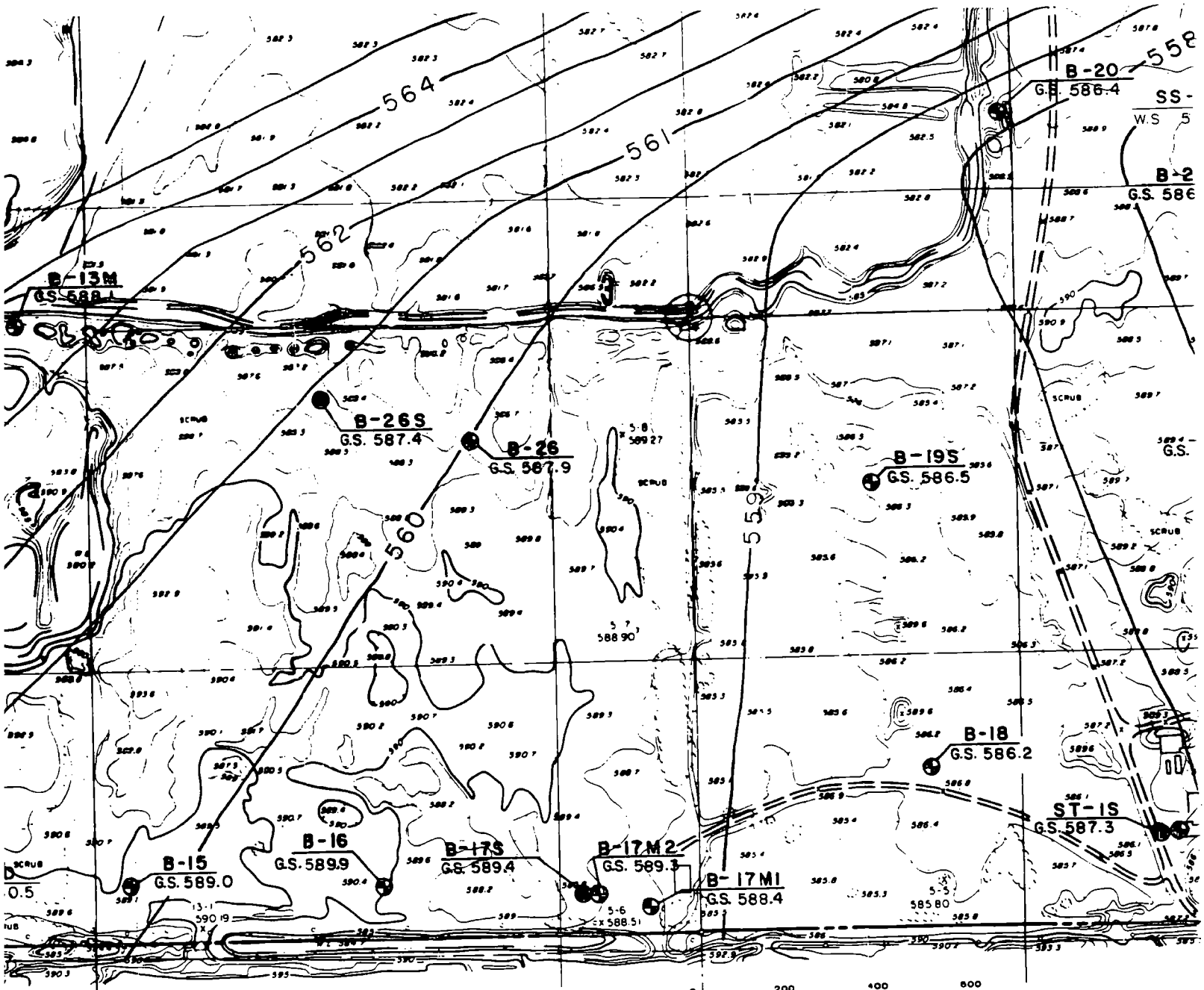
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B-18
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ST-1S
G.S. 587.3
B-15
G.S. 589.0
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G.S. 589.9
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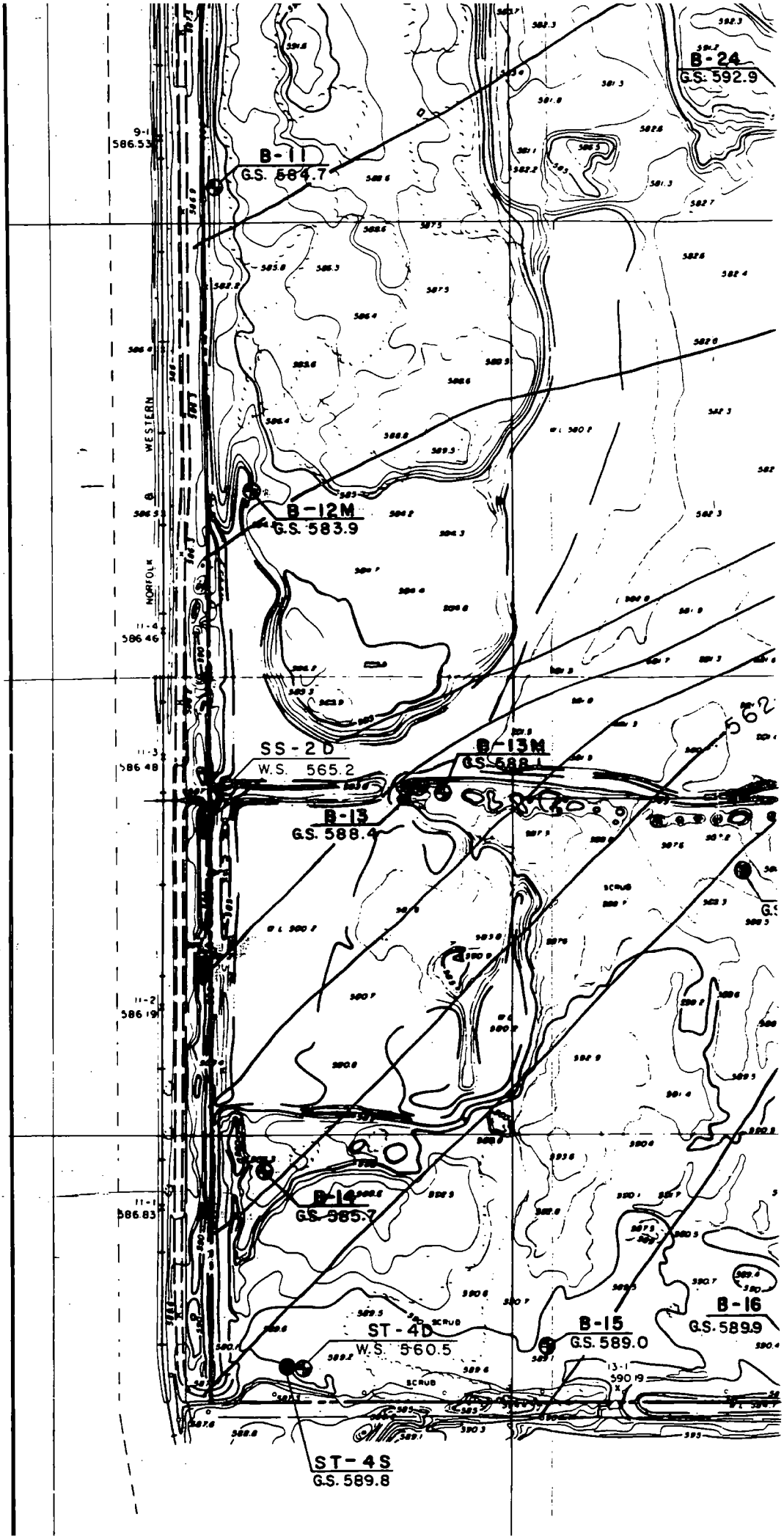
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W.S. 565.2
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B-13
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G.S. 585.7
ST-4D
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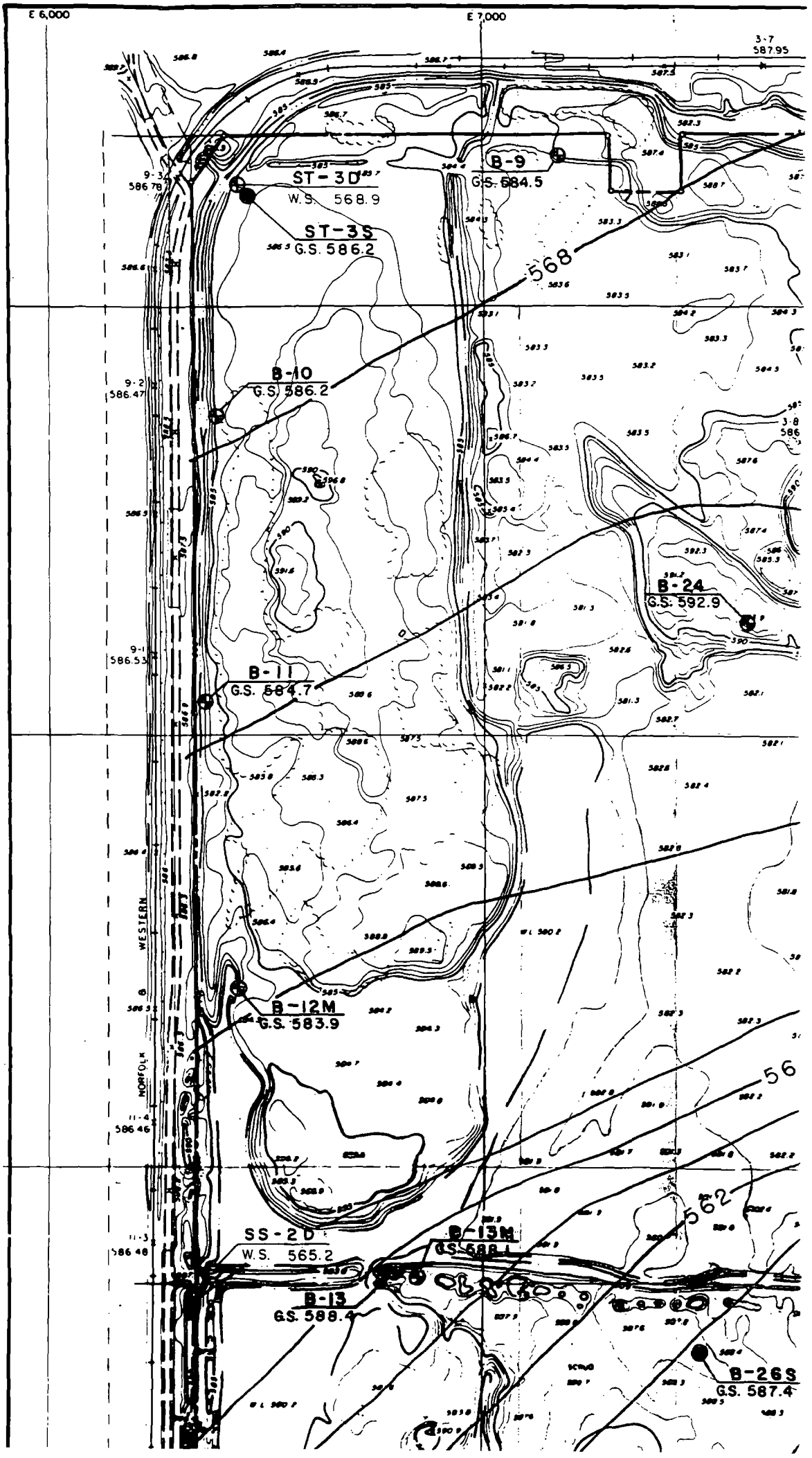
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WESTERN
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G.S. 588.1
B-13
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G.S. 587.4

3. THESE CONTOURS ARE BASED ON READINGS TAKEN DURING MAY, 1982.

4. THIS DRAWING HAS BEEN REPRODUCED FROM AN UNNUMBERED DRAWING SUPPLIED BY WASTE MANAGEMENT ON MAY 6, 1982. THE DRAWING INCLUDED THE SURFACE TOPOGRAPHY (FROM AIRPHOTOGRAPHY TAKEN DEC., 1981), PROPERTY LINES, AND ASSUMED COORDINATE SYSTEM.

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PIEZOMETRIC SURFACE CONTOURS
NEAR SURFACE AQUIFER
INTERLAKE SITE
CHICAGO, ILLINOIS

PREPARED FOR

WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

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TE: 5/19/82	FIGURE 12	DRAWING NUMBER
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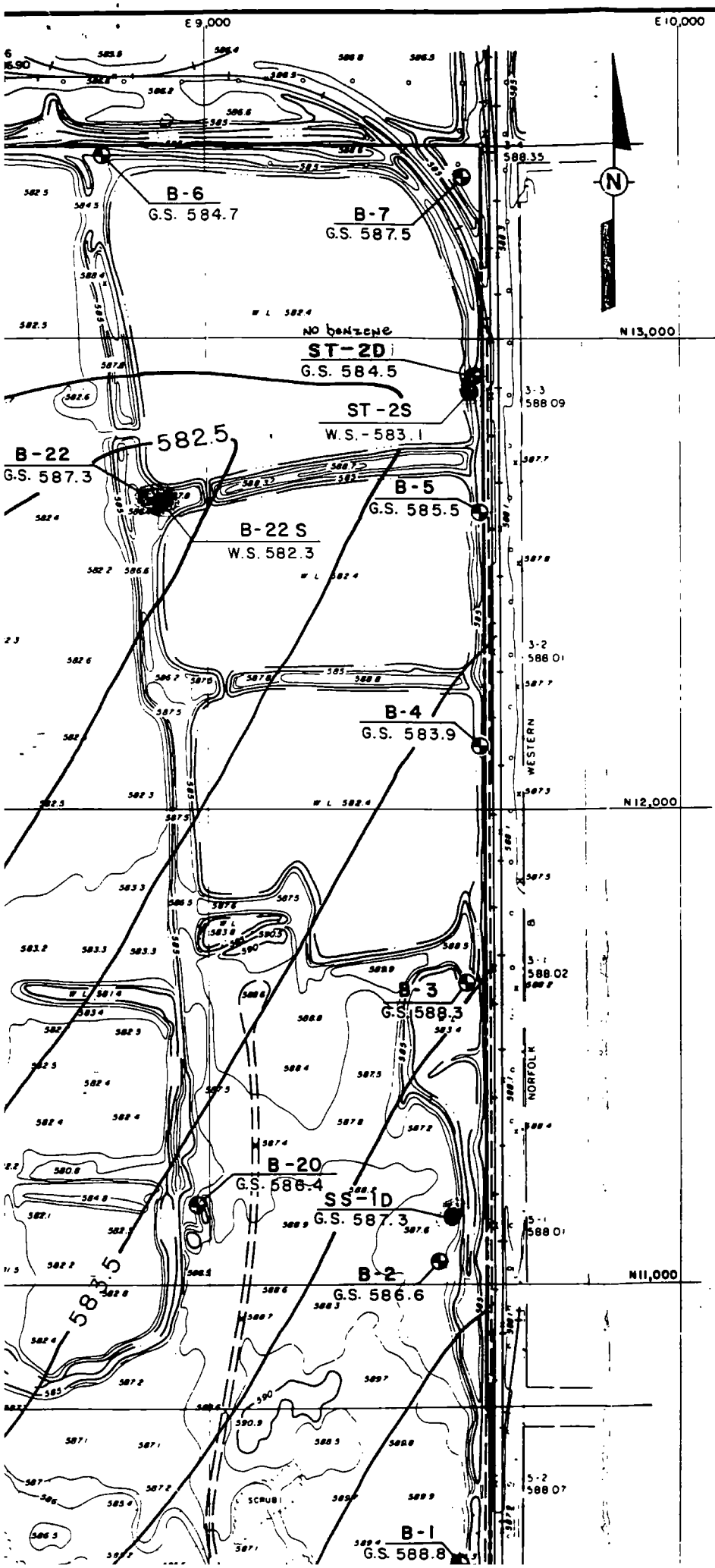

cyanide concentration at least 3x other wells

LEGEND

- PIEZOMETER SCREENED IN THE NEAR SURFACE AQUIFER.
- SOIL TEST BORING OR DEEPER PIEZOMETER.
- AUGERED BORING WITH DEEPER PIEZOMETER.
- ST-1D — BORING NUMBER; RELATIVE PIEZOMETER SCREEN DEPTH; G.S. 587.3 — GROUND SURFACE ELEVATION (MSL)
- ST-1S, W.S. 585.2 — WATER SURFACE ELEVATION USED TO DEVELOP CONTOURS
- 582.5 — NEAR SURFACE AQUIFER PIEZOMETRIC SURFACE ELEVATION CONTOURS (MSL), 0.5 FOOT INTERVAL.

ABBREVIATIONS:

- **ST** BORING DRILLED DURING PRELIMINARY EXPLORATION.
- **B** BORING DRILLED DURING MAIN EXPLORATION.
- **SS** STAINLESS STEEL PIEZOMETER.
- **S** PIEZOMETER SCREENED IN NEAR SURFACE AQUIFER.
- **D** PIEZOMETER SCREENED IN ROCK AQUIFER.
- **M** PIEZOMETER SCREENED IN SAND OR SILT SEAM.

NOTES

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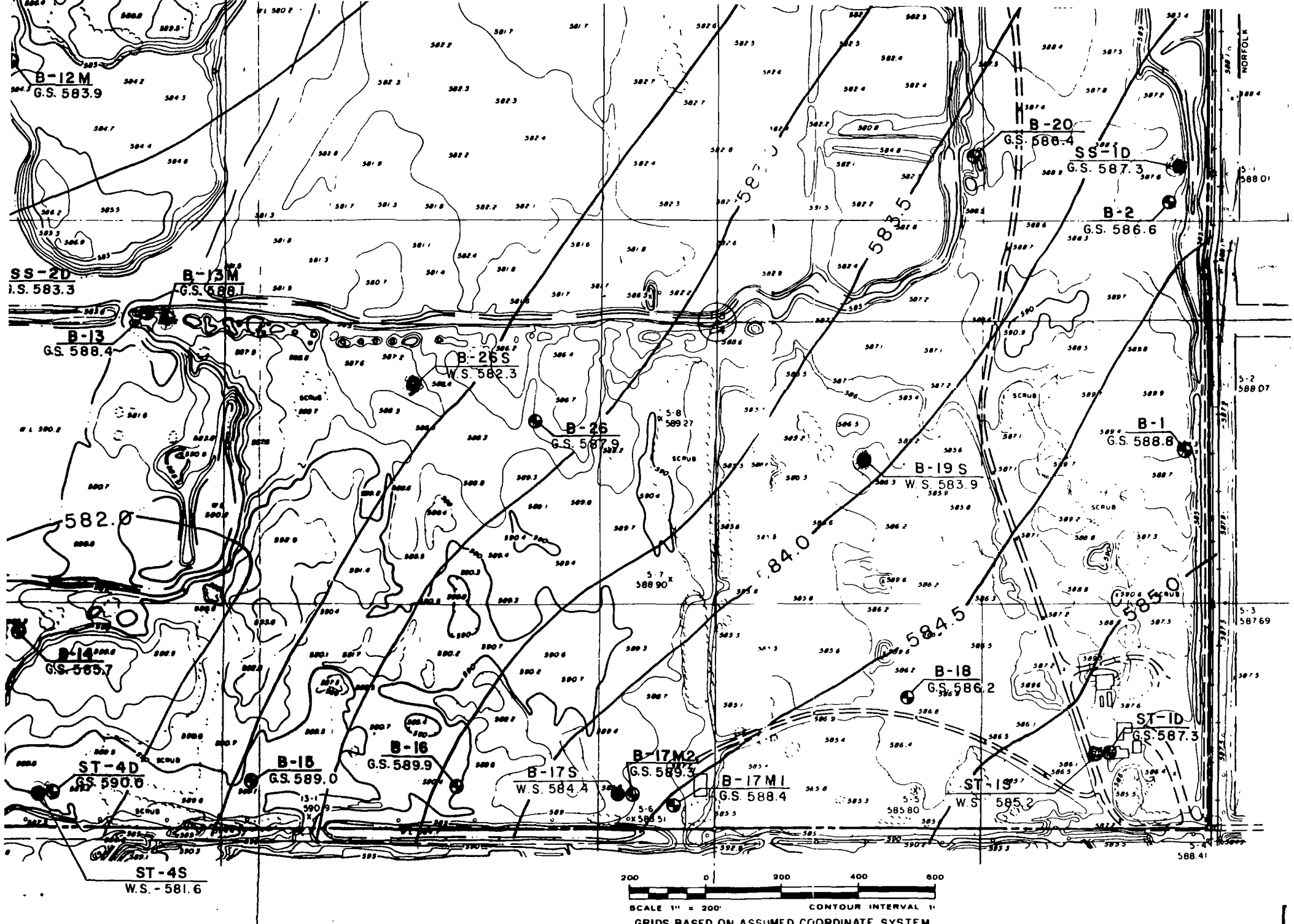
3. THESE CONTOURS ARE BASED ON READINGS TAKEN DURING MAY, 1982.
4. THIS DRAWING HAS BEEN REPRODUCED FROM AN UNNUMBERED DRAWING SUPPLIED BY WASTE MANAGEMENT ON MAY 6, 1982. THE DRAWING INCLUDED THE SURFACE TOPOGRAPHY (FROM AIRPHOTOGRAPHY TAKEN DEC., 1981), PROPERTY LINES, AND ASSUMED COORDINATE SYSTEM.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W.S. 582.3
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B-20
G.S. 586.4
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B-17M2
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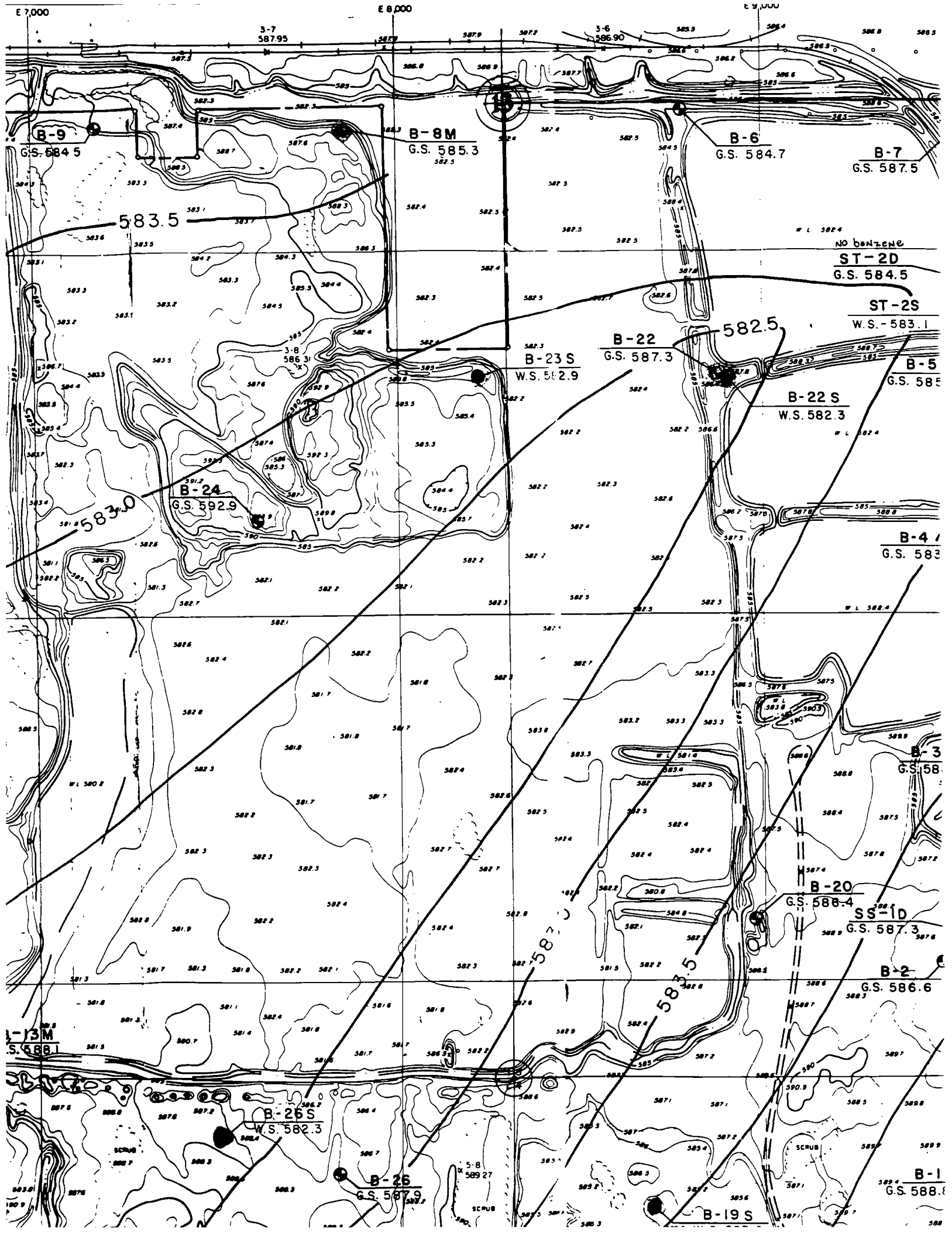
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NO benzene
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W.S.-583.1
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B-23 S
W.S. 582.9
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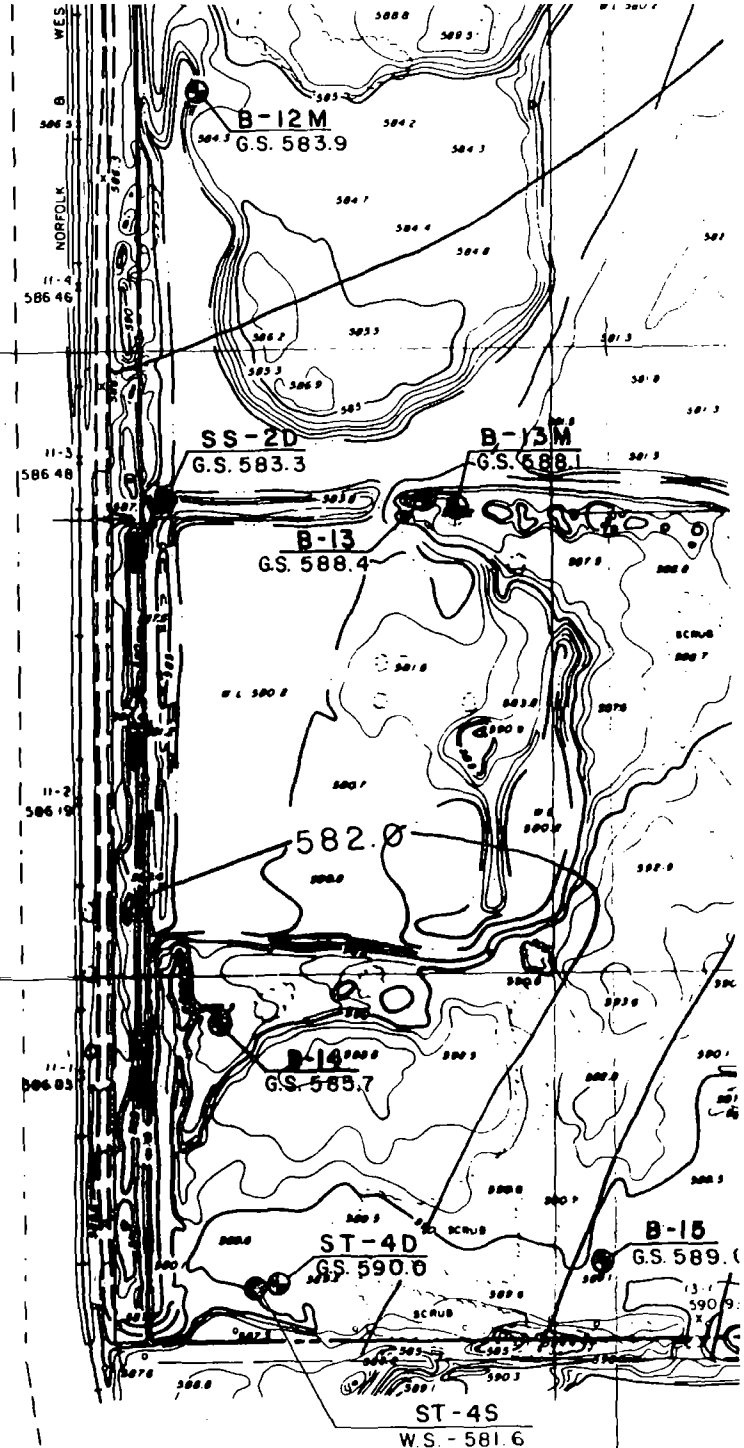
B-20
G.S. 588.4
SS-1D
G.S. 587.3
B-2
G.S. 586.6
583.5
B-13M
S. 588.1
B-25 S
W.S. 582.3
5-8
589.27
B-26
G.S. 587.9
B-19 S
B-1
G.S. 588.8
SCRUB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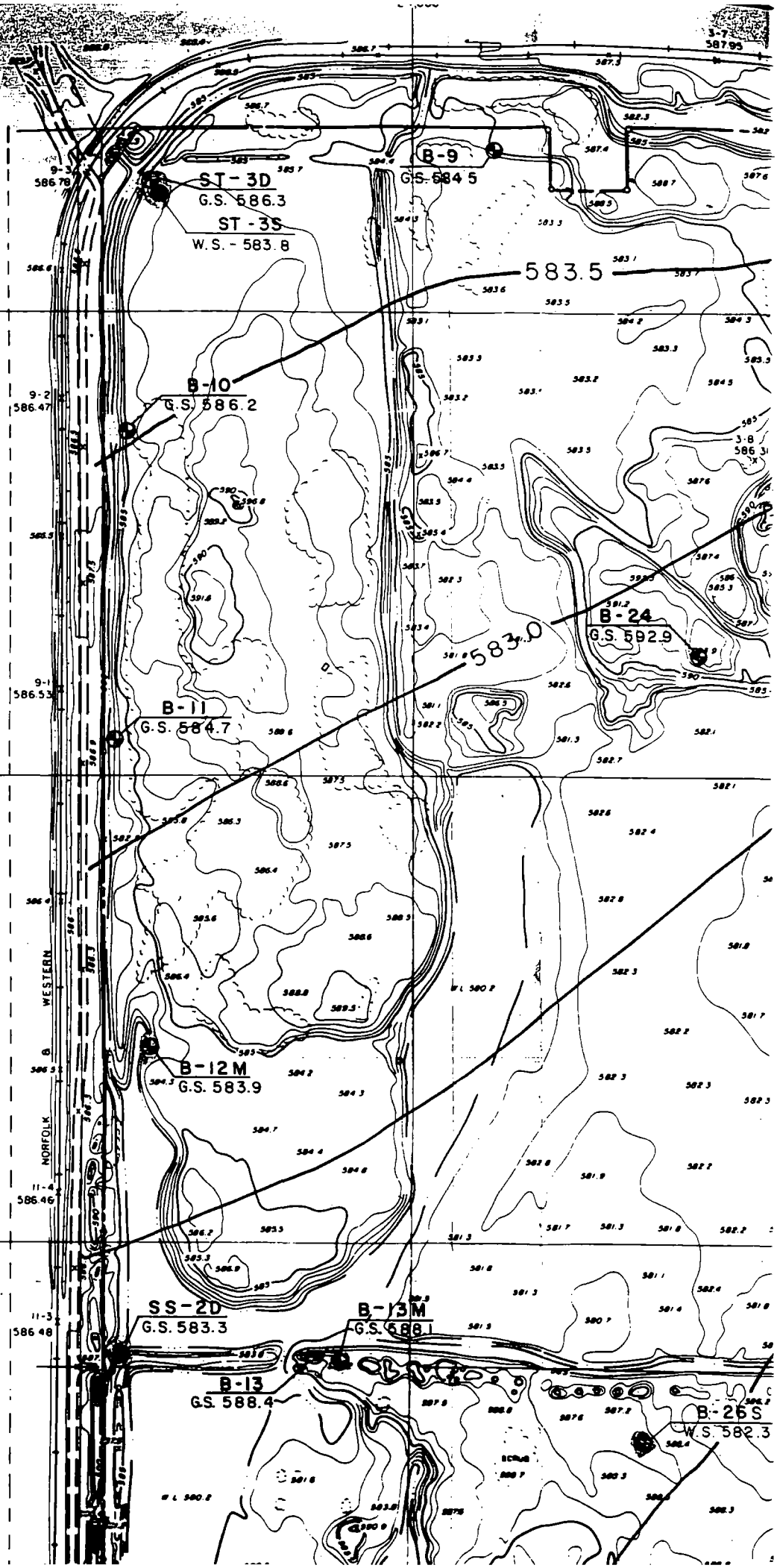
SS-2D
G.S. 583.3
B-13M
G.S. 588.1
B-13
G.S. 588.4
582.0
B-14
G.S. 585.7
ST-4D
G.S. 590.0
B-15
G.S. 589.
ST-4S
W.S. - 581.6
NORFOLK
SCRUB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ST-3S
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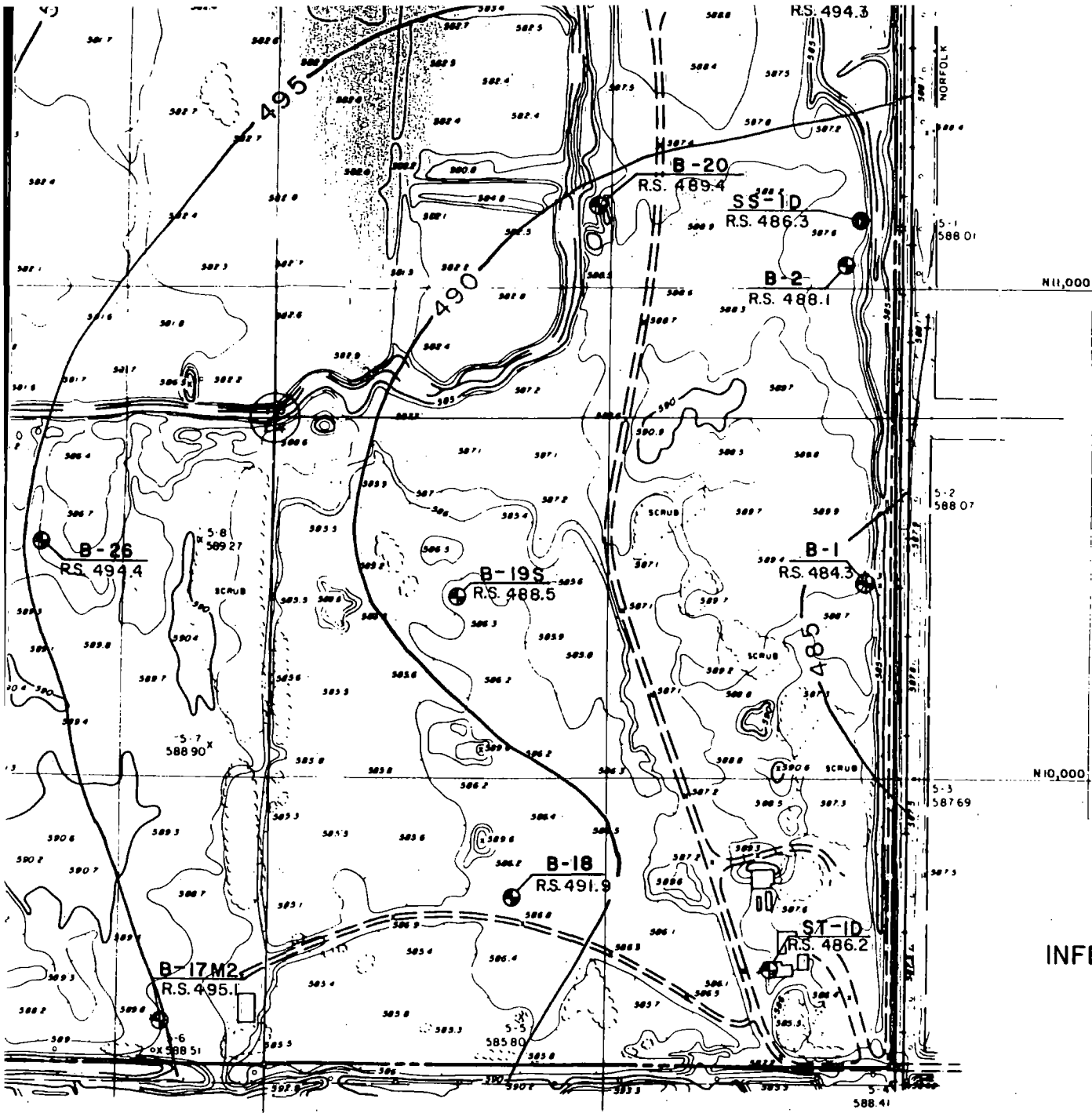
B-9
G.S. 584.5
583.5
B-10
G.S. 586.2
B-24
G.S. 592.9
583.0
B-11
G.S. 584.7
B-12M
G.S. 583.9
SS-2D
G.S. 583.3
B-13M
G.S. 588.1
B-13
G.S. 588.4
B-26S
W.S. 582.3
WESTERN
NORFOLK
9-3
586.78
9-2
586.47
9-1
586.53
11-4
586.46
11-3
586.48
3-7
587.95
3-8
586.31



