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REGION 4 **COUNTY** Rensselaer **TOWN** Nassau **NAME** Dewey Loeffel

DOCUMENT TYPE (CIRCLE)	PROGRAM (CIRCLE)	SITE NUMBER	DOCUMENT DATE (YYYY-MM-DD)

agreement .

application .

brief .

consent .

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factsheet .

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PHASE I FINAL HYDROGEOLOGIC REPORT

LOEFFEL SITE ENVIRONS REMEDIAL INVESTIGATION

Volume II

Prepared for:

General Electric Company
Albany, New York

October 1996

APPENDIX A

WELL CONSTRUCTION PROTOCOLS, WELL SCHEMATICS AND GEOLOGIC LOGS FOR WELLS INSTALLED FALL 1994

1 FIELDWORK COMPLETED FALL 1994

The Interim Hydrogeologic Report submitted August 1994 proposed several additional RI activities. Discussions in meetings between NYSDEC and GE in October and November of 1994 amended these activities to provide for installation, sampling, and testing of wells OMW-212, OMW-213, and OMW-214 (GE, 1994). Activities completed in the Fall of 1994 included: drilling and well construction of OPZ-208, OMW-209, OMW-210, OMW-211, OMW-212, OMW-213, and OMW-214; well development; hydraulic conductivity testing (slug tests); monthly water-level measurements; and groundwater sampling. Well specifications, protocols, well schematics, and geologic logs are provided.

2 BEDROCK AND OVERBURDEN MONITORING WELLS

A total of seven wells were installed outside of the containment system from October 3 through November 18, 1994 (Figure 1). Buffalo Drilling, Inc. of Buffalo, New York performed all drilling, under the supervision of GeoTrans, Inc. The objective of these installations was to further define the extent of contaminants found in the groundwater to the south of the site. A description of the location and objective for each new well is provided in Table 1. Well specifications for each of these wells is provided in Table 2.

The well installations additionally provided information on vertical hydraulic gradients and bedrock contaminant concentration variations with depth through well clusters or pairs. Three new well pairs/clusters were created, including two just south of the site and one southeast of the site between the site and residential wells (Figure 1). These well pairs/clusters included:

- A new overburden well, (OMW-210) paired with existing shallow bedrock well (approximately 20 ft into competent rock) OMW-205;
- A new overburden well, (OMW-211) paired with existing shallow bedrock well (approximately 20 ft into competent rock) OMW-204; and

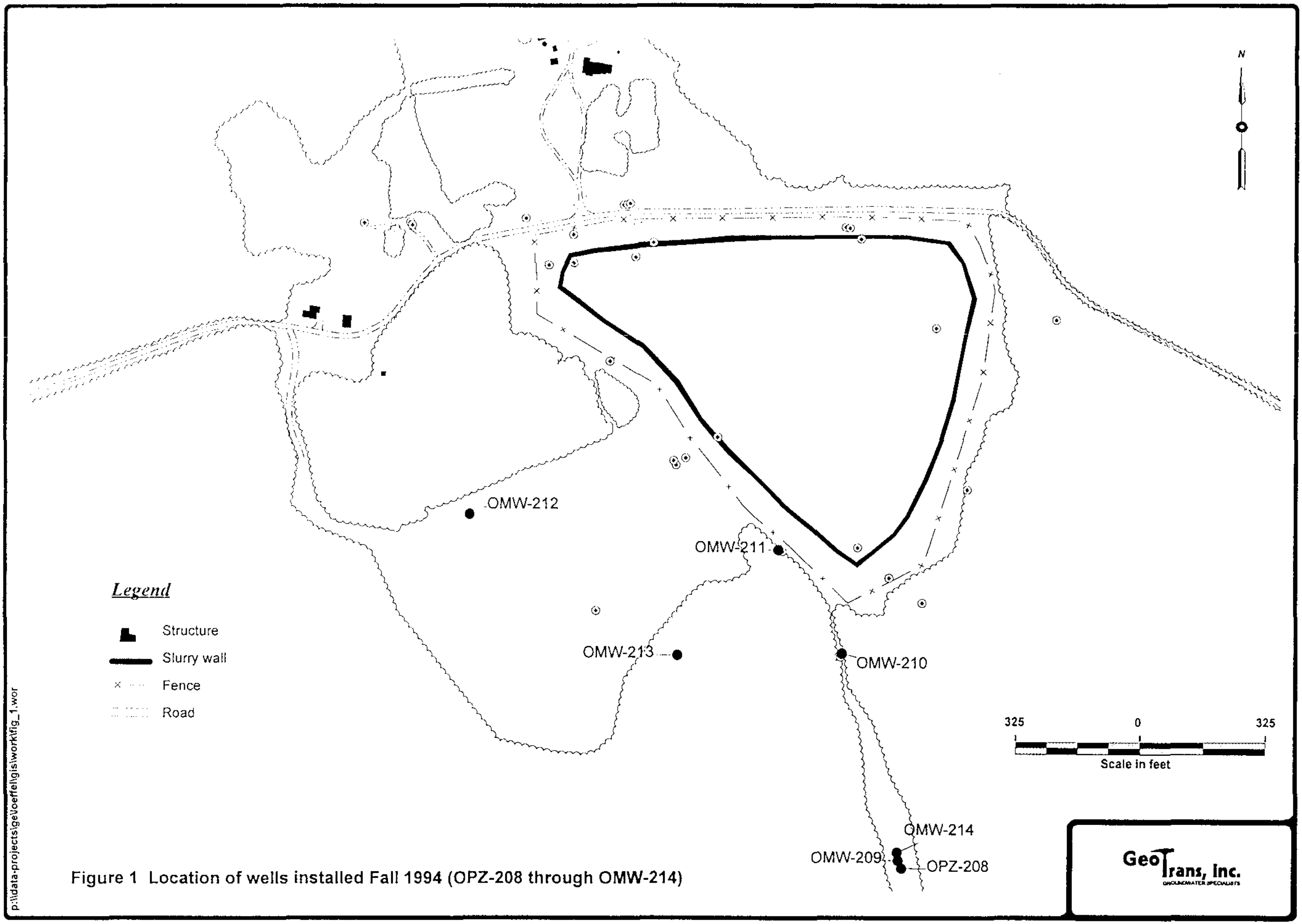

Figure 1 Location of wells installed Fall 1994 (OPZ-208 through OMW-214)

Table 1. Description of type, location and primary objective for each well installation completed in Fall 1994.

Well ID	Type/Location	Primary Objective
OPZ-208	Overburden piezometer located approximately 500 feet northeast of 192-01-3B well.	To evaluate groundwater flow in overburden to the south of the site.
OMW-209	Shallow bedrock well located approximately 500 feet northeast of 192-01-3B well.	To evaluate groundwater flow and groundwater quality in shallow bedrock (~20 feet into competent bedrock) to the south of the site.
OMW-210	Overburden well located adjacent to OMW-205, just southeast of the site.	To reduce uncertainty associated with the inferred overburden flow system just south of the site.
OMW-211	Overburden well located adjacent to OMW-204, just south of the site.	To reduce uncertainty associated with the inferred overburden flow system just south of the site.
OMW-212	Shallow bedrock well located approximately 500 feet west of OMW-102 in the borrow pit.	To evaluate groundwater flow and groundwater quality in shallow bedrock (~20 feet into competent bedrock) downgradient (as inferred from existing wells) and west-southwest of the site.
OMW-213	Shallow bedrock well located approximately 300 feet southwest of OMW-204.	To evaluate groundwater flow and groundwater quality in shallow bedrock (~20 feet into competent bedrock) downgradient (as inferred from existing wells) and south of the site.
OMW-214	Deeper (mid-depth) bedrock well located approximately 500 feet northeast of 192-01-3B well.	To evaluate groundwater flow and groundwater quality in deeper bedrock (~75 feet into competent bedrock) to the south of the site.

Table 2. Well specifications for bedrock and overburden wells/piezometers installed Fall 1994.

MW/Piez ID	Elevation of MRP (ft MSL)	Ground Surface Elevation (ft MSL)	Depth to Top of Bentonite Seal (ft bgs)	Depth to Top of Sand Pack (ft bgs)	Depth to Top of Screened Interval (ft bgs)	Depth to Bottom of Screened Interval (ft bgs)	Depth to Bottom of Borehole (ft bgs)	Casing Diameter and Material	Surface Casing	Geologic Description Screened Interval	Monitoring Interval Elevation (ft MSL)	Open Hole Interval (ft)
OMW-209	657.97	656.20	-	-	-	-	60.50	NX Hole	4" Steel	Bedrock	615.7 - 595.7	40.5 - 60.5
OMW-210	651.83	649.70	15.30	19.30	21.30	31.30	34.00	2" PVC	-	Overburden(Silt)	628.4 - 618.4	-
OMW-211	651.35	649.10	32.00	35.00	38.00	48.00	50.30	2" PVC	-	Overburden(Silt)	611.1 - 601.1	-
OMW-212	655.86	653.60	-	-	-	-	124.00	NX Hole	4" Steel	Bedrock	549.6 - 529.6	104.0 - 124.0
OMW-213	668.97	667.10	-	-	-	-	83.40	NX Hole	4" Steel	Bedrock	606.1 - 583.7	61.0 - 83.4
OMW-214	656.84	655.50	-	-	-	-	108.00	NX Hole	6" Steel	Bedrock	566.5 - 547.6	89.0 - 108.0
OPZ-208	658.86	656.50	22.00	26.00	28.00	38.00	38.00	2" PVC	-	Overburden (Clayey Silt)	628.5 - 618.5	-

Notes:
1) MRP - Measured Reference Point marked on top of the lower portion of the protective casing.
2) PVC - Polyvinyl Chloride
3) Survey data source: Blasland & Bouck (1992a) plus the distance from the top of the inner casing (where present) to the top of the lower portion of the outside protective casing as measured in the field by GeoTrans.

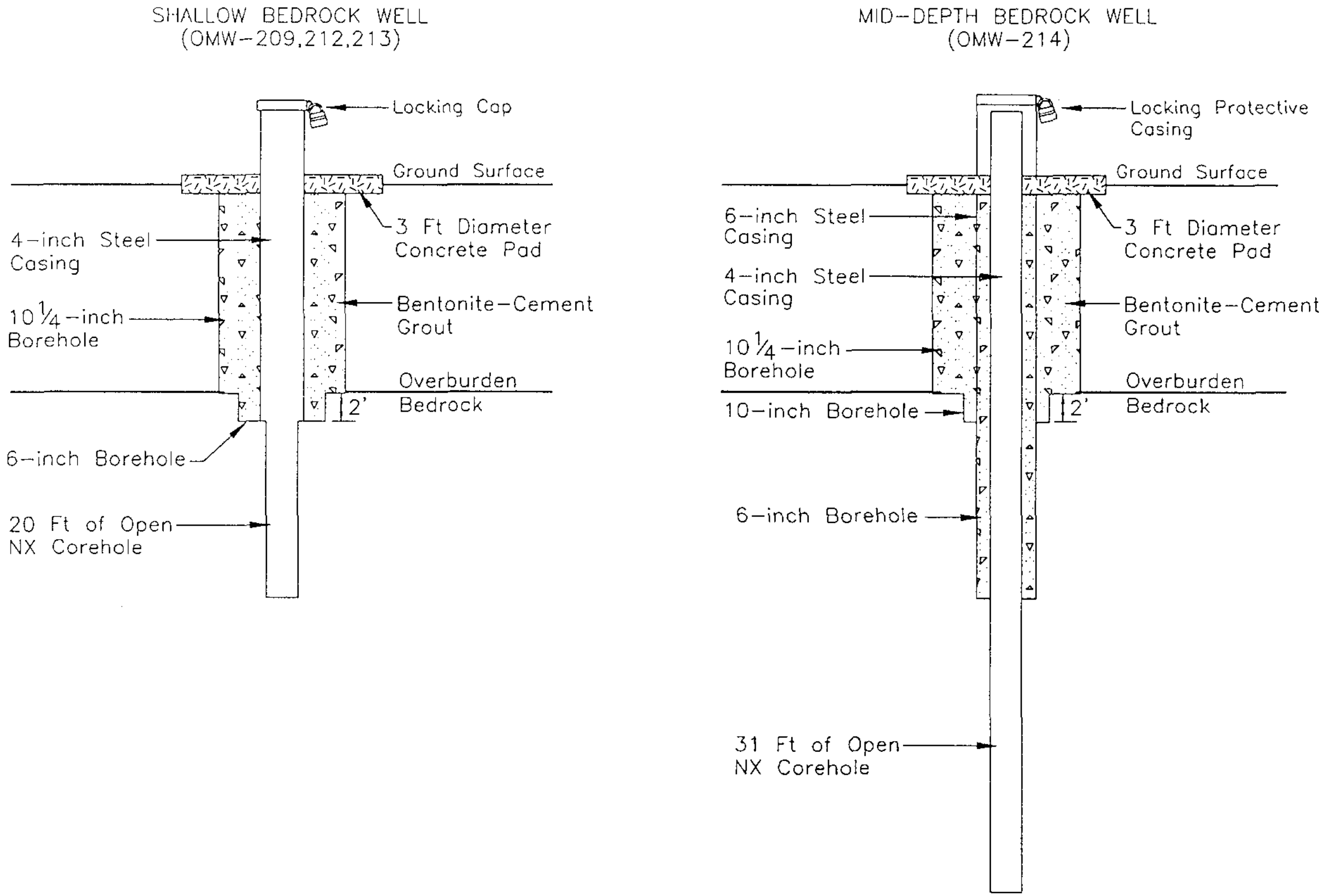

Figure 2. Schematic of the shallow and mid-depth bedrock well construction (Fall 1994).

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- A new well cluster consisting of OPZ-208 (Overburden), OMW-209 (Shallow Bedrock Well, approximately 20 ft into competent rock) and OMW-214 (Mid-Depth Bedrock Well, approximately 75 ft into competent rock).

3 SHALLOW AND MID-DEPTH BEDROCK WELL INSTALLATION

The following procedures were used to install shallow bedrock monitoring wells OMW-209 to -212, -213 and mid-depth bedrock well OMW-214 (Figure 2):

1. Hollow stem augers (6.25-in ID) were advanced to refusal, typically 5 to 15 feet below ground surface (bgs), except at OMW-213 where 4-inch ID augers were used to advance to 55 feet bgs.

2. At OMW-212 and -213, water rotary methods were used to advance the drilling and sampling through the overburden to approximately two feet into competent bedrock. A 6-inch borehole was advanced. A temporary 12-inch casing was installed to maintain drilling fluid circulation to ground surface.

2a. At OMW-209 and -214 air rotary methods were used to advance the drilling through the overburden to approximately two feet into competent bedrock. A 6-inch borehole was advanced two feet into bedrock. A temporary 12-inch casing was installed to maintain a seal at ground surface.

3. A 4-inch ID steel isolation casing was installed from ground surface to the bottom of the borehole (2 ft into competent bedrock) and pressure grouted via a tremie pipe.

4. The grout was allowed to cure for at least 24 hours.

5. A 3.625-inch NX core barrel was used to core 20 feet into bedrock below the bottom of the isolation casing. The well was completed as an open hole.

6. All wells were completed with a locking stickup protective casing and a 3-foot diameter cement pad.

Bedrock well OMW-214 was installed in a similar manner as discussed above, except that two isolation casings were installed. A 6-inch isolation casing was installed approximately two feet into competent bedrock to 39 feet bgs. The borehole for the 6-inch isolation casing was advanced with a 10-inch roller bit. The 6-inch casing was grouted in place and allowed to cure over the weekend. The borehole was then drilled to 49 feet and cored with a NX core bit to 88.5 feet bgs. The borehole for OMW-214 was then reamed to 88.5 feet bgs with a 6-inch roller bit. A 4-inch isolation casing was then installed inside of the 6-inch casing to a depth of 88.5 feet bgs. Coring then proceeded from 88.5 to 111.6 feet bgs. OMW-214 was completed as an open borehole.

4 Overburden Well Installation

The following procedures were used to install overburden piezometers and monitoring wells OPZ-208, OMW-210 and OMW-211 (Figure 3):

1. Hollow stem augers (6.25-in ID) were advanced to refusal, typically 5 to 15 feet bgs.

2. At OMW-210 and -211, water rotary methods were used to advance the drilling and sampling through the overburden to approximately two feet into competent bedrock. A 6-inch borehole was advanced. A temporary 12-inch casing was installed to maintain a fluid circulation seal at ground surface.

2a. At OPZ-208 air rotary methods were used to advance the drilling through the overburden to approximately two feet into competent bedrock. A 6-inch borehole was advanced. A temporary 12-inch casing was installed to maintain a seal at ground surface.

3. Two-inch, Schedule 40, PVC riser was installed from two feet above ground surface to 10 feet above the bottom of the borehole. The lower 10 feet of the well consisted of 2-inch, Schedule 40, PVC 10-slot screen.

4. The sand pack consisted of 12 to 13 feet of "00" quartz sand from the bottom of the borehole to approximately two to three feet above the well screen. This was followed by two to three feet of bentonite pellets.

5. The bentonite was allowed to set-up for one hour.

6. The remainder of the annulus was grouted to surface.

7. All wells were completed with a locking stickup protective casing and a 3-foot diameter cement pad.

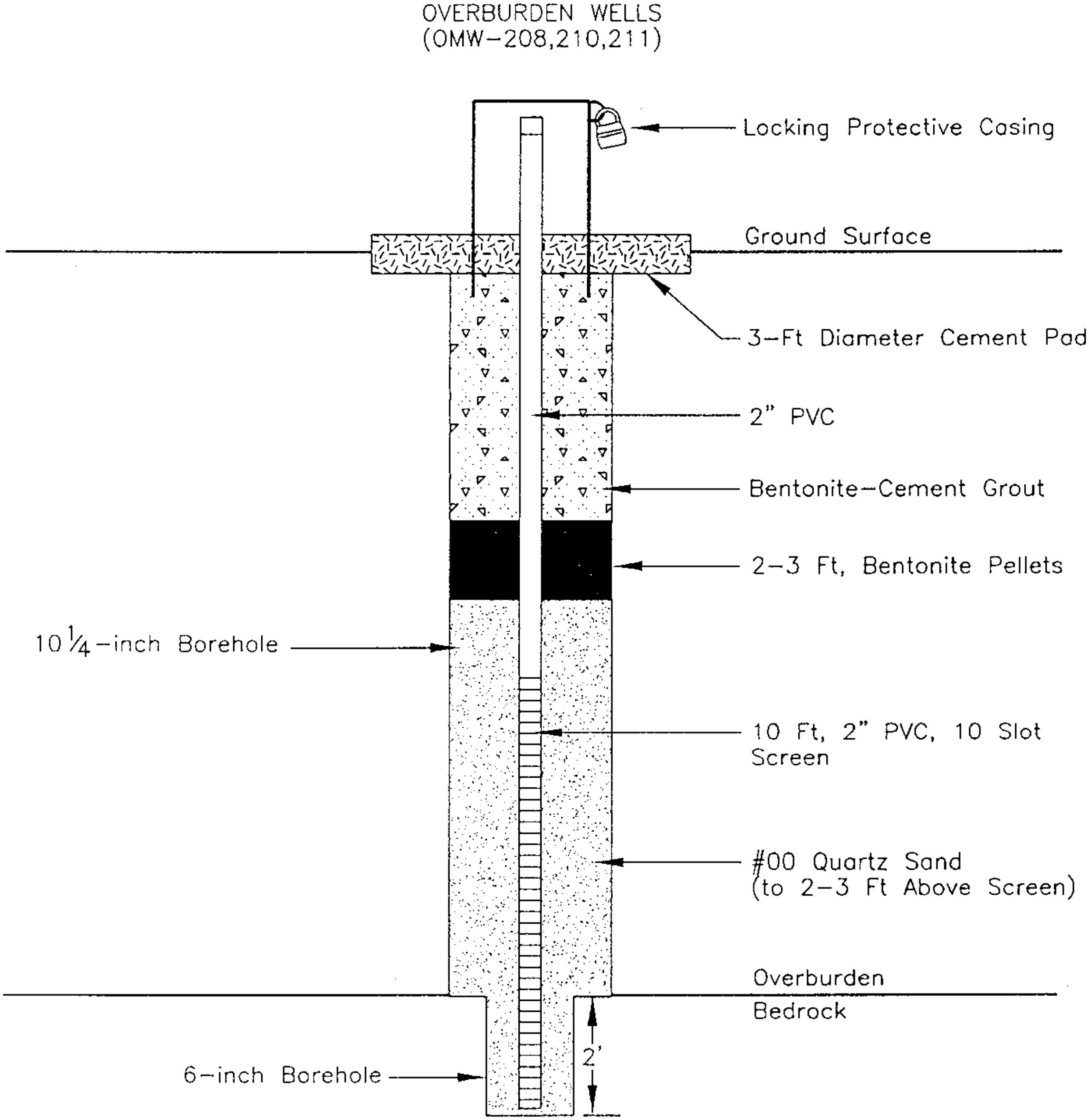

Figure 3. Schematic of overburden well construction (Fall 1994).

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5 WELL DEVELOPMENT

All new wells were developed during the period from November 4 through 18, 1994. A 3-foot PVC bailer (2-in ID) and/or Brainard-Kilman hand pump was utilized for well development and surging. The Brainard-Kilman hand pump consists of 2-inch ID PVC pipe with ¾-inch ID plunger inside. A check valve at the bottom of the outer pipe allows water into the pump during the upstroke, while during the downstroke water is forced out of the top of the outer pipe. Each of the new wells was developed by surging and discharging water. Surging was conducted by moving the pump body up and down in approximately 2-foot intervals across the open borehole. This was typically performed several times across the open interval. Well development was considered complete when three to five consecutive well volumes had been removed from the well and the well had been surged several times, or when the well had been developed continuously for at least two hours. Some turbidity reduction was generally observed in the wells by the end of well development. The pump and/or bailer was steam cleaned before and after development of each well.

6 CORE AND SPLIT SPOON SAMPLING AND BEDROCK CORING

During drilling, split-spoon samples were collected at 5-foot intervals from ground surface to the top of the bedrock. Samples of the overburden were not collected at OMW-210 and OMW-211, because overburden geology had already been determined from adjacent wells (OMW-205 and OMW-204, respectively). Descriptions of soil and bedrock samples were recorded in the field and transcribed to geologic logs. Subsurface logs for the existing GE 200 series wells, existing NYSDEC wells, and existing GE 100 Series wells are provided in Appendices A, B, and C of the Interim Hydrogeologic Report (GeoTrans, 1994), respectively.

Continuous cores were collected at bedrock wells OMW-212, 213, and 214. NX-core samples were obtained to further define the bedrock lithology, the degree of fracturing, and the dip of fractures and joints in the competent bedrock. Core collection length was 20 feet at OMW-212 and OMW-213 and 33 feet at OMW-214. Cores were not taken at OMW-209 because cores had previously been collected at adjacent well OMW-214. All recovered bedrock cores were placed in core boxes and all recovered split-spoon samples were placed in sample jars, which were stored in boxes. The core and split-spoon sample boxes are stored at the site within the locked fence.

The elevation and horizontal location of all wells installed in the Fall 1994 was established through surveying. The survey was performed by a licensed surveyor from Blasland & Bouck Engineers, now Blasland, Bouck & Lee, Inc. (BBL), of Syracuse, New York. The reported vertical accuracy was to the nearest 0.01 foot and the reported horizontal accuracy was less than 0.06 times the square root of the horizontal distance from the reference datum (in miles). Elevation measurements of the new and existing monitoring wells and piezometers were referenced to the 1929 National Geodetic Vertical Datum. Horizontal measurements were based on New York State Plane Coordinate System (1927). Survey measurements of existing on-site wells were established to the same coordinate systems.