200 0 200 400 600

SCALE 1" = 200' CONTOUR INTERVAL 1'

GRIDS BASED ON ASSUMED COORDINATE SYSTEM.

DATE OF PHOTOGRAPHY DECEMBER 1981 DATE OF MAPPING MARCH 1982

M PIEZOMETER SCREENED IN SAND OR SILT SEAM.

NOTES

1. BORING AND PIEZOMETER LOCATIONS ARE APPROXIMATE.
2. THE ROCK SURFACE HAS BEEN INTERPRETED FROM THE SOIL TEST BORINGS. APPROXIMATELY 10 FEET OF ROCK WAS CORED IN SIX OF THE BORINGS FOR DEEP PIEZOMETER INSTALLATION. IN THE REMAINING BORINGS, THE ROCK SURFACE WAS INFERRED FROM THE DEPTH OF REFUSAL TO SOIL DRILLING METHODS. REFUSAL TO SOIL DRILLING METHODS CAN BE CAUSED BY BEDROCK, BOULDERS, AND "FLOATING" ROCK SLABS. ALSO, DOLOMITE ROCK SURFACES CAN VARY ERRATICALLY BETWEEN BORINGS IN THE FORM OF PINNACLES AND SLOTS, ALTHOUGH THAT WOULD BE UNUSUAL IN THIS AREA. THEREFORE, THESE CONTOURS ARE INTENDED TO ILLUSTRATE GENERAL TRENDS AND NOT TO LOCATE SPECIFIC ELEVATIONS.
3. THIS DRAWING HAS BEEN REPRODUCED FROM AN UNNUMBERED DRAWING SUPPLIED BY WASTE MANAGEMENT ON MAY 6, 1982. THE DRAWING INCLUDED THE SURFACE TOPOGRAPHY (FROM AIRPHOTOGRAPHY TAKEN DEC., 1981), PROPERTY LINES, AND ASSUMED COORDINATE SYSTEM.

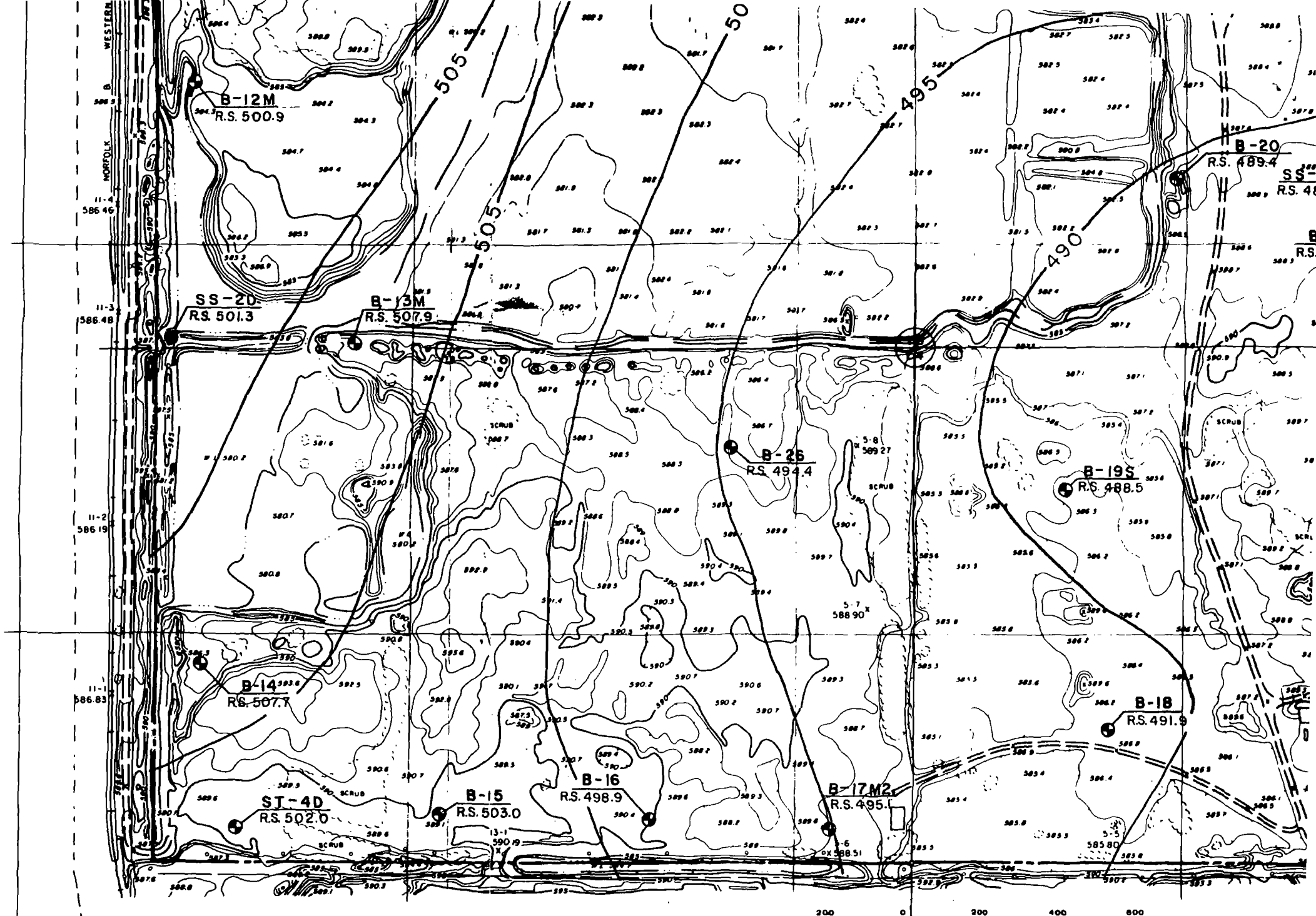
INFERRED ROCK SURFACE CONTOURS
INTERLAKE SITE
CHICAGO, ILLINOIS

PREPARED FOR

WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Canonie Environmental

DATE: 5/19/82	FIGURE 11	DRAWING NUMBER
SCALE: AS SHOWN		81-099 E5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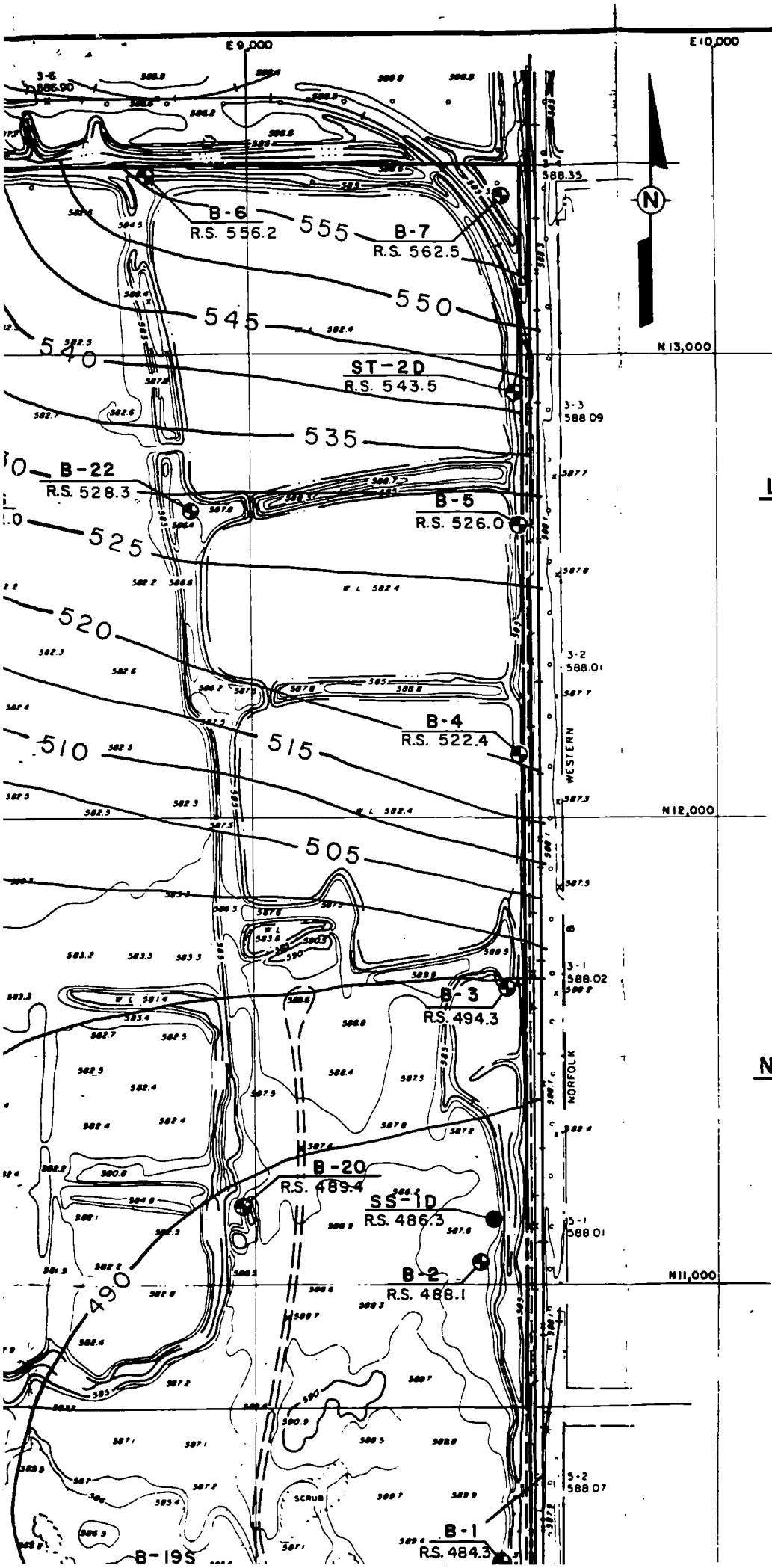
NORFOLK
B-12M
R.S. 500.9
SS-2D
R.S. 501.3
B-13M
R.S. 507.9
B-14
R.S. 507.7
ST-4D
R.S. 502.0
B-15
R.S. 503.0
B-16
R.S. 498.9
B-17M2
R.S. 495.1
B-26
R.S. 494.4
B-19S
R.S. 488.5
B-18
R.S. 491.9
B-20
R.S. 489.4
505
495
490
SCRUB
200 0 200 400 600
SCALE 1" = 200'
CONTOUR INTERVAL 1'
GRIDS BASED ON ASSUMED COORDINATE SYSTEM.
DATE OF PHOTOGRAPHY DECEMBER 1981
DATE OF MAPPING MARCH 1982



LEGEND

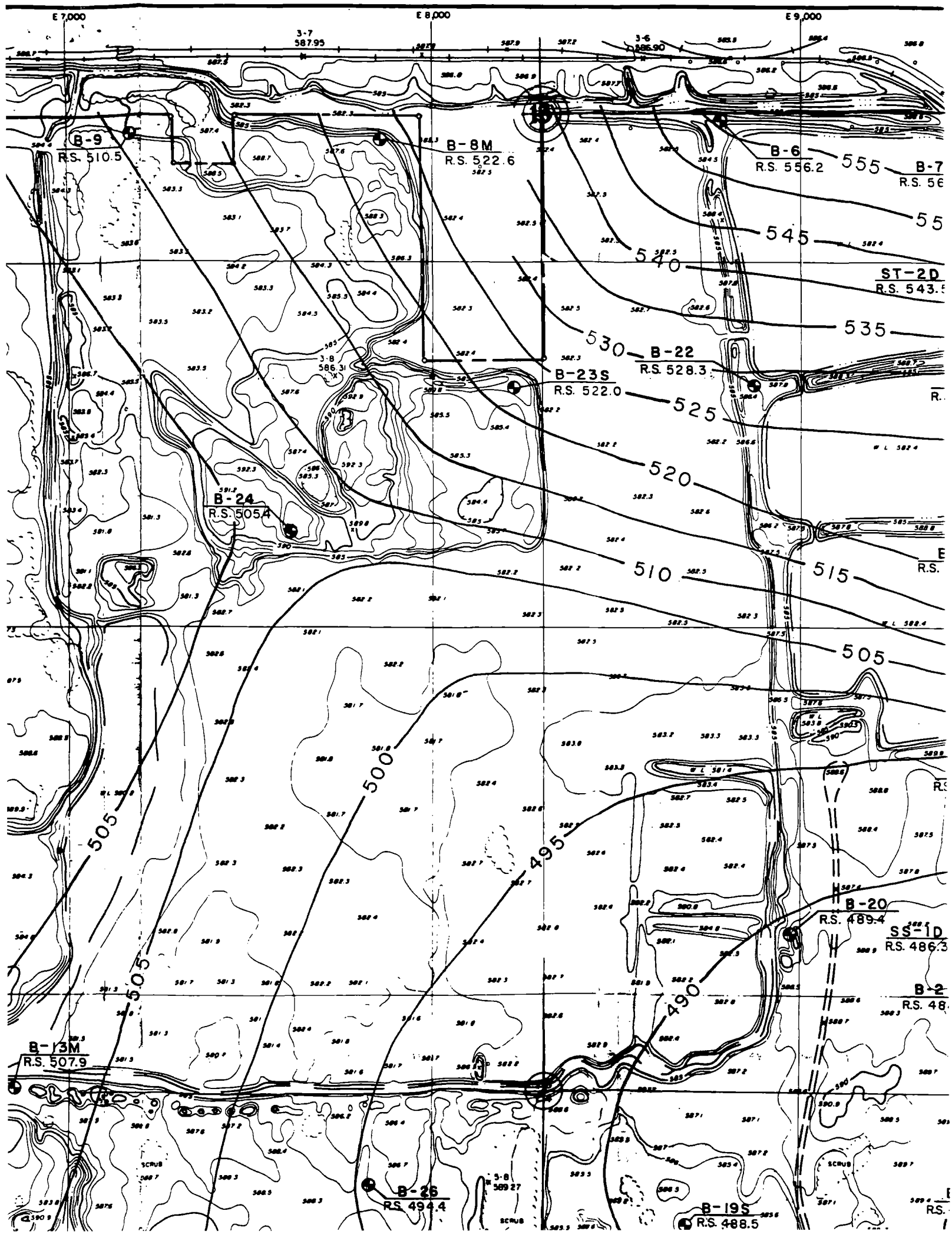
- SOIL TEST BORING WITH OR WITHOUT PIEZOMETER.
- AUGER BORING WITH PIEZOMETER
- ST-1D — BORING NUMBER; RELATIVE PIEZOMETER SCREEN DEPTH
- R.S. 486.2 — INFERRED ROCK SURFACE ELEVATION USED TO DEVELOP CONTOURS
- 530 — INFERRED ROCK SURFACE ELEVATION CONTOUR (MSL), 5.0 FOOT INTERVAL.

ABBREVIATIONS:

- ST BORING DRILLED DURING PRELIMINARY EXPLORATION.
- B BORING DRILLED DURING MAIN EXPLORATION.
- SS STAINLESS STEEL PIEZOMETER.
- S PIEZOMETER SCREENED IN NEAR SURFACE AQUIFER.
- D PIEZOMETER SCREENED IN ROCK AQUIFER.
- M PIEZOMETER SCREENED IN SAND OR SILT SEAM.

NOTES

1. BORING AND PIEZOMETER LOCATIONS ARE APPROXIMATE.
2. THE ROCK SURFACE HAS BEEN INTERPRETED FROM THE SOIL TEST BORINGS. APPROXIMATELY 10 FEET OF ROCK WAS CORED IN SIX OF THE BORINGS FOR DEEP PIEZOMETER INSTALLATION. IN THE REMAINING BORINGS, THE ROCK SURFACE WAS INFERRED FROM THE DEPTH OF REFUSAL TO SOIL DRILLING METHODS. REFUSAL TO SOIL DRILLING METHODS CAN BE CAUSED BY BEDROCK, BOULDERS, AND "FLOATING" ROCK SLABS. ALSO, DOLOMITE ROCK SURFACES CAN VARY ERRATICALLY BETWEEN BORINGS IN THE FORM OF PINNACLES AND SLOTS, ALTHOUGH THAT WOULD BE UNUSUAL IN THIS AREA. THEREFORE, THESE CONTOURS ARE INTENDED TO ILLUSTRATE GENERAL TRENDS AND NOT TO LOCATE SPECIFIC ELEVATIONS.
3. THIS DRAWING HAS BEEN REPRODUCED FROM AN UNNUMBERED DRAWING SUPPLIED BY WASTE MANAGEMENT ON MAY 6, 1982. THE DRAWING INCLUDED THE SURFACE TOPOGRAPHY (FROM AIRPHOTOGRAPHY TAKEN DEC., 1981), PROPERTY LINES, AND ASSUMED COORDINATE SYSTEM.


E 7,000
E 8,000
E 9,000
3-7
587.95
3-6
586.90
B-9
R.S. 510.5
B-8M
R.S. 522.6
B-6
R.S. 556.2
B-7
ST-2D
B-22
R.S. 528.3
B-23S
R.S. 522.0
3-8
586.31
B-24
R.S. 505.4
B-20
R.S. 489.4
SS-1D
B-13M
R.S. 507.9
B-26
R.S. 494.4
3-8
589.27
B-19S
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495
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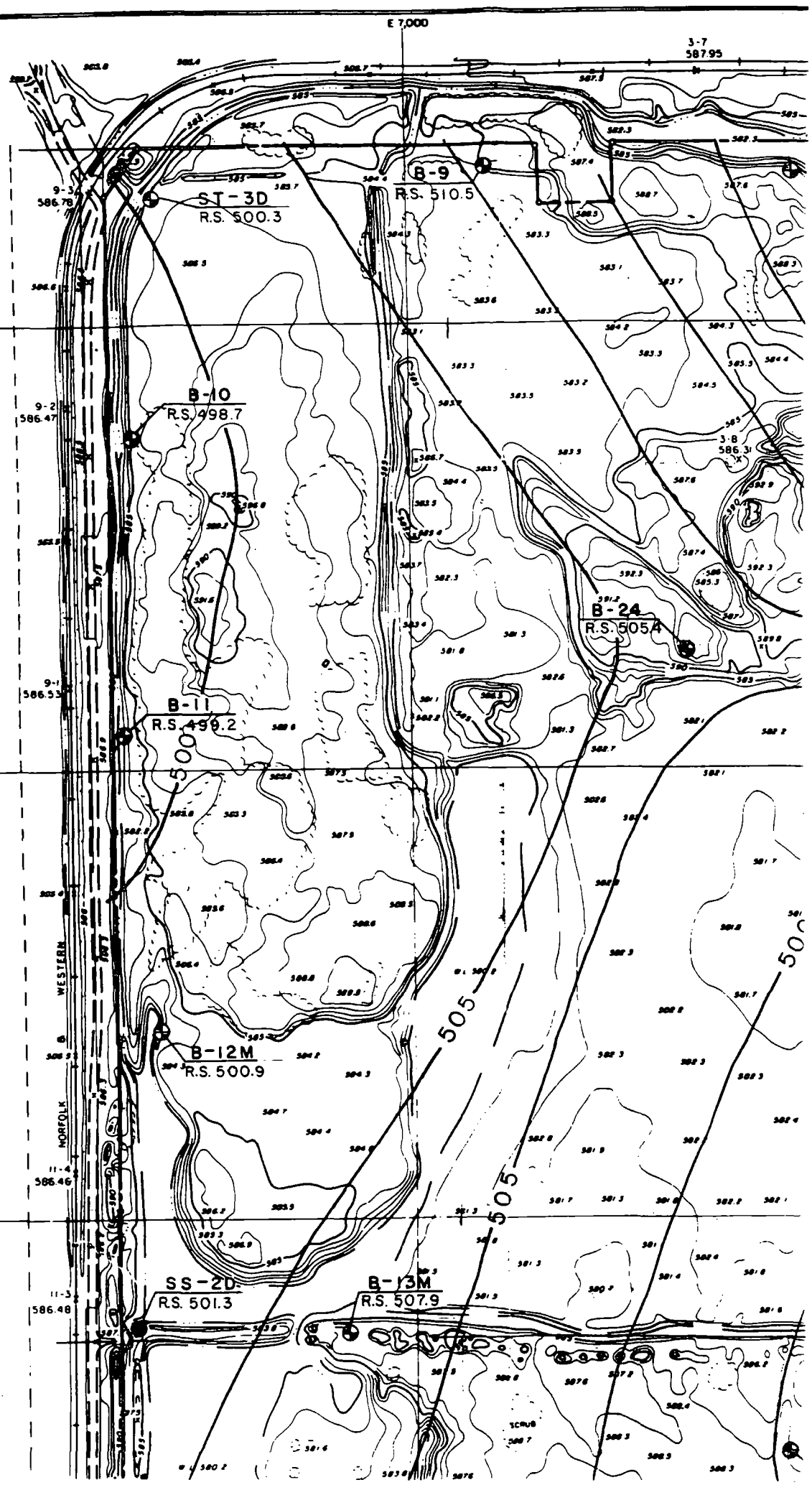
SCRUB


E 7,000
3-7
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9-3
586.78
ST-3D
R.S. 500.3
B-9
R.S. 510.5
B-10
R.S. 498.7
9-2
586.47
3-8
586.31
B-24
R.S. 505.4
9-1
586.53
B-11
R.S. 499.2
500
WESTERN
NORFOLK
B-12M
R.S. 500.9
505
11-4
586.46
SS-2D
R.S. 501.3
B-13M
R.S. 507.9
11-3
586.48
SCRUB

SAMPLE IDENTIFICATION: Interlake #9

TECHNICAL CENTER SAMPLE NUMBER: ENV 779

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	530	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	BDL	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #9

TECHNICAL CENTER SAMPLE NUMBER: ENV 779

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
[illegible]P.	ENDRIN ALDEHYDE	BDL	10
[illegible]P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

"POTABLE" DRILLING WATER

ENVIRONMENTAL LAB #: 779

SITE: CWM (Interlake) WELL POINT #: C-635

DATE SAMPLED: 5-11-82

LAB MANAGER: John W. Kalizewski 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N, mg/l ✓	0.43	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	<0.02	
			Sulfate, as SO_4, mg/l ✓	29.1	
			Phosphate, as PO_4, mg/l ✓	0.021	
pH, units			Cyanide, as CN, mg/l ✓	0.10	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	<0.005				
Barium, as Ba, mg/l ✓	0.021		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	<0.004		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.004		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	32.5		Cobalt, as Co, mg/l ✓	0.005	
Chromium, Total as Cr, mg/l ✓	0.011		Vanadium, as V, mg/l ✓	0.104	
Hexavalent Chromium, as Cr, mg/l ✓	<0.01		Radium		
Copper, as Cu, mg/l ✓	0.006		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.037		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	<0.005				
Lead, as Pb, mg/l ✓	<0.005				
Manganese, as Mn, mg/l ✓	0.041		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	13.1		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	<0.0001				
Nickel, as Ni, mg/l ✓	0.011				
Potassium, as K, mg/l ✓	50.3		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.010		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	13.4		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	<0.004		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.034				
Beryllium, as Be, mg/l ✓	<0.001				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	13.3				
COD mg/l ✓	21.3		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	1.1				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #8

TECHNICAL CENTER SAMPLE NUMBER: ENV 778

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
15P.	ENDRIN ALDEHYDE	BDL	10
16P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL ST-4D

ENVIRONMENTAL LAB #: 778

SITE: CWM (Interlake)

WELL POINT #: C-634

DATE SAMPLED: 5-11-82

LAB MANAGER: John W. Gingerich 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N, mg/l ✓	1.56	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	1.19	
			Sulfate, as SO_4, mg/l ✓	103.	
			Phosphate, as PO_4, mg/l ✓	0.015	
pH, units			Cyanide, as CN, mg/l ✓	0.24	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	0.006				
Barium, as Ba, mg/l ✓	0.196		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	1.99		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.003		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	78.0		Cobalt, as Co, mg/l ✓	0.001	
Chromium, Total as Cr, mg/l ✓	0.016		Vanadium, as V, mg/l ✓	0.344	
Hexavalent Chromium, as Cr, mg/l ✓	0.016		Radium		
Copper, as Cu, mg/l ✓	0.009		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.913		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	0.553				
Lead, as Pb, mg/l ✓	0.005				
Manganese, as Mn, mg/l ✓	0.025		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	42.9		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	<0.0001				
Nickel, as Ni, mg/l ✓	0.033				
Potassium, as K, mg/l ✓	46.6		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.005		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	172.		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	0.002		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.087				
Beryllium, as Be, mg/l ✓	0.0009				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	160.				
COD mg/l ✓	192.		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	1.0				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #11

TECHNICAL CENTER SAMPLE NUMBER: ENV 781

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	790	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	BDL	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #11

TECHNICAL CENTER SAMPLE NUMBER: ENV 781

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
15P.	ENDRIN ALDEHYDE	BDL	10
16P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL SS-3D

ENVIRONMENTAL LAB #: 781

SITE: CWM (Interlake)

WELL POINT #: C-637

DATE SAMPLED: 5-11-82

LAB MANAGER: John W. Kalogianis

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N, mg/l ✓	1.28	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	3.23	
			Sulfate, as SO_4, mg/l ✓	213.	
			Phosphate, as PO_4, mg/l ✓	<0.01	
pH, units			Cyanide, as CN, mg/l ✓	0.14	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	0.003				
Barium, as Ba, mg/l ✓	0.033		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	1.86		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.002		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	25.9		Cobalt, as Co, mg/l ✓	0.003	
Chromium, Total as Cr, mg/l ✓	0.003		Vanadium, as V, mg/l ✓	0.113	
Hexavalent Chromium, as Cr, mg/l ✓			Radium		
Copper, as Cu, mg/l ✓	0.005		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.066		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	0.030				
Lead, as Pb, mg/l ✓					
Manganese, as Mn, mg/l ✓	0.015		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	14.2		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	0.002				
Nickel, as Ni, mg/l ✓	0.021				
Potassium, as K, mg/l ✓	27.9		Endrin, mg/l		
Selenium, as Se, mg/l ✓	0.001		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.006		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	164.		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	<0.004		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.030				
Beryllium, as Be, mg/l ✓	0.0002				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	112.				
COD mg/l ✓	42.		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	0.8				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #3

ECHNICAL CENTER SAMPLE NUMBER: ENV 765

BASE-NEUTRAL
EXTRACTABLE ORGANICS (continued)

		CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
32B.	FLUORENE	BDL	10
33B.	HEXACHLOROBENZENE	BDL	10
34B.	HEXACHLOROBUTADIENE	BDL	10
35B.	HEXACHLOROCYCLOPENTADIENE	BDL	10
36B.	HEXACHLOROETHANE	BDL	10
37B.	INDENO (1,2,3-CD) PYRENE	BDL	25
38B.	ISOPHORONE	BDL	10
39B.	NAPHTHALENE	BDL	10
40B.	NITROBENZENE	BDL	10
41B.	N-NITROSODIMETHYLAMINE	BDL	10
'B.	N-NITROSODI-N-PROPYLAMINE	BDL	10
3B.	N-NITROSODIPHENYLAMINE	BDL	10
44B.	PHENANTHRENE	BDL	10
45B.	PYRENE	BDL	10
46b.	1,2,4-TRICHLOROBENZENE	BDL	10

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #3

TECHNICAL CENTER SAMPLE NUMBER: ENV 765

	BASE-NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1B.	ACENAPHTHENE	BDL	10
2B.	ACENAPHTHYLENE	BDL	10
3B.	ANTHRACENE	BDL	10
4B.	BENZIDINE	BDL	10
5B.	BENZO (A) ANTHRACENE	BDL	10
6B.	BENZO (A) PYRENE	BDL	10
7B.	3,4-BENZOFLUORANTHENE	BDL	10
8B.	BENZO (GHI) PERYLENE	BDL	25
9B.	BENZO (K) FLUORANTHENE	BDL	10
.0B.	BIS (2-CHLOROETHOXY) METHANE	BDL	10
.1B.	BIS (2-CHLOROETHYL) ETHER	BDL	10
2B.	BIS (2-CHLOROISOPROPYL) ETHER	BDL	10
3B.	BIS (2-ETHYLHEXYL) PHTHALATE	BDL	10
.	4-BROMOPHENYL PHENYL ETHER	BDL	10
5B.	BUTYL BENZYL PHTHALATE	BDL	10
6B.	2-CHLORONAPHTHALENE	BDL	10
7B.	4-CHLOROPHENYL PHENYL ETHER	BDL	10
8B.	CHRYSENE	BDL	10
9B.	DIBENZO (A,H) ANTHRACENE	BDL	25
0B.	1,2-DICHLOROBENZENE	BDL	10
1B.	1,3-DICHLOROBENZENE	BDL	10
2B.	1,4-DICHLOROBENZENE	BDL	10
3B.	3,3'-DICHLOROBENZIDINE	BDL	10
4B.	DIETHYL PHTHALATE	BDL	10
5B.	DIMETHYL PHTHALATE	BDL	10
5B.	DI-N-BUTYL PHTHALATE	BDL	10
7B.	2,4-DINITROTOLUENE	BDL	10
3B.	2,6-DINITROTOLUENE	BDL	10
9B.	DI-N-OCTYL PHTHALATE	BDL	10
0B.	1,2-DIPHENYLHYDRAZINE	BDL	10
1B.	FLUORANTHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #3

TECHNICAL CENTER SAMPLE NUMBER: ENV 765

	ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1A.	2-CHLOROPHENOL	BDL	25
2A.	2,4-DICHLOROPHENOL	BDL	25
3A.	2,4-DIMETHYLPHENOL	BDL	25
4A.	4,6-DINITRO-O-CRESOL	BDL	250
5A.	2,4-DINITROPHENOL	BDL	250
6A.	2-NITROPHENOL	BDL	25
7A.	4-NITROPHENOL	BDL	25
8A.	P-CHLORO-M-CRESOL	BDL	25
9A.	PENTACHLOROPHENOL	BDL	25
10A.	PHENOL	BDL	25
11A.	2,4,6-TRICHLOROPHENOL	BDL	25

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #3

TECHNICAL CENTER SAMPLE NUMBER: ENV 765

PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P. ALDRIN	BDL	10
2P. ALPHA-BHC	BDL	10
3P. BETA-BHC	BDL	10
4P. GAMMA-BHC	BDL	10
5P. DELTA-BHC	BDL	10
6P. CHLORDANE	BDL	10
7P. 4,4'-DDT	BDL	10
8P. 4,4'-DDE	BDL	10
9P. 4,4'-DDD	BDL	10
10P. DIELDRIN	BDL	10
11P. ALPHA-ENDOSULFAN	BDL	10
12P. BETA-ENDOSULFAN	BDL	10
13P. ENDOSULFAN SULFATE	BDL	10
14P. ENDRIN	BDL	10
15P. ENDRIN ALDEHYDE	BDL	10
16P. HEPTACHLOR	BDL	10
17P. HEPTACHLOR EPOXIDE	BDL	10
18P. PCB-1242	BDL	10
19P. PCB-1254	BDL	10
20P. PCB-1221	BDL	10
21P. PCB-1232	BDL	10
22P. PCB-1248	BDL	10
23P. PCB-1260	BDL	10
24P. PCB-1016	BDL	10
25P. TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL ST-2D

ENVIRONMENTAL LAB #: 765

SITE: CWM (Interlake) WELL POINT #: C-629

DATE SAMPLED: 5-5-82

LAB MANAGER: John W. Kolczanis 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N . mg/l ✓	0.16	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	0.81	
			Sulfate, as SO_4, mg/l ✓	242.	
			Phosphate, as PO_4, mg/l ✓	<0.01	
pH, units			Cyanide, as CN, mg/l ✓	2.96	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	<0.005				
Barium, as Ba, mg/l ✓	0.051		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	0.870		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.054		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	77.7		Cobalt, as Co, mg/l ✓	0.242	
Chromium, Total as Cr, mg/l ✓	0.315		Vanadium, as V, mg/l ✓	0.311	
Hexavalent Chromium, as Cr, mg/l ✓	0.02		Radium		
Copper, as Cu, mg/l ✓	0.136		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.214		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	0.052				
Lead, as Pb, mg/l ✓	<0.005				
Manganese, as Mn, mg/l ✓	0.084		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	26.8		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	0.0002				
Nickel, as Ni, mg/l ✓	0.273				
Potassium, as K, mg/l ✓	2100.		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.190		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	169.		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	0.049		2, 4, 5 TP (Silvex) mg/l		
Beryllium, as Be, mg/l ✓	0.011				
Antimony, as Sb, mg/l ✓	0.824				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	56.9				
COD mg/l ✓	458.		Priority Pollutant ✓		
Fluorides, as F, mg/l ✓	0.9		Scan		

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #3

TECHNICAL CENTER SAMPLE NUMBER: ENV 765

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	BDL	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	BDL	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #6

TECHNICAL CENTER SAMPLE NUMBER: ENV 769

BASE-NEUTRAL
EXTRACTABLE ORGANICS (continued)

		CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
32B.	FLUORENE	BDL	10
33B.	HEXACHLOROBENZENE	BDL	10
34B.	HEXACHLOROBUTADIENE	BDL	10
35B.	HEXACHLOROCYCLOPENTADIENE	BDL	10
36B.	HEXACHLOROETHANE	BDL	10
37B.	INDENO (1,2,3-CD) PYRENE	BDL	25
38B.	ISOPHORONE	BDL	10
39B.	NAPHTHALENE	BDL	10
40B.	NITROBENZENE	BDL	10
41B.	N-NITROSODIMETHYLAMINE	BDL	10
2B.	N-NITROSODI-N-PROPYLAMINE	BDL	10
43B.	N-NITROSODIPHENYLAMINE	BDL	10
44B.	PHENANTHRENE	BDL	10
45B.	PYRENE	BDL	10
46B.	1,2,4-TRICHLOROBENZENE	BDL	10

BDL= BELOW DETECTION LIMIT

LE IDENTIFICATION: Interlake #6

CHNICAL CENTER SAMPLE NUMBER: ENV 769

	BASE-NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1B.	ACENAPHTHENE	BDL	10
2B.	ACENAPHTHYLENE	BDL	10
3B.	ANTHRACENE	BDL	10
4B.	BENZIDINE	BDL	10
5B.	BENZO (A) ANTHRACENE	BDL	10
6B.	BENZO (A) PYRENE	BDL	10
7B.	3,4-BENZOFLUORANTHENE	BDL	10
8B.	BENZO (GHI) PERYLENE	BDL	25
9B.	BENZO (K) FLUORANTHENE	BDL	10
10B.	BIS (2-CHLOROETHOXY) METHANE	BDL	10
11B.	BIS (2-CHLOROETHYL) ETHER	BDL	10
12B.	BIS (2-CHLOROISOPROPYL) ETHER	BDL	10
13B.	BIS (2-ETHYLHEXYL) PHTHALATE	BDL	10
14B.	4-BROMOPHENYL PHENYL ETHER	BDL	10
15B.	BUTYL BENZYL PHTHALATE	29	10
16B.	2-CHLORONAPHTHALENE	BDL	10
17B.	4-CHLOROPHENYL PHENYL ETHER	BDL	10
18B.	CHRYSENE	BDL	10
19B.	DIBENZO (A,H) ANTHRACENE	BDL	25
20B.	1,2-DICHLOROBENZENE	BDL	10
21B.	1,3-DICHLOROBENZENE	BDL	10
22B.	1,4-DICHLOROBENZENE	BDL	10
23B.	3,3'-DICHLOROBENZIDINE	BDL	10
24B.	DIETHYL PHTHALATE	BDL	10
25B.	DIMETHYL PHTHALATE	BDL	10
26B.	DI-N-BUTYL PHTHALATE	BDL	10
27B.	2,4-DINITROTOLUENE	BDL	10
28B.	2,6-DINITROTOLUENE	BDL	10
29B.	DI-N-OCTYL PHTHALATE	BDL	10
30B.	1,2-DIPHENYLHYDRAZINE	BDL	10
31B.	FLUORANTHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #6

TECHNICAL CENTER SAMPLE NUMBER: ENV 769

	ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1A.	2-CHLOROPHENOL	BDL	25
2A.	2,4-DICHLOROPHENOL	BDL	25
3A.	2,4-DIMETHYLPHENOL	BDL	25
4A.	4,6-DINITRO-O-CRESOL	BDL	250
5A.	2,4-DINITROPHENOL	BDL	250
6A.	2-NITROPHENOL	BDL	25
7A.	4-NITROPHENOL	BDL	25
8A.	P-CHLORO-M-CRESOL	BDL	25
9A.	PENTACHLOROPHENOL	BDL	25
10A.	PHENOL	BDL	25
11A.	2,4,6-TRICHLOROPHENOL	BDL	25

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #6

TECHNICAL CENTER SAMPLE NUMBER: ENV 769

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	900	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	150	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL ST-1D

ENVIRONMENTAL LAB #: 769

SITE: Cwm (Interlake) WELL POINT #: C-632

DATE SAMPLED: 5-7-82

LAB MANAGER: John W. Kolczanis 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N , mg/l ✓	1.74	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	0.25	
			Sulfate, as SO_4, mg/l ✓	40.6	
			Phosphate, as PO_4, mg/l ✓	<0.05	
pH, units			Cyanide, as CN, mg/l ✓	0.45	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	<0.005				
Barium, as Ba, mg/l ✓	0.109		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	0.920		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.054		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	17.0		Cobalt, as Co, mg/l ✓	0.256	
Chromium, Total as Cr, mg/l ✓	0.140		Vanadium, as V, mg/l ✓	0.317	
Hexavalent Chromium, as Cr, mg/l ✓	0.140		Radium		
Copper, as Cu, mg/l ✓	0.141		Gross Alpha		
Iron, total as Fe, mg/l ✓	8.28		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	0.980				
Lead, as Pb, mg/l ✓	<0.005				
Manganese, as Mn, mg/l ✓	0.131		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	10.3		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	<0.0001				
Nickel, as Ni, mg/l ✓	0.265				
Potassium, as K, mg/l ✓	2140.		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.193		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	201.		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	0.084		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.881				
Beryllium, as Be, mg/l ✓	0.015				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	53.7				
COD mg/l ✓	83.2		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	1.4				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #6

TECHNICAL CENTER SAMPLE NUMBER: ENV 769

PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P. ALDRIN	BDL	10
2P. ALPHA-BHC	BDL	10
3P. BETA-BHC	BDL	10
4P. GAMMA-BHC	BDL	10
5P. DELTA-BHC	BDL	10
6P. CHLORDANE	BDL	10
7P. 4,4'-DDT	BDL	10
8P. 4,4'-DDE	BDL	10
9P. 4,4'-DDD	BDL	10
10P. DIELDRIN	BDL	10
11P. ALPHA-ENDOSULFAN	BDL	10
12P. BETA-ENDOSULFAN	BDL	10
13P. ENDOSULFAN SULFATE	BDL	10
14P. ENDRIN	BDL	10
15P. ENDRIN ALDEHYDE	BDL	10
16P. HEPTACHLOR	BDL	10
17P. HEPTACHLOR EPOXIDE	BDL	10
18P. PCB-1242	BDL	10
19P. PCB-1254	BDL	10
20P. PCB-1221	BDL	10
21P. PCB-1232	BDL	10
22P. PCB-1248	BDL	10
23P. PCB-1260	BDL	10
24P. PCB-1016	BDL	10
25P. TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #10

TECHNICAL CENTER SAMPLE NUMBER: ENV 780

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	770	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	BDL	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #10

TECHNICAL CENTER SAMPLE NUMBER: ENV 780

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
15P.	ENDRIN ALDEHYDE	BDL	10
16P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL SS-2D

ENVIRONMENTAL LAB #: 780

SITE: CWM (Interlake)

WELL POINT #: C-636

DATE SAMPLED: 5-11-82

LAB MANAGER: John W. Kobzanis 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N, mg/l ✓	0.68	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	0.54	
			Sulfate, as SO_4, mg/l ✓	60.2	
			Phosphate, as PO_4, mg/l ✓	0.012	
pH, units			Cyanide, as CN, mg/l ✓	0.22	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	0.008				
Barium, as Ba, mg/l ✓	0.021		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	0.578		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.001		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	18.2		Cobalt, as Co, mg/l ✓	0.004	
Chromium, Total as Cr, mg/l ✓	0.015		Vanadium, as V, mg/l ✓	0.033	
Hexavalent Chromium, as Cr, mg/l ✓	0.015		Radium		
Copper, as Cu, mg/l ✓	0.011		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.033		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	<0.005				
Lead, as Pb, mg/l ✓	<0.005				
Manganese, as Mn, mg/l ✓	0.001		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	0.154		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	0.0001				
Nickel, as Ni, mg/l ✓	0.010				
Potassium, as K, mg/l ✓	71.7		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.010		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	52.4		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	<0.004		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.019				
Beryllium, as Be, mg/l ✓	0.0003				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	27.7				
COD mg/l ✓	17.0		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	0.8				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #5

TECHNICAL CENTER SAMPLE NUMBER: ENV 767

BASE-NEUTRAL
EXTRACTABLE ORGANICS (continued)

		CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
32B.	FLUORENE	BDL	10
33B.	HEXACHLOROBENZENE	BDL	10
34B.	HEXACHLOROBUTADIENE	BDL	10
35B.	HEXACHLOROCYCLOPENTADIENE	BDL	10
36B.	HEXACHLOROETHANE	BDL	10
37B.	INDENO (1,2,3-CD) PYRENE	BDL	25
38B.	ISOPHORONE	BDL	10
39B.	NAPHTHALENE	BDL	10
40B.	NITROBENZENE	BDL	10
41B.	N-NITROSODIMETHYLAMINE	BDL	10
B.	N-NITROSODI-N-PROPYLAMINE	BDL	10
43B.	N-NITROSODIPHENYLAMINE	BDL	10
44B.	PHENANTHRENE	BDL	10
45B.	PYRENE	BDL	10
46B.	1,2,4-TRICHLOROBENZENE	BDL	10

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #5

TECHNICAL CENTER SAMPLE NUMBER: ENV 767

	ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1A.	2-CHLOROPHENOL	BDL	25
2A.	2,4-DICHLOROPHENOL	BDL	25
3A.	2,4-DIMETHYLPHENOL	BDL	25
4A.	4,6-DINITRO-O-CRESOL	BDL	250
5A.	2,4-DINITROPHENOL	BDL	250
6A.	2-NITROPHENOL	BDL	25
7A.	4-NITROPHENOL	BDL	25
8A.	P-CHLORO-M-CRESOL	BDL	25
9A.	PENTACHLOROPHENOL	BDL	25
10A.	PHENOL	BDL	25
11A.	2,4,6-TRICHLOROPHENOL	BDL	25

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #5

TECHNICAL CENTER SAMPLE NUMBER: ENV 767

	BASE-NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1B.	ACENAPHTHENE	BDL	10
2B.	ACENAPHTHYLENE	BDL	10
3B.	ANTHRACENE	BDL	10
4B.	BENZIDINE	BDL	10
5B.	BENZO (A) ANTHRACENE	BDL	10
6B.	BENZO (A) PYRENE	BDL	10
7B.	3,4-BENZOFLUORANTHENE	BDL	10
8B.	BENZO (GHI) PERYLENE	BDL	25
9B.	BENZO (K) FLUORANTHENE	BDL	10
0B.	BIS (2-CHLOROETHOXY) METHANE	BDL	10
1B.	BIS (2-CHLOROETHYL) ETHER	BDL	10
2B.	BIS (2-CHLOROISOPROPYL) ETHER	BDL	10
3B.	BIS (2-ETHYLHEXYL) PHTHALATE	BDL	10
9.	4-BROMOPHENYL PHENYL ETHER	BDL	10
.	BUTYL BENZYL PHTHALATE	BDL	10
6B.	2-CHLORONAPHTHALENE	BDL	10
7B.	4-CHLOROPHENYL PHENYL ETHER	BDL	10
8B.	CHRYSENE	BDL	10
9B.	DIBENZO (A,H) ANTHRACENE	BDL	25
0B.	1,2-DICHLOROBENZENE	BDL	10
1B.	1,3-DICHLOROBENZENE	BDL	10
2B.	1,4-DICHLOROBENZENE	BDL	10
3B.	3,3'-DICHLOROBENZIDINE	BDL	10
4B.	DIETHYL PHTHALATE	BDL	10
5B.	DIMETHYL PHTHALATE	BDL	10
5B.	DI-N-BUTYL PHTHALATE	BDL	10
7B.	2,4-DINITROTOLUENE	BDL	10
8B.	2,6-DINITROTOLUENE	BDL	10
9B.	DI-N-OCTYL PHTHALATE	BDL	10
0B.	1,2-DIPHENYLHYDRAZINE	BDL	10
B.	FLUORANTHENE	BDL	10

BDL-BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #5

TECHNICAL CENTER SAMPLE NUMBER: ENV 767

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	410	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	BDL	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #5

TECHNICAL CENTER SAMPLE NUMBER: ENV 767

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
[illegible]P.	ENDRIN ALDEHYDE	BDL	10
16P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #4

TECHNICAL CENTER SAMPLE NUMBER: ENV 766

BASE-NEUTRAL
EXTRACTABLE ORGANICS (continued)

		CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
32B.	FLUORENE	BDL	10
33B.	HEXACHLOROBENZENE	BDL	10
34B.	HEXACHLOROBUTADIENE	BDL	10
35B.	HEXACHLOROCYCLOPENTADIENE	BDL	10
36B.	HEXACHLOROETHANE	BDL	10
37B.	INDENO (1,2,3-CD) PYRENE	BDL	25
38B.	ISOPHORONE	BDL	10
39B.	NAPHTHALENE	BDL	10
40B.	NITROBENZENE	BDL	10
41B.	N-NITROSODIMETHYLAMINE	BDL	10
42B.	N-NITROSODI-N-PROPYLAMINE	BDL	10
43B.	N-NITROSODIPHENYLAMINE	BDL	10
44B.	PHENANTHRENE	BDL	10
45B.	PYRENE	BDL	10
46B.	1,2,4-TRICHLOROBENZENE	BDL	10

BDL= BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL ST-3S

ENVIRONMENTAL LAB #: 767

SITE: CWM (Interlake)

WELL POINT #: C-631

DATE SAMPLED: 5-5-82

LAB MANAGER: John W. Kleinman 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N, mg/l ✓	1.87	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	94.	
			Sulfate, as SO_4, mg/l ✓	139.	
			Phosphate, as PO_4, mg/l ✓	0.03	
pH, units			Cyanide, as CN, mg/l ✓	3.67	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	0.044	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	<0.005				
Barium, as Ba, mg/l ✓	0.064		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	3.15		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.056		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	28.8		Cobalt, as Co, mg/l ✓	0.262	
Chromium, Total as Cr, mg/l ✓	0.403		Vanadium, as V, mg/l ✓	0.257	
Hexavalent Chromium, as Cr, mg/l ✓	0.40		Radium		
Copper, as Cu, mg/l ✓	0.142		Gross Alpha		
Iron, total as Fe, mg/l ✓	4.20		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	0.553				
Lead, as Pb, mg/l ✓	0.010				
Manganese, as Mn, mg/l ✓	0.196		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	8.06		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	<0.0001				
Nickel, as Ni, mg/l ✓	0.277				
Potassium, as K, mg/l ✓	2180.		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.192		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	399.		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	0.096		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.840				
Beryllium, as Be, mg/l ✓	0.013				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	795.				
COD mg/l ✓	1250.		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	1.9				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #4