GEOLOGIC LOGS FOR WELLS INSTALLED FALL 1994

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005 — Boring Number OPZ-208
Location Nassau, New York — Date Started 10/26/94
Client General Electric Co. — Date Completed 11/4/94
Driller Buffalo Drilling Inc. — Drilling Method 10"HSA/6"air rot./CME 55
Ground Elevation 656.5 ft msl — Page Number 1 of 3
Water Level & Date Dry on 11/29/94 — Logged By D. Bennett

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
0	0-2	S1	1.6	2-2-4-8 (6)	Clayey Silt (ML), dark yellowish brown (10YR 4/2), moist, firm homogeneous structure, native, veg., roots : 0.0' to 0.5' Silty Clay (CL), light olive brown (5Y 5/6), moist, firm, rock fragments, sub-angular gravel, mod. brown (5YR 3/4) : 0.5' to 2.0'	Air Mont: Hnu, back-ground unless other-wise noted
-2						-
-4						-
	5-7	S2	1.0	10-10-19-18 (29)	Clayey Silt (ML), light olive gray (5Y 6/1) to olive gray (5Y 4/1), dry to moist, very stiff, rock fragments, moderate brown (5YR 3/4)	
-6						-
-8						-
	9-11	S3	0.8	14-16-22-25 (38)	Same as above	
-10						-
-12						-
-14	14-16	S4	1.6	21-8-26-30 (34)	Same as above	-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 656.5 ft msl
Water Level & Date Dry on 11/29/94

Boring Number OPZ-208
Date Started 10/26/94
Date Completed 11/4/94
Drilling Method 10"HSA/6"air rot./CME 55
Page Number 2 of 3
Logged By D. Bennett

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
16						
-18						-
	19-21	S5	1.7	17-20-24-33 (44)	Same as above	
-20						-
-22						-
-24	24-26	S6	0.9	25-26-100/1"	Same as above	- Refusal: spoon on boulder
-26						-
-28						-
	29-31	S7	1.0	15-18-23-27 (41)	Same as above, with some sand	
-30						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 656.5 ft msl
Water Level & Date Dry on 11/29/94

Boring Number OPZ-208
Date Started 10/26/94
Date Completed 11/4/94
Drilling Method 10"HSA/6"air rot./CME 55
Page Number 3 of 3
Logged By D. Bennett

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
32						
-34	34-36	S8	1.1	17-16-25-35 (41)	Same as above	-
-36						-
-38						- Top of rock at 38'
						Well Construction:
-40						- TD = 38' 2" PVC casing +2-28' 2" (00) PVC screen 28-38' Sand pack 26-38' - Bentonite seal 22-26' Grout seal 0-22'
-42						
-46						-
-48						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 656.2 ft msl
Water Level & Date 31.79 ft on 11/29/94

Boring Number OMW-209
Date Started 10/25/94
Date Completed 10/25/94
Drilling Method 10"HSA/6"air rot./CME 55
Page Number 1 of 1
Logged By S. Garrity

Depth BGS (ft)	Sample			SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
	Int-erval	Type &No.	Rec. (ft)			
					Soil lithology taken from OMW-208 Geologic log. Bedrock lithology taken from OMW-214 Rock Core log.	Air Mont: (Hnu, back-ground unless other-wise noted) Well Construction: - TD = 60.5' Open hole 40.5-60.5' 4" steel casing set +2-40.5'

GEOLOGIC LOG

Project	GE Loeffel Landfill 7666-005	Boring Number	OMW-210
Location	Nassau, New York	Date Started	10/10/94
Client	General Electric Co.	Date Completed	10/11/94
Driller	Buffalo Drilling Inc.	Drilling Method	10"HSA/6"wat rot./CME 55
Ground Elevation	649.7 ft msl	Page Number	1 of 1
Water Level & Date	18.71 ft on 11/29/94	Logged By	S. Garrity

Depth BGS (ft)	Sample			SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
	Int-erval	Type &No.	Rec. (ft)			
					Lithology taken from OMW-205 log.	Air Mont: (Hnu, back-ground unless other-wise noted)
-						- Well Construction:
						TD = 34' 2" PVC casing +2-21.3' 2" (00) PVC screen - 21.3-31.3' Sand pack 19.3-31.3' Bentonite seal 15.3-19.3' Grout seal 0-15.3'
-						
-						-
-						-
-						-
-						-
-						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 649.1 ft msl
Water Level & Date 43.70 ft on 11/29/94

Boring Number OMW-211
Date Started 10/5/94
Date Completed 10/7/94
Drilling Method 10"HSA/6"wat rot./CME 55
Page Number 1 of 1
Logged By S. Garrity

Depth BGS (ft)	Sample: Int-erval	Sample: Type &No.	Sample: Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
					Lithology taken from OMW-204 log.	Air Mont: (Hnu, background unless otherwise noted)
-						- Well Construction:
						TD = 50.3' 2" PVC casing +2-38' 2" (00) PVC screen - 38-48'
-						Sand pack 35-48' Bentonite seal 32-35' Grout seal 0-32'
-						-
-						-
-						-
-						-
-						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 653.6 ft msl
Water Level & Date 57.89 ft on 11/29/94

Boring Number OMW-212
Date Started 10/11/94
Date Completed 10/26/94
Drilling Method 10"HSA/6"wat rot./CME 55
Page Number 1 of 7
Logged By S. Garrity

Depth BGS (ft)	Sample Interval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
0	0-2	S1	0.6	1-5-8-16 (13)	Silty Clay (CL), grayish brown (5YR 3/2), moist, stiff, grey-green gravel, 2 cobbles	Air Mont: Hnu, background unless otherwise noted
-2						-
-4						-Auger refusal at 4'
	5-7	S2	0.9	9-13-14-16 (27)	Gravelly Silt w/ Clay (CL), pale brown (5YR 5/2), moist at bottom to dry, very stiff, grey-green gravel	
-6						-
						Rig chatter at 7.5', possible boulder
-8						-
-10	10-12	S3	1.5	27-29-34-33 (63)	Gravelly Lean Clay (CL), dark yellowish brown (10YR 4/2), moist, hard, grey-green to redish brown gravel	-
-12						-
						Rig chatter at 13', possible boulder
-14						-
	15-17	S4	0.3	12-16-22-28 (38)	Poorly Graded Gravel (GP), greyish green (10G 4/2) to mod. reddish brown (10YR 4/6), moist, dense	

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005 | Boring Number OMW-212
Location Nassau, New York | Date Started 10/11/94
Client General Electric Co. | Date Completed 10/26/94
Driller Buffalo Drilling Inc. | Drilling Method 6"wat rot./CME 55
Ground Elevation 653.6 ft msl | Page Number 2 of 7
Water Level & Date 57.89 ft on 11/29/94 | Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
16						
-18						-Rig chatter at 18', boulder
	19-21	S5	1.6	8-17-27-26 (44)	Same as S3	
-20						-
-22						-
-24	24-26	S6	1.3	22-23-24-24 (47)	Same as above	-
-26						-
-28						-
	29-31	S7	1.9	20-22-28-44 (50)	Same as above, except gravel is larger and more angular	
-30						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 653.6 ft.msl
Water Level & Date 57.89 ft on 11/29/94

Boring Number QMW-212
Date Started 10/11/94
Date Completed 10/26/94
Drilling Method 6"wat rot./CME 55
Page Number 3 of 7
Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
32						
-34	34-36	S8	1.0	15-20-29-47 (49)	Same as above	-
-36						-
-38						- Tripping difficulty at 39'
	39-41	ST1			No recovery	Shelby tube (ST1) crushed, no recovery
-40	40-42	ST2	0.9	-	Same as above (S8)	- Drove Shelby tube (ST2) 18", pressure was to high to continue
-42						-
-44	44-46	S9	1.3	24-28-33-47 (61)	Same as above	-
-46						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 653.6 ft msl
Water Level & Date 57.89 ft on 11/29/94

Boring Number QMW-212
Date Started 10/11/94
Date Completed 10/26/94
Drilling Method 6"wat rot./CME 55
Page Number 4 of 7
Logged By S. Garrity

Depth BG (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
48						
	49-51	S10	1.6	19-36-40-45 (76)	Same as above	
-50						-
-52						-
-54	54-56	S11	0.3	200/4"	Same as above, but gravel is larger and fissle	-Refusal
-56						Driller believes bit - on boulder at 56', drilling speed slow Drilling speed returns to 1'/3 min at 57'
-58						-
	59-61	S12	0.6	24-43-39-50 (82)	Same as above	
-60						-
-62						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 653.6 ft msl
Water Level & Date 57.89 ft on 11/29/94

Boring Number OMW-212
Date Started 10/11/94
Date Completed 10/26/94
Drilling Method 6"wat rot./CME 55
Page Number 5 of 7
Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
64	64-66	S13	2.0	15-35-40-40 (75)	Lean Clay w/ Gravel (CL), pale brown (5YR 5/2), moist, very dense, gravel is red,green and gray argillite similiar to S12	No Hnu available for air monitoring
-66						-
-68						-
	69-71	S14	0.25	40-25-39-110 (64)	Lean Clay w/ Gravel (CL), pale brown (5YR 5/2), moist, very dense	Spoon blockage resulted in low recovery
-70						-
-72						-
-74	74-76	S15	0.1	17-40-47-80 (87)	Same as above	-Poor recovery
-76						-
-78						-
	79-81	S16	1.8	19-26-39-47 (65)	Lean Clay w/ Gravel (CL), brownish gray (5YR 4/1), moist, very dense	

GEOLOGIC LOG

Project	GE Loeffel Landfill 7666-005	Boring Number	QMW-212
Location	Nassau, New York	Date Started	10/11/94
Client	General Electric Co.	Date Completed	10/26/94
Driller	Buffalo Drilling Inc.	Drilling Method	6"wat rot./CME 55
Ground Elevation	653.6 ft msl	Page Number	6 of 7
Water Level & Date	57.89 ft on 11/29/94	Logged By	S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
80						
-82						-
						Hnu in use: bg = 0.0 ppm
-84	84-86	S17	1.5	30-50-70-115 (120)	Lean Clay w/ Gravel (CL), pale brown (5YR 5/2), moist, very dense, gravel gray-green (5GY 4/1) to gray-red (10R 4/2), gravel subrounded to angular argillite	- Drove spoon 18"
-86						-
-88						-
	89-91	S18	2.0	40-47-75-140 (122)	Lean Clay w/ Gravel (CL), pale brown (5YR 5/2), moist, very dense, more clay and less gravel than previous 5 samples	
-90						-
-92						- Drilling very slow, boulders encountered at 91.5' and 93.5'
-94	94-96	S19	0.3	200/ 0.3'	Same as above, rock chips in bottom on spoon, dark green gray (5GY 4/1), quartz veining, subangular to angular	Refusal: spoon on boulder at 94.5' -

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005 | Boring Number QMW-212
Location Nassau, New York | Date Started 10/11/94
Client General Electric Co. | Date Completed 10/26/94
Driller Buffalo Drilling Inc. | Drilling Method 8"wat rot./CME 55
Ground Elevation 653.6 ft msl | Page Number 7 of 7
Water Level & Date 57.89 ft on 11/29/94 | Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
96						Borehole reamed to 94',drilling continued
-98						-
-100						-
						Driller notes top of rock at 101', drill a 3' socket
-102						-
-104	104-106	S20	0.2	200/ 0.2'	Shale, dusky red (5R 3/4), foliated, fissle	- Refusal
						Borehole complete at 94'
-106						6" drilled to 94', 8" - reamed to 94', 8" drilled 94' to 104' Set 4" casing to 104'
-108						-
-110						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 667.1 ft msl
Water Level & Date 60.17 ft on 11/29/94

Boring Number QMW-213
Date Started 10/27/94
Date Completed 11/4/94
Drilling Method 10"HSA/8"air rot./CME 55
Page Number 1 of 4
Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
0	0-2	S1	1.2	4-3-7-9 (10)	Silt (ML), pale yellowish brown (10YR 6/2) to light brownish gray (5YR 6/1), dry, stiff, gravel, top soil over first 0.2'	Air Mont: Hnu, back-ground unless other-wise noted
-2						-
-4						-
	5-7	S2	0.1	95-100/3"	Clayey Silt (ML), grayish brown (5YR 3/2), wet, gray gravel and green-gray rock chips from boulder	Refusal: spoon on boulder; 1.0 ppm over bg of sample
-6						-
-8						-
-10	10-12	S3	0.9	1-8-13-14 (21)	Silty Clay w/ Gravel (CL), dark yellowish brown (10YR 4/2), wet, very stiff, gray-green rock chips for initial 0.2'	- Switched to 8" water rotary drilling
-12						-
-14						-
	15-17	S4	0.8	5-9-5-17 (24)	Lean Clay w/ Gravel (CL), dark yellowish brown (10YR 4/2), moist, very stiff, gray-green to dusky red (shale), poorly graded gravel	

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 653.6 ft msl
Water Level & Date 60.17 ft on 11/29/94

Boring Number OMW-213
Date Started 10/27/94
Date Completed 11/4/94
Drilling Method 8"air rotary/CME 55
Page Number 2 of 4
Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
16						
-18						-
-20	20-22	S5	0.4	8-9-11-15 (20)	Same as above, except slightly less dense	-
-22						-
-24						-
	25-27	S6	1.0	7-6-9-16 (17)	Same as above	1.0 ppm over bg of sample
-26						-
-28						-
-30	30-32	S7	1.0	6-11-34-25 (45)	Same as above, wet	- Tripping difficulty in borehole at 30'

GEOLOGIC LOG

Project	GE Loeffel Landfill 7666-005	Boring Number	OMW-213
Location	Nassau, New York	Date Started	11/1/94
Client	General Electric Co.	Date Completed	11/4/94
Driller	Buffalo Drilling Inc.	Drilling Method	4" HSA/CME 55
Ground Elevation	653.6 ft msl	Page Number	3 of 4
Water Level & Date	60.17 ft on 11/29/94	Logged By	S. Garrity

Depth BGS (ft)	Sample			SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
	Int-erval	Type &No.	Rec. (ft)			
32						
						Original borehole OMW-213A was abandoned, lost spoon in
-34						- hole at 35', hole grouted, moved 25' north, complete OMW-213
	35-37	S8	1.0	10-20-28-34 (48)	Lean Clay w/ Gravel (CL), dark yellowish brown (10YR 4/2), moist, very stiff, gray-green to dusky red (shale), poorly graded gravel	First sample of OMW-213
-36						-
-38						-
-40						- Boulder at 40'
	41-43	ST1	0.1	-	Same as above	Shelby tube attempted, no appreciable recovery, no sample collected
-42						-
						Driller notes hard augering at 43', describes as till
-44						-
	45-47	S9	0.8	23-35-35-37 (70)	Lean Clay w/ Gravel (CL), pale yellowish brown (10YR 6/2), dry, hard, grey-green to dusky red (shale), poorly graded gravel	
-46						-

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005 | Boring Number QMW-213
Location Nassau, New York | Date Started 11/1/94
Client General Electric Co. | Date Completed 11/4/94
Driller Buffalo Drilling Inc. | Drilling Method 4"HSA/8"water rot/CME 55
Ground Elevation 653.6 ft msl | Page Number 4 of 4
Water Level & Date 60.17 ft on 11/29/94 | Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
48						
-50	50-52	S10	0.7	35-30-49-47 (79)	Same as above	-
-52						-
-54						-Difficulty tripping out of hole at 55', switched to 8" water rotary drilling, reamed hole to 55'
	55-57	S11	0.8	30-32-(50/4")	Same as above, except moist	Spoon meet w/ refusal
-56						- at 55'
-58						- Rig chatter at 58'
-60	60-62	S12	0.2	50/2"	Shale, dusky red (5YR 3/4), foliated	-Refusal at 60', bedrock reached, drill 2' socket, drilling fluid has turned red from shale
-62						- Borehole complete at 62' Set 4" steel casing to 61' Caving from 61'-62'

GEOLOGIC LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 655.5 ft.msl
Water Level & Date 41.18 ft on 11/29/94

Boring Number OMW-214
Date Started 11/9/94
Date Completed 11/10/94
Drilling Method 10"HSA/12"air rot./CME55
Page Number 1 of 1
Logged By S. Garrity

Depth BGS (ft)	Sample Int-erval	Sample Type &No.	Sample Rec. (ft)	SPT Results (N)	Description: Name & USGS Group Symbol, Color, Moisture Content, Rel. Density or Consistency, & Mineralogy	Remarks: incl Air, Mont, Depth of Casing Dril Rate, & Fluid Loss
					Lithology taken from OMW-208 log.	Air Mont: (Hnu, background unless otherwise noted)
-						- Boring complete at 39.5' Set 6" steel casing to 38.8'
-						-
-						-
-						-
-						-
-						-
-						

ROCK CORE LOG

Project	GE Loeffel Landfill 7666-005	Boring Number	OMW-212
Location	Nassau, New York	Date Started	11/10/94
Client	General Electric Co.	Date Completed	11/10/94
Driller	Buffalo Drilling Inc.	Drilling Method	4" air rotary/CME 55
Ground Elevation	653.6 ft msl	Page Number	1 of 2
Water Level & Date	57.89 ft on 11/29/94	Logged By	S. Garrity

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
104	NX-1 104-114 3.4/10 =34%	0.0/10 =0%				0-104' on Geologic log for OMW-212 104-105' - 3 min
-106						- 105-106'-1.6 min
-108						-
						109-114' - 16.3 min
-110						-
			--- >10 --- >10 --- 5	Broken core, fractures, 0°, smooth, stepped, open	Shale, grayish red, (5R 4/2), interbedded w/ laminated argillite, grayish green, (5G 5/6), highly weathered at 112.9 calcite veins in argillite	Core location is an estimate, as coring was more difficult late in run
-112						-
-114						-
	NX-2 114-124 3.1/10 =31%	0.0/10 =0%				114-119' - 13.4 min
-116						-
-118						119-124' - 14.5 min

ROCK CORE LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 653.6 ft msl
Water Level & Date 57.89 ft on 11/29/94

Boring Number OMW-212
Date Started 11/7/94
Date Completed 11/9/94
Drilling Method 4" air rotary/CME 55
Page Number 2 of 2
Logged By S. Garrity

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
120						
			6	Broken core, fractures, 0°, smooth, planar, open	Same as above, NX-1	
-122						-
			7			
			7			
-124						
						Well Construction:
						TD = 124'
-126						-
						Open hole 104-124' 4" steel casing set +2-104'
-128						-
-130						-
-132						-
-134						

ROCK CORE LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 667.1 ft msl
Water Level & Date 60.17 ft on 11/29/94

Boring Number OMW-213
Date Started 11/7/94
Date Completed 11/9/94
Drilling Method 4" air rotary/CME 55
Page Number 1 of 2
Logged By S. Garrity

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
-62	NX-1 61-62.5' 0.8/1.5 =53%	0.0/1.5 0%	6	61-62.5 broken core,disk shaped pieces, generally less than 1" thick, fractures and bedding, horz., smooth, stepped to planar, clay coating, open	Shale, med. brown (5YR 3/4) and Argillite, gray(N8) fine grnd, weathered, hard,lam. to thinly bed., qtz veins at 62.2	0-61' on Geologic log of OMW-213 Smooth coring, - 1 ft/3 min.
-64 -66	NX-2 62.5-67.5 0.8/5 =16%	0.0/5 =0%	5 ---	Broken core, disk shaped pieces, fractures, 0°-20°, smooth, stepped to planar, calcite infilling, open	Shale, grayish red (5R 4/2) and Argillite, grayish green (5G 5/6), fine grnd, weathered, thinly bed., calcite veinlets	Core barrel blockage prevented good recovery - Argillite is more competent than shale Water in hole -
-68 -70 -72	NX-3 67.5-72.5 1.3/5 =26%	0.0/5 =0%	7 ---	Fractures, 0°-45°, smooth, undulating to planar, Fe staining, open	Same as above, w/ some laminated interbedding of shale and argillite, some round, cobbles of shale and argillite	- Driller notes smooth, hard coring - Core dropped by drillers, orientation, placement lost Cor bit lost in - borehole
					Footage lost to	reaming hole
-74	NX-4 73-78 2.0/5 =40%	0.0/5 =0%	--- 5	Fractures, 10°-45°, smooth, planar, open	Same as above	Initial drilling - rapid, 1 ft/0.5 min. 75-76' - 2.6 min

ROCK CORE LOG

Project GE Loeffel Landfill 7666-005 | Boring Number QMW-213
Location Nassau, New York | Date Started 11/7/94
Client General Electric Co. | Date Completed 11/9/94
Driller Buffalo Drilling Inc. | Drilling Method 4" air rotary/CME 55
Ground Elevation 667.1 ft msl | Page Number 2 of 2
Water Level & Date 60.17 ft on 11/29/94 | Logged By S. Garrity

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
76			4 --- 2	Fractures, 0°-30°, smooth, stepped, tight Fractures 77.8 and 78.0, 10°, stepped, open	76.7-77.0 shale, as above, laminated w/ argillite 77.9-78 argillite, gray-green	76-77' - 1.6 min 77-78' - 2 min
-78 -80 -82	NX-5 78-83 4.0/5 =80%	0.0/5 =0%	>10 --- >10 --- 6 --- 8 --- 5	Fractures, 0°, smooth, planar, open Fracture 79.3, 60°, smooth, tight, 0°,smooth,plnr,open Fractures 82.4 and 82.7, 45°, smooth, stepped, tight	Shale, same as above 82.3-83, argillite, same as above	78-80' - 6.1 min - 80-81' - 2.5 min 81-82' - 2.1 min - 82-83' - 2 min
-84 -86 -88 -90						Well Construction: - TD = 83.4' Open hole 61-83.4' 4" steel casing +2-61' - -

ROCK CORE LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 655.5 ft msl
Water Level & Date 41.18 ft on 11/29/94

Boring Number QMW-214
Date Started 10/31/94
Date Completed 11/18/94
Drilling Method 4" water rot./CME 55
Page Number 1 of 5
Logged By D. Bennett

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
38						0-38.8' on Geologic log for QMW-214
-40 -42 -44	NX-1 39-44.4 0.5/5.4 =9%	0.0/5.4 =0%			Argillite, greenish black (5G 2/1), some quartz veins, highly fractured, weathered	- - -
-46 -48	NX-2 44.4 to 48.4 1.5/4.0 =38%	0.0/4 =0%			Same as above	- -
	NX-3 48.4 to 48.9	0.0/0.5 =0%		Recovery 0.5/0.5 = 100%	Argillite, greenish grey (5G4/1) qtz veins, fractured, wthrd.	
-50	NX-4 48.9 to 51.5	0.0/2.6 =0%		Recovery 1.0/2.6 = 38.5%	Argillite, medium bluish grey (5B 5/1), trace qtz veins, fractured, wthrd.	-
-52	NX-5 51.5-54 1.2/2.5 =46%	0.0/2.5 =0%			Same as above	-

ROCK CORE LOG

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 653.6 ft msl
Water Level & Date 41.18 ft on 11/29/94

Boring Number OMW-214
Date Started 10/31/94
Date Completed 11/18/94
Drilling Method 4" water rot./CME 55
Page Number 2 of 5
Logged By D. Bennett

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
54	NX-6 54-57.2	0.0/3.2 =0%			Same as above with trace calcite veins	
-56	1.5/3.2 =47%					-
	NX-7 57.2 to 58.0	0.0/0.8 =0%		Recovery 0.2/0.8 = 25%	Argillite, dark greenish grey (5G 4/1), fractured	
-58						-
	NX-8 58-58.5	0.0/0.5 =0%		Recovery 0.1/0.5 = 20%	Same as above, not fractured	
	NX-9 58.5 to 59.1	0.0/0.6 =0%		Recovery 0.55/0.6 = 92%	Argillite, dark greenish grey (5G 4/1), fractured	
-60						-
	NX10 58.4 to 61.5	0.0/3.1 = 0%		Recovery 1.75/3.1 = 56.5%	Argillite, med. bluish grey (5B 5/1), very fractured	Core barrel lost in hole, was not recovered, orig. hole abandoned
-62						-(OMW-214A), new hole (OMW-214) was cored from 58.4' bgs. to final depth. Logs were combined at
	NX11 61.5 to 73	0.0/11.5 = 0%			Argillite, med. bluish grey (5B 5/1), some quartz, some lamination, numerous fractures	
-64	9.9/11.5 =86%					- this point.
-66						-
-68						-

ROCK CORE LOG

Project GE Loeffel Landfill 7666-005 | Boring Number QMW-214
Location Nassau, New York | Date Started 10/31/94
Client General Electric Co. | Date Completed 11/18/94
Driller Buffalo Drilling Inc. | Drilling Method 4" water rot./CME 55
Ground Elevation 655.5 ft msl | Page Number 3 of 5
Water Level & Date 41.18 ft on 11/29/94 | Logged By D. Bennett

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
70						
-72						-
-74	NX12 73-78	0.35 /5 =7%			73-75.3 Same as above	-
-76	4.6/ 5 =92%				75.3-78 Same as above, with reddish brown laminations, fractures	-
-78						-
-80	NX13 78-88.5 9.1/ 10.5 =87%	0.0/ 10.5 =0%			78-79 Argillite, med. bluish grey (5B 5/1), some quartz veins, some dark reddish brown (10R 3.4) laminations fractured, weathered	-
-82					79-86 Shale, dark reddish brown (10R 3/4), quartz veins, some styolites,	-
-84					laminated with bluish grey argillite	-

ROCK CORE LOG

Project	GE Loeffel Landfill 7666-005	Boring Number	OMW-214
Location	Nassau, New York	Date Started	10/31/94
Client	General Electric Co.	Date Completed	11/18/94
Driller	Buffalo Drilling Inc.	Drilling Method	4" water rot./CME 55
Ground Elevation	655.5 ft msl	Page Number	4 of 5
Water Level & Date	41.18 ft on 11/29/94	Logged By	D. Bennett

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
86					86-88.5 Argillite, med. bluish grey (5B 5/1), with Shale, dark reddish brown(10R 3/4) laminations, fractured, wthrd	
-88						-
-90	NX14 88.5 -98 9.3/ 9.5 =98%	0.0/ 9.5 =0%			Argillite, med. bluish grey (5B 5/1), with Shale, greyish red (5R 4/2), laminated, trace quartz, fractured, weathered	-
-92						-
-94						-
-96						-
-98						-
-100	NX15 98- 108 9.7/ 10 =97%	6.0/ 10 =60%	2 --- 2 --- 1 --- 2	Fractures, weathered, open	98-104 Argillite, med. bluish grey (5B 5/1), with Shale, greyish purple (5P 4/2), laminated, some quartz veins, more competent than above	Reach more competent rock -