TECHNICAL CENTER SAMPLE NUMBER: ENV 766

	BASE-NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1B.	ACENAPHTHENE	BDL	10
2B.	ACENAPHTHYLENE	BDL	10
3B.	ANTHRACENE	BDL	10
4B.	BENZIDINE	BDL	10
5B.	BENZO (A) ANTHRACENE	BDL	10
6B.	BENZO (A) PYRENE	BDL	10
7B.	3,4-BENZOFLUORANTHENE	BDL	10
8B.	BENZO (GHI) PERYLENE	BDL	25
9B.	BENZO (K) FLUORANTHENE	BDL	10
0B.	BIS (2-CHLOROETHOXY) METHANE	BDL	10
1B.	BIS (2-CHLOROETHYL) ETHER	BDL	10
2B.	BIS (2-CHLOROISOPROPYL) ETHER	BDL	10
3B.	BIS (2-ETHYLHEXYL) PHTHALATE	BDL	10
.	4-BROMOPHENYL PHENYL ETHER	BDL	10
5B.	BUTYL BENZYL PHTHALATE	BDL	10
6B.	2-CHLORONAPHTHALENE	BDL	10
7B.	4-CHLOROPHENYL PHENYL ETHER	BDL	10
8B.	CHRYSENE	BDL	10
9B.	DIBENZO (A,H) ANTHRACENE	BDL	25
0B.	1,2-DICHLOROBENZENE	BDL	10
1B.	1,3-DICHLOROBENZENE	BDL	10
2B.	1,4-DICHLOROBENZENE	BDL	10
3B.	3,3'-DICHLOROBENZIDINE	BDL	10
4B.	DIETHYL PHTHALATE	BDL	10
5B.	DIMETHYL PHTHALATE	BDL	10
6B.	DI-N-BUTYL PHTHALATE	BDL	10
7B.	2,4-DINITROTOLUENE	BDL	10
8B.	2,6-DINITROTOLUENE	BDL	10
9B.	DI-N-OCTYL PHTHALATE	BDL	10
0B.	1,2-DIPHENYLHYDRAZINE	BDL	10
.B.	FLUORANTHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #4

TECHNICAL CENTER SAMPLE NUMBER: ENV 766

	ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1A.	2-CHLOROPHENOL	BDL	25
2A.	2,4-DICHLOROPHENOL	BDL	25
3A.	2,4-DIMETHYLPHENOL	BDL	25
4A.	4,6-DINITRO-O-CRESOL	BDL	250
5A.	2,4-DINITROPHENOL	BDL	250
6A.	2-NITROPHENOL	BDL	25
7A.	4-NITROPHENOL	BDL	25
8A.	P-CHLORO-M-CRESOL	BDL	25
9A.	PENTACHLOROPHENOL	BDL	25
10A.	PHENOL	BDL	25
11A.	2,4,6-TRICHLOROPHENOL	BDL	25

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #4

TECHNICAL CENTER SAMPLE NUMBER: ENV 766

PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P. ALDRIN	BDL	10
2P. ALPHA-BHC	BDL	10
3P. BETA-BHC	BDL	10
4P. GAMMA-BHC	BDL	10
5P. DELTA-BHC	BDL	10
6P. CHLORDANE	BDL	10
7P. 4,4'-DDT	BDL	10
8P. 4,4'-DDE	BDL	10
9P. 4,4'-DDD	BDL	10
10P. DIELDRIN	BDL	10
11P. ALPHA-ENDOSULFAN	BDL	10
12P. BETA-ENDOSULFAN	BDL	10
13P. ENDOSULFAN SULFATE	BDL	10
14P. ENDRIN	BDL	10
P. ENDRIN ALDEHYDE	BDL	10
16P. HEPTACHLOR	BDL	10
17P. HEPTACHLOR EPOXIDE	BDL	10
18P. PCB-1242	BDL	10
19P. PCB-1254	BDL	10
20P. PCB-1221	BDL	10
21P. PCB-1232	BDL	10
22P. PCB-1248	BDL	10
23P. PCB-1260	BDL	10
24P. PCB-1016	BDL	10
25P. TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #4

TECHNICAL CENTER SAMPLE NUMBER: ENV 766

VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V. ACROLEIN	BDL	100
2V. ACRYLONITRILE	BDL	100
3V. BENZENE	540	10
4V. BIS (CHLOROMETHYL) ETHER	BDL	10
5V. BROMOFORM	BDL	10
6V. CARBON TETRACHLORIDE	BDL	10
7V. CHLOROBENZENE	BDL	10
8V. CHLORODIBROMOMETHANE	BDL	10
9V. CHLOROETHANE	BDL	10
10V. 2-CHLOROETHYLVINYL ETHER	BDL	10
11V. CHLOROFORM	BDL	10
12V. DICHLOROBROMOMETHANE	BDL	10
13V. DICHLORODIFLUOROMETHANE	BDL	10
14V. 1,1-DICHLOROETHANE	BDL	10
15V. 1,2-DICHLOROETHANE	BDL	10
16V. 1,1-DICHLOROETHYLENE	BDL	10
17V. 1,2-DICHLOROPROPANE	BDL	10
18V. 1,3-DICHLOROPROPYLENE	BDL	10
19V. ETHYLBENZENE	BDL	10
20V. METHYL BROMIDE	BDL	10
21V. METHYL CHLORIDE	BDL	10
22V. METHYLENE CHLORIDE	BDL	10
23V. 1,1,2,2-TETRACHLOROETHANE	BDL	10
24V. TETRACHLOROETHYLENE	BDL	10
25V. TOLUENE	BDL	10
26V. 1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V. 1,1,1-TRICHLOROETHANE	BDL	10
28V. 1,1,2-TRICHLOROETHANE	BDL	10
29V TRICHLOROETHYLENE	BDL	10
30V. TRICHLOROFLUOROMETHANE	BDL	10
31V. VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #7

TECHNICAL CENTER SAMPLE NUMBER: ENV 770

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
15P.	ENDRIN ALDEHYDE	BDL	10
16P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE		

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL SS-1D

ENVIRONMENTAL LAB #: 770

SITE: CWM (Interlake) WELL POINT #: C-633

DATE SAMPLED: 5-7-82

LAB MANAGER: John W. Kolzowski

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N, mg/l ✓	0.68	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	0.34	
			Sulfate, as SO_4, mg/l ✓	43.4	
			Phosphate, as PO_4, mg/l ✓	<0.05	
pH, units			Cyanide, as CN, mg/l ✓	0.11	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	<0.005				
Barium, as Ba, mg/l ✓	0.005		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	0.998		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.002		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	5.05		Cobalt, as Co, mg/l ✓	0.003	
Chromium, Total as Cr, mg/l ✓	0.057		Vanadium, as V, mg/l ✓	0.035	
Hexavalent Chromium, as Cr, mg/l ✓	0.04		Radium		
Copper, as Cu, mg/l ✓	0.012		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.094		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	<0.005				
Lead, as Pb, mg/l ✓	<0.005				
Manganese, as Mn, mg/l ✓	0.001		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	0.105		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	0.0002				
Nickel, as Ni, mg/l ✓	0.007				
Potassium, as K, mg/l ✓	121.		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.016		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	96.0		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	0.027		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.008				
Beryllium, as Be, mg/l ✓	0.0008				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	48.1				
COD mg/l ✓	533.		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	1.2				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #7

TECHNICAL CENTER SAMPLE NUMBER: ENV 770

VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V. ACROLEIN	BDL	100
2V. ACRYLONITRILE	BDL	100
3V. BENZENE	620	10
4V. BIS (CHLOROMETHYL) ETHER	BDL	10
5V. BROMOFORM	BDL	10
6V. CARBON TETRACHLORIDE	BDL	10
7V. CHLOROBENZENE	BDL	10
8V. CHLORODIBROMOMETHANE	BDL	10
9V. CHLOROETHANE	BDL	10
10V. 2-CHLOROETHYLVINYL ETHER	BDL	10
11V. CHLOROFORM	BDL	10
12V. DICHLOROBROMOMETHANE	BDL	10
13V. DICHLORODIFLUOROMETHANE	BDL	10
14V. 1,1-DICHLOROETHANE	BDL	10
15V. 1,2-DICHLOROETHANE	BDL	10
16V. 1,1-DICHLOROETHYLENE	BDL	10
17V. 1,2-DICHLOROPROPANE	BDL	10
18V. 1,3-DICHLOROPROPYLENE	BDL	10
19V. ETHYLBENZENE	BDL	10
20V. METHYL BROMIDE	BDL	10
21V. METHYL CHLORIDE	BDL	10
22V. METHYLENE CHLORIDE	BDL	10
23V. 1,1,2,2-TETRACHLOROETHANE	BDL	10
24V. TETRACHLOROETHYLENE	BDL	10
25V. TOLUENE	BDL	10
26V. 1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V. 1,1,1-TRICHLOROETHANE	BDL	10
28V. 1,1,2-TRICHLOROETHANE	BDL	10
29V TRICHLOROETHYLENE	BDL	10
30V. TRICHLOROFLUOROMETHANE	BDL	10
31V. VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL ST-25

ENVIRONMENTAL LAB #: 766

SITE: CWM (Interlake)

WELL POINT #: C-630

DATE SAMPLED: 5-5-82

LAB MANAGER: John W. Kolegaris 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N , mg/l ✓	<0.05	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	1.94	
			Sulfate, as SO_4, mg/l ✓	446.	
			Phosphate, as PO_4, mg/l ✓	<0.01	
pH, units			Cyanide, as CN, mg/l ✓	1.29	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	<0.005				
Barium, as Ba, mg/l ✓	0.070		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	0.83		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.53		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	139		Cobalt, as Co, mg/l ✓	0.245	
Chromium, Total as Cr, mg/l ✓	0.319		Vanadium, as V, mg/l ✓	0.325	
Hexavalent Chromium, as Cr, mg/l ✓	<0.01		Radium		
Copper, as Cu, mg/l ✓	0.133		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.434		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	<0.005				
Lead, as Pb, mg/l ✓	<0.005				
Manganese, as Mn, mg/l ✓	0.823		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	28.8		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	0.0006				
Nickel, as Ni, mg/l ✓	0.250				
Potassium, as K, mg/l ✓	2110.		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.189		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	170.		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	0.051		2, 4, 5 TP (Silvex) mg/l		
Antimony, as Sb, mg/l ✓	0.838				
Beryllium, as Be, mg/l ✓	0.011				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	179.				
COD mg/l ✓	458.		Priority Pollutants Scan ✓		
Fluorides, as F, mg/l ✓	1.4				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #2

TECHNICAL CENTER SAMPLE NUMBER: ENV 746

BASE-NEUTRAL
EXTRACTABLE ORGANICS (continued)

		CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
32B.	FLUORENE	BDL	10
33B.	HEXACHLOROBENZENE	10	10
34B.	HEXACHLOROBUTADIENE	BDL	10
35B.	HEXACHLOROCYCLOPENTADIENE	BDL	10
36B.	HEXACHLOROETHANE	BDL	10
37B.	INDENO (1,2,3-CD) PYRENE	BDL	25
38B.	ISOPHORONE	BDL	10
39B.	NAPHTHALENE	BDL	10
40B.	NITROBENZENE	BDL	10
41B.	N-NITROSODIMETHYLAMINE	BDL	10
[illegible]2B.	N-NITROSODI-N-PROPYLAMINE	BDL	10
[illegible]3B.	N-NITROSODIPHENYLAMINE	BDL	10
44B.	PHENANTHRENE	BDL	10
45B.	PYRENE	BDL	10
46B.	1,2,4-TRICHLOROBENZENE	BDL	10

BDL = BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #2

TECHNICAL CENTER SAMPLE NUMBER: ENV 746

	BASE-NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1B.	ACENAPHTHENE	BDL	10
2B.	ACENAPHTHYLENE	BDL	10
3B.	ANTHRACENE	BDL	10
4B.	BENZIDINE	BDL	10
5B.	BENZO (A) ANTHRACENE	BDL	10
6B.	BENZO (A) PYRENE	BDL	10
7B.	3,4-BENZOFLUORANTHENE	BDL	10
8B.	BENZO (GHI) PERYLENE	BDL	25
9B.	BENZO (K) FLUORANTHENE	BDL	10
0B.	BIS (2-CHLOROETHOXY) METHANE	BDL	10
1B.	BIS (2-CHLOROETHYL) ETHER	BDL	10
2B.	BIS (2-CHLOROISOPROPYL) ETHER	BDL	10
3B.	BIS (2-ETHYLHEXYL) PHTHALATE	BDL	10
[illegible].	4-BROMOPHENYL PHENYL ETHER	BDL	10
[illegible].	BUTYL BENZYL PHTHALATE	BDL	10
6B.	2-CHLORONAPHTHALENE	BDL	10
7B.	4-CHLOROPHENYL PHENYL ETHER	BDL	10
8B.	CHRYSENE	BDL	10
9B.	DIBENZO (A,H) ANTHRACENE	BDL	25
0B.	1,2-DICHLOROBENZENE	BDL	10
1B.	1,3-DICHLOROBENZENE	BDL	10
2B.	1,4-DICHLOROBENZENE	BDL	10
3B.	3,3'-DICHLOROBENZIDINE	BDL	10
4B.	DIETHYL PHTHALATE	BDL	10
5B.	DIMETHYL PHTHALATE	BDL	10
6B.	DI-N-BUTYL PHTHALATE	BDL	10
7B.	2,4-DINITROTOLUENE	BDL	10
8B.	2,6-DINITROTOLUENE	BDL	10
9B.	DI-N-OCTYL PHTHALATE	BDL	10
0B.	1,2-DIPHENYLHYDRAZINE	BDL	10
B.	FLUORANTHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #2

TECHNICAL CENTER SAMPLE NUMBER: ENV 746

	ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1A.	2-CHLOROPHENOL	BDL	25
2A.	2,4-DICHLOROPHENOL	BDL	25
3A.	2,4-DIMETHYLPHENOL	BDL	25
4A.	4,6-DINITRO-O-CRESOL	BDL	250
5A.	2,4-DINITROPHENOL	BDL	250
6A.	2-NITROPHENOL	BDL	25
7A.	4-NITROPHENOL	BDL	25
8A.	P-CHLORO-M-CRESOL	BDL	25
9A.	PENTACHLOROPHENOL	BDL	25
10A.	PHENOL	BDL	25
11A.	2,4,6-TRICHLOROPHENOL	BDL	25

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #2

TECHNICAL CENTER SAMPLE NUMBER: ENV 746

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	720	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	360	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #2

TECHNICAL CENTER SAMPLE NUMBER: ENV 746

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
15P.	ENDRIN ALDEHYDE	BDL	10
16P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL ST-4S

ENVIRONMENTAL LAB #: 746

SITE: CWM (Interlake)

WELL POINT #: C-628

DATE SAMPLED: 5-4-82

LAB MANAGER: John W. Evans 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N , mg/l ✓	0.06	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	57.9	
			Sulfate, as SO_4, mg/l ✓	72.4	
			Phosphate, as PO_4, mg/l ✓	<0.01	
pH, units			Cyanide, as CN, mg/l ✓	0.14	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	<0.010	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	0.005				
Barium, as Ba, mg/l ✓	0.296		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	2.42		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.018		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	126.		Cobalt, as Co, mg/l ✓	0.012	
Chromium, Total as Cr, mg/l ✓	0.034		Vanadium, as V, mg/l ✓	1.79	
Hexavalent Chromium, as Cr, mg/l ✓	0.02		Radium		
Copper, as Cu, mg/l ✓	<0.002		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.089		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	<0.005				
Lead, as Pb, mg/l ✓	0.006				
Manganese, as Mn, mg/l ✓	0.076		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	254.		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	0.0001				
Nickel, as Ni, mg/l ✓	0.089				
Potassium, as K, mg/l ✓	95.5		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	<0.003		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	148.		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	<0.004		2, 4, 5 TP (Silvex) mg/l		
Beryllium, as Be, mg/l ✓	<0.001				
Antimony, as Sb, mg/l ✓	0.238				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	319.				
COD mg/l ✓	83.2		Priority Pollutant Scan ✓		
Fluorides, as F, mg/l ✓	1.3				

PHYSICAL APPEARANCE:

SAMPLE IDENTIFICATION: Interlake #1

TECHNICAL CENTER SAMPLE NUMBER: ENV 745

	BASE-NEUTRAL EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1B.	ACENAPHTHENE	BDL	10
2B.	ACENAPHTHYLENE	BDL	10
3B.	ANTHRACENE	BDL	10
4B.	BENZIDINE	BDL	10
5B.	BENZO (A) ANTHRACENE	BDL	10
6B.	BENZO (A) PYRENE	BDL	10
7B.	3,4-BENZOFLUORANTHENE	BDL	10
8B.	BENZO (GHI) PERYLENE	BDL	25
9B.	BENZO (K) FLUORANTHENE	BDL	10
0B.	BIS (2-CHLOROETHOXY) METHANE	BDL	10
1B.	BIS (2-CHLOROETHYL) ETHER	BDL	10
2B.	BIS (2-CHLOROISOPROPYL) ETHER	BDL	10
3B.	BIS (2-ETHYLHEXYL) PHTHALATE	BDL	10
4B.	4-BROMOPHENYL PHENYL ETHER	BDL	10
[illegible]	BUTYL BENZYL PHTHALATE	BDL	10
6B.	2-CHLORONAPHTHALENE	BDL	10
7B.	4-CHLOROPHENYL PHENYL ETHER	BDL	10
8B.	CHRYSENE	BDL	10
9B.	DIBENZO (A,H) ANTHRACENE	BDL	25
0B.	1,2-DICHLOROBENZENE	BDL	10
1B.	1,3-DICHLOROBENZENE	BDL	10
2B.	1,4-DICHLOROBENZENE	BDL	10
3B.	3,3'-DICHLOROBENZIDINE	BDL	10
4B.	DIETHYL PHTHALATE	BDL	10
5B.	DIMETHYL PHTHALATE	BDL	10
6B.	DI-N-BUTYL PHTHALATE	BDL	10
7B.	2,4-DINITROTOLUENE	BDL	10
8B.	2,6-DINITROTOLUENE	BDL	10
9B.	DI-N-OCTYL PHTHALATE	BDL	10
0B.	1,2-DIPHENYLHYDRAZINE	BDL	10
1B.	FLUORANTHENE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #1

TECHNICAL CENTER SAMPLE NUMBER: ENV 745

BASE-NEUTRAL
EXTRACTABLE ORGANICS (continued)

		CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
32B.	FLUORENE	BDL	10
33B.	HEXACHLOROBENZENE	BDL	10
34B.	HEXACHLOROBUTADIENE	BDL	10
35B.	HEXACHLOROCYCLOPENTADIENE	BDL	10
36B.	HEXACHLOROETHANE	BDL	10
37B.	INDENO (1,2,3-CD) PYRENE	BDL	25
38B.	ISOPHORONE	BDL	10
39B.	NAPHTHALENE	BDL	10
40B.	NITROBENZENE	BDL	10
41B.	N-NITROSODIMETHYLAMINE	BDL	10
[illegible]B.	N-NITROSODI-N-PROPYLAMINE	BDL	10
[illegible]B.	N-NITROSODIPHENYLAMINE	BDL	10
44B.	PHENANTHRENE	BDL	10
45B.	PYRENE	BDL	10
46B.	1,2,4-TRICHLOROBENZENE	BDL	10

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #1

TECHNICAL CENTER SAMPLE NUMBER: ENV 745

ACID EXTRACTABLE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1A. 2-CHLOROPHENOL	BDL	25
2A. 2,4-DICHLOROPHENOL	BDL	25
3A. 2,4-DIMETHYLPHENOL	BDL	25
4A. 4,6-DINITRO-O-CRESOL	BDL	250
5A. 2,4-DINITROPHENOL	BDL	250
6A. 2-NITROPHENOL	BDL	25
7A. 4-NITROPHENOL	BDL	25
8A. P-CHLORO-M-CRESOL	BDL	25
9A. PENTACHLOROPHENOL	BDL	25
10A. PHENOL	BDL	25
11A. 2,4,6-TRICHLOROPHENOL	BDL	25

BDL= BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #1

TECHNICAL CENTER SAMPLE NUMBER: ENV 745

	VOLATILE ORGANICS	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1V.	ACROLEIN	BDL	100
2V.	ACRYLONITRILE	BDL	100
3V.	BENZENE	910	10
4V.	BIS (CHLOROMETHYL) ETHER	BDL	10
5V.	BROMOFORM	BDL	10
6V.	CARBON TETRACHLORIDE	BDL	10
7V.	CHLOROBENZENE	BDL	10
8V.	CHLORODIBROMOMETHANE	BDL	10
9V.	CHLOROETHANE	BDL	10
10V.	2-CHLOROETHYLVINYL ETHER	BDL	10
11V.	CHLOROFORM	BDL	10
12V.	DICHLOROBROMOMETHANE	BDL	10
13V.	DICHLORODIFLUOROMETHANE	BDL	10
14V.	1,1-DICHLOROETHANE	BDL	10
15V.	1,2-DICHLOROETHANE	BDL	10
16V.	1,1-DICHLOROETHYLENE	BDL	10
17V.	1,2-DICHLOROPROPANE	BDL	10
18V.	1,3-DICHLOROPROPYLENE	BDL	10
19V.	ETHYLBENZENE	BDL	10
20V.	METHYL BROMIDE	BDL	10
21V.	METHYL CHLORIDE	BDL	10
22V.	METHYLENE CHLORIDE	BDL	10
23V.	1,1,2,2-TETRACHLOROETHANE	BDL	10
24V.	TETRACHLOROETHYLENE	BDL	10
25V.	TOLUENE	BDL	10
26V.	1,2-TRANS-DICHLOROETHYLENE	BDL	10
27V.	1,1,1-TRICHLOROETHANE	BDL	10
28V.	1,1,2-TRICHLOROETHANE	BDL	10
29V	TRICHLOROETHYLENE	BDL	10
30V.	TRICHLOROFLUOROMETHANE	BDL	10
31V.	VINYL CHLORIDE	BDL	10

BDL=BELOW DETECTION LIMIT

SAMPLE IDENTIFICATION: Interlake #1

TECHNICAL CENTER SAMPLE NUMBER: ENV 745

	PESTICIDES/PCB'S	CONCENTRATION (UG/L)	DETECTION LIMIT (UG/L)
1P.	ALDRIN	BDL	10
2P.	ALPHA-BHC	BDL	10
3P.	BETA-BHC	BDL	10
4P.	GAMMA-BHC	BDL	10
5P.	DELTA-BHC	BDL	10
6P.	CHLORDANE	BDL	10
7P.	4,4'-DDT	BDL	10
8P.	4,4'-DDE	BDL	10
9P.	4,4'-DDD	BDL	10
10P.	DIELDRIN	BDL	10
11P.	ALPHA-ENDOSULFAN	BDL	10
12P.	BETA-ENDOSULFAN	BDL	10
13P.	ENDOSULFAN SULFATE	BDL	10
14P.	ENDRIN	BDL	10
15P.	ENDRIN ALDEHYDE	BDL	10
16P.	HEPTACHLOR	BDL	10
17P.	HEPTACHLOR EPOXIDE	BDL	10
18P.	PCB-1242	BDL	10
19P.	PCB-1254	BDL	10
20P.	PCB-1221	BDL	10
21P.	PCB-1232	BDL	10
22P.	PCB-1248	BDL	10
23P.	PCB-1260	BDL	10
24P.	PCB-1016	BDL	10
25P.	TOXAPHENE	BDL	10

BDL=BELOW DETECTION LIMIT

WELL MONITORING ANALYSIS REPORT

WELL ST-15

ENVIRONMENTAL LAB #: 745

SITE: CWM (Interlake)

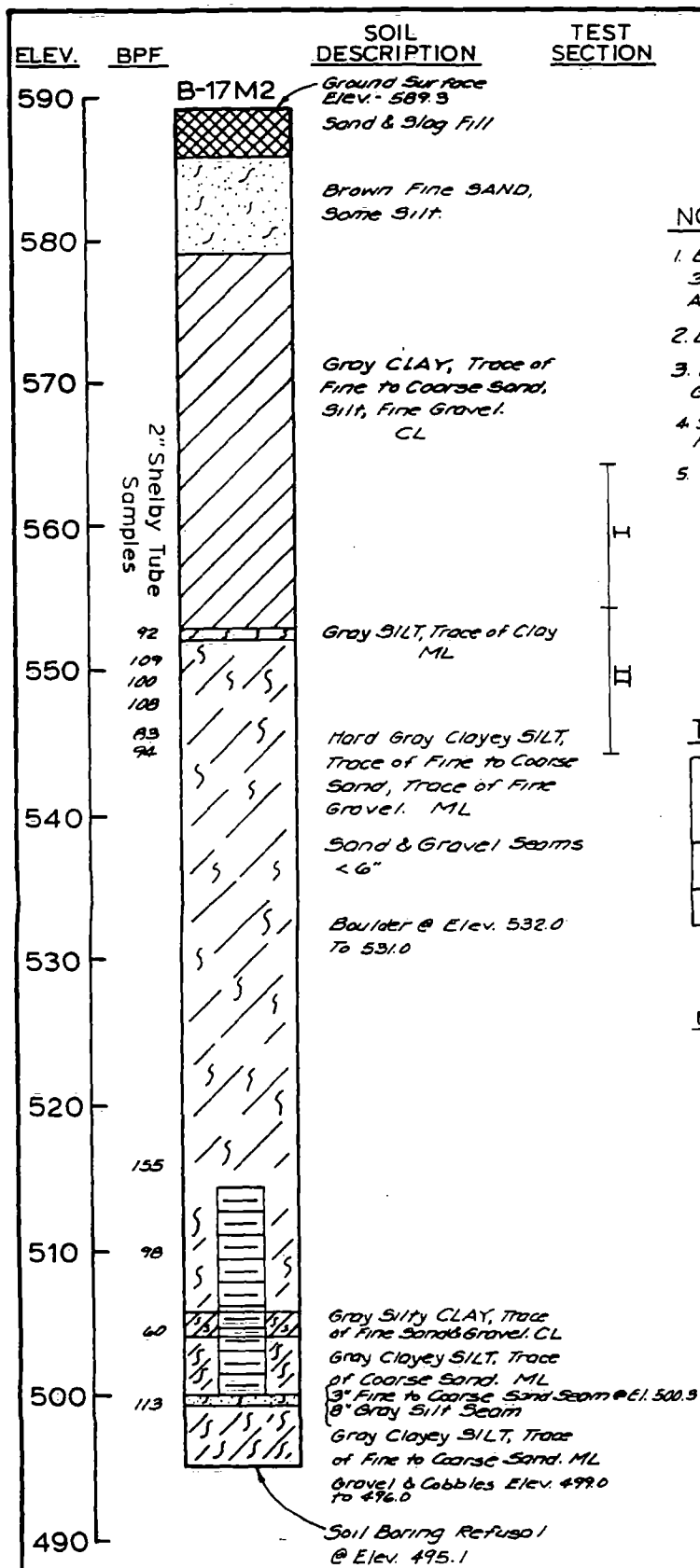
WELL POINT #: C-627

DATE SAMPLED: 5-4-82

LAB MANAGER: John W. Kolpanen 6-16-82

Test	Results	Date Complete	Test	Results	Date Complete
Depth, m			Hardness, as $CaCO_3$, mg/l		
Stick-up, m			Nitrate, as N, mg/l ✓	0.36	
Temperature, °C			Nitrogen, Ammonia, as N, mg/l ✓	5.60	
			Sulfate, as SO_4, mg/l ✓	8.95	
			Phosphate, as PO_4, mg/l ✓	<0.01	
pH, units			Cyanide, as CN, mg/l ✓	0.19	
Conductivity, mS			Oil and Grease, mg/l		
Thallium, as Tl, mg/l ✓			Phenol, mg/l ✓	0.067	
Molybdenum, as Mo, mg/l ✓					
Arsenic, as As, mg/l ✓	<0.005				
Barium, as Ba, mg/l ✓	0.088		Total Dissolved Solids, mg/l @ 180° C		
Boron, as B, mg/l ✓	<0.004		Total Suspended Solids, mg/l @ 105° C		
Cadmium, as Cd, mg/l ✓	0.003		Residue on Evaporation @ 180° C		
Calcium, as Ca, mg/l ✓	100.		Cobalt, as Co, mg/l ✓	0.009	
Chromium, Total as Cr, mg/l ✓	0.034		Vanadium, as V, mg/l ✓	0.019	
Hexavalent Chromium, as Cr, mg/l ✓	<0.01		Radium		
Copper, as Cu, mg/l ✓	0.009		Gross Alpha		
Iron, total as Fe, mg/l ✓	0.011		Gross Beta		
Iron, dissolved as Fe, mg/l ✓	<0.005				
Lead, as Pb, mg/l ✓	<0.005				
Manganese, as Mn, mg/l ✓	0.003		Total Organic Carbon, mg/l		
Magnesium, as Mg, mg/l ✓	0.410		Total Organic Halogen, mg/l		
Mercury, as Hg, mg/l ✓	0.0002				
Nickel, as Ni, mg/l ✓	<0.01				
Potassium, as K, mg/l ✓	258.		Endrin, mg/l		
Selenium, as Se, mg/l ✓	<0.005		Lindane, mg/l		
Silver, as Ag, mg/l ✓	0.019		Methoxychlor, mg/l		
Sodium, as Na, mg/l ✓	76.3		2, 4D, mg/l		
Zinc, as Zn, mg/l ✓	<0.004		2, 4, 5 TP (Silvex) mg/l		
Beryllium, as Be, mg/l ✓	<0.001				
Antimony, as Sb, mg/l ✓	0.034				
Alkalinity, as $CaCO_3$, mg/l			Fecal Coliform		
Chloride, as Cl, mg/l ✓	99.1				
COD mg/l ✓	83.2		Priority Pollutants ✓		
Fluorides, as F, mg/l ✓	1.7		Scan		

PHYSICAL APPEARANCE:



NOTES

1. BPF - Blows Per Foot From A 350 lb. Weight Dropped 17" Driving A 3" Split-Spoon Sampler.
2. Elevation Datum - Mean Sea Level
3. U.S.C.S. Soil Classifications Are Given After Each Soil Description.
4. Some Soil Descriptions Were Obtained From The Adjacent Soil Boring, B-17M1.
5. Piezometer Screen

TEST RESULTS

TEST SECTION	TEST HOLE L(ft)/r(in)	Q(cfs)	H(ft)	K(cm/sec)
I	10/1.56	BDL(3.71×10^{-4})	80	$<9.8\times10^{-7}$
II	10/1.56	BDL(3.71×10^{-4})	90	$<8.7\times10^{-7}$

NOTES

BDL (7.43×10^{-5}) — Maximum flow rate that could remain undetected

BDL — Below detectible limit

$<1.8\times10^{-6}$ - Less than sign denotes permeability value obtained by accuracy of test procedure, not by actual readings. The actual permeability is less than that listed.

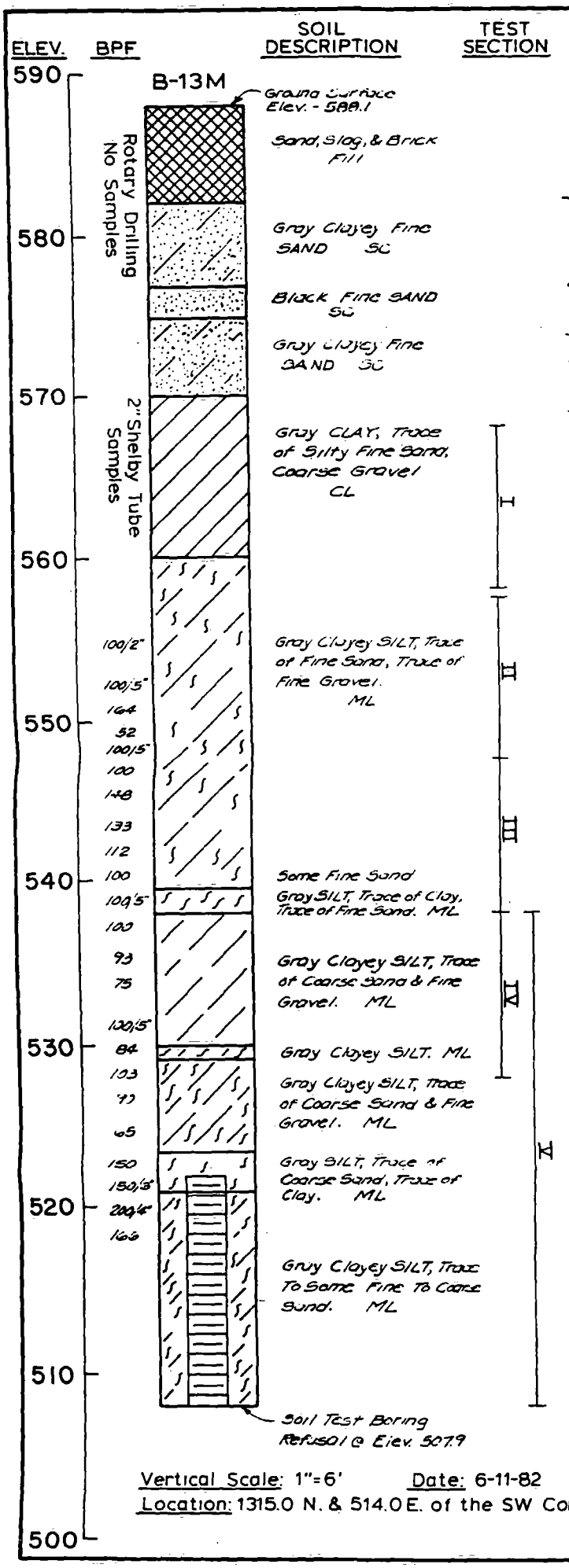
FIELD PERMEABILITY TEST SECTION DESCRIPTIONS

TEST NUMBER TWO, B-17M2

INTERLAKE SITE
CHICAGO, ILLINOIS
PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Vertical Scale: 1"=8' Date 6-14-82
Location: 54.3'N. & 1830.7'E. of the SW Corner

Canonie Engineers



NOTES

1. BPF - Blows Per Foot From A 350 lb. Weight Dropped 17" Driving A 3" Split-Spoon Sampler.
2. Some Soil Descriptions Were Obtained From The Adjacent Soil Boring, B-13.
3. Elevation Datum - Mean Sea Level
4. U.S.C.S. Soil Classifications Are Given After Each Soil Description.
5. Piezometer Screen

TEST RESULTS

TEST SECTION	TEST HOLE L(ft) / r(in)	Q(cfs)	H(ft)	K(cm/sec)
I	10/1.56	1.38×10^{-2}	57	5.1×10^{-4} *
II	10/1.56	BDL(7.43×10^{-5})	86	$< 1.8 \times 10^{-6}$
III	10/1.56	BDL(3.71×10^{-5})	95	$< 8.2 \times 10^{-7}$
IV	21/1.56	BDL(7.43×10^{-5})	111	$< 7.9 \times 10^{-7}$
V	30/1.56	BDL(7.43×10^{-5})	115	$< 5.3 \times 10^{-7}$

NOTES

BDL (7.43×10^{-5}) — Maximum flow rate that could remain undetected; Below detectible limit

$< 1.8 \times 10^{-6}$ - Less than sign denotes permeability value obtained by accuracy of test procedure, not by actual readings. The actual permeability is less than that listed.

* The 3-foot long casing-soil seal was likely fractured during this test and the water flowed into the overlying sands.

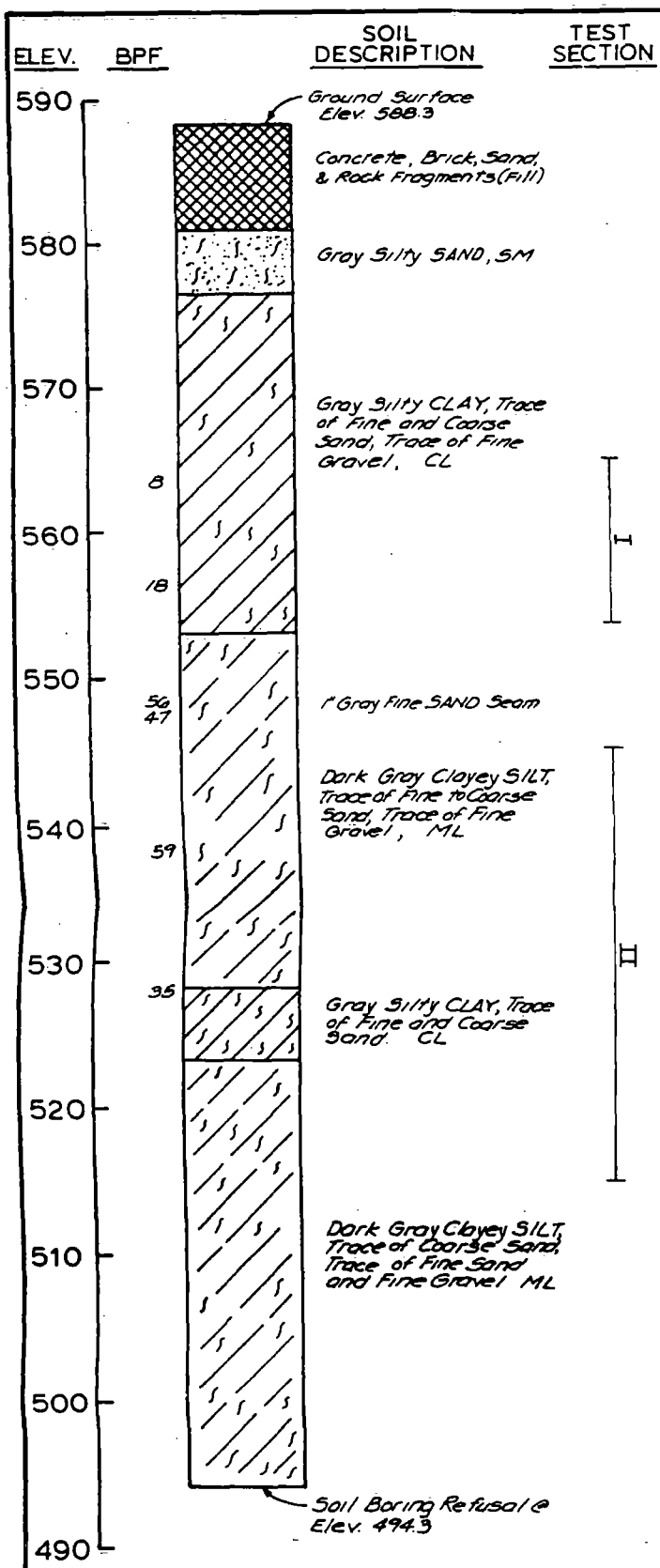
FIELD PERMEABILITY TEST SECTION DESCRIPTIONS

TEST NUMBER ONE, B-13M

INTERLAKE SITE
CHICAGO, ILLINOIS
PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Vertical Scale: 1"=6' Date: 6-11-82
Location: 1315.0 N. & 514.0 E. of the SW Corner

CanonieEngineers



NOTES

1. BPF - Blows Per Foot From A 140 lb. Weight Dropped 30" Driving a 2" Split-Spoon Sampler.
2. Elevation Datum - Mean Sea Level
3. U.S.C.S. Soil Classifications Are Given After Each Soil Description.
4. Some Soil Descriptions Were obtained From The Adjacent Soil Boring B-3

TEST RESULTS

TEST SECTION	TEST HOLE L(ft)/r(in)	Q(cfs)	H(ft)	K(cm/sec)
I	11.5/1.56	BDL(9.75×10^{-6})	79	$< 9.0\times10^{-8}$
II	30/1.56	BDL(1.50×10^{-6})	136	$< 9.0\times10^{-9}$

NOTES

BDL (7.43×10^{-5}) — Maximum flow rate that could remain undetected

BDL — Below detectible limit

$< 1.8 \times 10^{-6}$ - Less than sign denotes permeability value obtained by accuracy of test procedure, not by actual readings. The actual permeability is less than that listed.

FIELD PERMEABILITY TEST SECTION DESCRIPTIONS TEST NUMBER THREE

INTERLAKE SITE
CHICAGO, ILLINOIS
PREPARED FOR
WASTE MANAGEMENT, INC.
OAK BROOK, ILLINOIS

Vertical Scale: 1"=8' Date 6-21-82
Location: 40'± N. of B-3

Canonie Engineers

In all the tests but one, no flow was recorded beyond that expected from the internal systems losses. Therefore, the resulting permeability values are governed by the accuracy of the testing equipment, test pressure vs. overburden, pressure considerations, and testing time. When no flow is measured, the calculated values are not the actual values, but the maximum possible values that could exist based on the testing procedure. Such values are presented with a less-than symbol to denote this fact. Thus, $< 7.9 \times 10^{-7}$ cm/sec. indicates the soil permeability is less than 7.9×10^{-7} cm/sec. - not equal to 7.9×10^{-7} cm/sec.

In order to increase the precision of the flow readings, the testing procedure was slightly altered for the final tests in the boring 40 feet north of B-3. Instead of relying on a flow meter, a 55-gallon water reservoir tank was used so that the volume of water used could be more accurately measured. This is reflected in the permeability values presented in the following pages.

No zones of relatively high horizontal permeability were encountered, indicating the sandy and gravelly seams are actually lenses of limited extent without good connection to an aquifer. Horizontal permeability values compare within an order of magnitude to the laboratory results, indicating sample disturbance effects are not significant and that the horizontal permeabilities of the clay are about the same as the vertical permeabilities measured in the laboratory.

References:

1. United States Department of Interior, Bureau of Reclamation, 1974, Earth Manual, 2 Edition, United States Printing Office, Washington, D.C.

2. Winterkorn and Fang, 1975, Foundation Engineering Handbook, Van Nostrand Reinhold Company.

FIELD PERMEABILITY TESTING PROGRAM

Field permeability testing was performed during our investigation at Borings B-13M, B-17M2, and 40 feet± north of Boring B-3. The detailed results are presented on the following sheets. The testing was conducted to obtain the following information:

1. Hydraulic conductivity of the sandy and gravelly seams encountered in some of the borings.

2. Mass horizontal permeability values for the in situ materials.

3. Correlations with laboratory test results to check for sample disturbance effects.

The tests were conducted in general accordance with the Bureau of Reclamation's procedure. Initially, an NX (three-inch ID) casing was driven into the soil to obtain a tight seal between the outside of the casing and the surrounding soil. The soil inside the casing was then washed out and the test section was drilled using rotary drilling methods with water, rather than with drilling mud. Soil samples were taken as desired. After the test section was completed and flushed, a pneumatic packer was installed to the bottom of the casing and inflated. Water was then forced, under pressure, into the test section and the flow of the water was measured. An approximate coefficient of permeability or hydraulic conductivity was then calculated using the following equation (References 1 and 2):

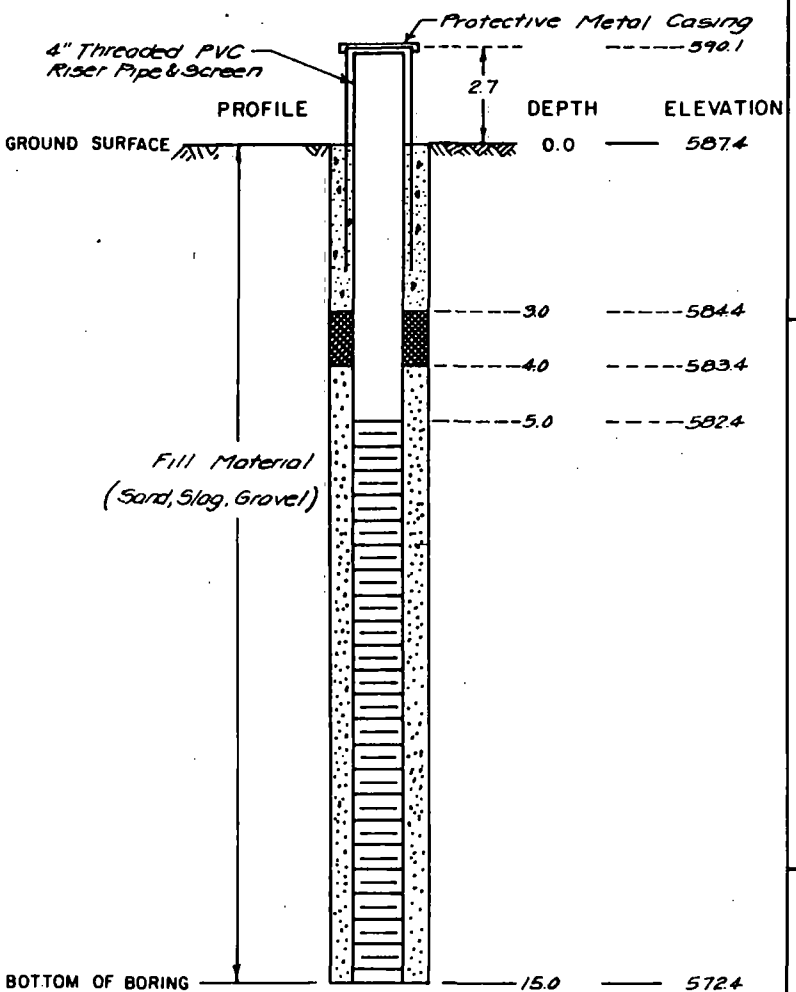
$$K = \frac{Q}{2\pi LH} \ln\left(\frac{L}{r}\right) \qquad \text{For } L \geq 10r$$

Where

K = coefficient of permeability
Q = flow into the test section
L = length of test section
H = differential head on the test section
r = radius of the test section

DRAWN BY	RGD 5/27/82	CHECKED BY / APPROVED BY	DRAWING NUMBER

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

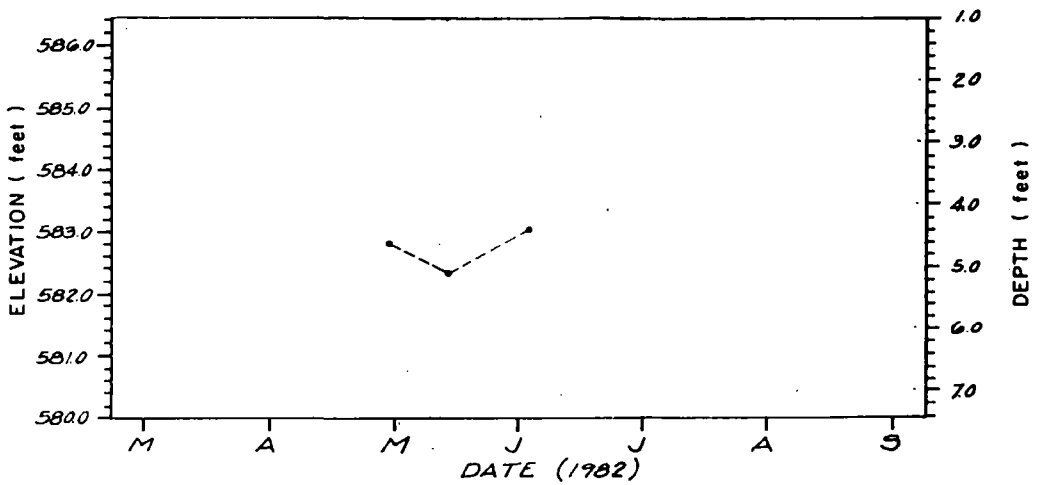
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
4/30	7.3	582.8					
5/12	7.8	582.3					
6/3	7.1	583.0					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/16/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-26S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1255 HERCULENE ADD SMITH CO PGH PA 17 1550 1070

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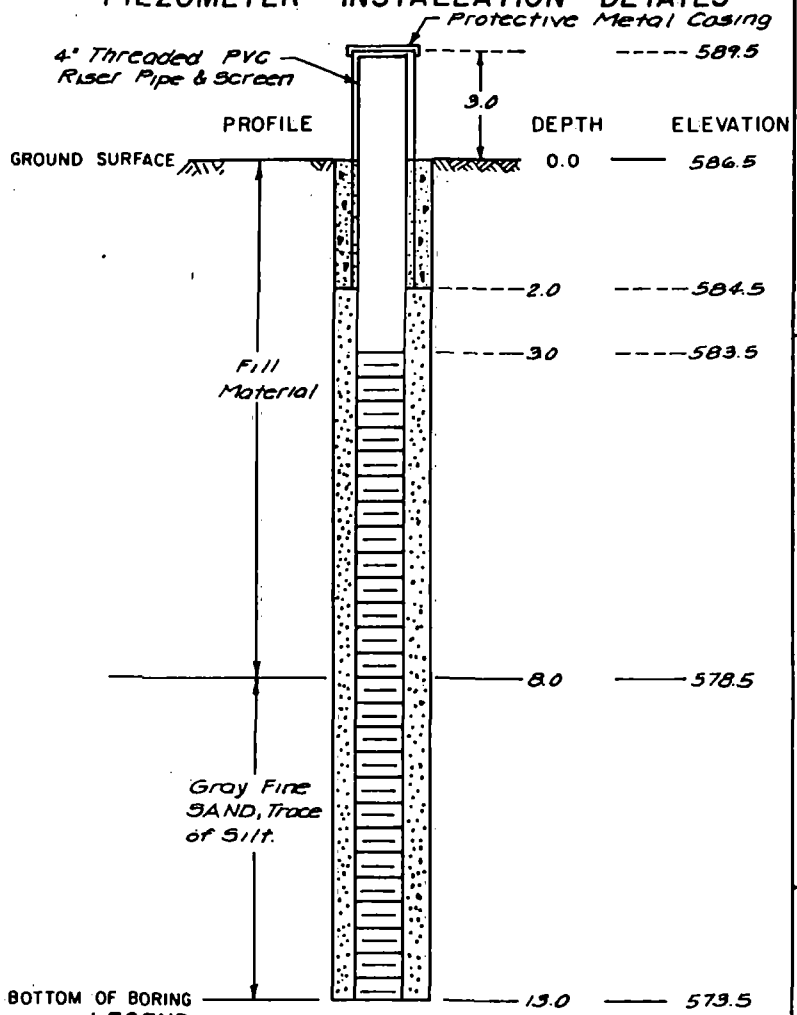
RGD 6/7/82			

PIEZOMETER INSTALLATION DETAILS



LEGEND

- CEMENT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SENSING ZONE

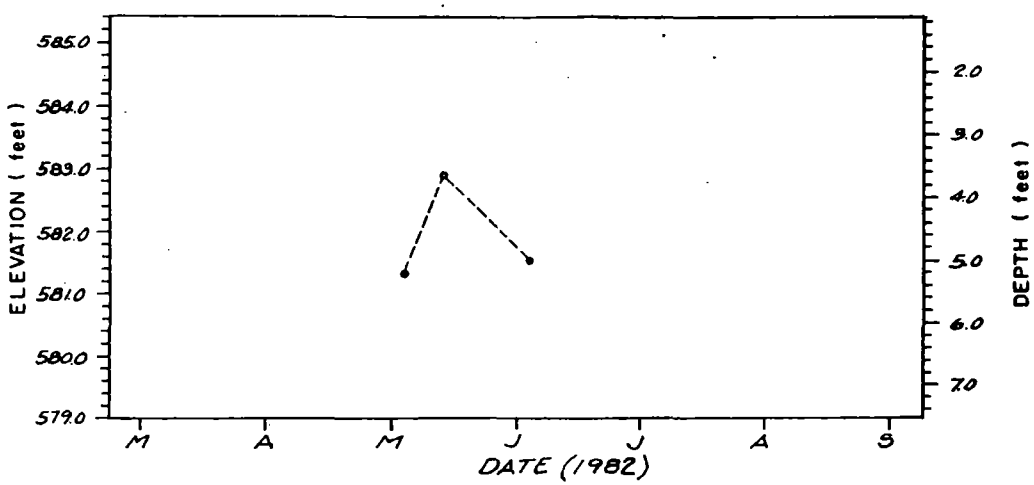
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/3	8.2	581.3					
5/12	6.6	582.9					
6/3	8.0	581.5					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/15/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-23S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1295 HERCULENE ADD SMITH CO PGH PA LY11320-1079

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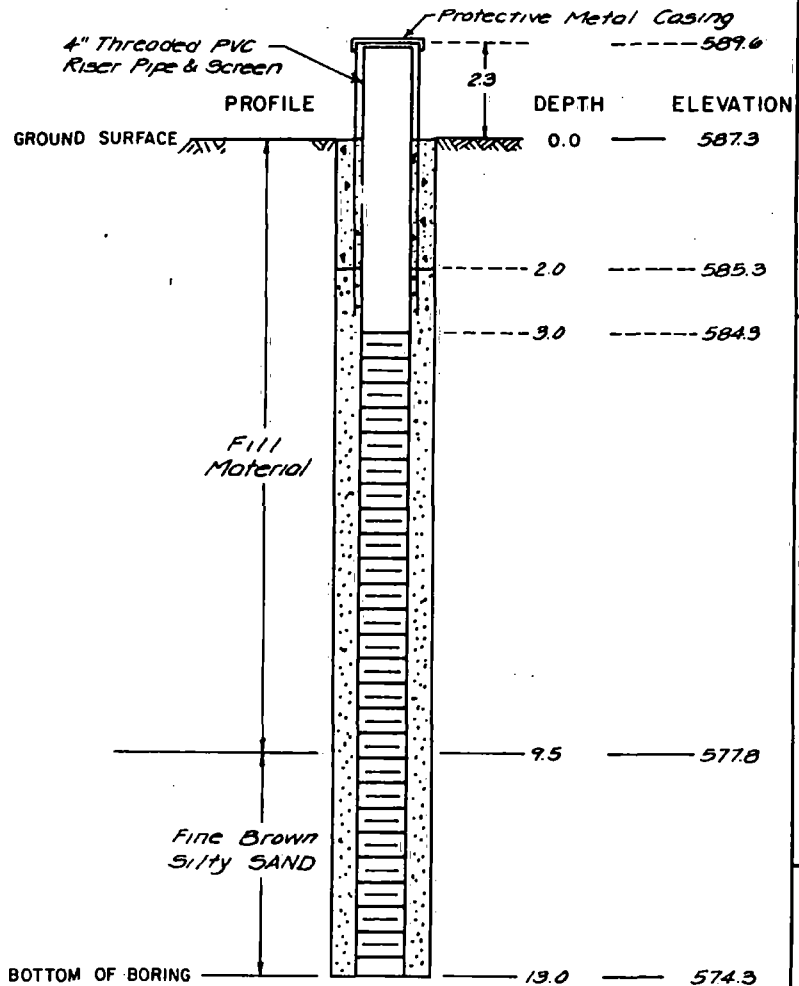
PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

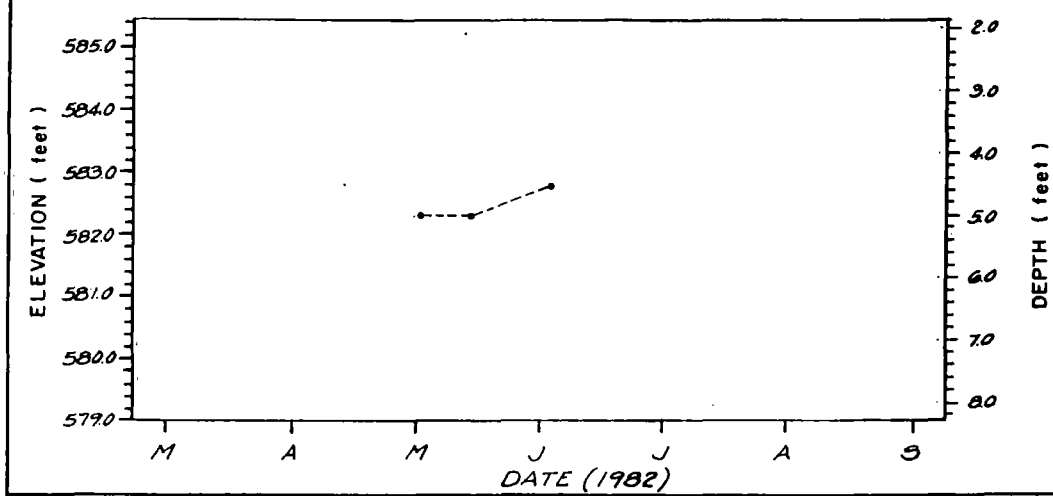
1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/1	7.3	582.3	
5/12	7.3	582.3	
6/3	6.9	582.7	