Project GE Loeffel Landfill 7666-005
Location Nassau, New York
Client General Electric Co.
Driller Buffalo Drilling Inc.
Ground Elevation 655.5 ft msl
Water Level & Date 41.18 ft on 11/29/94

Boring Number QMW-214
Date Started 10/31/94
Date Completed 11/18/94
Drilling Method 4" water rot./CME 55

Logged By D. Bennett

Depth BGS (ft)	Run Lgth &Rec	RQD	Frac /ft	Fracture Description: Depth, Type, Orientation, Roughness, Planarity, Infilling & Staining	Lithology: Color, Texture, Minerl, Weather, Hardnes	Remarks: Casing, Fluid Loss, Coring Rate, Rod Drops
102			2	Fractures, weathered, open		
			3			
-104			0		104-108 Same as above, except no laminated shale	-
			2			
-106			2			-
			2			
-108						-
						Well Construction:
-110						- TD = 108' Open hole 89-108' 6" steel casing +2-39' 4" steel casing
-112						- +2-89'
-114						-
-116						-

CALENDAR OF FIELD ACTIVITIES
FALL 1994

(OCTOBER 1994 TO DECEMBER 1994)

October

1994 **1994**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6 Obtained permit for drilling. Drilled OMW-211 to 45.3 ft. BGS.	7 Completed drilling of OMW-211 to 50.3 ft. Installed well at OMW-211.	8
9	10 Setup and began drilling OMW-210 to 14.7 ft.	11 Completed well drilling and construction of OMW-210, casing to 15 ft. Installed diverter casing and split spoon to 7 ft at OMW-212. Installed diverter casing at OMW-208.	12 Drilled to 39 feet at OMW-212. Collected 6 split spoon samples.	13 Drilled 10 ft at OMW-212. Took a Shelby tube sample and 2-split-spoon samples. Mechanical problems took greater part of the day to fix.	14 Drill 10 ft at OMW-212 to 64 ft. Collect sample OMW-212 S11. Cut path to OMW-213.	15
16	17 Drilled OMW-212 to 69 ft. Collected one split-spoon sample at 64' - 66'.	18 Drilled 10 ft at OMW-212. Collected split-spoon samples at 69'-71' (S-14), 74'-76' (S-15), and 79'-81' (S-16).	19 Drilled 13 ft from 81' - 94' 6" at OMW-212. Collected 2 split spoons (89'-91' and 84'-86'). Approval for access to OMW-213, 214, 208, 209 is confirmed.	20 Drilled through obstructions at 30 ft and 60 ft. Collected one split spoon sample (94' - 96'). No drilling footage, spent day retrieving rods from hole and cleaning.	21 Drilled to 95' BGS at OMW212. Collected split spoon sample from 94'-96'.	22
23 30	24 Set diverter casing at OMW-214. Set up OMW-209 for 6" water rotary drilling. Set-up 8" bit for reaming MW-212. 31	25 Reamed OMW-212 to 98' bgs, set casing to 40.5'. Installed 4" casing into OMW-209 and grouted.	26 Set casing to 104' bgs, with 2 ft stickup at OMW-212. Drill to 20' bgs at OMW-214. Drill at 214A to 18.5' bgs until rig broke.	27 Set surface casing at OMW-213. Set 6" casing to rock at OMW-209. Cased (6") and grouted OMW-214A to 39'.	28 Drill to 25' at OMW-213. Drilled OMW-209 to 60.5' bgs. Set 6" casing.	29

November

1994 1994

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Augured to 40' bgs at new location for 213. Cored 13' at MW-214. Cored 214A 48.9' - 59.1' bgs, 5 runs.	2 Auger 15', 40' - 55' bgs. Took 2 spoons and 1 Shelby tube no recovery from Shelby tube at 213. Cored 214A 59.1' - ? bgs. Lost inner core barrel in hole.	3 Drilled 8"hole with water rotary at 213. Reamed hole to 38' Bailed 7 gallons from well 211. Fished for rod and barrel out of 214A with no luck. Bailed 8.5 gallons from 210.	4 Drilled 213 to 62.5' bgs, set 4" casing to 61' and grouted. Install 2" PVC, and grout at 208.	5
6	7 Cored 61' - 67.5' bgs at 213. Tried to install 4" casing in 214A. No luck pulling core barrel or rods out of hole.	8 Purged 8 gallons out of well 210. Cored 67.5'-72.5' bgs at 213. Cleanup of site.	9 Cored 213 to 83.4'. Grouted to 61' bgs. Decon rig and rod. Mobilize to 212 and ream out grout to 90' (hole to 104'). Continue fishing for core barrel and rod with no success. Abandon 214A decide to drill at new location.	10 Drilled to 39.5' bgs at new 214. Stopped reaming 214 at 19'. Casing to 104' at 212. Cored to 109' bgs.	11 Bailed 15 gallons out of 213 for development. Bailed 5 gallons out of 212 for development. Installed 6" casing to 38.8' bgs at 214 and grouted.	12
13	14 Drilled 214 to 49' bgs with 57/8" bit.	15 Drilled 214 to 58.5'. Core to 62' bgs.	16 Core 214 to 58.4' to 73' bgs.	17 Cored 214 from 73' bgs to 88' bgs. Reamed with 5 7/8" to 88'. Installed 4" casing and grouted. Bailed 209.	18 Decon rig. Purged water from 213. Cored 214 from 88.5' to 111.6' bgs. Flushed 209 to 46.7' bgs.	19 Fish for rods and barrel in 214A. No luck so decide to abandon. Grout 214A. Develop 214 Ream 209 with 3 " bit rod to 60.5' and developed.
20	21	22	23	24	25	26
27	28	29 Conduct WL survey at all but 3 wells.	30 Complete WL survey. Complete 2 slug tests each on OMW-210 and OMW-211. Leave test running at 214 - 219. Set up data loggers at GMW -1C and 1D to collect WL's every 12 hours until 4/13/95.			

December

1994 **1994**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
				1 Complete slug test at OMW-213. Start test at OMW-212 and let run overnight. Set and secure data loggers at OMW-11 to collect WL every 12 hours.	2 Download data from slug test on OMW-212. Set and secure data logger in GMW-118 to take 12 hour readings for 3 months.	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

APPENDIX B

WELL CONSTRUCTION PROTOCOLS, WELL SCHEMATICS AND GEOLOGIC LOGS FOR WELLS INSTALLED SUMMER 1995

1 RI ACTIVITIES COMPLETED IN SUMMER 1995

All of the work completed in June through September 1995 was outlined in Third Work Plan Addendum. These tasks included: the containment wall effectiveness evaluation, including containment wall location verification (angled borings), piezometer installation (PW-1, PW-2, PW-3; PB-1, PB-2; and PO-1), and two pumping tests; deep bedrock well and piezometer installations (OMW-215, OMW-216, and OPZ-217); a full round of groundwater sampling; and continued monthly water level measurement surveys for short-term water level monitoring. Well specifications, protocols, schematics and geologic logs are provided.

2 OVERBURDEN WELL INSTALLATION

After the containment wall location was confirmed, a series of six temporary wells were installed adjacent to the wall. The new wells were used, in conjunction with certain nearby existing wells, to create a "cluster" of three monitoring points. An overburden and shallow bedrock well outside of the wall were paired with an overburden well on the inside of the wall. The wells that made up each of the clusters were located within 20 feet of each other to allow for a measurable water level response in the monitoring wells within a 24-hour pumping period. As described in Table 1, a total of four new overburden wells (PW-1, PW-2, PW-3, and PO-1) were installed.

Wells PW-1, PW-2, and PW-3 were installed in the overburden outside the containment wall (Figure 1). Wells PW-1 and PW-2 were installed to an elevation equivalent to the existing corresponding overburden cluster wells located inside the wall (GMW-10B and GMW-11B, respectively). Wells PW-3 and PO-1 were installed based on the projected depth to rock.

The following procedures were used to install overburden wells PO-1, PW-1, PW-2, and PW-3 (Figure 2):

1. Hollow stem augers (6.25-in ID) were advanced to the point of auger refusal or to 20 feet bgs, whichever was less. For wells PO-1, PW-2, and PW-3 the auger flights remained in place to act as temporary casings for water rotary drilling. At PW-1, a 6-inch diameter permanent steel casing was grouted in

Table 1. Specifications of wells used in the containment wall effectiveness evaluation.

Pumping Test	MW/Piez ID	Elevation of MRP (ft MSL)	Ground Surface Elevation (ft MSL)	Depth to Top of Bentonite Seal (ft bgs)	Depth to Top of Sand Pack (ft bgs)	Depth to Top of Screened Interval (ft bgs)	Depth to Bottom of Screened Interval (ft bgs)	Depth to Bottom of Borehole (ft bgs)	Casing Diameter and Material	Description	Monitoring Interval Elevation (ft MSL)
1	PW-3	651.07	647.80	30.75	34.25	37.00	47.00	48.00	2" PVC	Overburden (outside wall)	610.8 - 600.8
1	PB-2	650.66	648.11	-	-	51.00*	-	61.00	4" Steel	Bedrock (outside wall)	597.1 - 587.1
1	PO-1	650.78	647.42	32.75	34.50	37.00	47.00	47.50	2" PVC	Overburden (inside wall)	610.4 - 600.4
2	PW-2	644.39	641.62	6.75	9.75	12.50	17.50	18.25	2" PVC	Overburden (outside wall)	629.1 - 624.1
2	GMW-11	639.57	637.53	2.00	3.80	4.10	14.10	15.00	4" PVC/SS	Overburden (outside wall)	633.4 - 623.4
2	GMW-11A	640.26	638.14	30.50	32.50	37.00	47.00	48.20	4" PVC/SS	Bedrock (outside wall)	601.1 - 591.1
2	GMW-11B	646.56	644.25	14.00	15.00	15.00	20.00	20.00	2" PVC/SS	Overburden (inside wall)	629.3 - 624.3
3	GMW-10B	642.27	640.31	46.00	48.10	50.10	52.60	55.80	2" PVC/SS	Overburden (inside wall)	590.2 - 587.7
3	PB-1	643.07	640.32	56.50	59.75	62.50	72.50	73.00	1" PVC	Bedrock (outside wall)	585.6 - 575.6
3	PW-1	642.75	639.52	48.50	51.75	54.75	59.75	61.00	2" PVC	Overburden (outside wall)	584.8 - 579.8

Notes:
1) MRP - Measured Reference Point marked on top of the lower portion of the protective casing.
2) PVC - Polyvinyl Chloride
3) Survey data source: Blasland & Bouck (1992a) plus the distance from the top of the inner casing (where present) to the top of the lower portion of the outside protective casing as measured in the field by GeoTrans.
4) Monitoring interval based on top of screen to bottom of screen or open borehole.
* Open borehole.

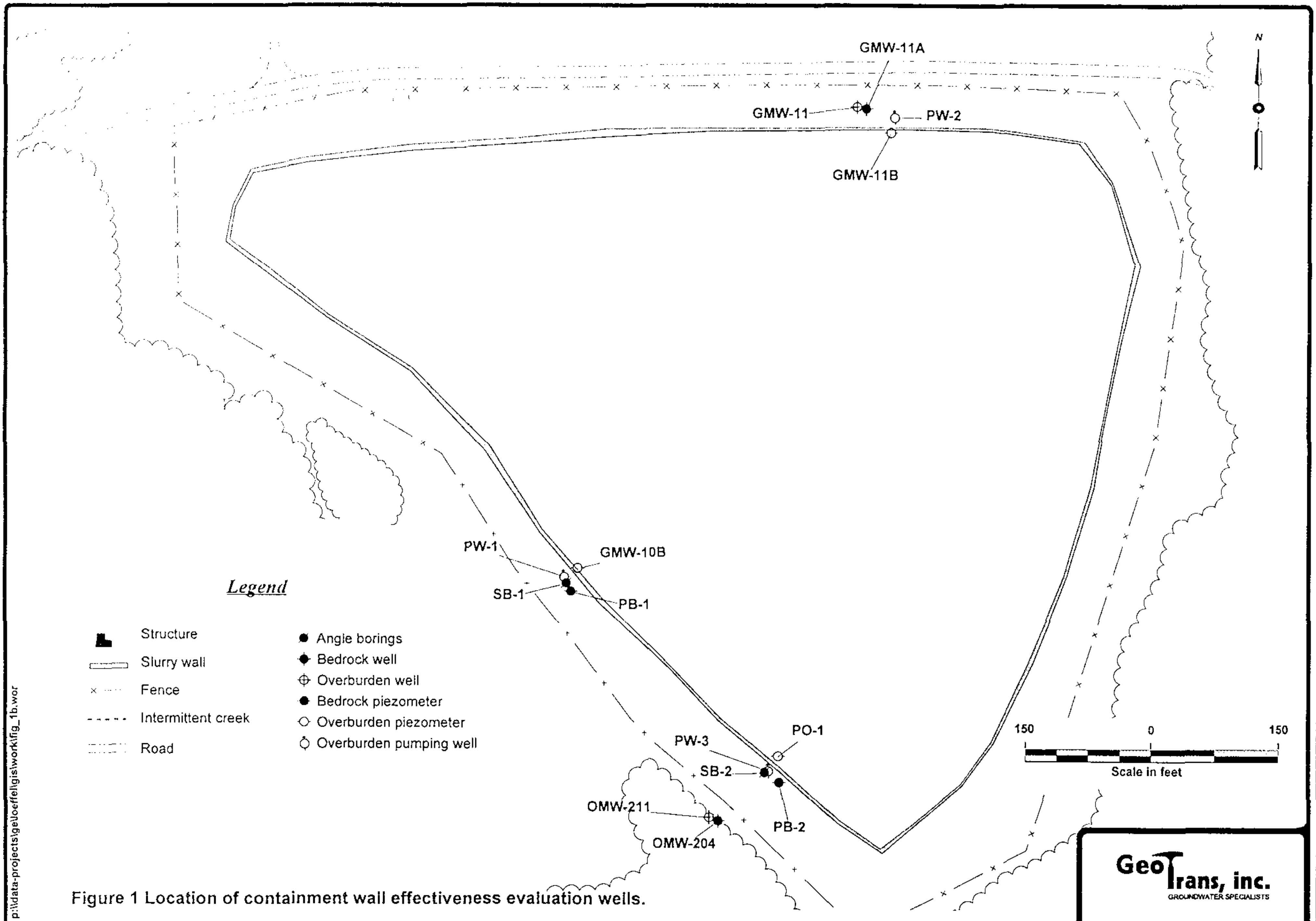

Figure 1 Location of containment wall effectiveness evaluation wells.

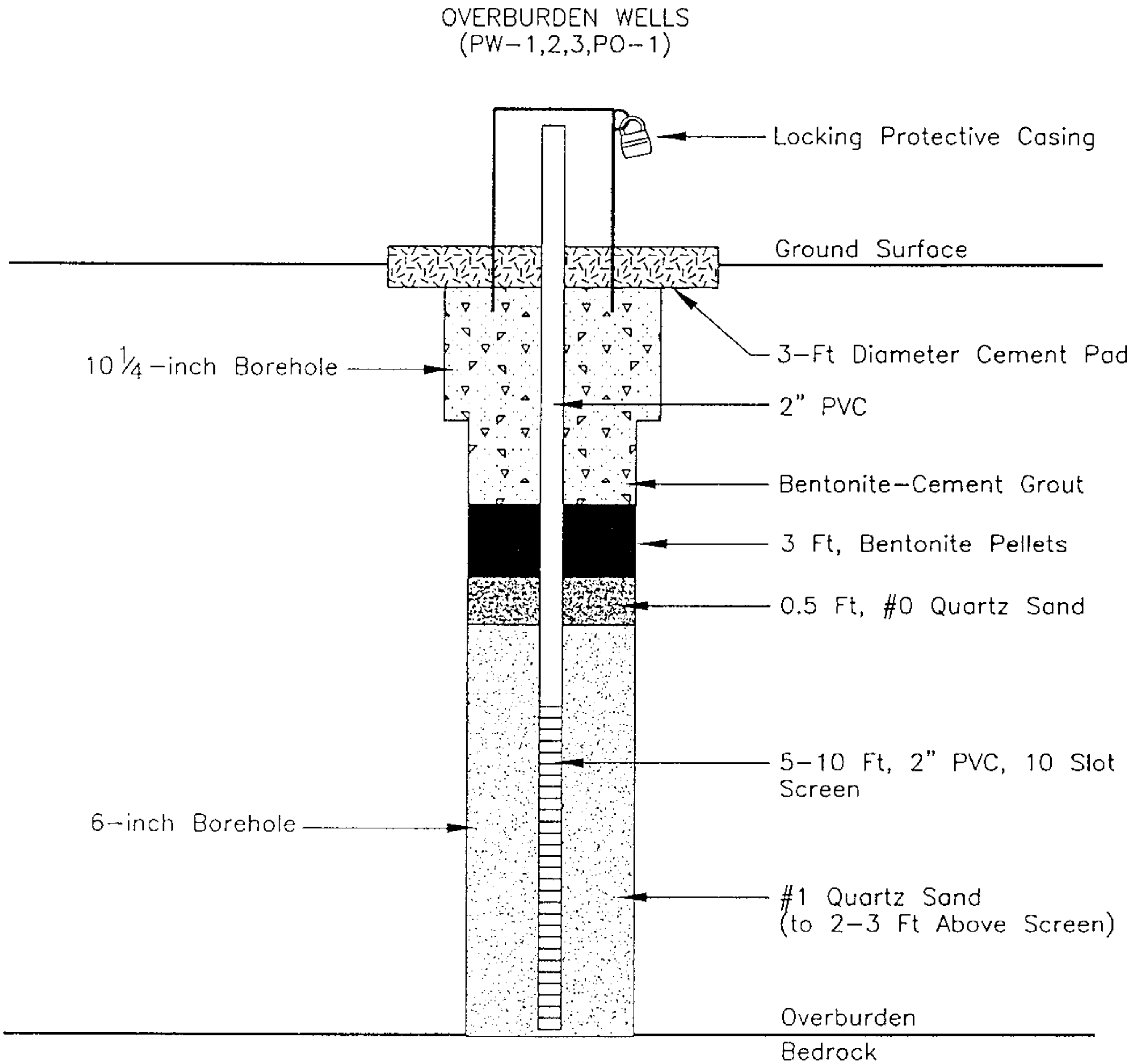

Figure 2. Schematic of overburden well construction (Summer 1995).

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place to 16 feet bgs because an adequate seal for water rotary drilling could not be formed with the hollow stem augers.

2. Water rotary methods were used to advance the drilling through the remaining overburden to the target depth with a 5.875-inch roller bit. During water rotary drilling, a mud-tub was installed over the top auger (or casing) to maintain a seal for drilling fluids. The use of water rotary drilling minimized health and safety hazards caused by the release of methane during drilling.

3. A 2-inch ID, Schedule 40 PVC riser of appropriate length was threaded to a five or 10 foot long stainless-steel screen (1.8-in ID, 0.01-in slot) and lowered to the pre-determined monitoring depth.

4. The sandpack consisted of 7.5 to 8 feet of Number 1 quartz sand, followed by approximately ½-foot of Number 0 quartz sand, and approximately three feet of bentonite chips.

5. The bentonite chips were allowed to hydrate for one hour.

6. The remainder of the annulus was tremie-grouted to land surface with a bentonite-cement grout with a grout density of approximately 14 lbs/gal.

7. All wells were completed with a locking protective casing and a 3-foot diameter, 3-foot deep cement pad. A 3-foot deep pad was selected over a 4-foot deep pad to avoid disturbing the cap of the landfill.

Each well was surveyed to New York State Planar Coordinates to provide a reference elevation for water level data.

3 BEDROCK PIEZOMETER INSTALLATION

Piezometers PB-1 and PB-2 were installed in the bedrock outside the containment wall adjacent to their corresponding overburden piezometers (PW-1 and PW-3, respectively). The following procedures were used to install the bedrock piezometers:

1. Hollow stem augers (6.25-in ID) were advanced to 24 feet bgs at PB-2, and to auger refusal at PB-1 (20 ft bgs).

2. At PB-2, water rotary methods were used to advance drilling through the remaining 24.5 feet of overburden and 1.5 feet into competent bedrock. Water rotary drilling was performed with a 5.875-inch roller bit. At PB-1, a 6-inch casing was grouted in place to 20 feet bgs to provide a seal for water rotary drilling. Water rotary drilling continued to a depth of 55.4 feet bgs which was the depth of bedrock encountered at PW-1 (previously completed).

3. A 4-inch ID steel isolation casing was installed from ground surface to the bottom of each borehole and pressure grouted via a tremie-pipe with a bentonite-cement grout (approximately 14 lbs/gal).

4. The grout was allowed to cure for at least 24 hours.

5. A 3-25/32-inch (HQ) core barrel was used to core 10 feet into bedrock below the bottom of the isolation casing at PB-2. PB-2 was completed as an open hole. At PB-1, 3-25/32-inch (HQ) coring was attempted from 56 to 57.9 feet bgs. The core sample collected was very soft and was not believed to be bedrock. Coring was replaced with water rotary drilling which proceeded to 95 feet bgs with a 3-⅞ roller bit. A final evaluation of subsurface material was taken with a split spoon sampler from the bottom of PB-1 which yielded very soft weathered shale.

6. PB-1 was backfilled with bentonite chips up to 72 feet bgs and allowed to hydrate for one hour.

7. A 10 foot, Schedule 40 PVC, 1.6-inch OD screen with riser was lowered to the bottom of the remaining open borehole.

8. A sandpack was installed consisting of 12.8 feet of Number 1 quartz sand, followed by ½-foot of Number 0 quartz sand, and 3.2 feet of bentonite chips. The remaining annulus was pressure grouted via tremie-pipe to ground surface with bentonite-cement grout (density approximately 14 lbs/gal).

10. Both wells were completed with a locking protective casing and a 3-foot diameter, 3-foot deep cement pad. A 3-foot deep pad was selected over a 4-foot deep pad to avoid disturbing the cap of the landfill.

Each well was surveyed to New York State Planar Coordinates by BBL to provide a reference elevation for water level data.

4 SPLIT SPOON SAMPLING AND BEDROCK CORING

During overburden drilling on the landfill, split-spoon samples were collected at continuous, two-foot intervals from ground surface to hollow-stem auger refusal. Samples were not collected at PO-1 and PW-3, because overburden geology had already been determined from adjacent well PB-2. Descriptions of soil and bedrock samples were recorded in the field and transcribed to subsurface logs. All recovered split-spoon samples were placed in sample jars or sealable plastic bags for headspace analysis and further classification and ultimately disposed of in drums currently stored at the site.

Continuous HQ cores were collected at bedrock wells PB-2 (10 ft). Cores were obtained to further define the bedrock lithology, the degree of fracturing, and the dip of fractures and joints in the bedrock. All core samples were placed in boxes. The core boxes are stored at the site within the locked fence.

5 DEEP BEDROCK INVESTIGATION

Data collected during Fall 1994 indicated that some of the groundwater in the Nassau shale (bedrock) in the vicinity of the site was contaminated. To the south of the site, VOC concentrations were higher in deeper bedrock than in adjacent shallower bedrock and overburden wells. RI water level data indicated that groundwater flow in the Nassau shale is generally east to west across the site. To further evaluate groundwater quality and deep groundwater flow two deep bedrock wells, OMW-215 and OMW-216, were installed south of the site (Figure 3).

Monitoring depths were determined by first coring intervals starting at a depth equivalent to the base of adjacent existing bedrock monitoring wells and stopping at an elevation equivalent to the bottom of 191-05-21B. Following coring, the depth interval to be monitored was determined from the results of water quality sampling and hydraulic testing during packer testing of the open coreholes. OMW-216 was completed as an open-hole bedrock well. OMW-215 was completed as a 1-inch PVC well because the fractured nature of the bedrock prevented packer testing and well completion as an open hole. A third groundwater monitoring point, piezometer OPZ-217, was installed to provide deep bedrock water-level data in the northern portion of the site. Well specifications are summarized in Table 2.

6 DRILLING OF OMW-216

The drilling of OMW-216 (deep bedrock) was completed using the following procedures:

1. Drilling with a 12-inch O.D. hollow stem auger was initially attempted. At 6-feet bgs, the auger reached refusal due to the very dense nature of the glacial till (overburden).

2. Hollow-stem augering was replaced with 8-inch air-rotary drilling that was used to drill to a depth of three feet into competent bedrock (44 ft bgs).

3. A 12.5-inch roller bit was used to ream the completed 8-inch borehole.

4. Overburden deposits were permanently sealed off from the underlying bedrock by installing an 8-inch casing from landsurface to four feet into bedrock and grouting in place.

5. After a 24-hour grout set period, an 8-inch hammer bit was advanced through the shale bedrock to 108 feet bgs.

6. A 4-inch flush-joint temporary casing was set into bedrock with a diamond spin shoe to 108 feet bgs.

7. HQ-coring was performed to a depth of 256 feet bgs. Coring fluid was dyed with Rhodamine-WT dye and the concentration was monitored with an in-field fluorometer.

8. Packer testing was completed in 42 foot intervals in the HQ-Cored interval.

9. The 4-inch temporary casing was removed and the existing 3-25/32-inch borehole was enlarged by drilling a 7-⅞-inch borehole to a depth of 108 feet bgs.

10. A final 4-inch steel casing with a shale trap at the lower end was placed in the borehole to a depth of 108 feet bgs and tremie-grouted in place with bentonite-

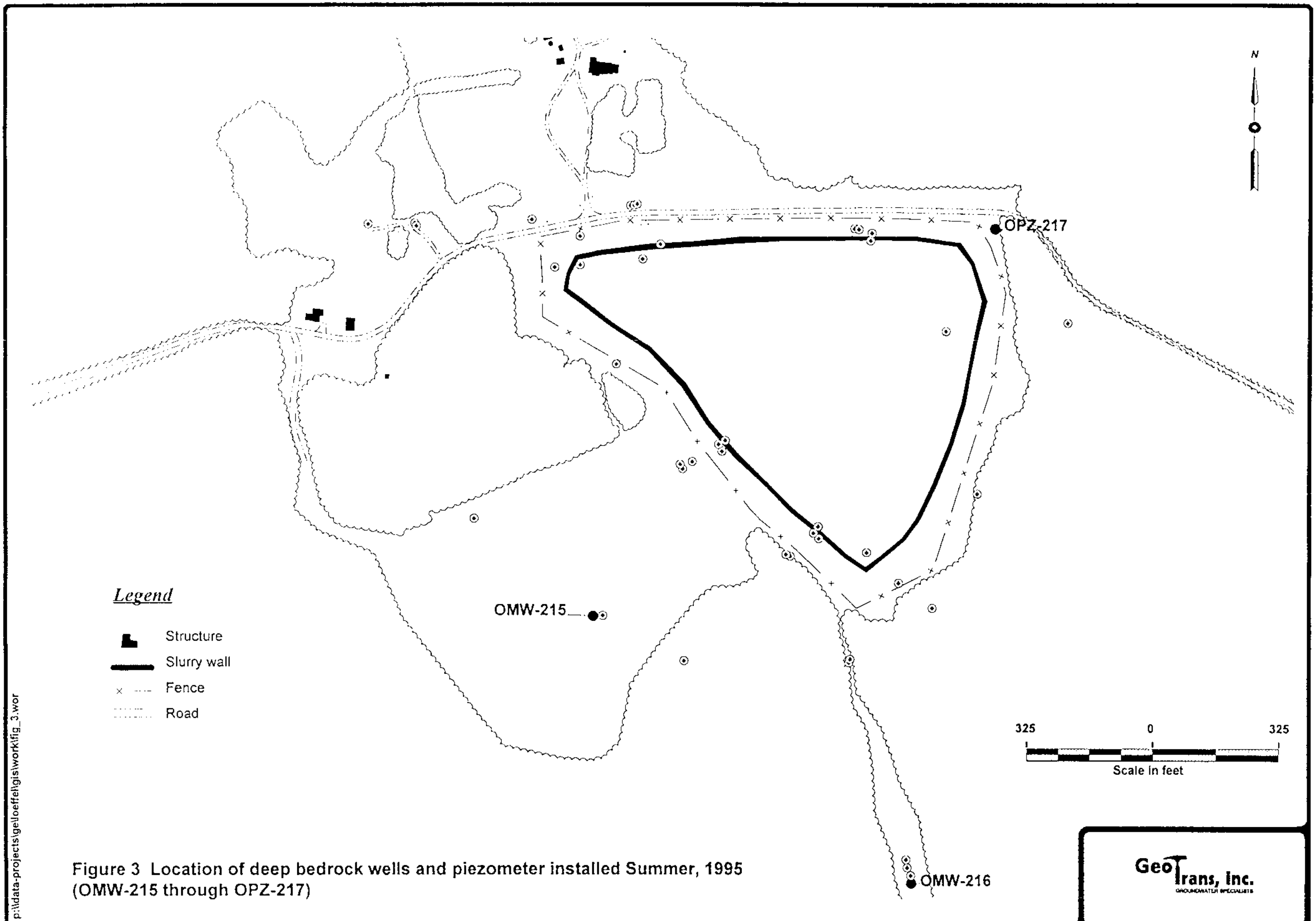


Figure 3 Location of deep bedrock wells and piezometer installed Summer, 1995
(OMW-215 through OPZ-217)

Table 2. Well specifications for bedrock wells installed Summer 1995.

MW/Piez ID	Elevation of MRP (ft MSL)	Ground Surface Elevation (ft MSL)	Depth to Top of Bentonite Seal (ft bgs)	Depth to Top of Sand Pack (ft bgs)	Depth to Top of Screened Interval (ft bgs)	Depth to Bottom of Screened Interval (ft bgs)	Depth to Bottom of Borehole (ft bgs)	Casing Diameter and Material	Geologic Description Screened Interval	Final Monitoring Interval Elevation (ft MSL)	Open Hole Interval (bgs)
OMW-215	657.91	656.19	172.00	195.80	203.00	243.50	243.50	1" PVC	Bedrock	453.2 - 412.7	-
OMW-216	659.18	657.64	-	-	-	-	170.00	4" Steel	Bedrock	549.6 - 487.6	108-170
OPZ-217	666.53	664.69	-	-	-	-	157.00	4" Steel	Bedrock	547.7 - 507.7	117-157

Notes:
1) MRP - Measured Reference Point marked on top of the lower portion of the protective casing.
2) PVC - Polyvinyl Chloride
3) Survey data source: Blasland & Bouck (1992a) plus the distance from the top of the inner casing (where present) to the top of the lower portion of the outside protective casing as measured in the field by GeoTrans.
4) Monitoring interval based on top of screen to bottom of screen or open borehole.

cement grout. The bentonite-cement grout was allowed to cure for a 24-hour period.

11. To remove drilling fluids, the corehole was developed through surging with drill rods and pumping with a submersible pump until the dye concentration was less than 15 percent of the original.

12. The monitoring zone was backfilled with pelletized bentonite to a depth of 170 feet bgs (the bottom of the final monitoring zone).

13. A permanent, lockable, protective casing was installed four feet bgs and set in a 3-foot circular concrete pad four feet deep.

7 DRILLING OF OMW-215

The drilling of OMW-215 (deep bedrock) was completed using the following procedures:

1. Drilling through the overburden was completed by using a 10-inch air-rotary hammer bit followed by a 12.5-inch water-rotary hammer bit. The borehole was advanced five feet into competent rock (100 ft bgs).

2. Overburden deposits were permanently sealed off from the underlying bedrock by installing an 8-inch casing from landsurface to five feet into bedrock and grouting in place.

3. After a 24-hour grout set period, an 8-inch hammer bit was advanced through bedrock to 111 feet bgs.

4. A 4-inch flush-joint steel casing was set into bedrock (111 ft bgs) with five feet of bentonite seal.

5. HQ-coring was performed to a depth of 243.5 feet bgs.

6. Due to the high degree of fracturing, packer testing was not attempted in this borehole.

7. A 40-foot, 10-slot, Schedule 80, PVC screen with appropriate PVC riser was lowered to a monitoring depth of 243.5 feet bgs.

8. The sand pack consisted of 46 feet of Number 1 sand, followed by 1.6 feet of Number 0 sand, and 23.8 feet of bentonite slurry. The remaining annulus was

pressure grouted via tremie-pipe to ground surface. Grout density was monitored using mud balance with criteria of 13-15 pounds per gallon.

9. Completion included a stickup protective casing with lock, a PVC slip-cap, and a 3-foot diameter, 4-foot deep cement pad.

8 DRILLING OF OPZ-217

The drilling of OPZ-217 (deep bedrock) was completed using the following procedures:

1. A 10-inch rotary hammer bit was advanced five feet into bedrock (15 ft bgs).
2. An 8-inch steel casing was placed in the borehole and tremie-grouted to the surface.
3. After a 24-hour grout set period, an 8-inch hammer bit was advanced through bedrock to 117 feet bgs.
4. A 4-inch flush-joint steel casing with a shale trap was set into bedrock with five feet of bentonite seal.
5. HQ-coring was performed to a depth of 157 feet bgs.
6. The purpose of this well was to provide information on deep bedrock groundwater elevations. As OMW-215 and OMW-216 had already been completed, the final monitoring interval for OPZ-217 was selected as 117 to

   157 feet bgs (roughly equivalent in elevation to the completed OMW-216 interval).
7. The 4-inch steel casing was tremie-grouted in place with bentonite-cement grout.
8. A permanent, lockable, protective casing was installed four feet bgs and set in a 3-foot circular concrete pad four feet deep.

WELL SCHEMATICS FOR WELLS INSTALLED SUMMER 1995

WELL CONSTRUCTION LOG

PROJECT	PROJECT NUMBER	WELL NUMBER
GE Loeffel	7666-005	OMW-215

SITE	COORDINATES	GROUND SURFACE ELEVATION	CASING STICKUP
Mead Road, Nassau, New York	932968.6 / 707391.8	656.19 ☒ Surveyed ☐ Estimated	1.93 / 658.12

Soil Boring Cross-Reference *OMW-215*

Town and City *Nassau*

County and State *Renesselear, NY*

Installation Date (s) *8/15-8/17/95*

Drilling Method *Mobile Drill B-59 / Wire-line*

Drilling Contractor *Aquifer Drilling & Testing*

Drilling Fluid *Potable Water w/ Dye*

~100 ppb, Red Liquid 50, Lot #3330 (Rhodamine)

Development Technique (s) / Dates

Powered Waterra purge

3/8" poly tubing with check valve

9/6-9/8/95

Fluid Loss During Drilling (gals) *+421 gal*

Water Removed During Development (gals)

250 gal -

Static Depth to Water Date *9/11/95*

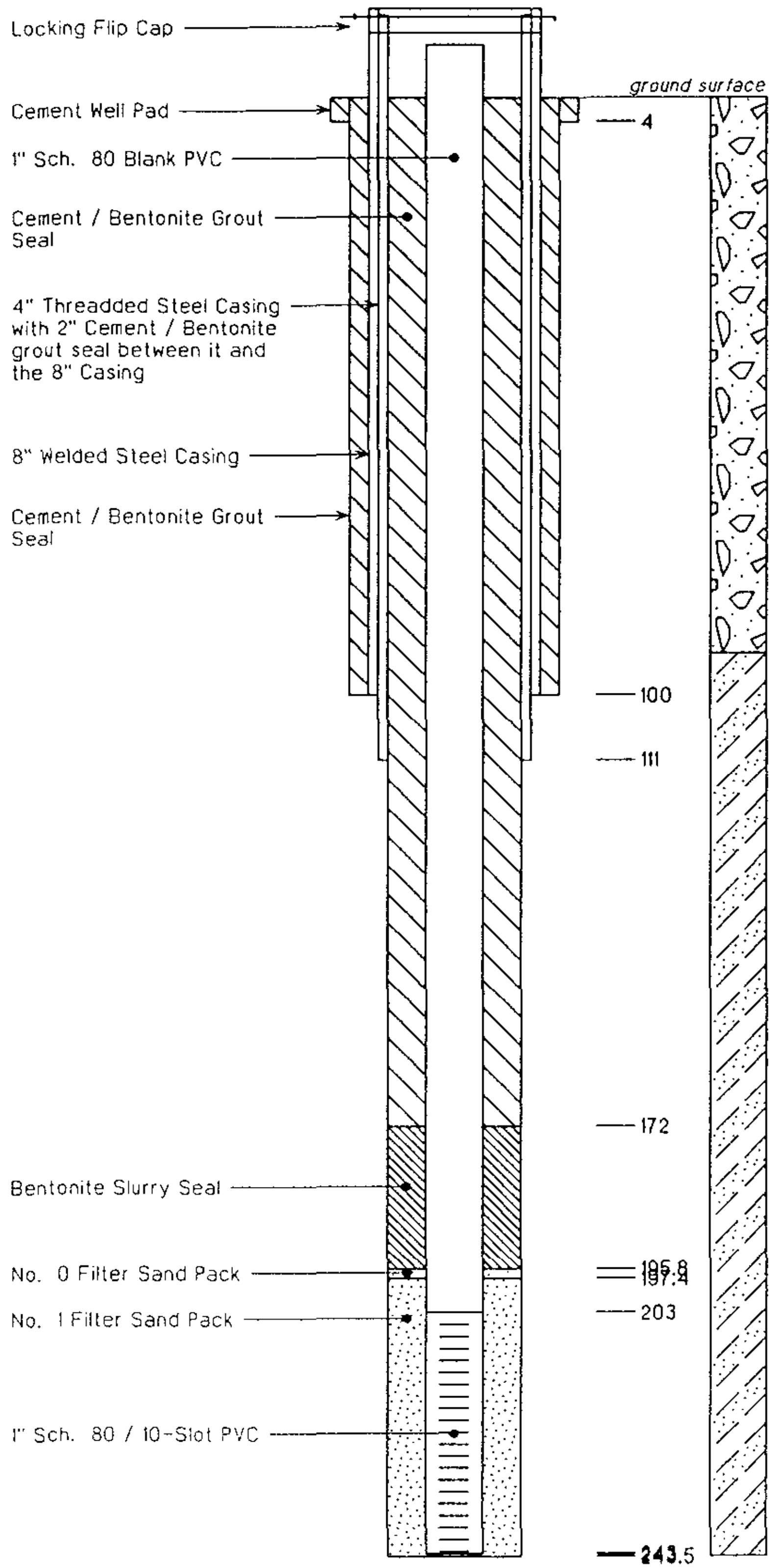
Static Depth to Water (feet) *51 ft. From top of PVC*

Well Purpose *Monitoring ground water*

Remarks

Prepared By *J.J. Zera*

Date Prepared *9/21/95*



WELL CONSTRUCTION LOG

PROJECT	PROJECT NUMBER	WELL NUMBER
GE Loeffel	7666-005	OMW-216

SITE	COORDINATES	GROUND SURFACE ELEVATION	CASING STICKUP
Mead Road, Nassau, New York	932276.5 / 708208.5	657.64 ☒Surveyed ☐Estimated	1.9 / 659.54

Soil Boring Cross-Reference *OMW-216*

Town and City *Nassau*

County and State *Renesselear, NY*

Installation Date (s) *8/15-8/17/95*

Drilling Method *Mobile Drill B-59 / Wire-line*

Drilling Contractor *Aquifer Drilling & Testing*

Drilling Fluid *Potable Water w/ Dye*
~100 ppb, Red Liquid 50, Lot #3330 (Rhodamine)

Development Technique (s) / Dates
Packer Testing / Grundfos Pump

Fluid Loss During Drilling (gals) *+421*

Water Removed During Development (gals)
498 - 8/2/95 - 8/10/95

Static Depth to Water Date *9/11/95*

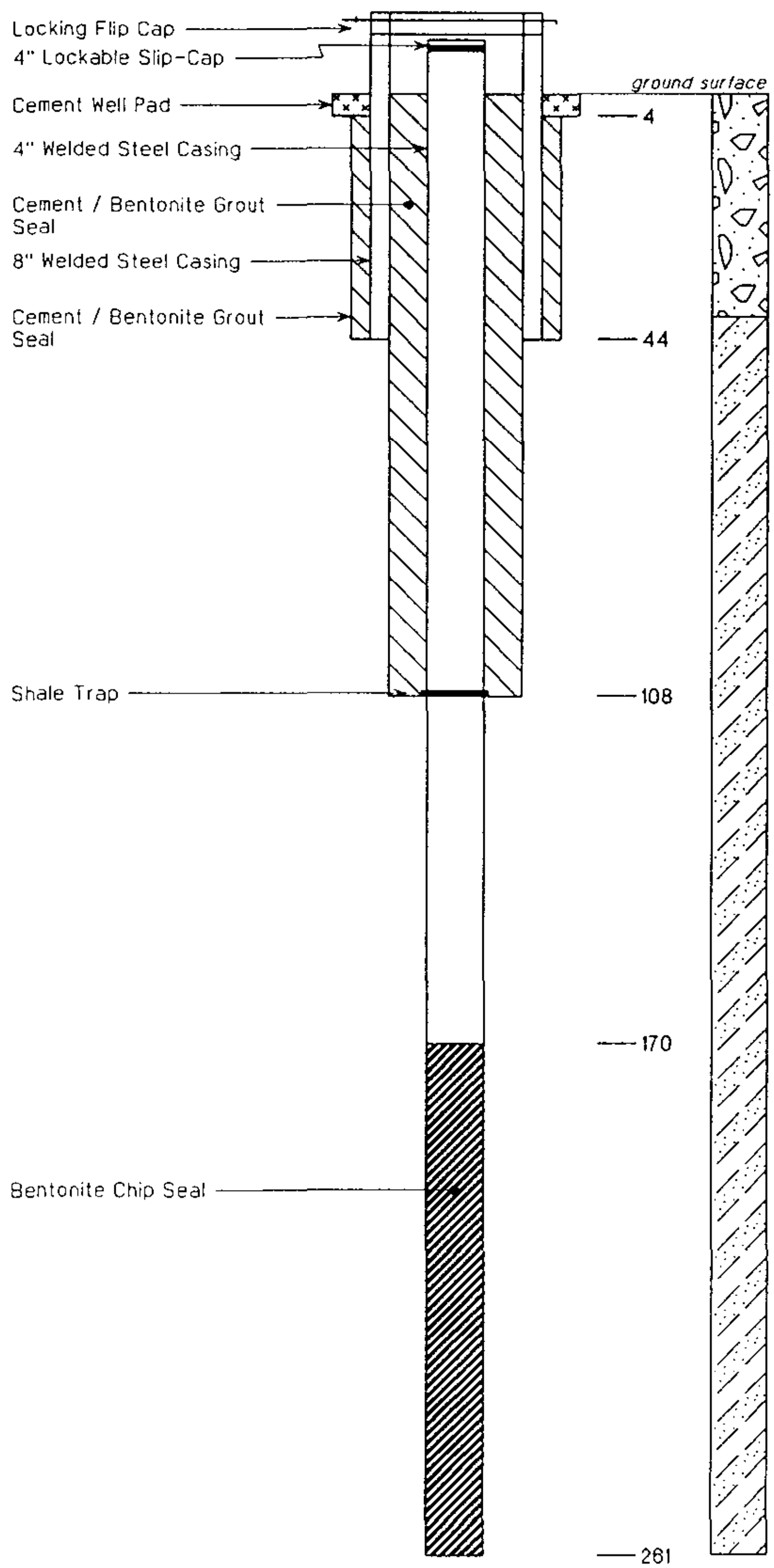
Static Depth to Water (feet) *32.99*

Well Purpose *Monitoring ground water / Packer Testing*

Remarks

Prepared By *J.J. Zera*

Date Prepared *9/27/95*



WELL CONSTRUCTION LOG

PROJECT	PROJECT NUMBER	WELL NUMBER
GE Loeffel	7666-005	OPZ-217

SITE	COORDINATES	GROUND SURFACE ELEVATION	CASING STICKUP
Mead Road, Nassau, New York	933976.0 / 708424.8	664.69 ☒Surveyed ☐Estimated	1.84 / 666.53

Soil Boring Cross-Reference *OPZ-217*

Town and City *Nassau*

County and State *Renesselear, NY*

Installation Date (s) *7/25; 8/15,17; 9/5/95*

Drilling Method *Mobile Drill B-59 / Wire-line*

Drilling Contractor *Aquifer Drilling & Testing*

Drilling Fluid *Potable Water*

Development Technique (s) / Dates

9/5/95

Fluid Loss During Drilling (gals)

Water Removed During Development (gals)

–

Static Depth to Water Date *9/11/95*

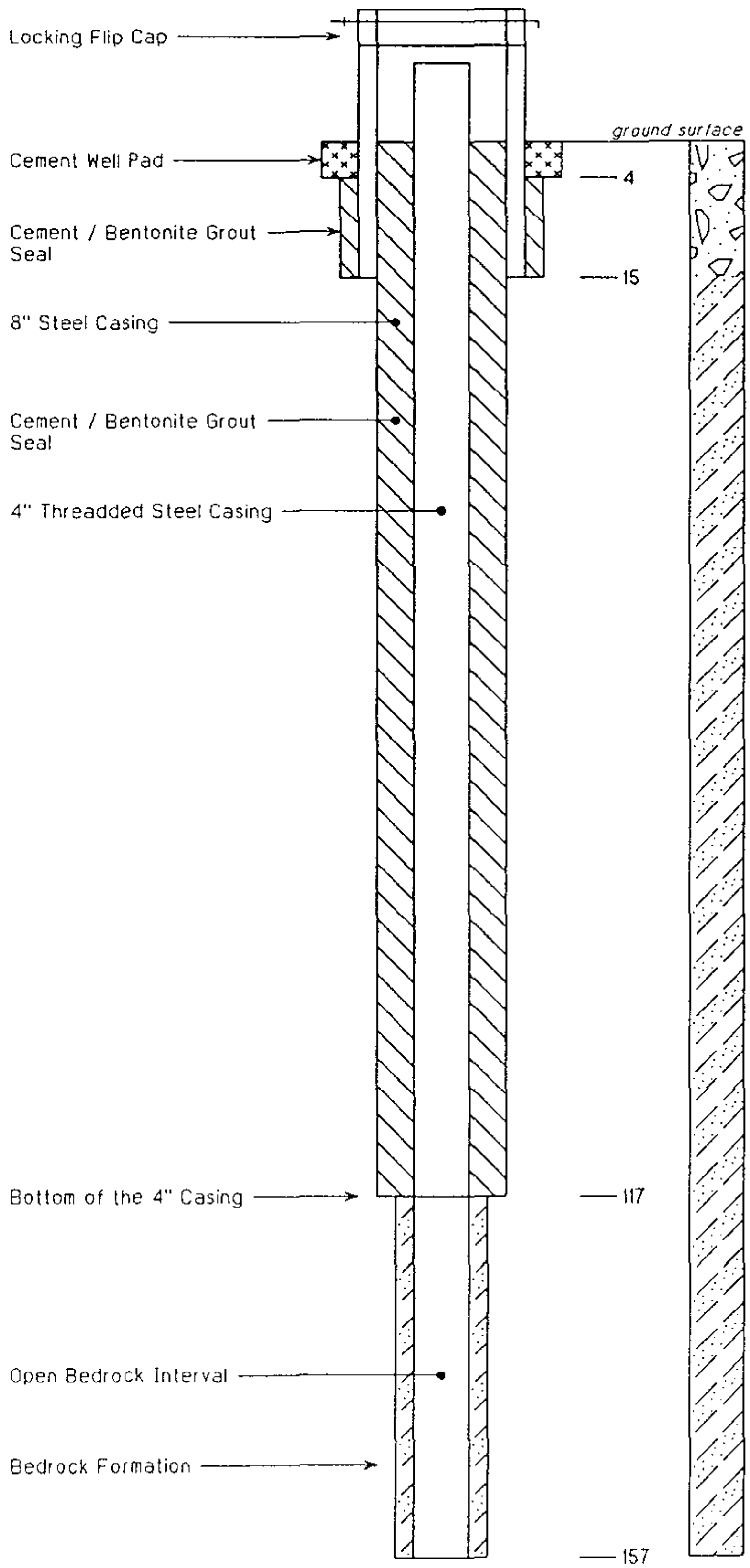
Static Depth to Water (feet) *19.05 ft. TIC*

Well Purpose *Monitoring ground water*

Remarks

Prepared By *J.J. Zera*

Date Prepared *10/6/95*



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GEOLOGIC LOGS FOR WELLS INSTALLED SUMMER 1995

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	1 of 7	OMW-215

SITE	COORDINATES	LOGGED BY	CHECKED BY
Mead Road, Nassau, New York	932968.6 / 707391.8	James Zera	Chuck Spalding

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
7/19/95	8/9/95	Aquifer Drilling & Testing	Mobile Drill B-59 / Wire-line	3.78125"	243.5

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
128.2 / 98		0	1.93 / 658.12	656.19	49.28 / *606.9* 49.28 / *606.9*	93 / 566.19 /

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
NONE	8"/100'; 4"/111'	

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					0			Dense to very dense, brown-red clayey TILL with sand to cobble size burgandy-red to pale greenish-grey shale, and grey-white quartzite. Rounded, sand to cobble size quartz, makes-up ~5% of the matrix. Dry.	Air rotary drilling with 10" button bit.
					5				
					~7			Large boulder of quartzite. Air caused fractures from the top of the boulder to ground surface. ~9' bgs bit is back into the TILL.	
					10				
					15			Ditto	
					20			Ditto	
					25			Ditto	
					30			Ditto	
					35				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	2 of 7	OMW-215

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								Ditto	
					40			Ditto	
					45			Ditto	
					50			Ditto	
					55			Ditto	
					60			Ditto	
					65			Ditto	
					70			Ditto	
					75				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	3 of 7	OMW-215