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/20/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-22S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

19 1293 HERCULENE, ADB SMITH CO., PGH., PA LT1830-1079

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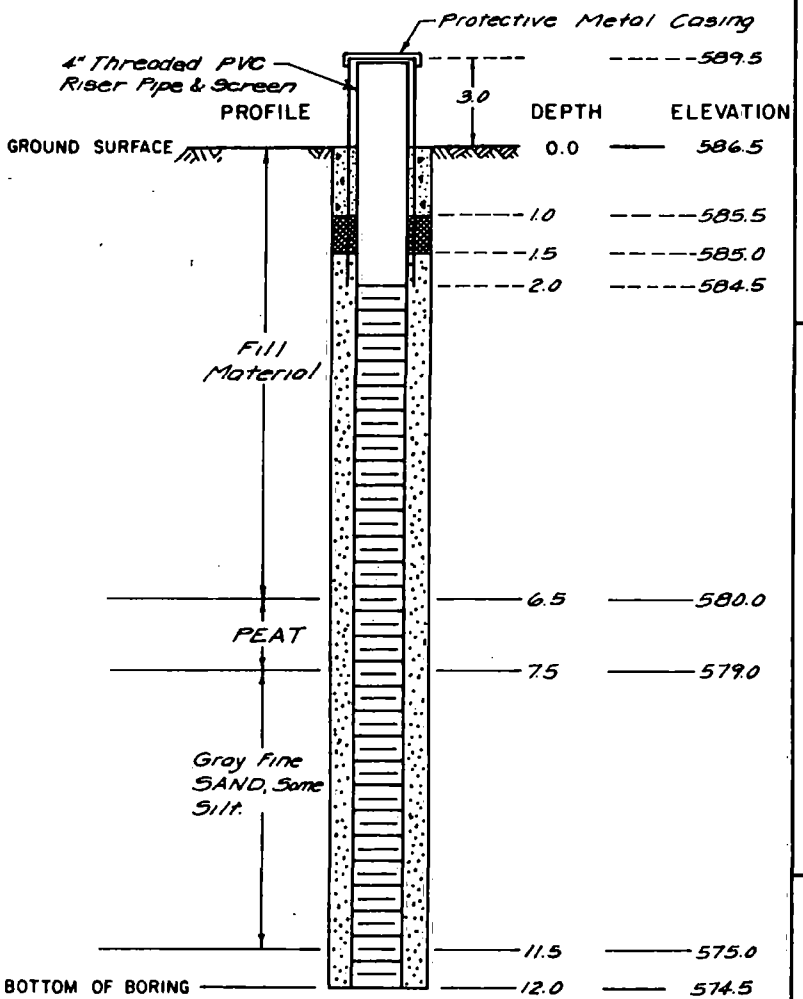
	5/27/82	APPROVED BY	
DRAWING NUMBER			

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

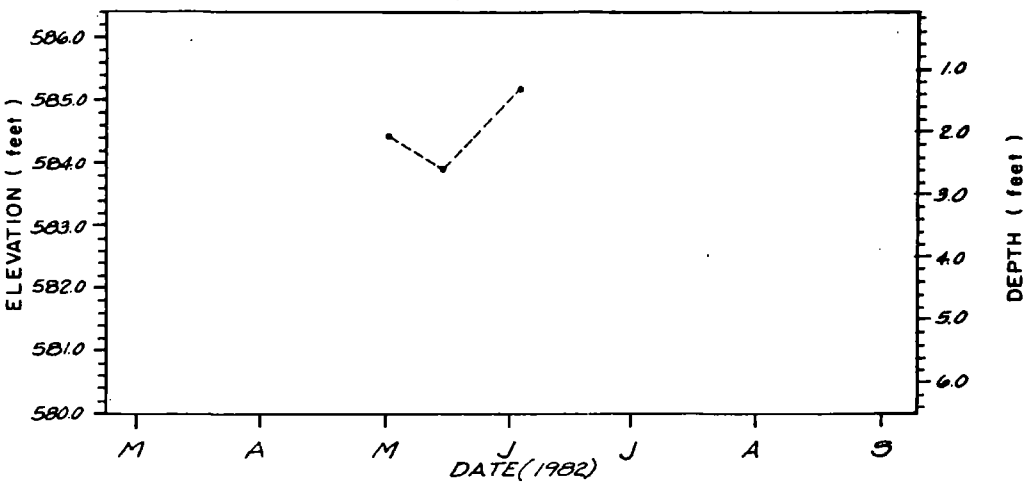
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/1	5.1	584.4					
5/12	5.6	583.9					
6/3	4.3	585.2					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/16/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-19S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR

WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1283 HERCULENE ADD SMITH CO PGH PA LT1530-1070

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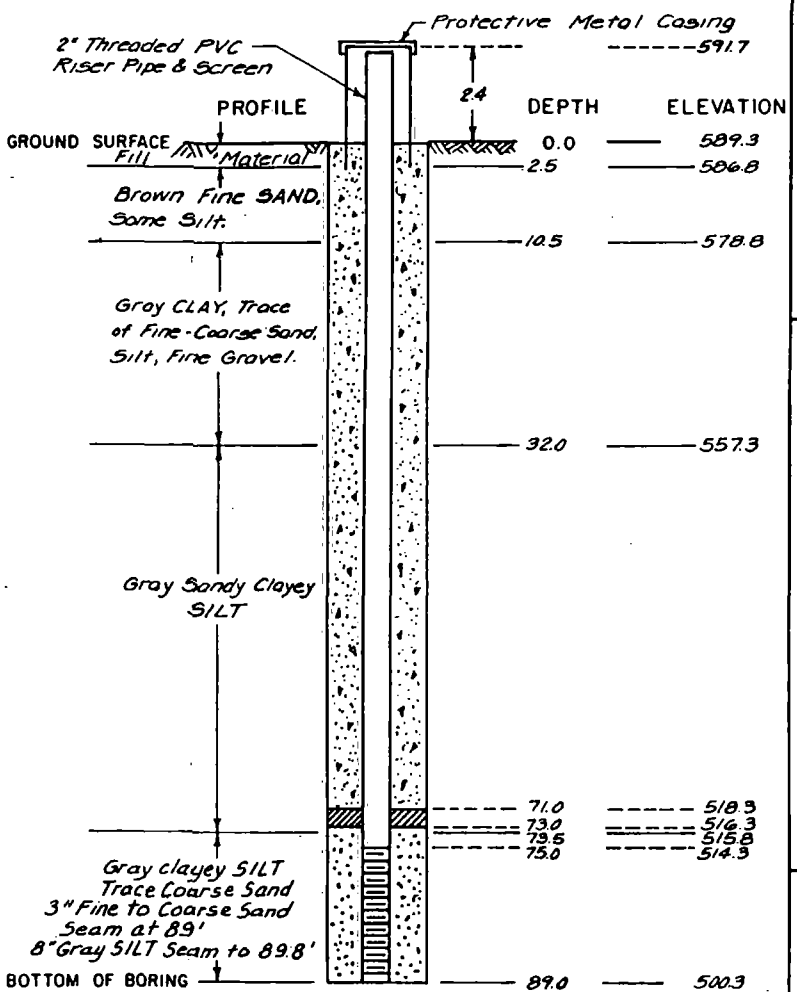
APGD 5/25/82	APPROVED BY	

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

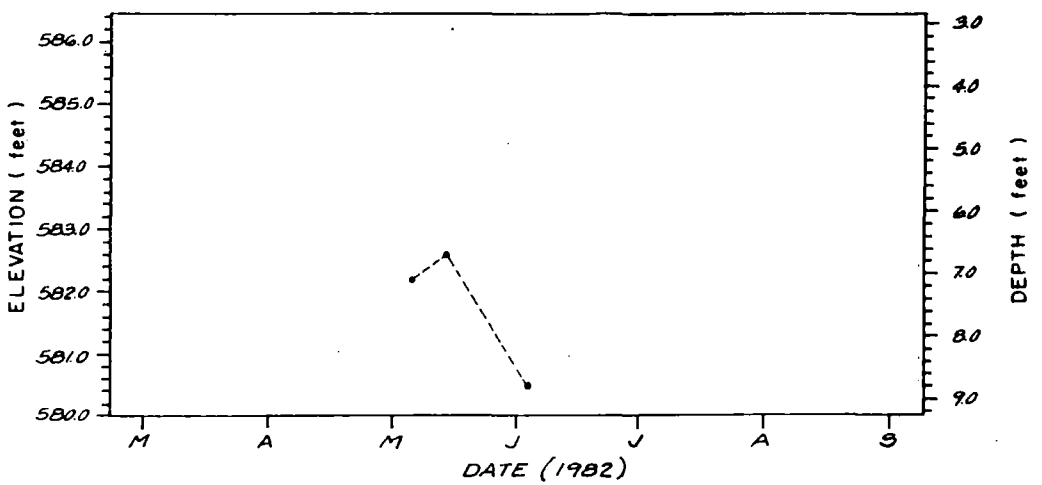
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE / TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE / TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/5	9.5	582.2					
5/12	9.1	582.6					
6/9	11.2	580.5					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/23/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-17M2
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

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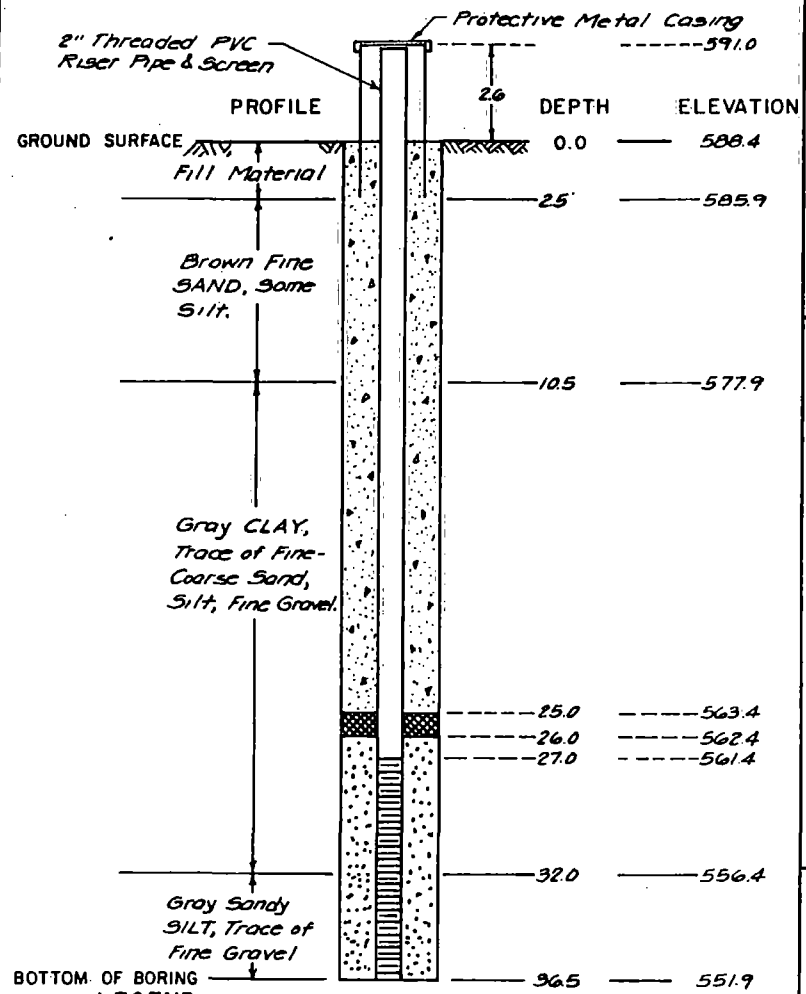
APPROVED BY	
DRAWN BY	RGD 5/25/82

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/12	7.4	583.6		-----			
6/8	7.3	583.7		-----			
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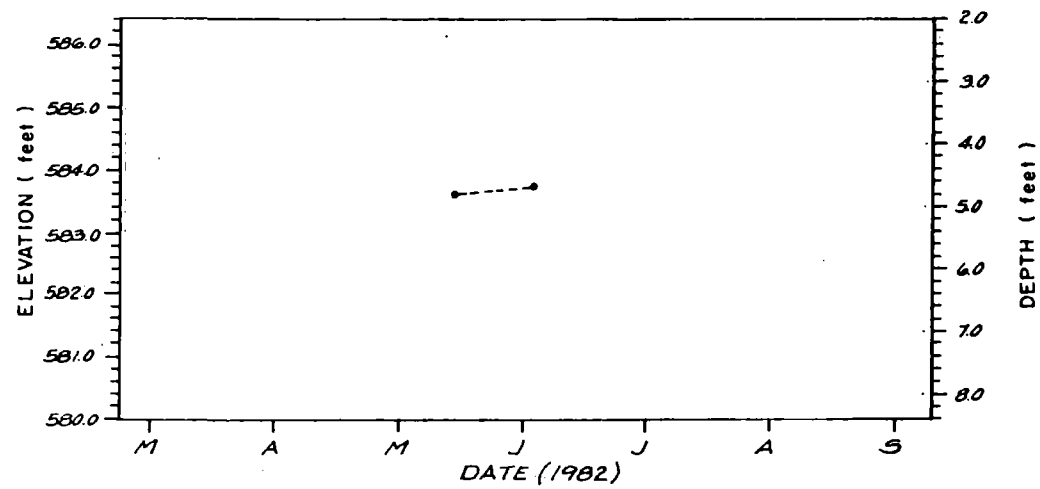
SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/1/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

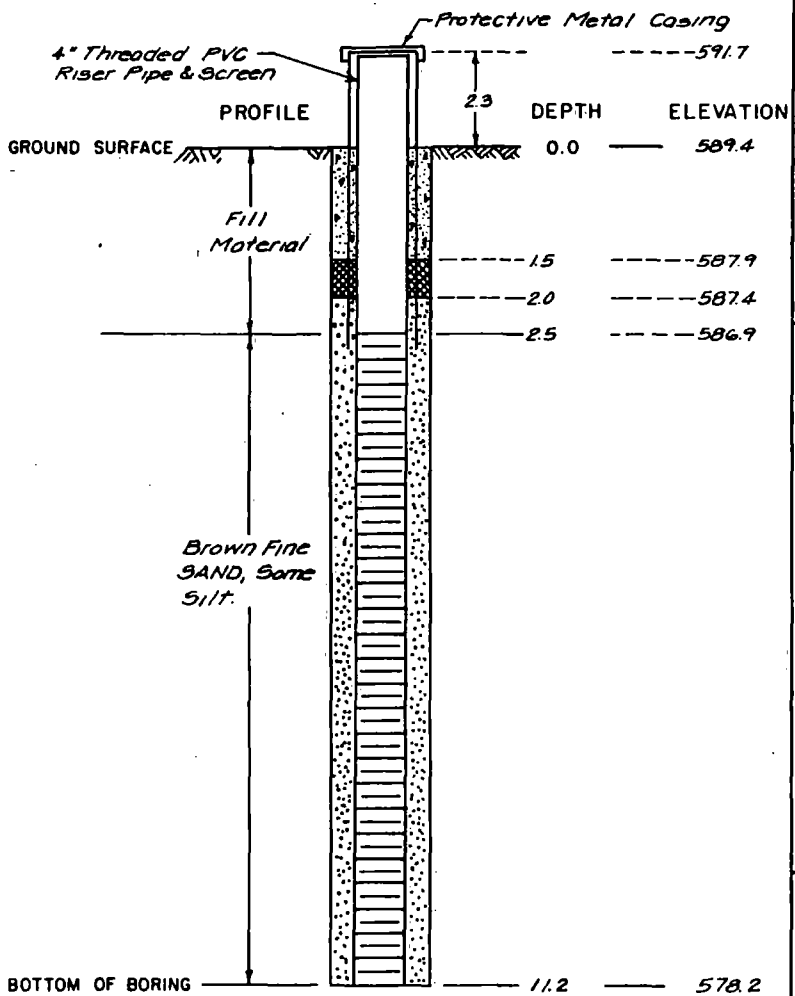
PIEZOMETER B-17MI
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Camonie Engineers

10 1283 HERCULENE, ADD SMITH CO., PGH., PA LT1930-1079

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

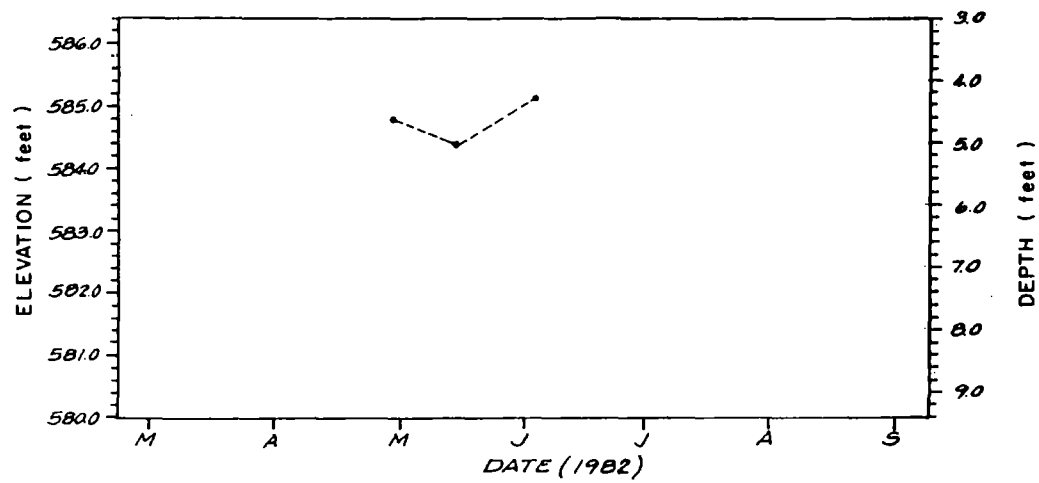
1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
4/30	6.9	584.8	
5/12	7.3	584.4	
6/9	6.6	585.1	

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/23/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-17S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR

WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

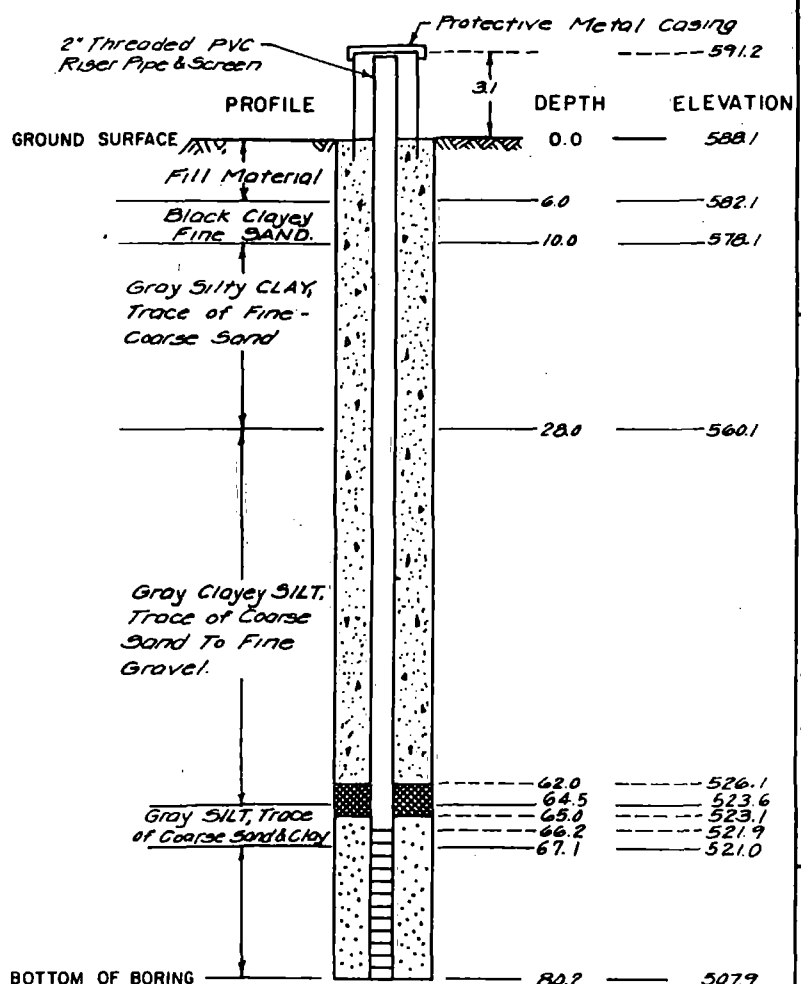
Canonie Engineers

DRAWN BY RGD 5/25/82 | CHECKED BY | APPROVED BY | DRAWING NUMBER

10 1253 HERCULENE. A&B SMITH CO. PGH. PA L71930-1079

DRAWN BY	CHECKED BY	DRAWING NUMBER
RGO 5/25/82	APPROVED BY	

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

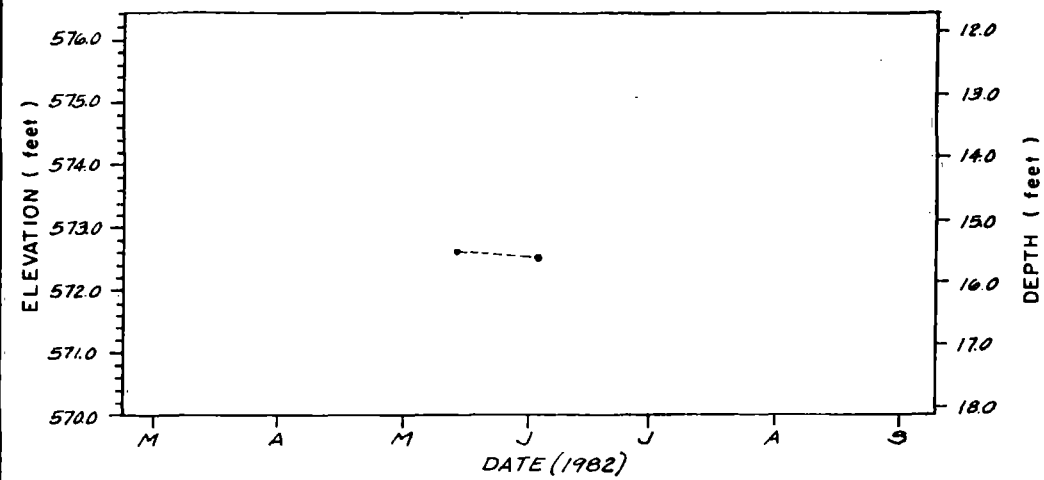
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/12	18.6	572.6					
6/2	18.7	572.5					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/15/82 .
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING .
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

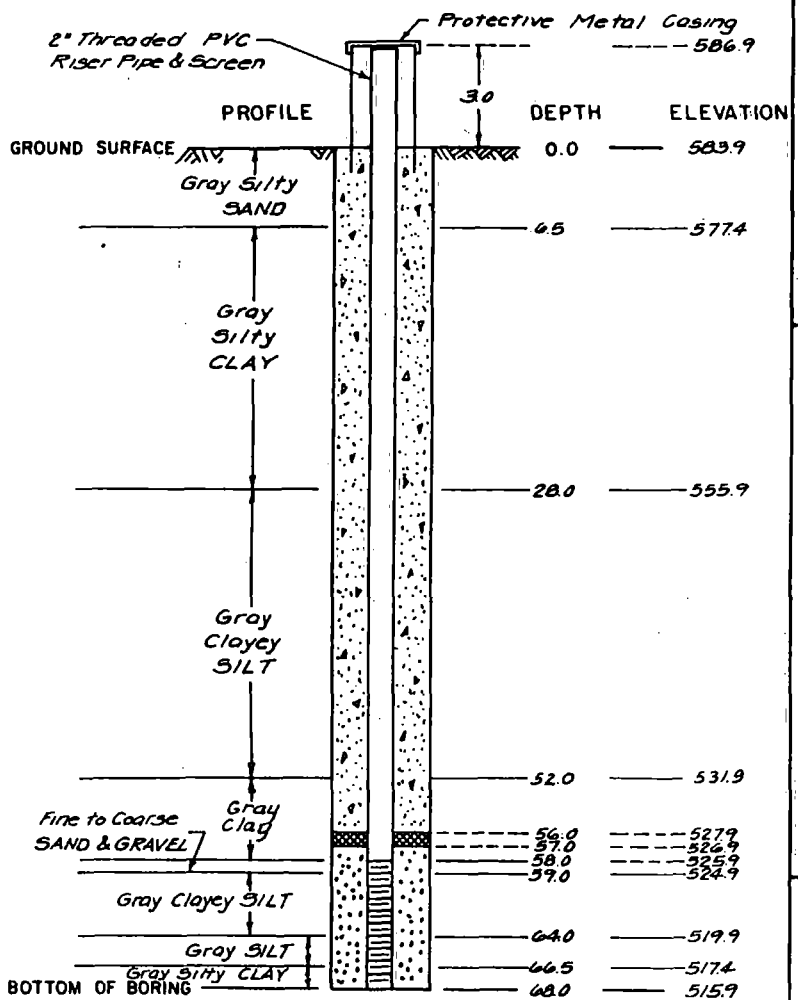
PIEZOMETER B-13M
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1293 HERCULENE ABB SMITH CO PBH PA LT1550 1079

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/18	13.6	573.3		-----			
6/8	13.5	573.4		-----			
-----				-----			
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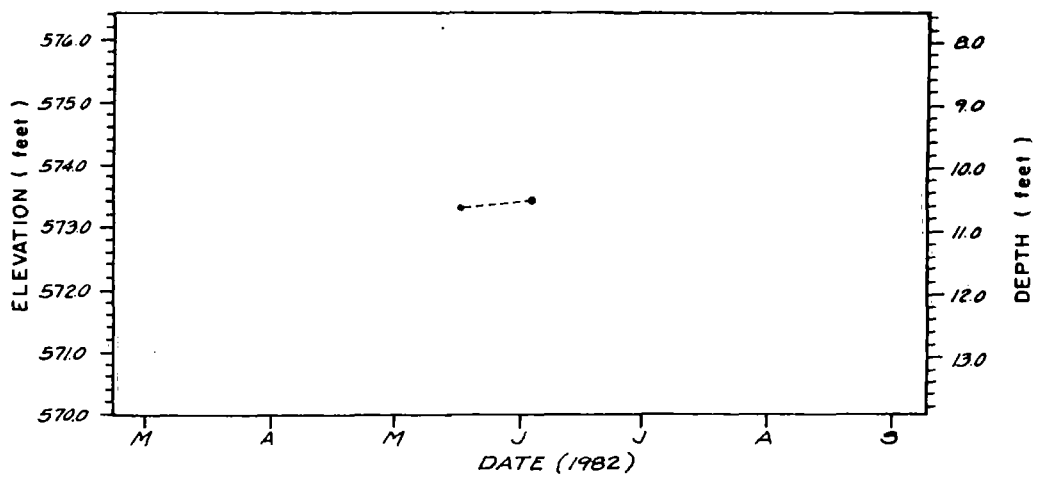
SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/9/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-12M
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