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								Ditto	
					80			Ditto	
					85			Ditto	
					90			Ditto	
				563.2 93.0				Top of bedrock.	93-94' broke into confined aquifer in weathered bedrock. Borehole quickly filled with water to ~45' bgs. Set-up for mud rotary from 94'.
					95				
					100				
					105				
					110				Initial water meter: 31806 gal Geologist: J. Zera core interval: 113-221.7 ft.
1	4/98%	79%	ND		115			Burgandy red and pale greenish gray argillaceous SHALE interbedded with grey-white, vf f-grained WACKE. Bedding ranges	Water In: 597 gal Water Out: 676 gal Net Water: +79 gal

GEOLOGIC DRILL LOG	PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
	GE Loeffel	7666-005	4 of 7	OMW-215

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								from laminea to ~1 ft for the shale and 0.05-~0.80 ft for the wacke. The greenish grey shale appears most frequently as bands and lenses inside of the red shale.	+Net from extra water in tub Rate: 10 min/ft
2	7/90%	33%			120			115'= a small fault as a result of tight folding with 0.1 ft offset bedding. The wacke beds contain calcite-healed fractures/veinlets that terminate at the shale contact. Crossbedding is noted in the larger beds of wacke, marked by red silt and/or black carbonaceous bedding-plane laminations. SAME, with multiple fractures, faults and calcite veinlets. ~122' = very tight fold or small fault slice, possible penecontemperaneous deformation. Burgandy colored shale is dominant with few to no green bands.	Water In: 905 gal Water Out: 858 gal Net Water: -32 gal Rate: 7.7 min/ft
3	8/104%	53%			125 130			SAME, with tight fold? from 128.8-130.6'. Some intact shears from 124.1-124.3.	Water In: 893 gal Water Out: 967 gal Net Water: +42 gal Rate: 5.6 min/ft
4	10/100%	67%			135 140			SAME, with multiple brown-yellow stained fractures, and partially to completely, calcite-healed fractures. ~136.8' = a multiply-sheared calcite vein, but the shear planes <u>do not</u> offset bedding. ~138.3 -139' = Deformed core/ offset veinlets/ calcite inclusion? ~140.8- 141.5' = Deformed core/ micro-fault breccia filled with calcite.	Water In: 840 gal Water Out: 871 gal Net Water: +73 gal Rate: 5.6 min/ft
5	10/100%	65%			145 150			SAME. At 142.5-143.2 = Calcite-filled micro fault-breccia with 0.05' bedding off-sets. At 150.4' = Bedding-plane fracture with some calcite infilling, and yellow-brown staining. Multiple fractures throughout run. Higher frequency of wacke beds.	Water In: 1050 gal Water Out: 1159 gal Net Water: +188 gal Rate: 7.7 min/ft
					155				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	5 of 7	OMW-215

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
6	10/100%	22%			160			SAME, with multiple yellow-brown stained fractures throughout run. ~90% of shale in this run is burgandy red. *HCL reacts strongly on calcite infilling and shows some reaction to the wacke beds.	Water In: 932 gal Water Out: 993 gal Net Water: +249 gal Rate: N/A, several problems with rig
7	10/99%	35%			165 170			SAME. Possible soft sediment deformation features from 167- 167.6' Breaks in core at 169.15, 169.2 and 169.4' reveal glassy black carbonaceous bedding plane laminations. 169.8 = Top of wacke bed that grades? into green-blue shale to muddy fracture at 170.65'. Possible rip-up clast or fault slice of wacke at 171.2'. (see photo)	Water In: 1210 gal Water Out: 1267 gal Net Water: +306 gal Rate: N/A Run spanned the weekend
8	10/95%	74%			175 180			SAME. Fault breccia from 173.7-174.2', and bedding steepens to ~45 degrees across core following this fault. Multiple possible fractures throughout run. Definite bedding plane fractures at 177 and 177.7'.	Water In: 805 gal Water Out: 785 gal Net Water: +286 gal Rate: 4.3 min/ft
9	9.7/106%	69%			185 190			SAME, with metallic-yellow sulfide minerals (calchopyrite/ massive) that pervade core in tiny blotches. 187.3' = Start of intact shear ~60 degrees across core that off sets bedding by 0.1'. Bedding "bends" to vetical at ~191.1' and reverses dip at 191.8'. Multiple veinlets confined in the wacke beds.	Water In: 815 gal Water Out: 864 gal Net Water: +335 gal Rate: 4.0 min/ft
					195				

GEOLOGIC DRILL LOG	PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
	GE Loeffel	7666-005	6 of 7	OMW-215

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
10	7.5/100%	67%						SAME, but bedding shallows again to the original 35-40 degrees of dip across core. Green-blue bands of shale have become more common. Some calcite veinlets in wacke beds exhibit minor offsets.	Water In: 947 gal Water Out: 944 gal Net Water: +332 gal Rate: 6.7 min/ft
11	2.5/96%	79%			200			SAME. Wacke bed bends again to vertical in the last 3' of this run.	Water In: 309 gal Water Out: 330 gal Net Water: +353 gal Rate: 5.3 min/ft
12	10/98%	70%			205 210			SAME, with deformation present in the top ~1' of this run. Diappearance of sulfides. Multiple possible fractures throughout run.	Water In: 1108 gal Water Out: 1151 gal Net Water: +396 gal Rate: 5.9 min/ft
13	10/100%	83%			215 220			SAME, but bedding steepens to 45 degrees. 213.3-218.9' = blue -green band of shale. Multiple calcite veinlets and mico-faults throughout run.	Water In: 1143 gal Water Out: 1165 gal Net Water: +418 gal Rate: 6.2 min/ft
14	9.5/97%	71%			225 230			SAME, with few beds of wacke. Green-blue to green-grey shale is soft (H=3-4), and is non-calcareous. The few beds of wacke are loaded with sulfides and are confined in the thin burgandy-red bands of shale. First appearance of light silver-grey bands of shale (olive- green when wet) with an abundance of silt sized muscovite. Last ~.8' of core is poorly defined because shale is easily reduced to mud.	Water In: 1694 gal Water Out: 1715 gal Net Water: +439 gal Rate: 9.1 min/ft
					235			SAME, but bedding steepens from ~60 to ~70 degrees at ~233' then back to ~60 degrees near the end of the run. Entire run exhibits a silver sheen from silt-sized mucovite, but diminishes after ~5' into run. Sulfides still present in wacke beds. As core	Water In: 1723 gal Water Out: 1750 gal Net Water: +466 gal

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	7 of 7	OMW-215

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
15	10/101%	73%			240			dries-out, suficial hair-line cracks form parallel to one another and in three distinct orientations. This is noted for the last few runs, but may occur in all of them.	Rate: 10 min/ft
16	2.3/43%	100%		*412.7* 243.5				SAME Burgandy-red shale with green, blue-grey bands/lenses, interbedded with "dirty" grey-white very-fine to fine-grained wacke.	Water In: 463 gal Water Out: 418 gal Net Water: +421 gal
					245			Bottom of boring	
					250				
					255				
					260				
					265				
					270				
					275				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	1 of 7	OMW-216

SITE	COORDINATES	LOGGED BY	CHECKED BY
Mead Road, Nassau, New York	932276.5 / 708208.5	James Zera	Chuck Spalding

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
7/14/95	7/31/95	Aquifer Drilling & Testing	Mobile Drill B-59 / Wire-line	3.78125"	261

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
128.2 / 100		0	1.9 / 659.54	657.64	▽ 25 / *632.6* ▼ 31.45 / *626.2*	38 / *619.6*

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
NONE	8"/44'; 4"/108'	

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					0			Dense to very dense, CLAYEY TILL (10R 4/2) with sand to cobble size shale (10R 3/4 to 5BG 5/2) and quartzite (5B 7/1). Rounded, sand to cobble size quartz, makes-up ~<5% of the matrix. Dry.	12" auger to ~6' bgs.
					5			SAME	Air rotary with 8" button bit to 108' bgs.
					10			SAME	
					15			SAME	
					20			SAME	
					25		▽	SAME	
					30			SAME	
					31.45		▼		
					35				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	2 of 7	OMW-216

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								SAME	
				617.6 40.0	40			Top of BEDROCK. Return cuttings are small chips of SHALE (10R 3/4 and 5BG 5/2). Dry.	
					45				
					50			SAME	
					55			SAME	
					60			SAME	
					65			SAME	
					70			SAME	
					75				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	3 of 7	OMW-216

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER Elev. Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								SAME	
					80			SAME	
					85			SAME	
					90			SAME	
					95			SAME	
					100			SAME	Initial water meter: 22040 gal Geologist: J. Zera
					105			SAME, with possible tight fracture (s) at ~102', as some moist "balls" of cuttings were returned to the surface.	core interval: 108-261 ft.
1	6.5/98%	97%			110			ARGILLACEOUS SHALE (10R 3/4 to 5BG 5/2), interbedded with vf f-grained WACKE (5B 7/1). Bedding thickness varies from laminea to ~1 ft for the shale and 0.05-~0.80 ft for the wacke. Beds dip ~30-35° across the core. The 5BG 5/2 shale appears most frequently as bands and lenses inside of the 10R 3/4 shale. Crossbedding is noted in the larger beds of wacke, marked by 10R 3/4 silt and/or carbonaceous (N1) bedding-plane laminations	Water In: 420 gal Water Out: N/A gal Net Water: N/A gal Rate: N/A min/ft
					115				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	4 of 7	OMW-216

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
2	10.1/101%	98%			120			Same, with calcite filled "gash" fractures and veinlets.	Water In: 410 gal Water Out: N/A gal Net Water: N/A gal Rate: 7.7 min/ft
3	10/100%	99%			125 130			Same to ~126' where 10R 3/4 shale terminates, and there is an increase in the number of (N1) carbonaceous laminations within the 5BG 5/2 shale. Some calcite-filled fractures, and appearence of metallic-yellow sulfides (massive) along some fractures and wacke beds.	Water In: 195 gal Water Out: N/A gal Net Water: N/A gal Rate: 5.0 min/ft
4	6.2/103%	95%			135 140			Same, but bedding dip has shallowed to only ~3-5°. Some partially healed fractures at 137.5-138.35.	Water In: 495 gal Water Out: N/A gal Net Water: N/A gal Rate: <10.0 min/ft
5	3.8/89%	100%						Same to 142.9' where the 10R 3/4 shale appears again. Possible fracture at 143.4'.	Water In: 211 gal Water Out: N/A gal Net Water: N/A gal Rate: 4.2 min/ft
6	[illegible].15/102%	97%			145 150 155			Same, but 10R 3/4 shale is now dominant throughout this run. Some calcite healed fractures from 147.2-148.1'. *Possible flame structures at 151.45' indicative of *overturned bedding*. These structures appear as a "wavy" flame that starts at a bedding contact between the 10R 3/4 shale and terminates inside of the "dirty" 5B 7/1 wacke as a 10R 3/4 flame.	Water In: 556 gal Water Out: N/A gal Net Water: N/A gal Rate: N/A min/ft

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	5 of 7	OMW-216

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER Elev. Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
7	/%	%			160			Same. 158.1-160.5 = Fault breccia with calcite infilling. Sulfides still present in wacke beds.	Water In: 746 gal Water Out: N/A gal Net Water: N/A gal Rate:
8	10.1/101%	100%			165, 170			Same. Closer inspection of 10R 3/4 shale reveals abundant silt-size flakes of biotite and muscovite.	Water In: 606 gal Water Out: N/A gal Net Water: N/A gal Rate: 6.7 min/ft
9	10.1/101%	%			175, 180			Same. More flame structres indicative of overturned bedding. Few calcite filled veinlets that exhibit en echelon orientation which are actually parallel-planar fractures at an angle across the core.	Water In: 601 gal Water Out: N/A gal Net Water: N/A gal Rate: 5.0 min/ft
10	10.2/102%	100%			185, 190, 195			Same. Note more crossbedding and flame structures in the wacke beds.	Water In: 800 gal Water Out: N/A gal Net Water: N/A gal Rate: 6.3 min/ft

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	6 of 7	OMW-216

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					200			Same. Fracture from 201.7-202.1' with some calcite infilling. 201.3-201.6' = A tiny fault slice? or slump? with a white veinlet that terminates at each contact.	Water In: 823 gal Water Out: N/A gal Net Water: N/A gal Rate: 5.6 min/ft
					205 210			Same. More flame structures inluding some tiny ball structures, en echelon alligned veinlets, and micro fault offsets of <0.05'.	Water In: 723 gal Water Out: N/A gal Net Water: N/A gal Rate: min/ft
					215 220			Same to 215.4' = transition back to all 5BG 5/2 shale with (N1) carbonaceous laminations. Beds of wacke appear to have a higher percentage of coarser (fine) grains. Partially healed fractures ~50 degrees to core at 220.3 and 223.6.	Water In: 708 gal Water Out: N/A gal Net Water: N/A gal Rate: 4.3 min/ft
					225 230 235			Same to 130.1' = transition back to both 10R 3/4 and 5BG 5/2 shale with alternating beds /bands of ~1 ft. 232.5 = Possible shallow angle fracture with some orange-brown staining. Slickensided reverse fault (a normal fault if bedding is overtunered), at 233.4'. Just below this fault, bedding "bends" to near vertical with a higher frequency of veinlets and fractures that are mostly healed with calcite. This fault cuts across core at ~45°.	Water In: 742 gal Water Out: N/A gal Net Water: N/A gal Rate: 4.5 min/ft

GEOLOGIC DRILL LOG	PROJECT GE Loeffel	PROJECT NUMBER 7666-005	SHEET NO. 7 of 7	HOLE NUMBER OMW-216

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					240			**Same**, but the vertical bedding "bends" back just before another fault at 245.9' with ~30° of dip. At 238.15' bedding "bends" again from a shallow angle fault to a similar fault at 239.25'. After this fault, the core is normal as seen in previous run with parallel bands of shale with occational beds of wacke. Sulfides noted again along breaks in the bent section of core.	Water In: 742 gal Water Out: N/A gal Net Water: N/A gal Rate: 4.3 min/ft
					245 250			Mostly 5BG 5/2 to 10G 6/2 shale. Some thin, clacite-healed fractures from 245.5-245.7'. Only 3, thin beds of wacke. Core is very clean.	Water In: 606 gal Water Out: N/A gal Net Water: N/A gal Rate: 5.0 min/ft
					255 260			**Same**. The few beds of wacke are *very* faint along suface of core, but are more visible on freshly broken surfaces.	Water In: 376 gal Water Out: N/A gal Net Water: N/A gal Rate: 5.3 min/ft
				396.6 261.0	265 270 275			Bottom of boring	

GEOLOGIC DRILL LOG

PROJECT: GE Loeffel	PROJECT NUMBER: 7666-005	SHEET NO.: 1 of 5	HOLE NUMBER: OPZ-217		
SITE: Mead Road, Nassau, New York	COORDINATES: 933976.0 / 708424.8	LOGGED BY: James Zera	CHECKED BY:		
BEGUN: 7/25/95	COMPLETED: 9/5/95	DRILLER: Aquifer Drilling & Testing	DRILL EQUIPMENT: Mobile Drill B-59 / Wire-line	BORING DIA.: 3.78125"	TOTAL DEPTH: 157
CORE RECOVERY (FT./%): 39.8 / 99.5	CORE BOXES: 3	SAMPLES: 0	CASING STICKUP: 1.84 / 666.53	GROUND ELEV.: 664.69	DEPTH/*ELEV.* GROUND WATER: 7.96 / *656.7*; 17.21 / *647.5*
DEPTH/*ELEV.* TOP OF ROCK: 10.5 / *654.2*	SAMPLE TYPE: NONE	CASING DIA/LENGTH: 8"/15'; 4"/117'	NOTES:		

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
				664.2 .5	0			First 0.5 ft. organic-rich TOP SOIL to CLAYEY TILL (5R 4/2-10R 4/2) with sand to cobble size shale (10R 3/4-5BG 5/2) and quartzite (5B 7/1).	Air rotary drilling with 10" button bit.
					5			SAME	FID 0.0 PPM
					10			Top of BEDROCK. SHALE (10R 3/4).	FID 0.0 PPM
				649.7 15.0	15			Set 8" casing with cement / bentonite grout. Air rotary drilling with 8" hammer to 117 ft. bgs.	
								Cuttings are DRY.	
					20				
					25				
					30				
					35				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	2 of 5	OPZ-217

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								Cuttings are MOIST.	FID 0.0 PPM
					40				
					45			Cuttings are WET.	
					50				
					55			Cuttings are DRY. Resumed drilling using water rotary on 8/17/95.	
					60				
					65				
					70				FID 0.0 PPM
					75				

GEOLOGIC DRILL LOG	PROJECT GE Loeffel	PROJECT NUMBER 7666-005	SHEET NO. 3 of 5	HOLE NUMBER OPZ-217

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER Elev. Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					80				FID 0.0 PPM
					85				
					90				FID 0.0 PPM
					95				FID 0.0 PPM
					100				FID 0.0 PPM
					105				FID 0.0 PPM
					110				
					115				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	4 of 5	OPZ-217

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER Elev. Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
									Geologist: J. Zera core interval: 117-157 ft.
1	8.6/101%	100%			120, 125			ARGILLACEOUS SHALE (10R 3/4 some 5BG 5/2) interbedded with "dirty" QUARTZITE (WACKE) (5B 7/1). Some calcite veinlets. Minor crossbedding noted in the wacke beds. Very competent.	Rate: 3.8 min/ft
2	9.85/99%	100%			130, 135			SAME	Rate: 4.2 min/ft
3	10/100%	100%			140, 145			SAME	Rate: 4.8 min/ft
4	10/100%	100%			150, 155			SAME	Rate: 4.3 min/ft

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	5 of 5	OPZ-217

continuation

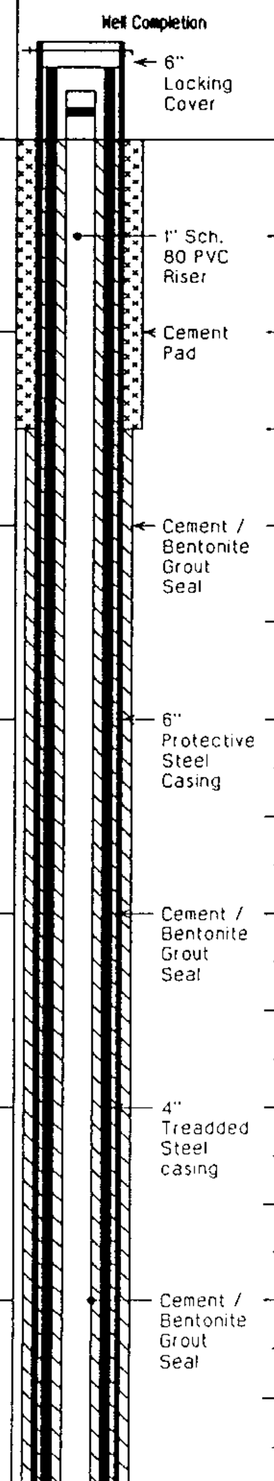
RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%)		LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
5	1.3/87%	100%						SAME	Rate: 5.0 min/ft
				507.7 157.0				Bottom of cored interval.	
					160				
					165				
					170				
					175				
					180				
					185				
					190				
					195				

GeoTrans, Inc. 6 Lancaster County Road Suite Four Harvard, Ma 01451 Phone (508) 772-7557 Fax (508) 772-6183	**Log of Well PB-1** GE Loeffel GE Nassau, NY	**Sheet 1 of 7** **Job Number:** 7666-011 **Elevation:** 640.32

	Drilling	**Date**	**Time**
Driller: Aquifer Drilling & Testing			
Drill Method: Hollow Stem Auger - Mobile Drill B-59	**Started**	8/22/95	08:04
Sample Method: 2' Stainless Steel Split Spoon	**Finished**	8/31/95	12:16

Borehole Diameter: 8 1/4 in. | **Water Level:** 26.98 / 643.07 | **Logged By:** J. Zera | **Checked By:** C. Spalding

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID/ (PPM)	Depth (feet)	Materials Description
SS1 0-2	1.5	- 22 15 22	0.0 0.0	0–2	**SILT** (10YR 6/6), vf-**SAND**, f **GRAVEL**. Some crs **SAND** and f **GRAVEL** to 0.6' of spoon. Rest is **CLAYEY SILT** (5R 4/2) with f **GRAVEL** (shale, 10R 3/4-5BG 5/2). **FILL**. Slightly plastic. Dry.
SS2 2-4	1.8	16 20 35 17	8.25/7 0.4	2–4	**SAME**, with .3' piece of gravel.
SS3 4-6	0.7	10 14 21 19	15/8 0.2	4–6	**CLAYEY SILT** with vf **SAND** that grades to m **GRAVEL**. **FILL**. Slightly plastic. Dry.
SS4 6-8	0.75	46 25 35 19	85/45 0.2	6–8	**SAME**.
SS5 8-10	1.6	17 14 31 100/.4	400/200 Inop.	8–10	Organic soil (10YR 2/2-N1) with severely decomposed roots into **CLAYEY TILL** with vf-crs **SAND** and f-m **GRAVEL** (10R 4/2). Firm and moist to wet on the outside of soil plug.
				10–12	Auger refusal at 10 ft. Switched to water rotary (3 7/8") and passed through cobble at 11+ ft., but couldn't keep the seal on the outside the augers. **Abandonned** hole and moved ~5 ft to the west.
				12–14	Resume split-spoons in new location (8/23). See PW-1 boring log for geology from 10-16 ft.



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Log of Well PB-1

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Nassau, NY

Job Number: 7666-011

Elevation: 640.32

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID/ (PPM)	Depth (feet)	Materials Description
				14–16	
SS6 16-18	0.6	72 47 47 100	10	16–18	Same **TILL** as 8-10 ft. 10R 4/2 with 5RP 4/2. Very stiff. 1.5" piece of gravel jammed in the mouth of the spoon.
SS7 18-20	1.05	99 58 100/.4 -	10/6	18–20	**SAME**. Dry.
SS8 20-22	0.2	43 100/.1 - -	n/d	20–22	**SAME** to refusal. Set 6" casing to 20 ft. with grout. Resume drilling with water rotary on 8/28 **BOULDER** 20.5-23 ft.
				23–25	**TILL**.
				25–26	**COBBLE** ~25-26 ft.
				26–30	**TILL**.