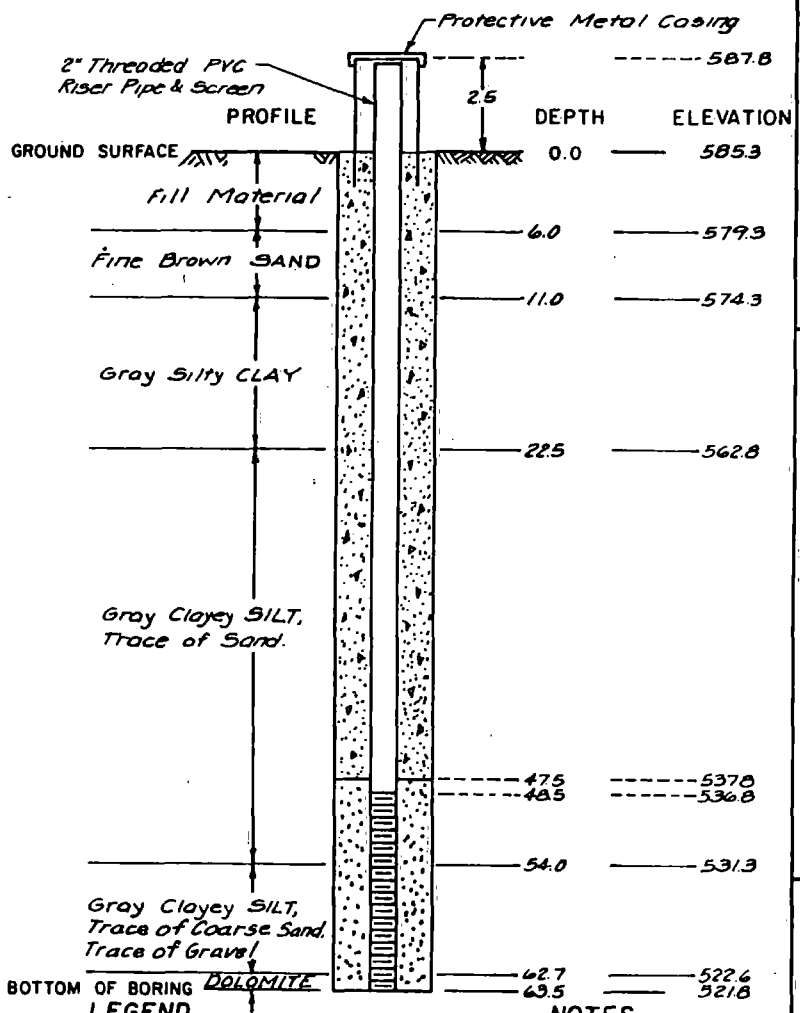
Canonie Engineers

DRAWN BY	RGD 5/25/82	CHECKED BY	APPROVED BY	DRAWING NUMBER

10 1253 HERCULENE, A&B SMITH CO., PGH., PA LT1850-1070

DRAWN BY	RGO	5/28/82	CHECKED BY	APPROVED BY	DRAWING NUMBER

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

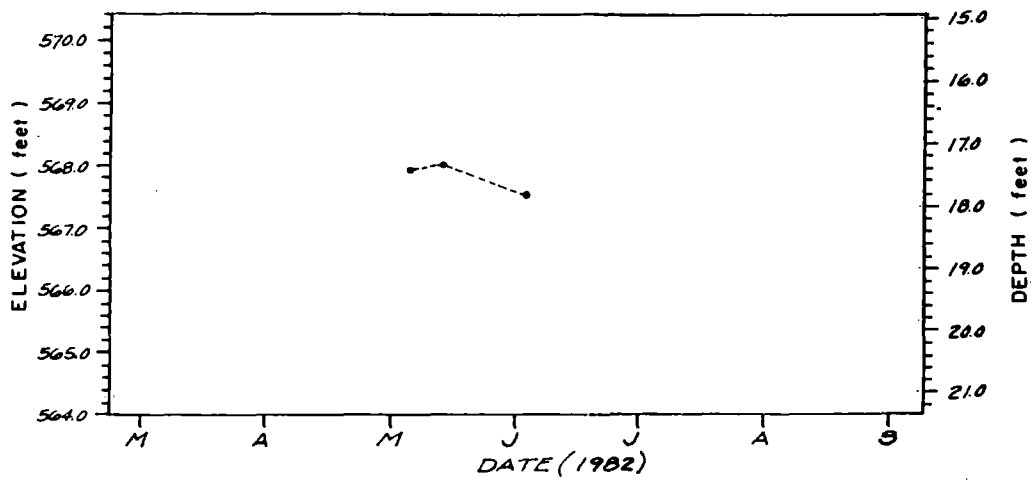
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/5	19.9	567.9					
5/12	19.8	568.0					
6/2	20.3	567.5					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/15/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-8M
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR

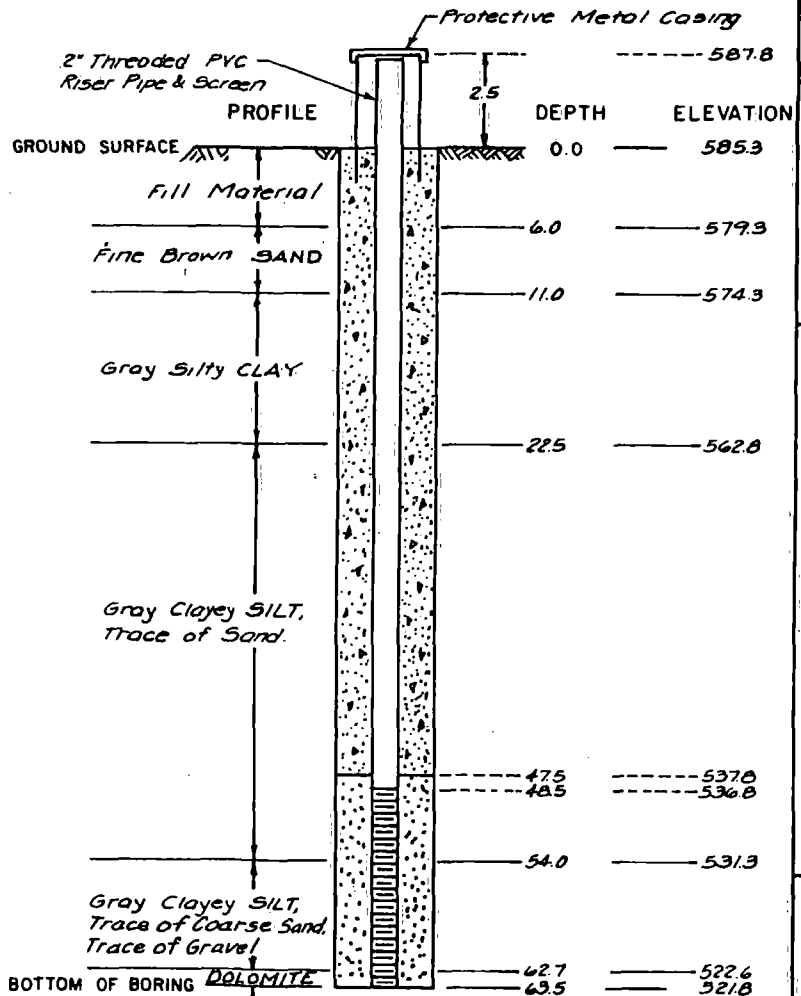
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Camonie Engineers

HP 1203 HERCULENE, ADD SMITH CO PGH PA LT1530-1070

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
R.G.D. 5/28/82			

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

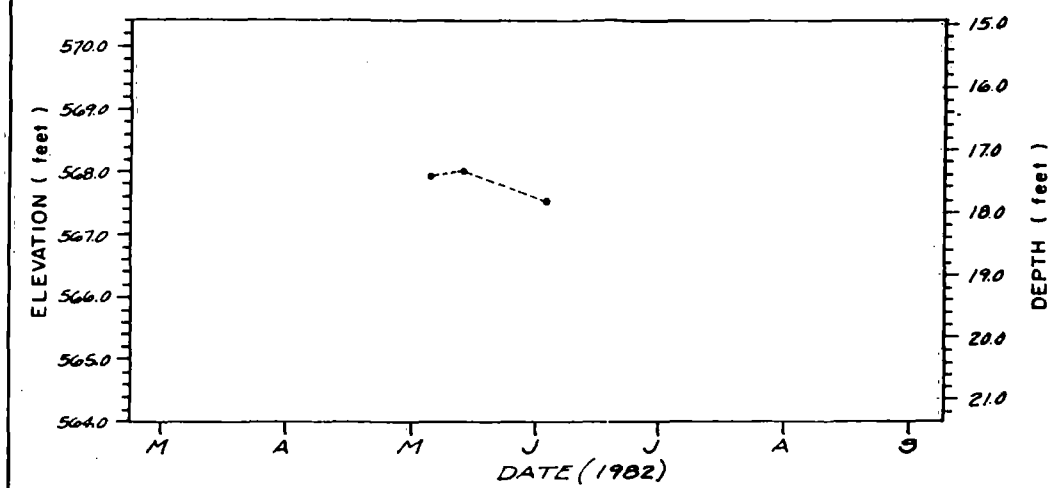
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/5	19.9	567.9					
5/12	19.8	568.0					
6/2	20.3	567.5					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/15/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER B-8M
INSTALLATION & MONITORING DETAILS

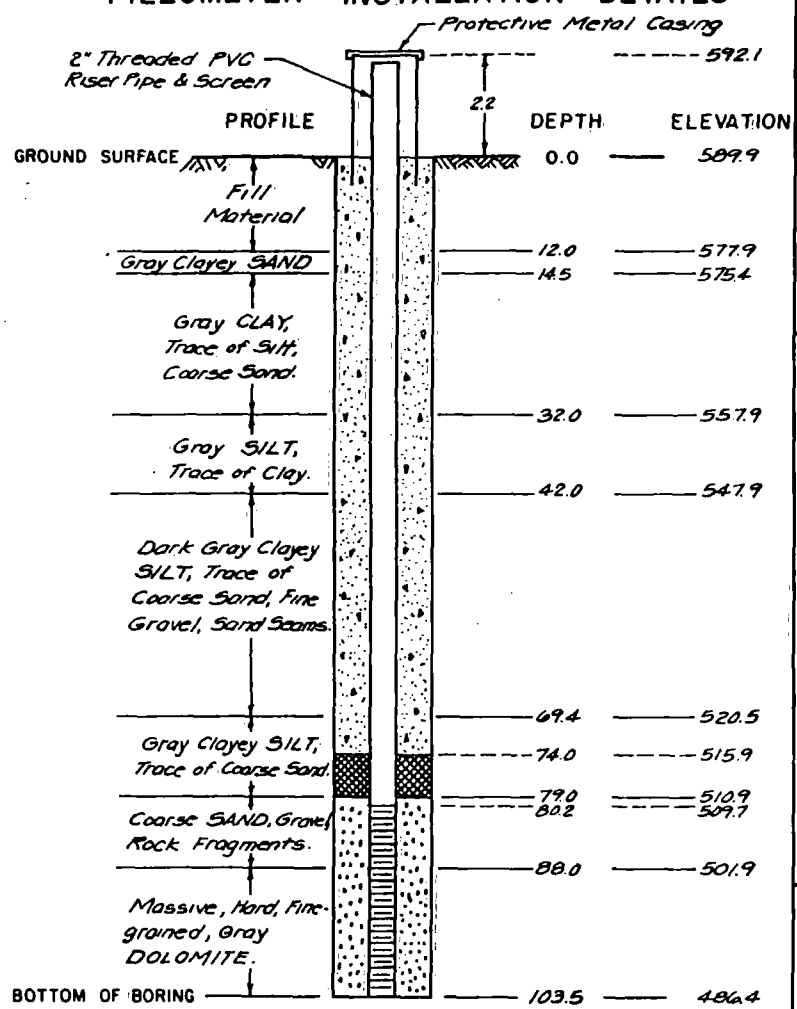
INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1333 HERCULENE, A&B SMITH CO PGH PA L71530-1070

DRAWN BY	CHECKED BY	DRAWING NUMBER
RGD 5/23/82	APPROVED BY	

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

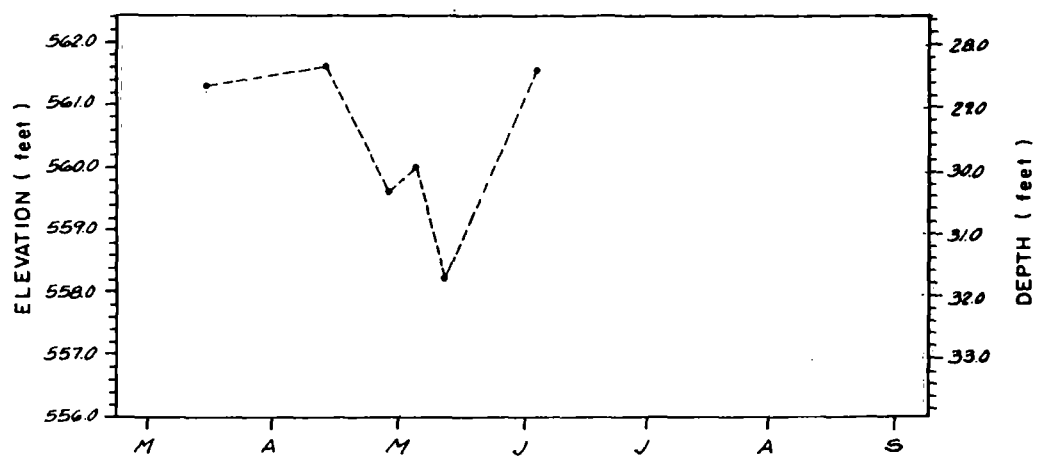
1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
3/17	30.8	561.3	
4/14	30.5	561.6	
4/28	32.5	559.6	
5/5	32.1	560.0	
5/12	33.9	558.2	
6/3	30.6	561.5	

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 3/12/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER ST-4D
INSTALLATION & MONITORING DETAILS

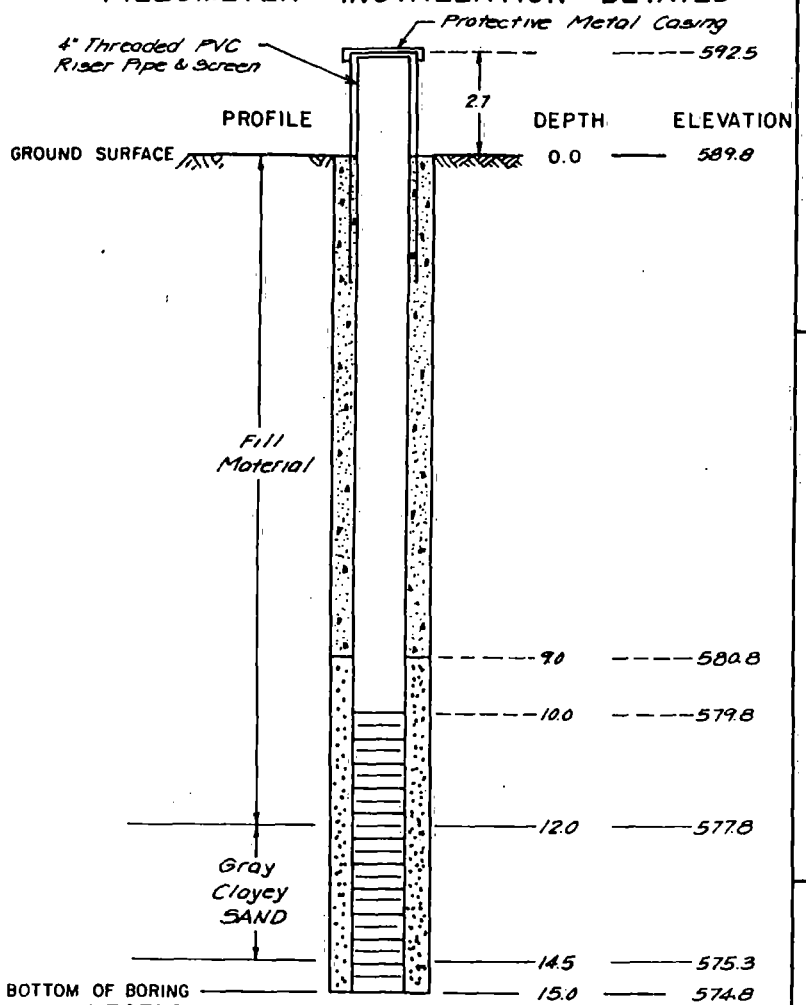
INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1253 HERCULENE ASB SMITH CO PGH PA LTI5250 1979

DRAWN BY	CHECKED BY	DRAWING NUMBER
FGO 5/28/82	APPROVED BY	

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

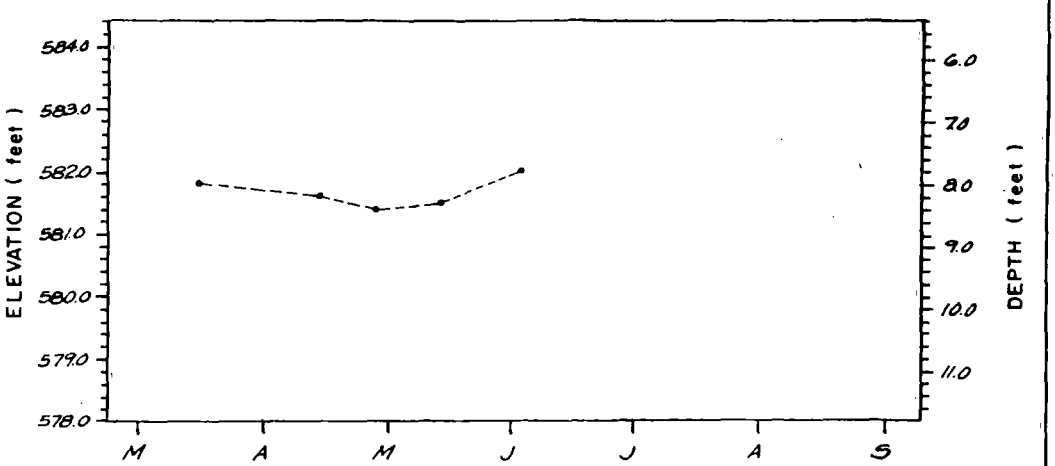
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE / TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE / TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
3/17	10.7	581.8					
4/14	10.9	581.6					
4/28	11.1	581.4					
5/12	11.0	581.5					
6/3	10.5	582.0					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 3/12/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER ST-4S
INSTALLATION & MONITORING DETAILS

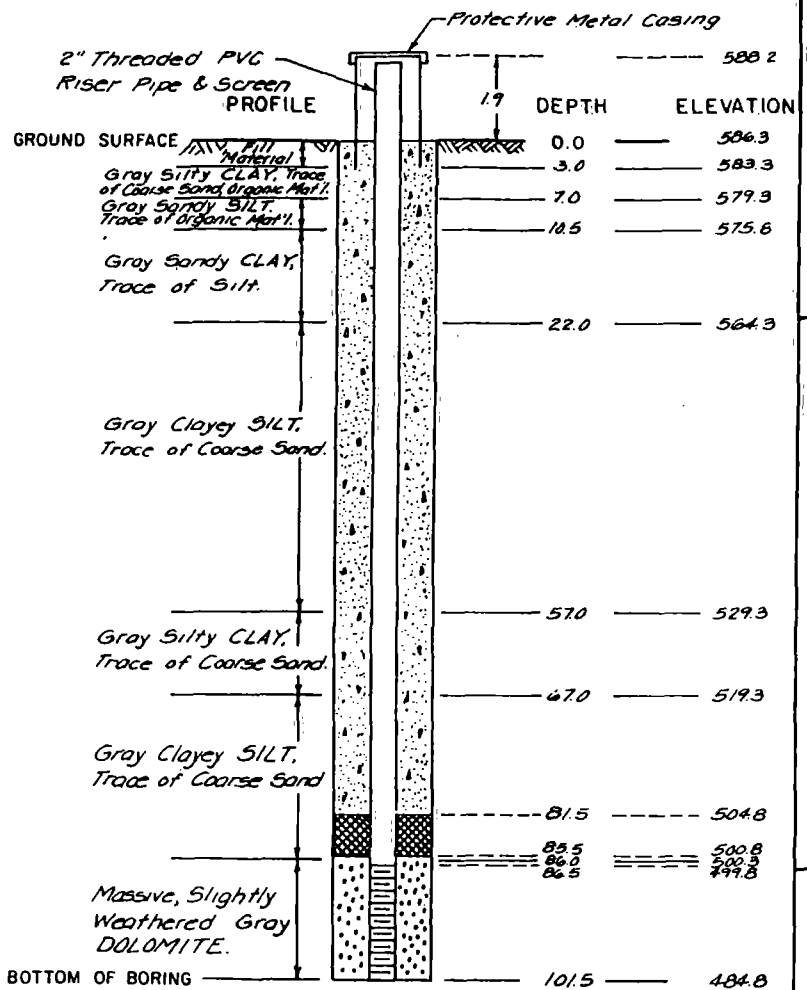
INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

19 1253 HERCULENE A&B SMITH CO PGH PA L71530-1079

DRAWN BY	CHECKED BY	DRAWING NUMBER
RGD 5/23/82	APPROVED BY	

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

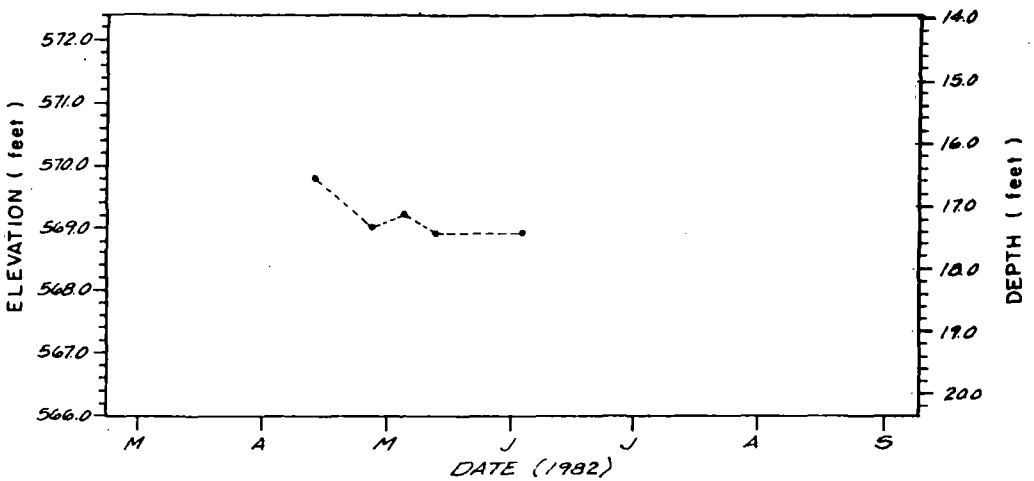
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
4/14	18.4	569.8					
4/28	19.2	569.0					
5/5	19.0	569.2					
5/12	19.3	568.9					
6/9	19.3	568.9					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/13/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

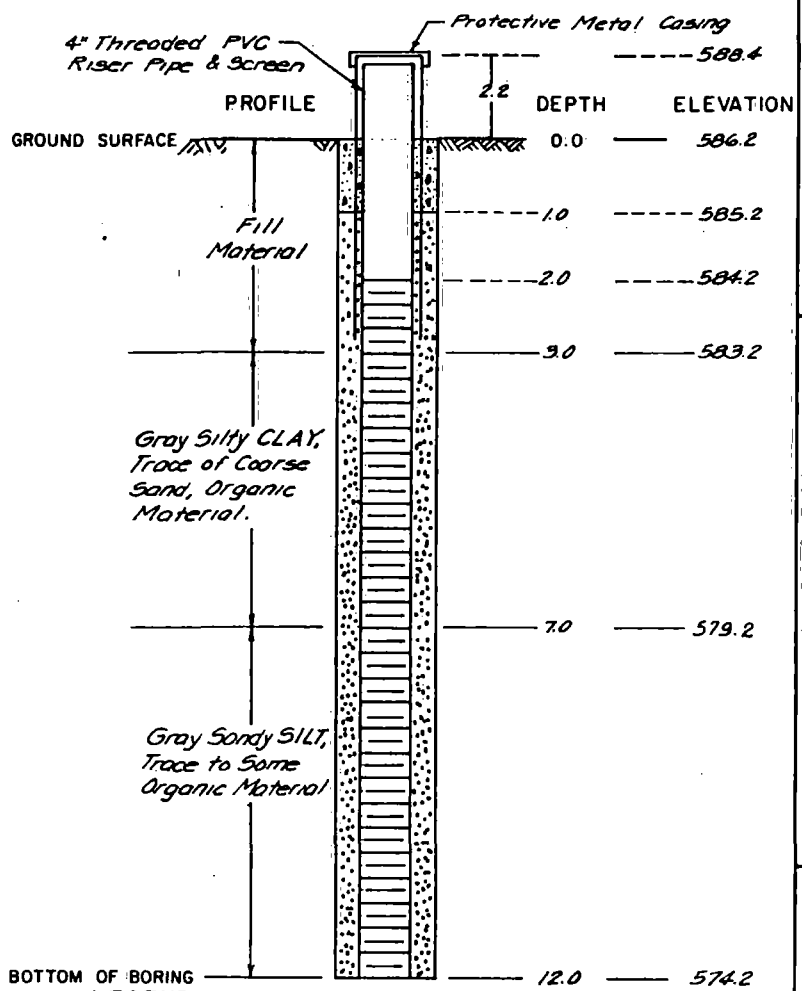
PIEZOMETER ST-3D
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

18 1253 HERCULENE A&B SMITH CO FOH PA L71550 10%

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

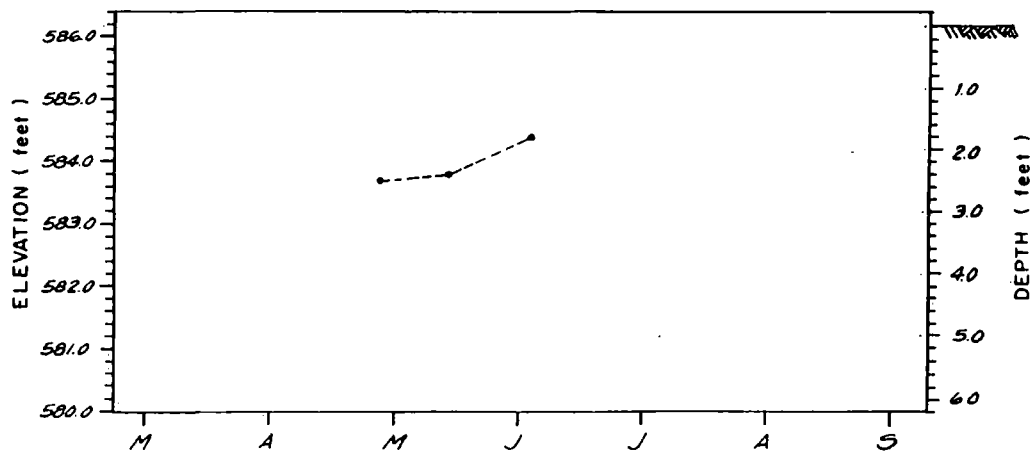
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
4/28	4.7	583.7					
5/12	4.6	583.8					
6/9	4.0	584.4					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/12/82 .
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING .
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER ST-3S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

CanonieEngineers

DRAWN BY | DATE 5/28/82 | CHECKED BY | APPROVED BY | DRAWING NUMBER

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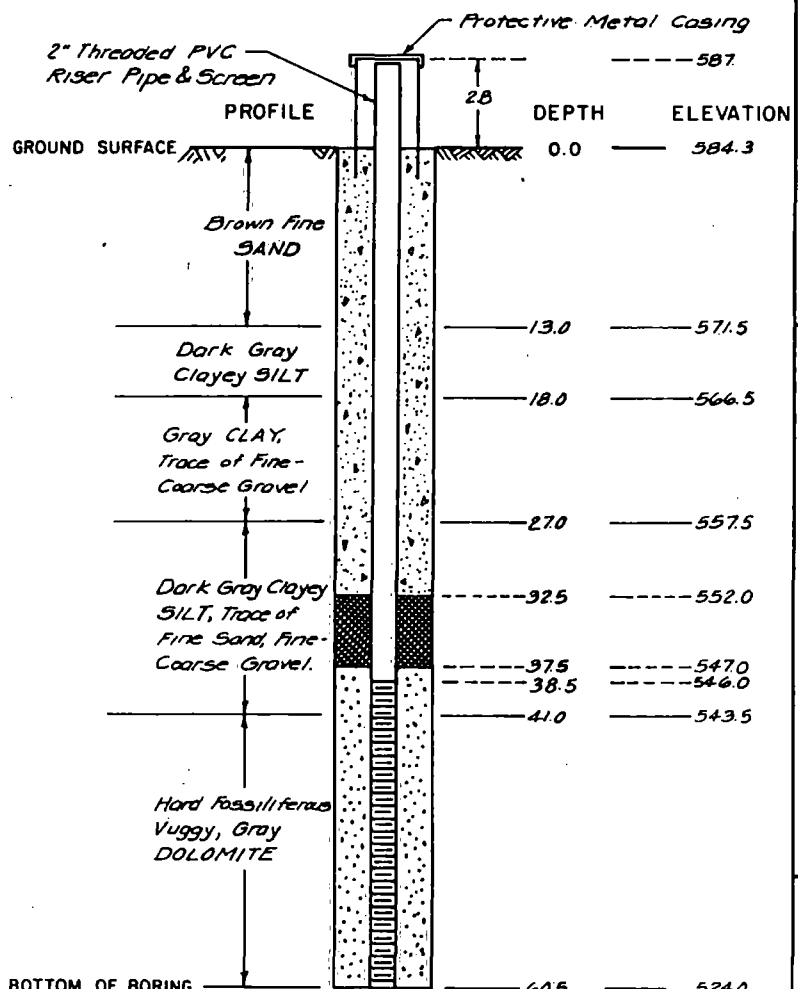
DRAWN BY	CHECKED BY	DRAWING NUMBER
RGD 5/27/82	APPROVED BY	