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Log of Well PB-1
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Nassau, NY

Job Number: 7666-011

Elevation: 640.32

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID/ (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				31			
				32			
				33			
				34			Cement / Bentonite Grout Seal
				35			
				36			
				37		TILL.	
				38			
				39			4" Treadded Steel casing
				40			
				41			
				42			
				43			Cement / Bentonite Grout Seal
				44			
				45			

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Log of Well PB-1
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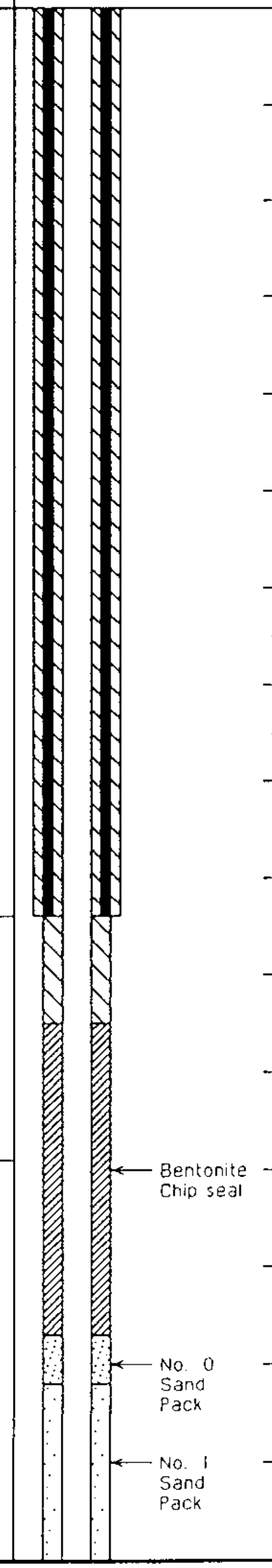
Nassau, NY

Job Number: 7666-011

Elevation: 640.32

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID/ (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				47		Possible top of bedrock. Return water changed from 5YR 5/2 to N7. Cuttings are mostly shale (5B 5/1) coated with clay 5B 7/1, as well as many other color shades of fine rock fragments.	
				48		Driller notes that dilling is very "smooth" as if there was no longer a roller bit on the end of the rods.	
				49			
				50			
				51			
				52			
				53		Bedrock. **SHALE** (5B 5/1). Difficult drilling because till is so dense that a transition into bedrock using water rotary is *extremely* subtle. Especially because the till was derived from the bedrock.	
				54			
				55			
				56		Bottom of boring. Set 4" threadded casing with grout. Attempted to core on 8/30 from 56 ft. **RUN** of 1.9 ft. **RECOVERY** 0.1 ft. **RATE** 10min/ft. Very stiff **CLAY** (5B 7/1).	
				57			
				58		Resume water rotary drilling with continuous screening of cuttings.	Bentonite Chip seal
				59		**SHALE and CLAY** (5B 5/1-5B 7/1). ** The action of the core barrel and the water easily reduce the shale to clay. Some of the shale fragments are stained 10YR 6/6.	
				60			No. 0 Sand Pack
				61			No. 1 Sand Pack



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Log of Well PB-1
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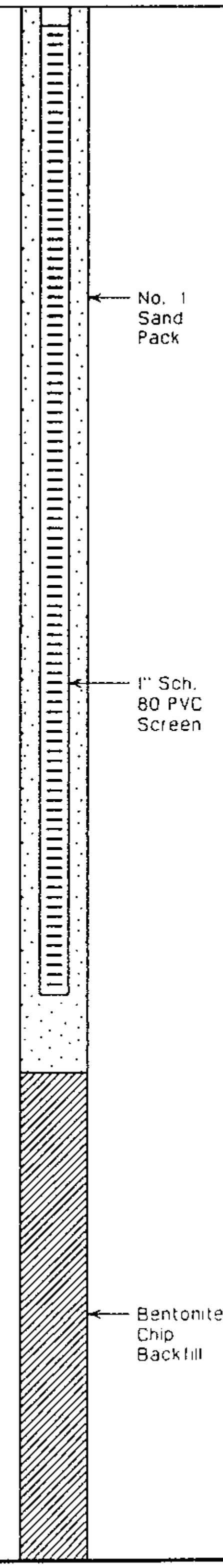
Job Number: 7666-011

Elevation: 640.32

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID/ (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				63			
						SAME.	
				64			
				65			
				66			
				67			
				68		68-69 ft. Rate = 6min/ft. Seeing some m sand-size sub-rounded grains of quartz as well as some red shale fragments...	
				69			
				70		70-71 ft. Rate = 6min/ft.	
				71			
				72			
				73			
				74			
				75			
				76			
				77			



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Log of Well PB-1
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Job Number: 7666-011

Elevation: 640.32

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID/ (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				79			
				80			
				81			
				82			
				83			
				84			
				85			
				86		Extremely hard from 85.5-85.8 ft.	← Bentonite Chip Backfill
				87			
				88			
				89			
				90			
				91			
				92			
				93			

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Log of Well PB-1
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Job Number: 7666-011

Elevation: 640.32

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID/ (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				95			
SS9 95-97	0.1	200/.1	0.0	96		Bottom of the boring *Very* soft **SHALE** (5B 5/1) interbedded? with **CLAY** (5B 7/1). Clay may have been the result of the friction of the spoon and the presence of water.	
				97			
				98			
				99			
				100			
				101			
				102			
				103			
				104			
				105			
				106			
				107			
				108			
				109			

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Log of Well PB-2
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Nassau, NY

Job Number: 7666-011

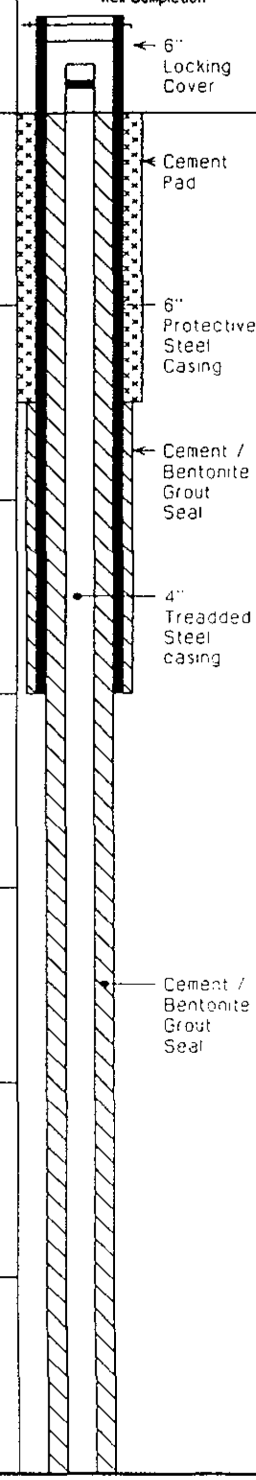
Elevation: 648.11

	Drilling	Date	Time
Driller: Aquifer Drilling & Testing			
Drill Method: Hollow Stem Auger – Mobile Drill B-59	Started	8/10/95	10:25
Sample Method: 2' Stainless Steel Split Spoon	Finished	8/11/95	15:00

Borehole Diameter: 8 1/4 in. | **Water Level:** 18.3 / 832.36 | **Logged By:** C.P.S. / J.J.Z. | **Checked By:** C.Spalding

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Materials Description
SS1 0-2	1.2	4 6 4 4	0.5	0–2	light brown **SILT**, little**GRAVEL**, light gray shale, moist, roots, and grass. **FILL**.
SS2 2-4	0.5	6 5 6 6	0.0	2–4	Light brown-grey **CLAY**, little **GRAVEL**, light grey shale,
SS3 4-6	0.9	3 3 4 4	0.5 –	4–6	Dark brown **SILT** little small **GRAVEL**, moist.
SS4 6-8	0.8	2 3 2 4	0.5 0.5	6–8	Light brown **CLAY**, little **GRAVEL**, moist.
SS5 8-10	0.9	2 3 3 4	0.0	8–10	**SAME**
SS6 10-12	0.8	6 8 7 19	0.0 300	10–12	Light grey **GRAVEL**, some **CLAY**, wet.
SS7 12-14	1.0	19 20 27 50	0.0	12–14	Light brown **CLAY**, some **GRAVEL**, (red and grey shale).

Well Completion



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Log of Well PB-2
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Nassau, NY

Job Number: 7666-011

Elevation: 648.11

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Materials Description
SS8 14-16	n/a	12 21 81 72	0.0	15	Light brown **SILT** with little **GRAVEL** some brown **CLAY**, coarse sand.
SS9 16-18	n/a	70 82 57 53	0.0	16, 17	Light brown **SILTY MUD** with some fine to medium **SAND**. Recovery is unrecordable.
SS10 18-20	1.1	47 21 67 65	0.0	18, 19	Light brown **CLAY** with **GRAVEL** and coarse sand.
SS11 20-22	0.3	54 37 31 33	3-4	20, 21	Light brown **GRAVEL**, some **CLAY**.
SS12 22-24	n/a	n/a	-	22, 23	Light brown **SILTY MUD** with some fine to medium **SAND**. Recovery is unrecordable.
				24, 25, 26, 27, 28, 29	Begin Water Rotary to 51' bgs.

Well Completion:
- 4" Treadded Steel casing
- Cement / Bentonite Grout Seal

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Log of Well PB-2
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Nassau, NY

Job Number: 7666-011

Elevation: 648.11

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				30–31		Drill water mixes with the fines in the till to form a thick mud (5YR 5/2). Cuttings in this mud consist of vf-m, angular to sub- rounded, sand and fine gravel divided: 50-75% shale (10R 3/4-5BG 5/2) ; 15-25% calcite (N9-clear) (the rounded grains are quartz); 3-5% (10YR 6/6-N1) other rock fragments.	
				33		**COBBLE**	
				35		**SAME**	4" Treadded Steel casing
				40		**SAME**	Cement / Bentonite Grout Seal
				41		Top of **COBBLE Through it at ~42'.**	
				45		**SAME**	

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Log of Well PB-2
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Nassau, NY

Job Number: 7666-011

Elevation: 648.11

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				47			
				48		Top of **BEDROCK**. Fresh medium sand to fine gravel size cuttings of **SHALE** (10R 3/4-5BG 5/2) with a small percentage of **CALCITE** (N9) and **QUARTZITE (WACKE)** (5B 7/1).	
				49			
				50			
				51		Bottom of Boring, 2.5' into competent bedrock.	Bottom of 4" Steel Casing
				52			
				53			
				54			4" Open Borehole
				55			
				56		SEE CORE LOG	
				57			Bedrock Formation
				58			
				59			
				60			
				61		Bottom of core interval	

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Log of Well PW-1
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Nassau, NY

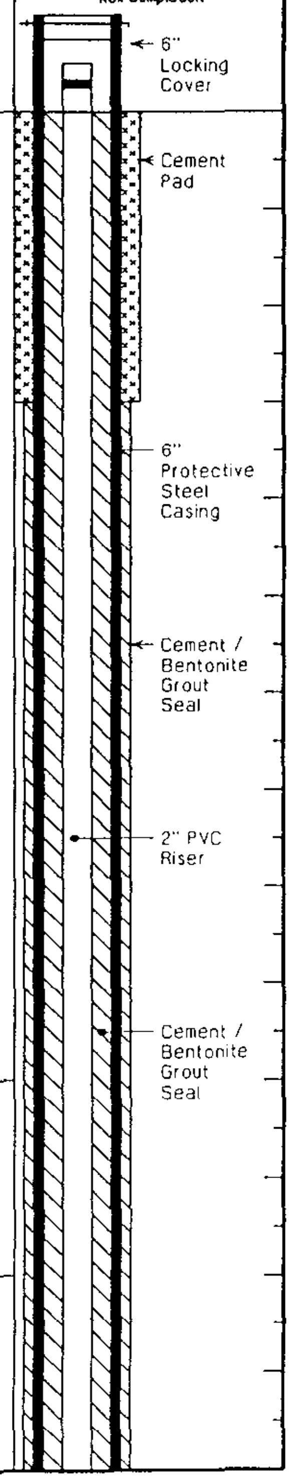
Job Number: 7666-011
Elevation: 639.52

	Drilling	**Date**	**Time**
Driller: Aquifer Drilling & Testing			
Drill Method: Hollow Stem Auger - Mobile Drill B-59	**Started**	8/22/95	15:45
Sample Method: 2' Stainless Steel Split Spoon	**Finished**	8/25/95	16:31

Borehole Diameter: 8 1/4 in. **Water Level:** 27.02 / 615.73 **Logged By:** J. Zera **Checked By:** C. Spalding

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (PPM) Unfilt/Filt	Depth (feet)	Materials Description
				0–10	See Geologic Log for PB-1. PB-1 is located 20 ft south of PW-1.
SS1 10-12	0.85	28 12 22 71	500/575	10–12	Slightly plastic **SILT** (10R 4/2), some **CLAY**, crs **SAND**, and f **GRAVEL**. The outside of the soil plug is wet but the inside is moist.
SS2 12-14	0.0	100/.5 - - -	-	12–14	Pushed **COBBLE** 0.5 ft.

Well Completion



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Log of Well PW-1
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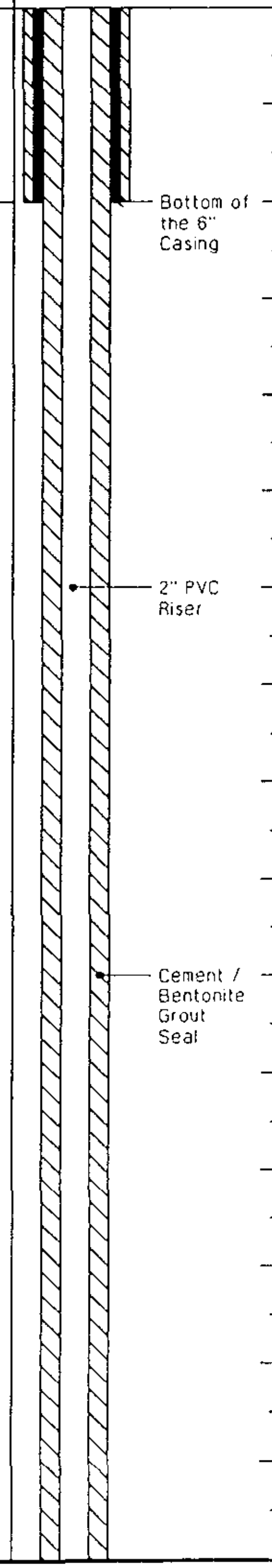
Nassau, NY

Job Number: 7666-011

Elevation: 639.52

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (PPM) Unfilt/Filt	Depth (feet)	Materials Description
SS3 14-16	1.0	12 38 50/0 38 100/.2 - -	10/5	15	**CLAYEY TILL** 10R 4/2 with shades of 10R 3/4, 5BG 5/2, and 5RP 4/2 from weathered rock fragments. Moist, m-crs **SAND** and **GRAVEL** throughout the matrix with trace sub to rounded fragments.
				16	Auger refusal. Top of **BOULDER**. 6" casing gouted to 16'. Resume drilling with water rotary on 8/25.
				17	
				18	Through **BOULDER** at 17.8 ft., and back into **TILL**.
					COBBLE 18.5-19 ft.
				19	
				20	
					TILL.
				21	
				22	
					COBBLE 22-23 ft.
				23	
				24	
				25	
				26	
				27	**TILL**.
				28	
				29	

Well Completion



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Log of Well PW-1
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Nassau, NY

Job Number: 7666-011

Elevation: 639.52

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (PPM) Unfilt/Filt	Depth (feet)	Graphic Log	Materials Description	Well Completion
				31			
				32		**SAME**	
				33			
				34			
				35			2" PVC Riser
				36			
				37		**SAME.** Driller notes that the overburden has become	
				38			
				39			
				40			Cement / Bentonite Grout Seal
				41			
				42		**SAME.**	
				43			
				44			
				45			

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Log of Well PW-1

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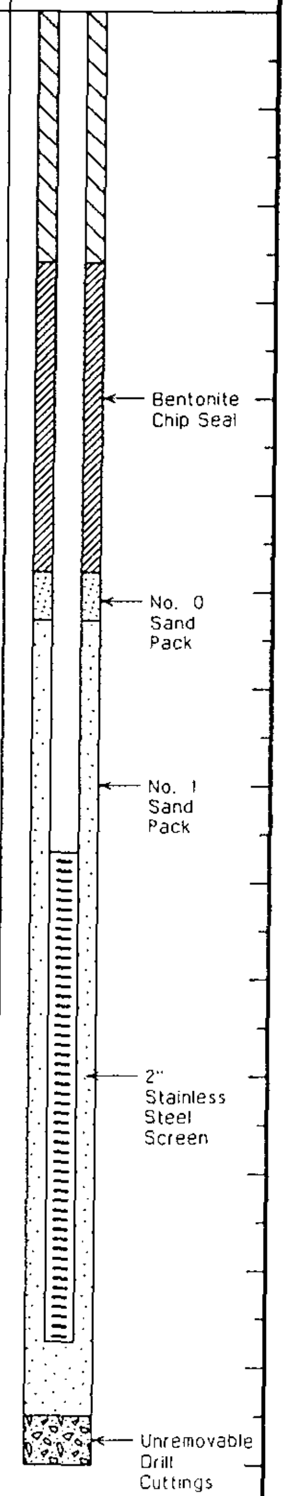
Nassau, NY

Job Number: 7666-011

Elevation: 639.52

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (PPM) Unfilt/Filt	Depth (feet)	Materials Description
				47	**SAME**
				48	
				49	
				50	**COBBLE** 50-50.7 ft.
				51	
				52	**TILL.**
				53	
				54	
				55	
				56	
				57	**SAME**, but starting to make some water. Drill rate of 2.33m/ft.
				58	
				59	
				60	
				61	Bottom of the boring. Top of bedrock. **SHALE**, (5B 5/1), soft.

Well Completion



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Log of Well PW-2
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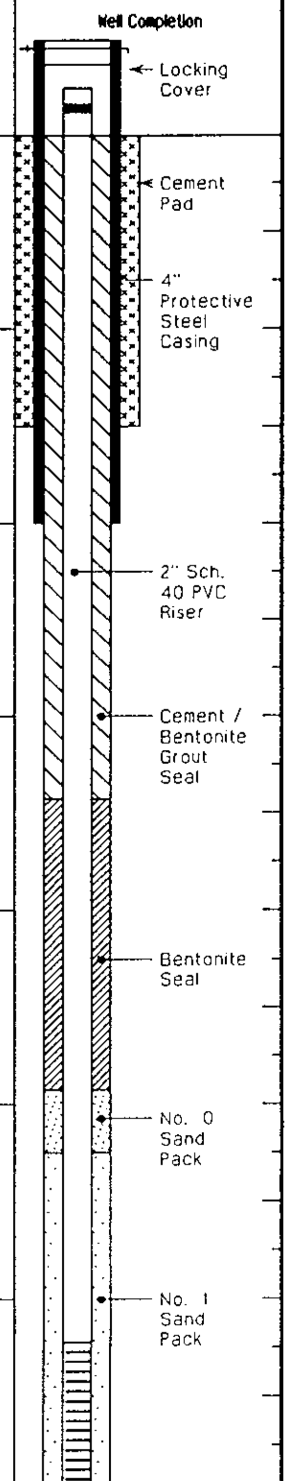
Job Number: 7666-011

Elevation: 641.62

Driller: Aquifer Drilling & Testing	**Drilling**	**Date**	**Time**
Drill Method: Hollow Stem Auger - Mobile Drill B-59	**Started**	8/29/95	13:00
Sample Method: 2' Stainless Steel Split Spoon	**Finished**	8/29/95	16:30

Borehole Diameter: 8 1/4 in. **Water Level:** 12.61 / 631.78 **Logged By:** J. Zera **Checked By:** C. Spalding

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (OVA) / PPM	Depth (feet)	Materials Description
SS1 0-2	0.85	17 12 12 8	0.0	0-2	0-.15 ft, Organic **TOP SOIL** (5YR 3/2). Rest is dry, (5R 4/2) **SILT** to crs. **SAND**. **(FILL)**. Loose.
SS2 2-4	0.7	3 3 3 3	0.0	2-4	**SAME** to 2.35', damp, brown **SILT** and **CLAY**, with small % of crs **SAND** and f-m **GRAVEL (FILL)**. Derived from local glacial *till* for landfill's **CAP**. Firm and semi-plastic.
SS3 4-6	0.5	2 4 4 4	10	4-6	**SAME**. Moist.
SS4 6-8	0.45	5 42 100/.6 -	150	6-8	**SAME**. Moist. Cobble at ~7.2 ft.
SS5 8-10	0.3	8 5 11 13	200	8-10	Moist, **SILT** and **CLAY**, (10R 4/2) with trace crs **SAND** and f-m **GRAVEL**. Loose with (N1) organic staining and decomposing roots. *Former landfill surface.*
SS6 10-12	0.35	3 10 17 23	100	10-12	**SAME** Pushed cobble with spoon. Outside bottom half of the spoon is wet and the borehole contains visible water at ~10 ft. bgs.
SS7 12-14	0.6	22 34 36 37	250	12-14	Saturated, crs **SAND** and f **GRAVEL** with small percent of **SILT** (5YR 4/1). Loose, with a strong fuel oil-like odor, as well as a colorful sheen on the water on the outside of the spoon.



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Log of Well PW-2
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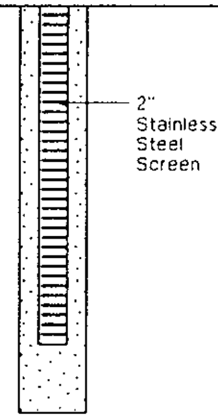
Nassau, NY

Job Number: 7666-011

Elevation: 641.62

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (OVA) / PPM	Depth (feet)	Graphic Log	Materials Description	Well Completion
SS8 14-16	0.4	13 9 10 11	300	15		AME. Gravel is angular to sub-rounded, and is comprised of the local shale and wacke.	
SS9 16-18	0.3	17 100/.4 – –	90	16, 17		**SAME**	
				18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29		After augering, the bottom of boring was sounded to 8.2 ft.	

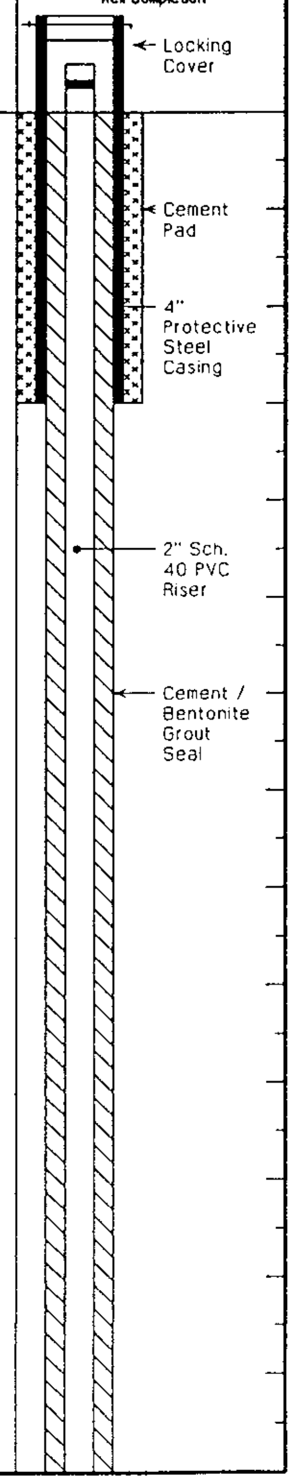


GeoTrans, Inc.	Log of Well PW-3	Sheet 1 of 4
6 Lancaster County Road Suite Four Harvard, Ma 01451 Phone (508) 772-7557 Fax (508) 772-6183	GE Loeffel GE Nassau, NY	**Job Number:** 7666-011 **Elevation:** 647.80

	Drilling	Date	Time
Driller: Aquifer Drilling & Testing			
Drill Method: Hollow Stem Auger - Mobile Drill B-59	Started	8/15/95	11:05
Sample Method: 2' Stainless Steel Split Spoon	Finished	8/15/95	15:45

Borehole Diameter: 8¼ in.	**Water Level:** 33.23 / 617.84	**Logged By:** J. Zera	**Checked By:**

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (OVA) / PPM	Depth (feet)	Materials Description
				0–1	Augered to 20 ft. bgs. with no split-spoon sampling. **See PB-2 log** for spoons taken 20 ft. south of this location.
0-5			0.0	2–3	Semi-plastic **SILT** and crs. **SAND** (5R 4/2). **(FILL)**. Loose and moist.
5-10			n/a	7–8	**FILL** derived from local glacial **TILL**. Firm matrix of **CLAYEY SILT, vf-crs SAND and GRAVEL**
10-15			8/5.5 0.0	12	**SAME**, with some organic soil (N1).



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Log of Well PW-3
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Job Number: 7666-011

Elevation: 647.80

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (OVA) / PPM	Depth (feet)	Graphic Log	Materials Description	Well Completion
15-20			200/150	15–20		**TILL** (10R 4/2). Very firm, and dry.	Cement / Bentonite Grout Seal
				20–21		**SAME**. Dry. Switch over to water rotary with 3 7/8" roller bit. from 20 ft. bgs.	
				21–22		**COBBLE** 21-22 ft.	
				22–30		**TILL**. Drill water combines with the clay, silt and vf sand to form a thick mud. This mud has to be jarred and rinsed in order to see the cuttings.	2" PVC Riser

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Suite Four
Harvard, Ma 01451
Phone (508) 772-7557 Fax (508) 772-6183

Log of Well PW-3
GE Loeffel
GE
Nassau, NY

Job Number: 7666-011

Elevation: 647.80

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (OVA) / PPM	Depth (feet)	Graphic Log	Materials Description	Well Completion
						SAME.	
				31			
				32			
				33			Bentonite Chip Seal
				34			
				35		SAME.	No. 0 Sand Pack
				36			
				37			
				38			
				39			No. 1 Sand Pack
				40		SAME.	
				41			
				42			2" Stainless Steel Screen
				43			
				44			
				45		SAME.	

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Log of Well PW-3
GE Loeffel
GE
Nassau, NY

Job Number: 7666-011

Elevation: 647.80

Sample No./Depth Range	Recovery (ft.)	Blow Counts	FID (OVA) / PPM	Depth (feet)	Graphic Log	Materials Description	Well Completion
				47		**SAME.**	
				48		Stopped drilling here to keep the boring above bedrock.	Unremovable Drill Cuttings
				49			
				50			
				51			
				52			
				53			
				54			
				55			
				56			
				57			
				58			
				59			
				60			
				61			

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Log of Well PO-1
GE Loeffel
GE
Nassau, NY

Job Number: 7666-011

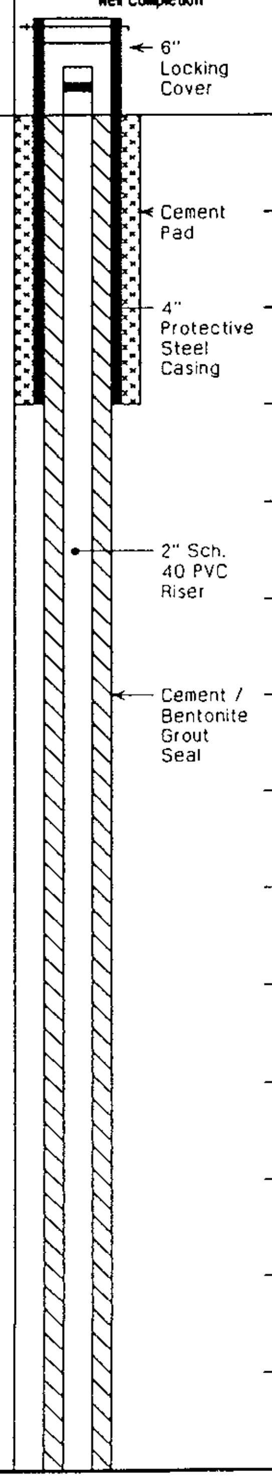
Elevation: 647.42

Driller: Aquifer Drilling & Testing	**Drilling**	**Date**	**Time**
Drill Method: Hollow Stem Auger - Mobile Drill B-59	**Started**	8/16/95	14:17
Sample Method: 2' Stainless Steel Split Spoon	**Finished**	8/18/95	10:22

Borehole Diameter: 8 1/4 in. | **Water Level:** 30.23 / 620.55 | **Logged By:** J. Zera | **Checked By:** C. Spalding

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Graphic Log	Materials Description
						See Logs for PB-2 (20 ft. SW) and for PW-3 (20 ft. w). Augers turned to 15 ft. bgs., then water rotary used to 48 ft. bgs.
				1		
				2		
				3		
				4		
			0.0 0.0	5		
				6		
				7		
				8		
				9		
			18/6 2.0	10		
				11		
			9/5	12		
				13		

Well Completion



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Log of Well PO-1
GE Loeffel
GE
Nassau, NY

Job Number: 7666-011

Elevation: 647.42

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				15			
				16			
				17			
				18			Cement / Bentonite Grout Seal
				19			
			8/4 inop.	20		Thread-cutting oil-like odor noticed between 18 to 22 ft. bgs.	
				21			
				22			
				23			2" PVC Riser
				24			
			2/1.5 –	25			
				26			
				27			
				28			
				29			
			3/1.5 –				

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Log of Well PO-1
GE Loeffel
GE
Nassau, NY

Job Number: 7666-011

Elevation: 647.42

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
			3/1.5 -				
				31			
				32		Black film noted on drill water in tub. Possible carbonaceous film from rock fragments.	
				33			Bentonite Chip Seal
				34			
			3.25/2.25 -	35			No. 0 Sand Pack
				36			
				37			
				38			
				39			No. 1 Sand Pack
				40			
				41			
				42			2" Stainless Steel Screen
				43		COBBLE	
				44			
				45			

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Log of Well PO-1
GE Loeffel
GE
Nassau, NY

Job Number: 7666-011

Elevation: 647.42

Sample No./Depth Range	Recovery (ft.)	Blow Counts	PID/FID (PPM)	Depth (feet)	Graphic Log	Materials Description	Well Completion
				47			
				48		Bottom of boring kept above bedrock.	Unremovable Drill Cuttings
				49			
				50			
				51			
				52			
				53			
				54			
				55			
				56			
				57			
				58			
				59			
				60			
				61			

CALENDAR OF FIELD ACTIVITIES
SUMMER 1995

July

1995 **1995**

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	6	7	8
9	10	11	12 Mobilization	13 Mobilization	14 Drill to 44' bgs @ 216 w/8" hammer	15
16	17 Ream 216 w/12.5" hammer to 43' bgs	18 Finish 216 ream to 44' bgs; 8" casing to 44' Grout	19 Drill 215 to 33' bgs w/10" hammer	20 Drill 215 to 94' bgs; BR @ 93'; Received trailer; Sample hydrant	21 Drill 216 44-108' bgs w/7 ⅝" roller bit to 10' bgs; 2 angle borings	22
23 / 30	24 4" casing to 108' bgs @ 216; 215 drilled to 100' bgs w/12.5" bit / 31 Cored 216, 224.5-261'; WL survey	25 Cored 216; 217 drilled, cased and grouted to 15'; 215 cased to 8"/100'	26 Cored 216, 134.5-154.5'; 215 drilled to 111'; 7 ⅝" hammer	27 Cored 216, 154.4-184.5'; 4" casing set @ 215 to 111'	28 Cored 216, 184.5'-224.5'	29

August

1995 1995

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1 Packer test set-up on 216; Core rig set up on 215	2 216 packer test; Cored 215, 111-117'	3 216 packer test completed; Cored 215, 117-157'; 216 backfilled to 171'	4 216's 4" casing removed and new 4" set; Cored 215	5
6	7 Cored 215 to 199.2'; 216 grouted; Leachate tank pumped	8 Core 215 to 233'; Develop 216 w/data collection	9 Finish coring 215 to 243.5'; Develop 216 w/data collection	10 PB-2 augered to 22'; Develop 216 w/data collection	11 PB-2 drilled to 51' and 4" casing set	12
13	14 PB-2 grouted; 216 gets protective casing	15 PW-3 drilled to 48'; 215 completed w/1" PVC; 217 drilled 15-60'	16 PW-3 completed w/2" PVC; PO-1 augered to 15'; 215 partially grouted	17 215 grouted 92' to surface; 217 drilled 60-118'; Shramm rig off site	18 PO-1 drilled to 48' and completed w/2" PVC; 217 gets 4" casing to 117'	19
20	21 PB-2 cored to 61'	22 PW-3, PB-2 and PO-1 developed; PB-1 drilled and abandoned; PW-1 augered 10'	23 PW-1 gets 6" casing grouted to 16'; PB-1 augered 18'	24 Transducers set in PW-3, PB-2 and PO-1; PB-1 gets 6" casing to 20'	25 PW-1 drilled to 63' completed w/2" PVC; Weather station logging B.P.	26
27	28 PB-1 drilled to 55.4' and 4" casing grouted; 2 roll-offs leave site	29 PW-2 drilled and completed w/4" protective casing and 2" PVC	30 Cored PB-1, 56-57.9'	31 PB-1 drilled to 95'; Backfilled to 72'; Completed w/1" PVC		

September

1995 1995

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
					1 GMW11 series wells get transducers 217 cored, 117-125.5'; 2 roll-offs depart	2
3	4	5 217 cored, 125.5-157' and developed; Preliminary pump test on PW-2	6 217 grouted PW-2 pump test initiated	7 End of PW-2 pump test; PW-1 pump test started and finished; 6 well-pad holes dug	8 215 developed; GMW1 series wells get transducers including leachate tank and GMW2b	9
10	11 Leachate tank pump test 1; Datalogger reprogrammed; 11 well-pad repairs	12 Leachate tank pump test 2; Mini-pump test on GMW1b;	13 Demobilization	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30

WELL CONSTRUCTION LOGS FOR WELLS INSTALLED FALL 1995

WELL CONSTRUCTION LOG	PROJECT GE Loeffel		PROJECT NUMBER 7666-005	WELL NUMBER OMW-218
SITE Mead Road, Nassau, New York	COORDINATES 933230.0 / 707115.347	GROUND SURFACE ELEVATION 652.6 ☒ Surveyed ☐ Estimated		CASING STICKUP 2.57

Soil Boring Cross-Reference **OMW-218**

Town and City *Nassau*

County and State *Renesselear, NY*

Installation Date (s) *11/21,22,27/95*

Drilling Method *Mobile Drill B-59 / Wire-line*

Drilling Contractor *Aquifer Drilling & Testing*

Drilling Fluid *Potable Water w/ Dye*

~100 ppb, Red Liquid 50, Lot #3330 (Rhodamine)

Development Technique (s) / Dates

2" Grundfos submersible pump

11/17-21/95

Fluid Loss During Drilling (gals) *>967 gal*

Water Removed During Development (gals)

1340.5 gal - 11/17-21/95

Static Depth to Water Date *1/4/96*

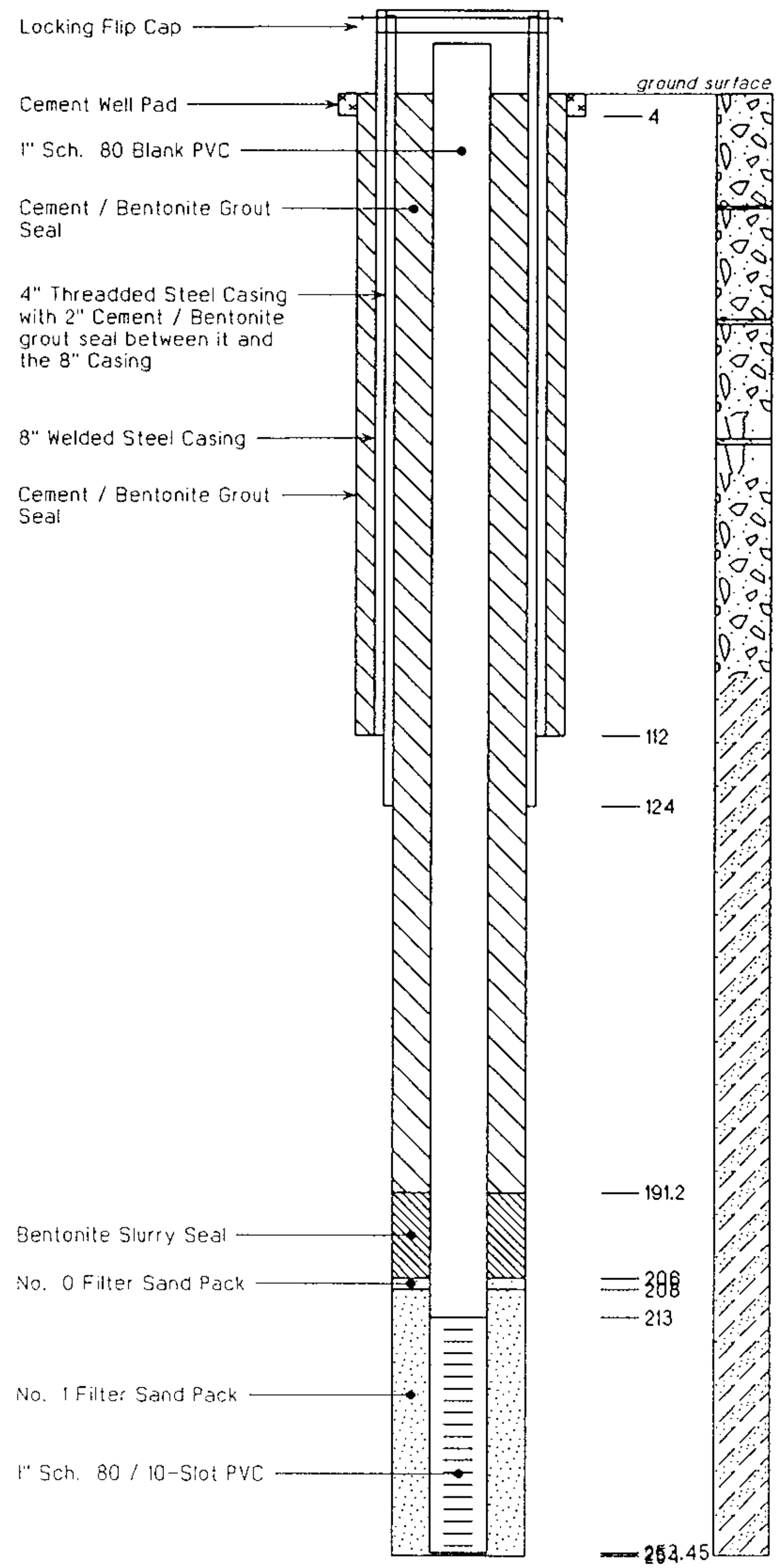
Static Depth to Water (feet) *55.83*

Well Purpose *Monitoring ground water*

Remarks

Prepared By *J.J. Zera*

Date Prepared *1/8/96*



GeoTrans, Inc.

WELL CONSTRUCTION LOG

PROJECT	PROJECT NUMBER	WELL NUMBER
GE Loeffel	7666-005	OMW-219

SITE	COORDINATES	GROUND SURFACE ELEVATION	CASING STICKUP
Mead Road, Nassau, New York	932867.002 / 707652.188	665.60 ☒Surveyed ☐Estimated	2.96

Soil Boring Cross-Reference *OMW-219*

Town and City *Nassau*

County and State *Renesselear, NY*

Installation Date (s) *12/27-29/95*

Drilling Method *Mobile Drill B-59 / Wire-line*

Drilling Contractor *Aquifer Drilling & Testing*

Drilling Fluid *Potable Water w/ Dye*
~100 ppb, Red Liquid 50, Lot #3330 (Rhodamine)

Development Technique (s) / Dates
2" Grundfos submersible pump
11/12-13/95

Fluid Loss During Drilling (gals) *n/a*

Water Removed During Development (gals)
224.3 - 12/12-13/95

Static Depth to Water Date *1/4/95*

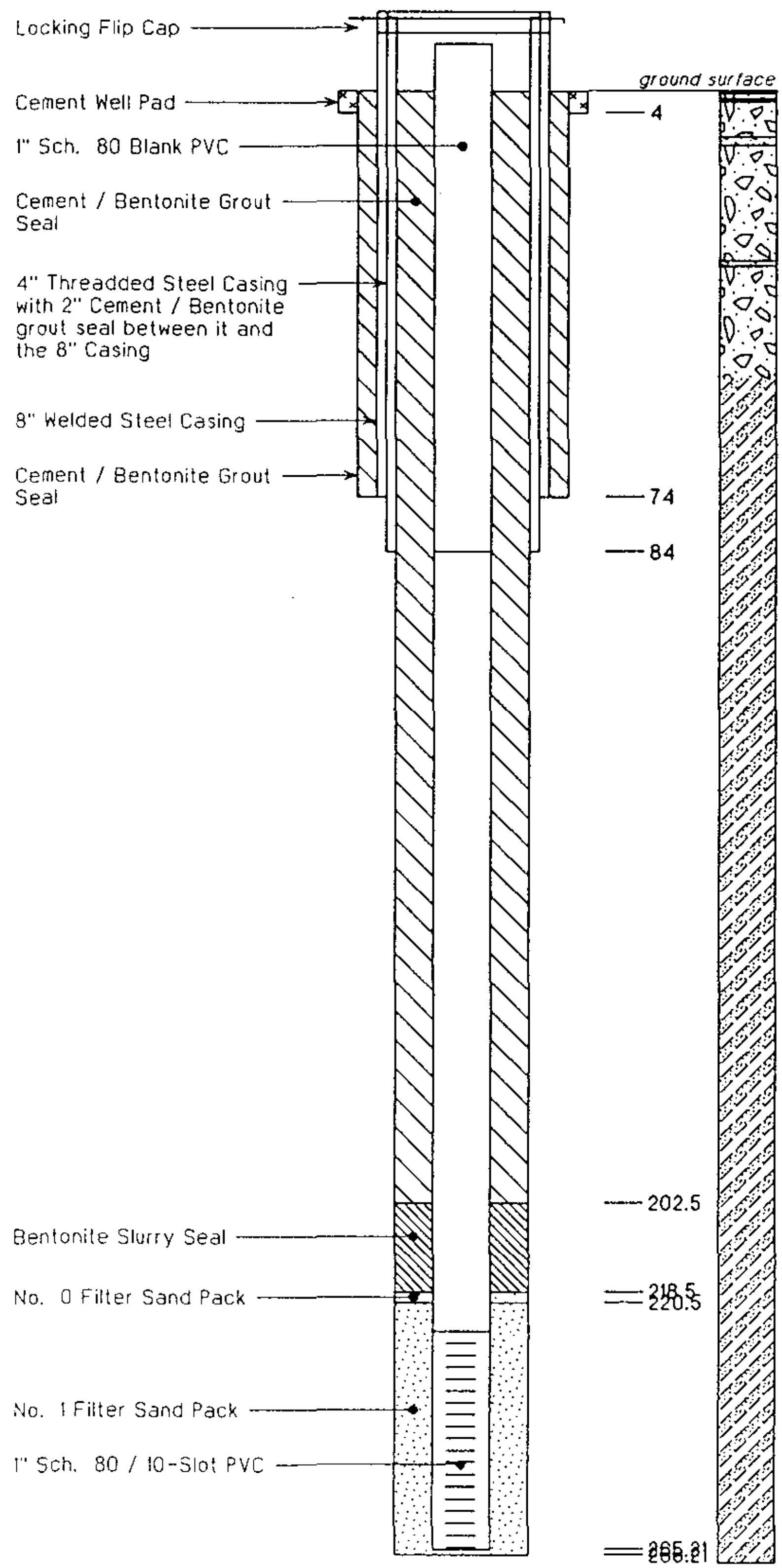
Static Depth to Water (feet) *58.34*

Well Purpose *Monitoring ground water, Packer Testing*

Remarks

Prepared By *J.J. Zera*

Date Prepared *1/8/96*



APPENDIX C

WELL CONSTRUCTION PROTOCOLS, WELL SCHEMATICS AND GEOLOGIC LOGS FOR WELLS INSTALLED FALL 1995

1 RI ACTIVITIES COMPLETED FALL 1995

Review of initial results of groundwater quality data collected September 11 to 15, 1995 suggested that additional deep bedrock wells were required for a more complete understanding of subsurface conditions. Following verbal approval from NYSDEC on October 13, 1995, two deep bedrock wells were installed (November 7 to December 27, 1995). Well specifications, protocols, well schematics, and geologic logs are included.

2 DEEP BEDROCK WELL INSTALLATIONS

The two deep bedrock wells installed during the Fall 1995, OMW-218 and OMW-219, were selected to characterize groundwater flow and water quality south and southwest of the site. Well completions were performed under the same protocols described for OMW-215 and OMW-216. Corehole testing intervals were selected to be equivalent to the bottom of adjacent wells OMW-212 and OMW-213 (Figure 1) and the bottom of 191-05-21B. A summary of well specifications is provided in Table 1.

3 DRILLING OF OMW-218

The following procedures were used to complete drilling at OMW-218.

1. Air rotary methods were used to advance the drilling through the overburden and bedrock to the predetermined depth for coring operations (124 ft bgs). A 12-inch, stabilized roller bit was advanced through the overburden 10 feet into competent bedrock (112 ft bgs). Samples of the return cuttings were placed in glass jars every ten feet for headspace analysis and geologic logging.

2. An 8-inch ID steel isolation casing was installed from ground surface to 112 feet bgs and pressure grouted via a tremie-pipe to seal off the unconsolidated deposits. Grout density was monitored using mud balance with criteria of 13 to 15 pounds per gallon.

3. The grout was allowed to cure for 24 hours.

4. A 7-⅞-inch air hammer bit was advanced through the bedrock to the 124 feet bgs. Samples of the return cuttings were placed in glass jars every ten feet for

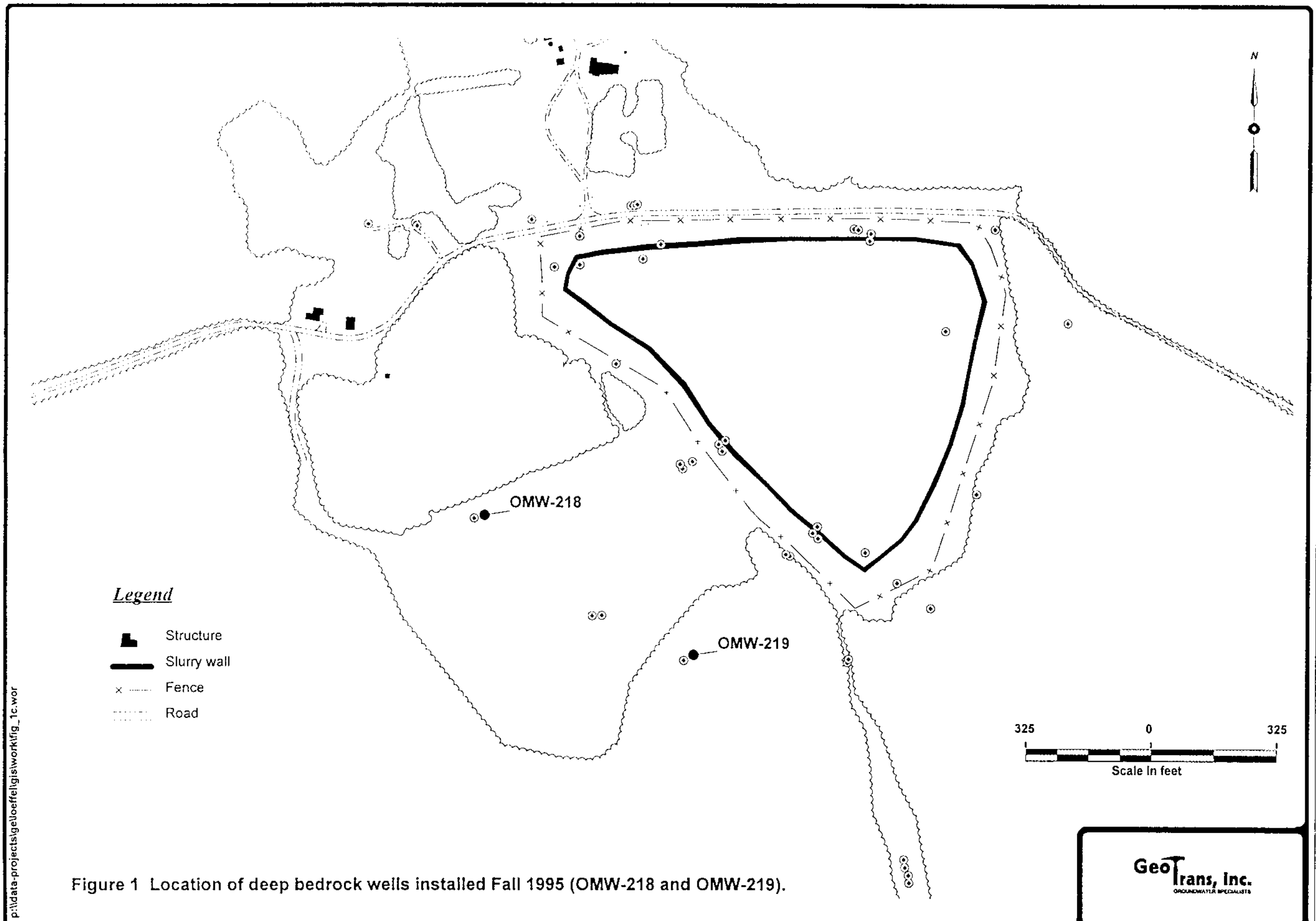


Figure 1 Location of deep bedrock wells installed Fall 1995 (OMW-218 and OMW-219).

Table 1. Well specifications of RI wells.

MW/Piez ID	Elevation of MRP (ft MSL)	Ground Surface Elevation (ft MSL)	Depth to Top of Bentonite Seal (ft bgs)	Depth to Top of Sand Pack (ft bgs)	Depth to Top of Screened Interval (ft bgs)	Depth to Bottom of Screened Interval (ft bgs)	Depth to Bottom of Borehole (ft bgs)	Casing Diameter and Material	Geologic Description Screened Interval	Monitoring Interval Elevation (ft MSL)	Open Hole Interval (bgs)
OMW-218	655.07	652.60	191.20	206.00	213.00	253.45	254.00	1" PVC	Bedrock	439.60 - 399.2	-
OMW-219	668.56	665.60	202.50	218.50	225.21	265.21	266.21	1"PVC	Bedrock	440.4 - 400.4	-

Notes:
1) MRP - Measured Reference Point marked on top of the lower portion of the protective casing.
2) PVC - Polyvinyl Chloride
3) Survey data source: Blasland & Bouck (1992a) plus the distance from the top of the inner casing (where present) to the top of the lower portion of the outside protective casing as measured in the field by GeoTrans.
4) Monitoring interval based on top of screen to bottom of screen or open borehole.

headspace analysis and geologic logging. A 4-inch temporary casing and shale trap was set in five feet of hydrated bentonite chips to 124 feet bgs. The bentonite was allowed to hydrate overnight.

5. A 3-25/32-inch (HQ) core barrel was used to core to a set depth of 254.0 feet bgs. Each core run was sampled, logged, and boxed. A water balance was maintained to quantify the amount of drilling fluids that entered and exited the borehole. The coring fluid was dyed with a fluorescent tracer at consistent low concentrations.

6. Packer testing was not attempted due to the risk of loosing packers in the highly fractured and faulted corehole. A short-term pumping test, however, was completed over the entire interval to remove drilling fluids, obtain hydraulic data, and screen groundwater concentrations.

7. A 40-foot, 10-slot, Schedule 80, PVC screen with appropriate PVC riser was lowered to a monitoring depth of 254.0 feet bgs.

8. The sand pack consisted of 48 feet of Number 1 quartz sand, followed by two feet of Number 0 quartz sand, and 14.8 feet of bentonite slurry. The remaining annulus was pressure grouted via tremie-pipe to ground surface. Grout density was monitored using mud balance with the criteria of 13 to 15 pounds per gallon.

9. Completion included a stickup protective casing with lock, a PVC slip-cap, and a temporary concrete pad. A permanent 3-foot diameter, 4-foot deep cement pad is to be installed Spring 1996.

4 DRILLING OF OMW-219

The following procedures were used to complete drilling at OMW-219.

1. Air rotary methods were used to advance the drilling through the overburden and bedrock to the predetermined depth for coring operations. A 12-inch, stabilized roller bit was advanced through the overburden 10 feet into competent bedrock (74 ft bgs). Samples of the return cuttings were placed in glass jars every 10 feet for headspace analysis and geologic logging.

2. An 8-inch ID steel isolation casing was installed from ground surface to 74 feet bgs and pressure grouted via a tremie-pipe to seal off the unconsolidated deposits. Grout quality was monitored using mud balance with criteria of 13 to 15 pounds per gallon.

3. The grout was allowed to cure for 24 hours.

4. A 7-7/8-inch air hammer bit was advanced through the bedrock to the top of the desired coring depth of 84 feet bgs. Samples of the return cuttings were placed in glass jars every ten feet for headspace analysis and geologic logging. A 4-inch casing was set in five feet of hydrated bentonite chips to 84 feet bgs. The bentonite was allowed to set-up for several days prior to coring operations.