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

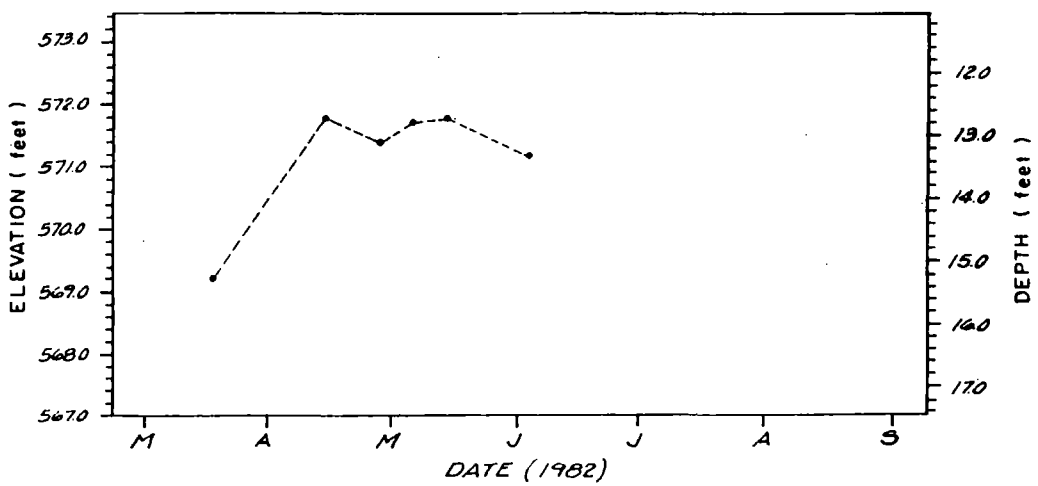
1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
3/17	18.1	569.2	
4/14	15.5	571.8	
4/28	15.9	571.4	
5/5	15.6	571.7	
5/12	15.5	571.8	
6/3	16.1	571.2	

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 3/8/82 .
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING .
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER ST-2D
INSTALLATION & MONITORING DETAILS

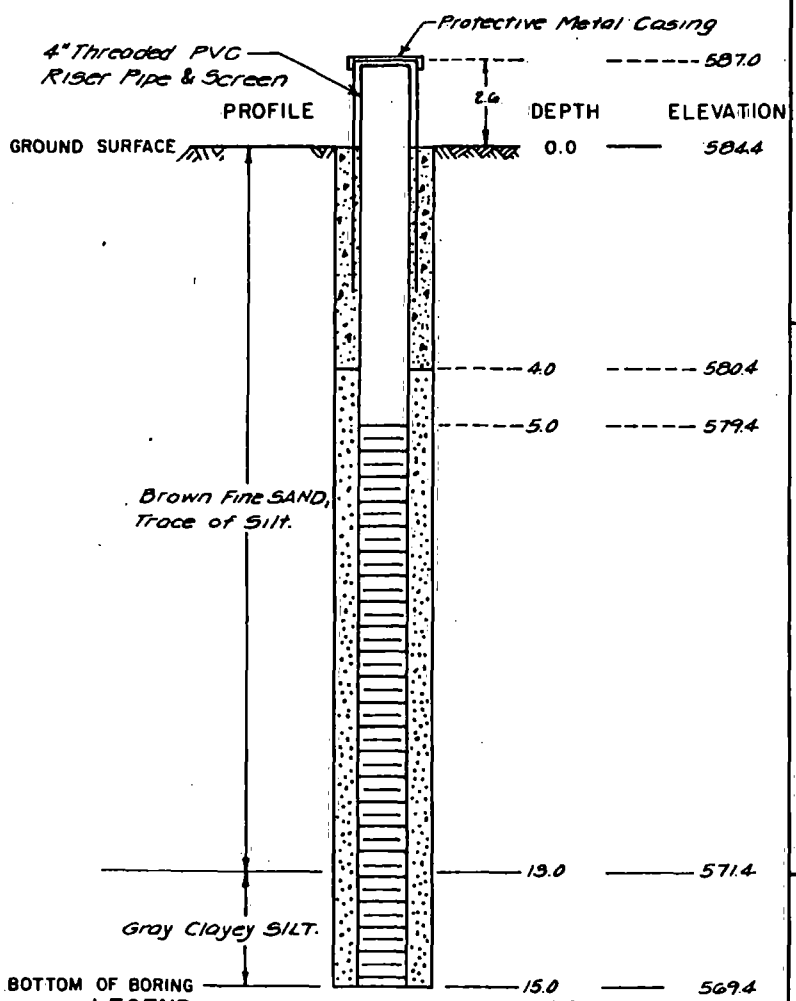
INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1253 HERCULENE. ABB SMITH CO PGH. PA LT1330-1079

DRAWN BY	RGD 5/28/82	CHECKED BY		DRAWING NUMBER
		APPROVED BY		

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

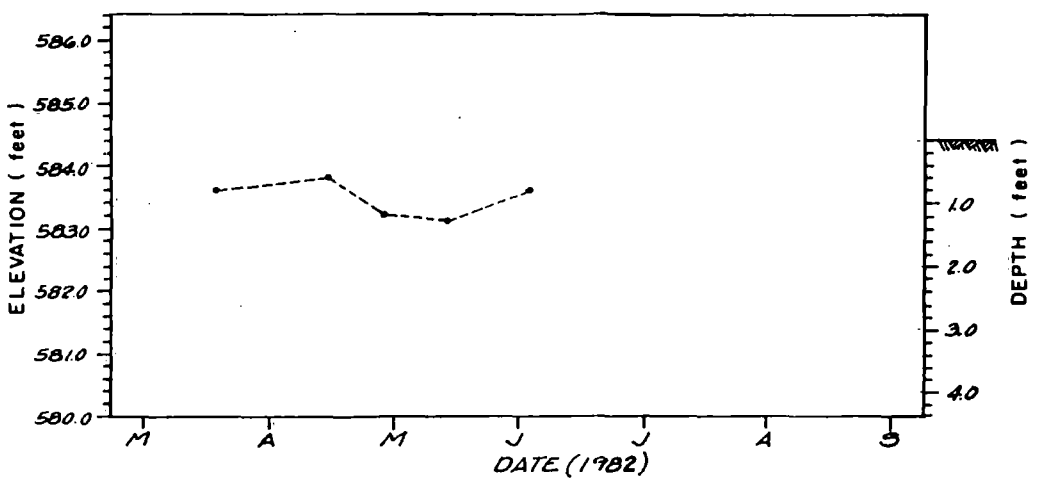
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
3/17	3.4	583.6					
4/14	3.2	583.8					
4/28	3.8	583.2					
5/12	3.9	583.1					
6/3	3.4	583.6					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 3/9/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER ST-2S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR

WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

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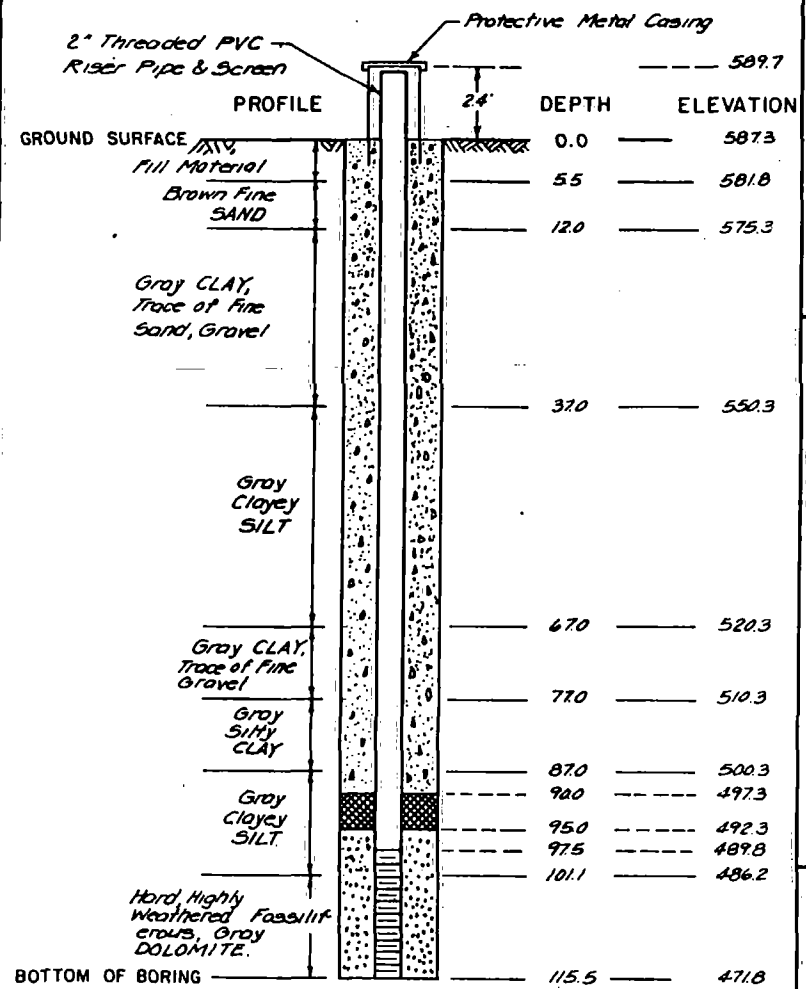
DRAWN BY	RGO	15-22-82	CHECKED BY	APPROVED BY	DRAWING NUMBER

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

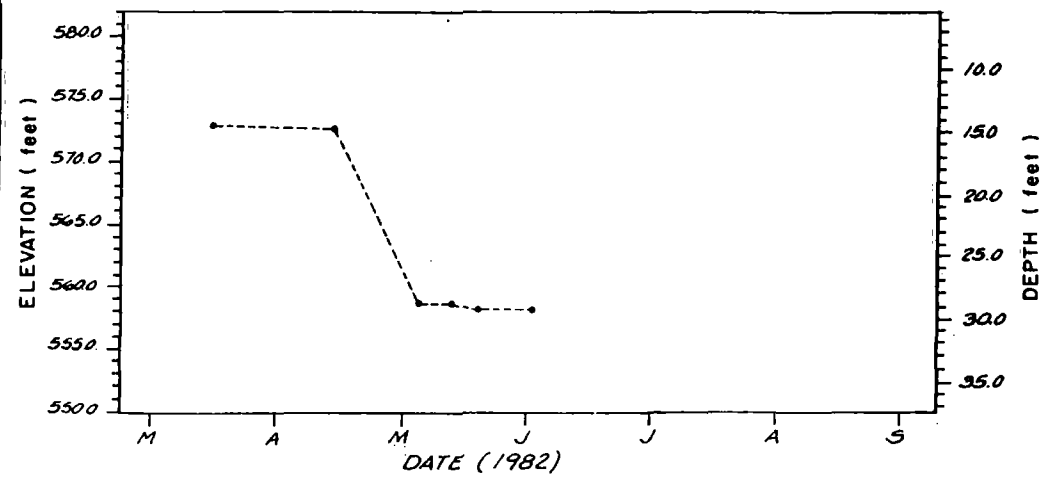
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
3/17	16.9	572.8					
4/14	17.1	572.6					
5/5	31.1	558.6	Change in water level due to mounding effect of drilling fluid				
5/12	31.1	558.6					
5/18	31.5	558.2					
6/3	31.5	558.2					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 3/3/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

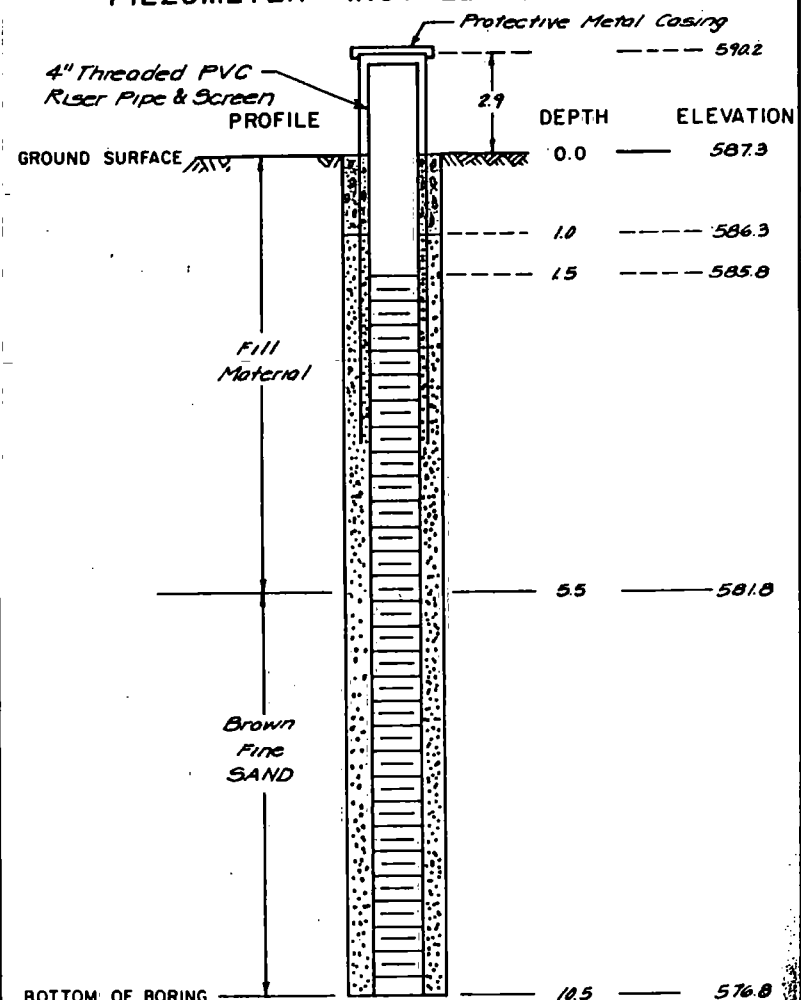
PIEZOMETER ST-1D
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1555 HERCULENE ABB SMITH CO. PGH., PA LT1550-1079

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

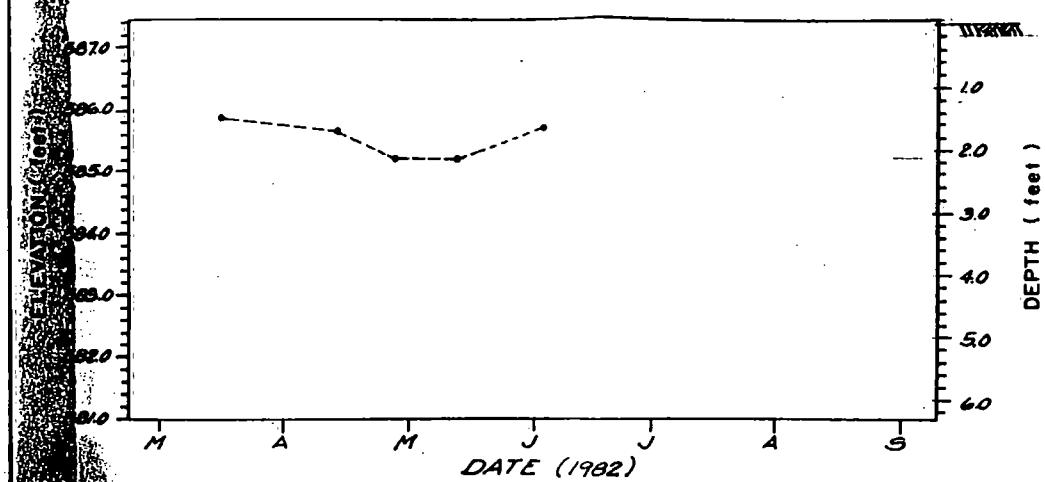
1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
3/17	4.4	585.8	
4/14	4.6	585.6	
4/28	5.0	585.2	
5/12	5.0	585.2	
6/2	4.5	585.7	

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

PIEZOMETER INSTALLED ON 3/3/82.

WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.

DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER ST-1S
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

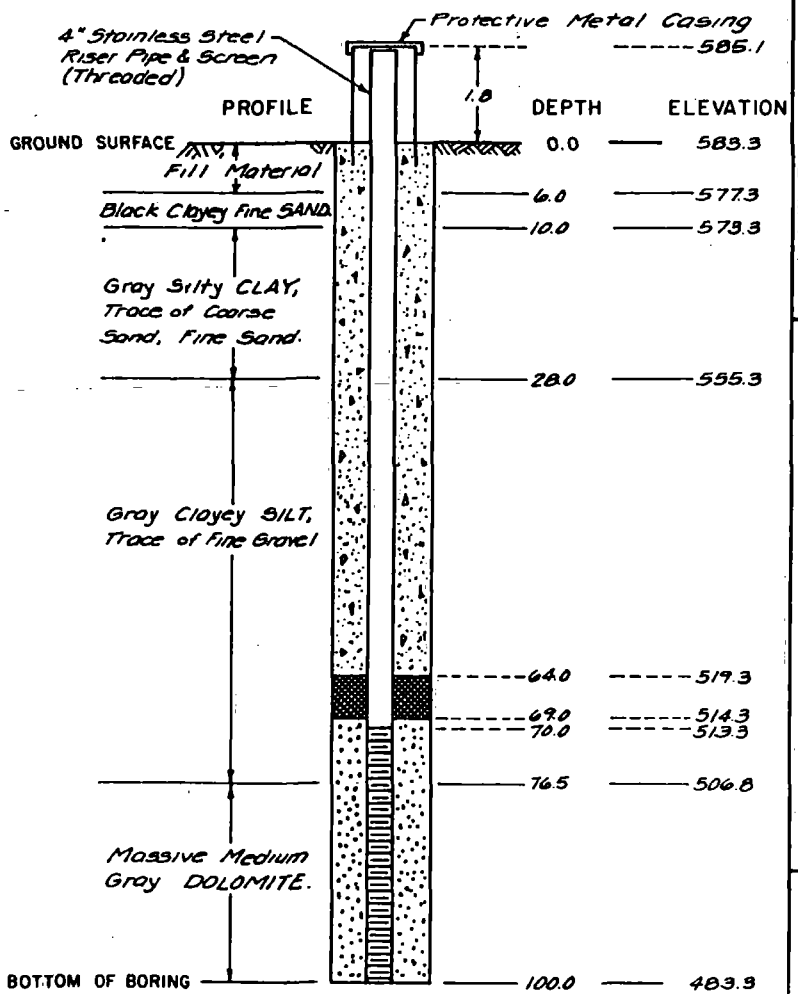
Canonie Engineers

DRAWN BY	CHECKED BY	DRAWING NUMBER
ASD 5-28-82	APPROVED BY	

10 1253 HERCULENE ADD SMITH CO PGH PA 1-71530-1070

DRAWN BY	CHECKED BY	DRAWING NUMBER
RGO 5/28/82	APPROVED BY	

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

NOTES

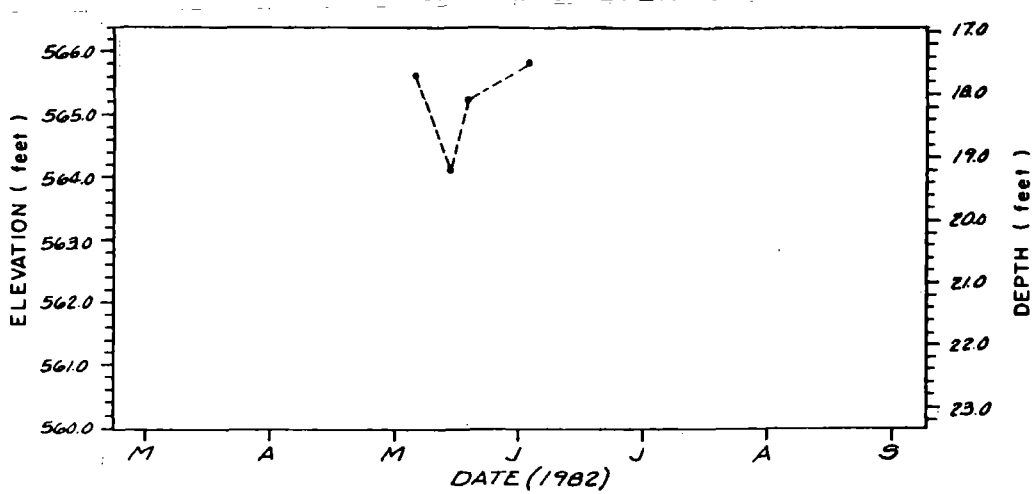
1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/5	19.5	565.6	
5/12	21.0	564.1	Water level read 2 days after water quality test.
5/18	19.9	565.2	
6/3	19.3	565.8	

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 5/3/82 .
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING .
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER SS-2D
INSTALLATION & MONITORING DETAILS

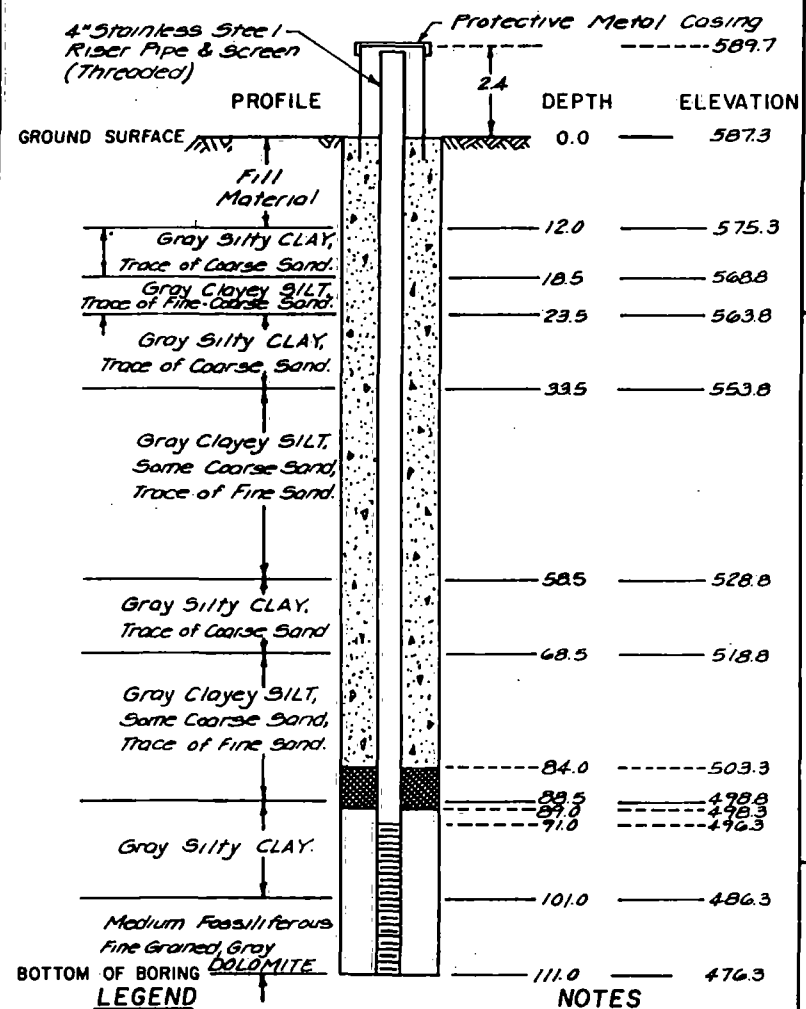
INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Canonie Engineers

10 1200 HERCULENE ABB SMITH CO PGH . PA LT1930-1070

DRAWING NUMBER	
CHECKED BY	
APPROVED BY	
DRAWN BY	AGO 5/27/82

PIEZOMETER INSTALLATION DETAILS



LEGEND

- GROUT
- BENTONITE
- GRANULAR BACKFILL
- NATURAL SOIL
- PIEZOMETER SCREEN

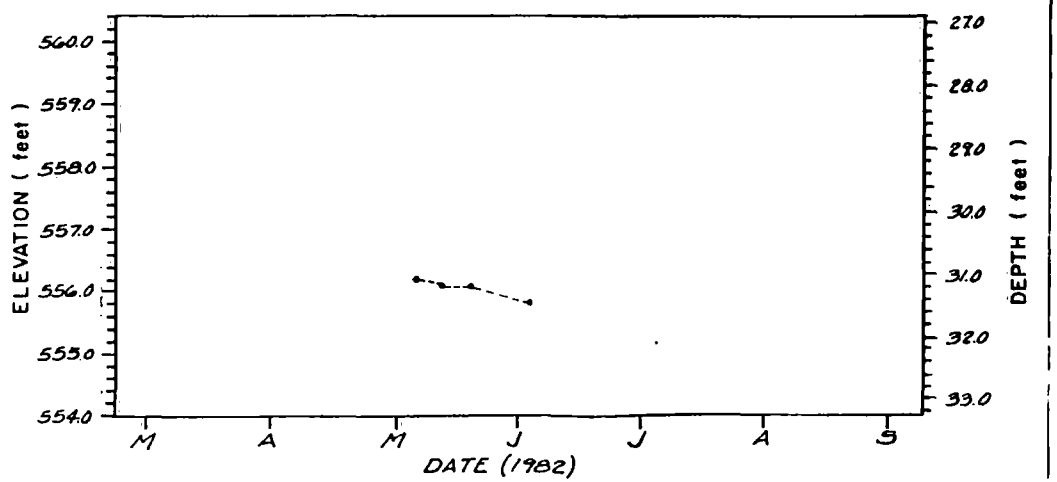
NOTES

1. NOT DRAWN TO SCALE.
2. DEPTH AND ELEVATION DATA IS APPROXIMATE.
3. DEPTH AND ELEVATION DATA IN FEET.

GROUNDWATER LEVEL OBSERVATIONS

DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS	DATE TIME	WATER LEVEL DEPTH	WATER LEVEL ELEV.	COMMENTS
5/5	33.5	556.2					
5/12	33.6	556.1					
5/18	33.6	556.1					
6/3	33.9	555.8					

SUMMARY OF PIEZOMETER LEVELS



GENERAL NOTES

1. PIEZOMETER INSTALLED ON 4/26/82.
2. WATER LEVEL DEPTH REPORTED UNDER "GROUNDWATER LEVEL OBSERVATIONS" IS FROM TOP OF CASING.
3. DEPTHS REPORTED ON "SUMMARY OF PIEZOMETER LEVELS" ARE REFERENCED TO THE GROUND SURFACE.

PIEZOMETER SS-1D
INSTALLATION & MONITORING DETAILS

INTERLAKE SITE
CHICAGO, ILLINOIS
FOR
WASTE MANAGEMENT, INC
OAK BROOK, ILLINOIS

Camonie Engineers

10 1259 HERCULENE ABB SMITH CO. PDH PA 17 1930 1979

PIEZOMETERS

Water level readings taken during the field operations do not provide information on the long term fluctuations of the water table. Also, long term readings are required to obtain reliable water level information in low yield aquifers. When this information is required, piezometers are necessary.

A piezometer is installed by inserting a pipe with a slotted screen bottom section into a boring. These borings cover either the soil test boring or auger borings described in Appendix A. Only potable drilling water was used to advance the borings near the ultimate piezometer sensing zones.

After the pipe is installed, the annulus between the bore hole and the screened section is backfilled with sand to the height of the desired "sensing zone", then a two to three-foot thick bentonite seal is installed. The remainder of the annulus is pressure-grouted to the ground surface. A steel protective casing with lock is placed over the top of the piezometer.

Individual installation details together with water level readings are presented on the following pages.