5. A 3-25/32-inch (HQ) core barrel was used to core to a depth of 265 feet bgs. Each core run was sampled, logged, and boxed. A water balance was maintained to quantify the amount of drilling fluids that entered and exited the borehole. The coring fluid was dyed with a fluorescent tracer concentration of 100 ppb.

6. Following packer testing, a 40-foot, 10-slot, Schedule 80, 1-inch PVC screen and riser was lowered to a monitoring depth of 265 feet bgs.

7. The sand pack consisted of 45 feet of Number 1 sand, followed by two feet of Number 0 sand, and 16 feet of bentonite slurry. The remaining annulus was pressure grouted via tremie-pipe to ground surface. Grout quality was monitored using mud balance with criteria of 13 to 15 pounds per gallon.

8. Completion included a protective casing with lock, a PVC slip-cap, and a temporary concrete pad. A permanent 3-foot diameter, 4-foot deep cement pad will be installed Spring 1996.

GEOLOGIC LOGS FOR WELLS INSTALLED FALL 1995

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	1 of 7	OMW-218

SITE	COORDINATES	LOGGED BY	CHECKED BY
Mead Road, Nassau, New York	933230.0 / 707115.347	James Zera	Chuck Spalding

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
11/8/95	11/16/95	Aquifer Drilling & Testing	Mobile Drill B-59 / Wire-line	3.78125"	254

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
125.8 / 97	8	0	2.57	652.6	∇ / *652.6* ▼ 54.2 / *598.4*	102 / *550.6*

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
NONE	8"/112'; 4"/124'	

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					0			Dense to very dense, CLAYEY TILL (10R 4/2) with sand to cobble boulder size shale (10R 3/4-5BG 5/2) and quartzite (5B 7/1). Rounded sand to cobble size quartz and quartz conglomerate makes-up <5% of the matrix. Dry to moist.	Air rotary drilling with 12" roller bit. Rig: Reich Drill T-650W Driller: Jeff Jaworski (ADT) Dates: 10/31-11/1/95
					5				
					10			SAME	Headspace (HS) 0.0 ppm
					15				
				633.1 *639.5* 20.0	20			Cobble to 20 ft.	HS 0.0 ppm
					25				
					30			SAME	HS 0.0 ppm
					35				

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	2 of 7	OMW-218

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
				613.6 39.0		Cobble to 40 ft.	
				612.6 40.0	40	SAME (TILL)	HS 0.0 ppm
			0.86		45		
					50	SAME	HS 0.0 ppm
			0.76		55		
				596.6 56.0		Start of cobble-rich zone that ends around 71 ft.	
				592.6 60.0	60	SAME. Cobble to 61 ft.	HS 0.0 ppm
				591.6 61.0			
					65		
				586.6 66.0			
					70	SAME	HS 0.0 ppm
			0.85		75		

GEOLOGIC DRILL LOG	PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
	GE Loeffel	7666-005	3 of 7	OMW-218

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					80			SAME	HS 0.0 ppm
			0.83		85				
					90			SAME, but is very dry since ~88 ft.	HS 0.0 ppm
			0.78		95			SAME, but moist.	
					100			SAME	HS 0.0 ppm
				550.6 102.0				Top of BEDROCK. Powder to medium cuttings of 5R 4/2-10R 2/2 and 5GY 5/2 Shale, "dirty/sugary" 5BG 7/2 Quartzite and trace fragments of N9 Calcite. Dry.	
					105				
			0.55						
					110				HS 0.0 ppm
								SAME	
									Bottom of 12" bore. Set 8" casing to here. 7 7/8" hammer bit used to 124 ft.
			3.06		115				

GEOLOGIC DRILL LOG	PROJECT GE Loeffel	PROJECT NUMBER 7666-005	SHEET NO. 4 of 7	HOLE NUMBER OMW-218

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER Elev. Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
			3.29		120			SAME	HS 0.0 ppm Set 4" casing to 124 ft. with 10 ft. bentonite seal.
1	6/92%	53% 15	n/a		125			SHALE (5R 4/2 to 10R 2/2; sparse 5GY 5/2) interbedded with f-grained WACKE (5GY 7/2-N9-5BG 5/2 blend). Bedding ranges from laminea to .21 ft. for the shale and to 0.6 ft. for the wacke, and dips 15 deg. across core. Ripple marks are noted in the larger beds of wacke, marked by silt (10R 3/4) and/or carbonaceous (N1) bedding-plane laminations.	core interval: 124-254 ft. Water In: 1121.5 gal Water Out: 920.5 gal Net Water: -201 gal
2	9.7/100%	47% 15/15/20	0.18		130 135			SAME, to 135 ft. Top of 3.5 ft (5GY 5/2) shale laminae zone with minor beds of wacke. Bed contains a vertical fracture with 10YR 5/4 staining. Remaining core contains many friable zones and poorly developed slickensided /striated faults 30-35 degrees across bedding.	Water In: 1400 gal Water Out: 1470 gal Net Water: +70 gal Influent water meter broken due to icing. "In" amounts estimated off graduated poly tank for remainder of coring operations.
3	6.8/88%	40% 45/65/70	0.12		140 145			SAME, with first appearence of thin calcite (N9) veinlets that offset bedding by 0.01 ft. 143.9-146.8 ft is another 5GY 5/2 shale laminae zone with fault surfaces streaked with metallic- yellow sulfides that easily flake-of. Positive ID for Bornite and pyrite (massive).	Water In: 800 gal Water Out: 809 gal Net Water: +9 gal
4	4.5/96%	33% 75/85/85	0.11		150			SAME, with continued striated slips along steep bedding planes. Few thin, calcite healed fractures that are confined in a 0.05 ft bed of wacke, perpendicular to the bedding planes. Last ~0.5 ft is highly fragmented.	Water In: 670 gal Water Out: 706 gal Net Water: +36 gal
5	5.5/104%	47% 90/35/45	0.11		155			SAME. First 2 ft of core is very deformed (Photo). Possible fold hinge. 153.3 ft is an abrupt (fault) transition to 10Y 6/2 shale laminae interbedded with wacke. Multiple calcite veinlets /veins noted as well as	Water In: 800 gal Water Out: 1826 gal Net Water: n/a gal Discharge line to

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	5 of 7	OMW-218

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								continued sufide streaking of slip surfaces. Last 0.6 ft of run has a gradational color transition back to red beds.	storage tanks was cleared using compressed air thus creating a false 'water out' meter reading.
6	7.9/99%	59% 65/45/50	0.09		160			SAME to 157.1 ft. 0.7 ft wacke bed (10G 4/2 and N7; 50/50 sugary mix). Color due to higher glauconite and/or chlorite content. 162.4 ft marks an unconformity (Photo). Remainder of core is severely deformed and silt sized muscovite is pervasive througout giving the core a silver sheen when dry. No preferred orientation was observed for the muscovite.	Water In: 1100 gal Water Out: 1090 gal Net Water: -10 gal Blocked core barrel.
7	1.9/95%	0% 50	0.14		165			SAME.	Water In: 200 gal Water Out: 204 gal Net Water: +4 gal
8	4.8/96%	73% 50/50/55	0.11		170			Another wacke bed (as 157.1-157.8) to 168.15 calcite vein. 10R 4/2 shale intebedded with few 10Y 6/2 laminae to end.	Water In: 650 gal Water Out: 624 gal Net Water: +26 gal
9	10/94%	70% 55/20/55	0.20		175 180			Highly fractured wacke bed to 174 ft with calcite infilling (Photo) exhibiting (10YR 8/2 and 5YR 8/4) staining. Few fractures are only partially healed and contain tiny euhedral calcite crystals (Photo). 173 ft has 0.1 ft, well lithified, brecciated fault. 10R 3/4 and 10GY 5/2 interbedded shale make up the remainder of the run and the beds do not exceed 0.3 ft in height. Multiple micro-offsets and highly variable bedding dip directions hint at multiple compression and slip vectors. Rip-up clast is notable (Photo).	Water In: 700 gal Water Out: 682 gal Net Water: -18 gal
1C	9.7/97%	93% 35/45/30	n/a		185 190			SAME to 187.5 ft. 10Y 6/2 zone of laminae to 189.8. Sulfides still common along slip planes, but muscovite is now absent. Few calcite veinlets and veins.	Water In: 1004 gal Water Out: 932 gal Net Water: -72 gal Influent water meter back in service. Problems with rig's gearbox / lost low-gear.
11	7.5/97%	61% 25/30/50	0.15		195			SAME with multiple wacke laminae and beds and multiple calcite veinlets perpendicular to bedding. (Photo) of core friability.	Water In: 900 gal Water Out: 850 gal Net Water: -50 gal Blocked core

GEOLOGIC DRILL LOG	PROJECT GE Loeffel	PROJECT NUMBER 7666-005	SHEET NO. 6 of 7	HOLE NUMBER OMW-218

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
									barrel.
12	2.2/96%	91% 55/90/89	0.14		200			SAME, but beds transition to vertical ~0.6 ft into this run after a deformed zone (Photo).	Water In: 352 gal Water Out: 323 gal Net Water: -29 gal
13	10.3/103%	95% 90/80/65	0.18		205 210			SAME with multiple calcite veinlets, few veins, and a good fracture at 208.7.	Water In: 1061 gal Water Out: 1036 gal Net Water: -25 gal
14	7.3/95%	77% 60/55/60	0.16		215			SAME. Intact slip that offsets bedding by 0.075 ft indicative of a reverse fault. Increase in the frequency of wacke beds.	Water In: 739 gal Water Out: 741 gal Net Water: +2 gal
15	2.6/113%	100% 65/75/60	0.16		220			SAME.	Water In: 583 gal Water Out: 320 gal Net Water: -263 gal
16	9.3/98%	67% 55/55/50	0.16		225 230			SAME. Photo of wacke confined calcite veins that run perpendicular to bedding. Another 10Y 6/2 laminae zone 224-225.2 ft. Deformed zone / possible breccia from ~228-230 ft (Photo). Remainder is same as before.	Water In: 1564 gal Water Out: 1186 gal Net Water: -378 gal
17	6.6/101%	91% 50/50/45	0.16		235			SAME	Water In: 1128 gal Eff. meter ceased functioning, but driller confirmed

GeoTrans, Inc.

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	7 of 7	OMW-218

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
							water loss during this run.
18	3.55/101%	89% 45/45/30	0.15		240	SAME, with a zone of deformation from 240.6 to the end. Zone contains some thin, open fractures.	Inf. water meter broken. Confirmed water loss with ~30 gpm in with a return of ~5 gpm. Equilibrium reached @ ~12 gpm in, with ~5 gpm out.
19	7.6/95%	58% 35/65/55	0.16		245	SAME	Water In: 1013 gal Water Out: *370 gal *Eff. meter reattached 5 ft into this run.
20	3.5/78%	87% 65/60/58	0.23	*398.6* 254.0	250	SAME	Water In: 491 gal Water Out: 370 gal Net Water: -34
					255	Bottom of boring.	
					260		
					265		
					270		
					275		

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	1 of 7	OMW-219

SITE	COORDINATES	LOGGED BY	CHECKED BY
Mead Road, Nassau, New York	932867.002 / 707652.188	James Zera	Chuck Spalding

BEGUN	COMPLETED	DRILLER	DRILL EQUIPMENT	BORING DIA.	TOTAL DEPTH
11/29/95	12/8/95	Aquifer Drilling & Testing	Mobile Drill B-59 / Wire-line	3.78125"	268

CORE RECOVERY (FT./%)	CORE BOXES	SAMPLES	CASING STICKUP	GROUND ELEV.	DEPTH/*ELEV.* GROUND WATER	DEPTH/*ELEV.* TOP OF ROCK
168.35 / 97	11	0	2.96	665.60	/ *665.6*; 58.34 / *607.3*	52.5 / *613.1*

SAMPLE TYPE	CASING DIA/LENGTH	NOTES
NONE	8"/74'; 4"/84'	

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
				665.1 .5		10YR 6/6-5YR 5/6 WEATHERED CLAYEY TILL. Some roots. Wet.	Air rotary drilling with 12" roller bit on 12' stabilizer.
			0.89	*664.1* *663.6* 2.0		Dense to very dense, CLAYEY TILL (10R 4/2) with sand to cobble boulder size shale (10R 3/4-5BG 5/2) and quartzite (5B 7/1). Rounded sand to cobble size quartz and quartz conglomerate makes-up <5% of the matrix. Moist. Cobble 1.5-2 ft.	Rig: Reich Drill T-650W Driller: Jeff Jaworski (ADT) Dates: 11/3-11/6/95
			0.85		5		
				657.1 8.5		BOULDER to 10 ft.	Very noisy since initial ground break.
				655.6 10.0	10	SAME. (TILL).	Headspace (HS) 0.0 ppm
			0.73				
					15		
			0.83				
					20	SAME.	HS - 0.0 ppm
			0.79				
					25		
			0.93				
					30	SAME.	HS - 0.0 ppm
				634.6 31.0		COBBLE to ~32 ft.	
			0.80	*633.6* 32.0			
					35		Smoother, quieter drilling /

GEOLOGIC DRILL LOG	PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
	GE Loeffel	7666-005	2 of 7	OMW-219

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
								less "bony".
			1.35					
					40		SAME.	HS - 0.0 ppm
			1.09					
					45			
			0.86					
					50		SAME.	HS - 0.0 ppm
			0.72	*613.1* 52.5			Top of BEDROCK. Powder to medium cuttings of 5R 4/2-10R 2/2 and 5GY 5/2 Shale, "dirty/sugary" 5BG 7/2 Quartzite and trace fragments of N9 Calcite. Moist.	Pressure: 800 Kpa Air: 50 psi - 360 psi (pulsed) Rotational hydraulic pressure: 1200 psi
					55			
			0.30					
					60			
			0.44					
					65			
			0.43					
					70			
			0.64					
					75			Bottom of 12"

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	3 of 7	OMW-219

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
					80				bore. Set 8" casing to here. 3 7/8" roller bit used to 84 ft. Bottom of 3 7/8" bore. (84') Set 4" casing to here with 10 ft. bentonite seal.
1	8.7/97%	79% 30/20/10	0.12		85 / 90			SHALE (10R 3/4) interbedded with f-grained WACKE (5GY 7/2-N9-5BG 5/2 blend). Bedding ranges from laminea to .1 ft. for the shale and to 0.2 ft. for the wacke. Ripple marks are noted in the larger beds of wacke, marked by silt (10R 3/4) and/or carbonaceous (N1) bedding-plane laminations. Multiple possible bedding-plane slips with 10YR 8/6-10YR 6/6 staining. ~87.5-88.2 ft marks two bands of lithified breccia (photo). Few calcite veins.	Driller: Marty Harrington (ADT) core interval: 84-258 ft. Water In: 1525 gal Water Out: n/a gal Effluent water meter broken due to icing.
2	9.55/96%	92% 10/15/15	0.18		95 / 100			SAME. Possible flame structures indicative that bedding is right -side up.	Water In: 691 gal
3	6/100%	73% 10/15/20	0.17		105			SAME. Open, thin fracture zone 105.3-107 ft with some calcite motling.	Water In: 700 gal Influent water meter broken due to icing. Readings taken off of the graduated poly tank until otherwise noted.
4	3.7/97%	92% 5/20/30	0.18		110 / 115			SAME. Open fracture at 112.3 ft. Intact slip with >.1 ft offset bedding at 115.3 ft. 45 degree fault at 117.2 ft with striations and a thin band of micro-breccia in a calcite matrix. Thin bed of wacke immidiately following this fault either represents the hinge of a tight fold or a small drag fold. (Photo of the striated slip)	Water In: 1000 gal

GEOLOGIC DRILL LOG	PROJECT GE Loeffel	PROJECT NUMBER 7666-005	SHEET NO. 4 of 7	HOLE NUMBER OMW-219

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
5	10/100%	77% 30/35/30	0.19		120 125			SAME, with some bright N9 calcite bedding plane laminations. Abundant beds of 10G6/2-5BG 7/2 f-m grained wacke due to an increase in glauconite and/or chlorite content. Thin, micaceous horizons noted in the wacke. Few calcite veinlets.	Water In: 900 gal
6	10/100%	79% 50/20/20	0.20		130 135			SAME with a transition out of the G-BG shale and wacke. Some open fractures and near-vertical calcite veinlets.	Water In: 700 gal
7	10/100%	86% 20/30/25	0.22		140 145			SAME, quiet, undeformed, thinly interbedded shale and wacke. Some calcite laminae parallel to bedding and veilets perpendicular to bedding. Some open fractures at both ends of the run.	Water In: 600 gal
8	9.55/96%	87% 20/20/15	0.22		150 155			SAME. First appearence of QUARTZ (N9) veins motled with 5Y 8/4 calcite that cut through a micro-breccia zone at 150-151 ft. Bedding dip reverses direction across this zone, but maintains the same angle. Few, very soft zones between 154-155 ft as well as open fractures nearly perpendicular to bedding @ 70 degrees of dip.	Water In: 650 gal

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	5 of 7	OMW-219

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
9	0.25/103%	93% 20/20/-	0.34		160, 165			SAME. Predominently shale. Few, partially calcite-healed veinlets. *Last three feet of run is very deformed, well lithified (breccia?) following a fracture just after 165 ft. Some, thin 5GY 5/2 bands in 10G4/2 matrix (No reds). Possible SILICEOUS MUDSTONE. Some quartz few and calcite veinlets.	Water In: 350 gal
10	7.4/99%	65% 50/30/40	0.22		170, 175			SAME. Deformed to 170 ft with multiple quartz / calcite veins. Some laminae 170-173 including a bed indicative of a fold apex. Color ranges 5GY 4/1-5GY 5/2 through 5BG 5/2. Reappearence of wacke bedding up to 0.4 ft thick near the end of the run. Note: colors of laminae = 5B 6/2 with 5GY 4/1 when wet.	Water In: 550 gal Blocked core barrel.
11	2.6/104%	100% 40/45/45	0.28					Back to 5R 4/2 shale laminae to 0.1 ft, interbedded with wacke laminae to 0.45 ft thick. Some calcite veinlets in the shale, and veins that are confined to the wacke beds.	Water In: 275 gal
12	10/100%	81% 40/10/25	0.26		180, 185			SAME. Notable zone of Si-mudstone and wacke 181.7-184 ft. Multiple calcite veinlets; some veins towards the end of the run.	Water In: 825 gal
13	9.1/91%	79% 60/40/35	0.26		190, 195			SAME. Rip-up clast of wacke suspended in the shale 189-190.5 ft.	Water In: 450 gal

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	6 of 7	OMW-219

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	GRAPHIC LOG	SAMPLE	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
14	1.5/30%	0% n/a	0.12*		200			Few recovered fragments sugggest the same as the previous run.	Water In: 650 gal Blocked barrel. Drilled-out ~3.5' of run.
15	5/100%	86% 25/25/25	0.28		205			Interbedded laminae of shale and wacke to 204.9 ft, bed of wacke to 105.6 ft. Remainder of core is deformed with a brecciated zone in a calcite (N9) matrix that spans the last foot. (photo)	Water In: 500 gal
16	9.8/98%	93% 33/50/-	0.23		210 215			Thin, undeformed bedding again to ~212 ft where deformation increases to a well-developed, slicken sided fault at 216.9 ft. Striations run parallel to the strike of the fault plane that dips 10-degrees. Euhedral, quartz crystal infilling noted in fractures around the fault. Quartz motling throughout run. Core aft of the fault is the same deformed (brecciated) rock described in CR-9.	Water In: 750 gal
17	10.1/101%	95% -/-/*	0.29		220 225			SAME to 225 ft. Fairly clean laminae zone (5Gy 6/1-5/2, 5Y 4/1, 5GY 6/1-2/1, N1). Prior to 225 ft, some weathered fractures quartz motling / veinlets. (3 photos)	Water In: 550 gal
18	10.1/101%	81% 30/40/45	0.26		230 235			SAME laminea zone. Some quartz veinlets and soft, papery faults. Pervasive, octagonal pyrite crystals (<= 1 mm) start at 236.5 ft. (photo) Last 0.3 ft of run is soft and deformed with some 5R 6/6 blotches. (photo)	Water In: 600 gal

GEOLOGIC DRILL LOG

PROJECT	PROJECT NUMBER	SHEET NO.	HOLE NUMBER
GE Loeffel	7666-005	7 of 7	OMW-219

continuation

RUN NUMBER	CORE RUN LEN AND REC (%)	RQD (%) BED DIP (deg)	DRILL RATE ft/min	LAYER *Elev.* Depth	DEPTH	DESCRIPTION AND CLASSIFICATION density, grain size/shape, color, structure composition, sorting, texture, moisture facies, odor	DRILLING NOTES water levels, water return, character of drilling, etc.
19	9.7/97%	86% 55/35/-	0.25		240, 245	SAME. One quartz vein. Last 1-foot of run is deformed.	Water In: 550 gal
20	10.3/103%	86% -/15/10	0.23		250, 255	SAME. Some deformed zones. (photo) Multiple quartz veinlets. Close-up photo of laminae with 0.015 ft off-sets / quartz veinlets.	Water In: 775 gal
21	10.1/101%	81% 5/5/10	0.26		260, 265	SAME.	Water In: 225 gal
				397.6 268.0	270, 275	Bottom of boring.	

GeoTrans, Inc.

APPENDIX D

AQUIFER TEST PROTOCOLS AND ANALYSIS

INTRODUCTION

This appendix presents the procedures used to obtain in-situ hydraulic conductivity values as part of the Remedial Investigation, Loeffel Site environs. GeoTrans Inc. personnel conducted in-situ hydraulic conductivity tests (slug tests). Slug tests to determine hydraulic conductivity were performed on piezometer OPZ-208 and wells OMW-209, -210, -211, -212, -213, and -214 between November 29 and December 3, 1994.

1 SLUG TEST PROCEDURES

Slug tests consist of causing a water-level rise within a well, piezometer, or packer interval and measuring the rate at which the water level returns to its original level. This rate of recovery can then be related to the hydraulic conductivity of the surrounding aquifer material. The slug tests were performed in accordance with ASTM method D4044-91 (ASTM, 1991).

The static water level in the well, piezometer, or packer interval was measured prior to the initiation of the test using a hand held water-level meter. In general, two falling-head slug tests were performed in order to demonstrate reproducible results. The tests were conducted by the rapid addition of a fixed volume of water into the well, piezometer, or packer interval. For the two-inch diameter wells, approximately one-half gallon of deionized water was added to the well. For the four-inch diameter wells, approximately 1.5 gallons of deionized water were added to the well. The volume of water added was determined as the amount that would cause a water-level rise in the well of approximately two feet. For a packer interval, a slug of deionized water was added to raise the water level approximately four feet per test. A larger water-level rise was desired in the packer intervals because of the potential of encountering a high conductivity zone where static conditions would occur quickly.

Changes in water levels were recorded digitally by the use of a pressure transducer and a data logger over time. A five or 15 psi pressure transducer, manufactured by Instruments Northwest, Inc. (INW) was submerged below the static water level to an optimum depth of approximately five feet in each well, piezometer, or packer interval and secured in place prior to starting the slug test. The pressure transducer was connected to an INW Aquistar Data Logger Model DL1-A to record the water-level changes at predetermined times throughout the duration of the test. The data logger was set to record water levels at shorter intervals during the beginning of the test when water levels change rapidly. Water levels are recorded less frequently as the test progresses, because the rate of change in the water level decreases over time. The individual tests were terminated when the water level returned to 80 percent of the original static level or two hours had elapsed.

After termination of the slug test, the data from the data logger were then downloaded to a laptop PC for analysis at a later time. To prevent cross-contamination between the wells, piezometers, or packer intervals, slug test equipment was decontaminated between each well, piezometer, or packer interval.

2 PACKER TESTING PROCEDURES

At the completion of coring, packer testing was performed to define vertical variation in groundwater quality and determine relative water yielding capabilities of bedrock intervals. Packer testing was only possible in OMW-216 and OMW-219. The risk of losing a packer assembly in the open corehole of OMW-215 and OMW-218 was great due to the highly fractured nature of bedrock observed in core samples. Thus, packer tests were not attempted on these wells.

Packer testing was completed in 42-foot intervals using a dual-packer system. During testing and sampling, the zone above the packers was monitored using a water-level probe as a check for leakage around the top packer. The interval below the lower packer was monitored using an air line attached to a differential pressure gauge.

Rhodamine WT, a potable-fluorescent dye, was used as a tracer of coring fluids. Water from the reserve drinking water reservoir for Nassau, New York, was mixed with the dye in a temporary polyurethane storage tank. This mixture was then used as a coring fluid. Tracer concentrations were monitored prior to entry in the borehole to ensure that a constant tracer concentration was maintained.

Piping between the packers was perforated to allow water to be removed from the test interval. Riser pipe lengths were linked together to the ground surface. The packer assembly was placed at pre-selected depths and the packers were inflated. Care was taken to maintain packer inflation pressures lower than the fracturing pressure of the bedrock. With the packers in place, interval testing proceeded. A 2-inch submersible pump was lowered to approximately 42 feet below the water surface on the inside of the assembly's 2-inch riser pipe. A 20 psi pressure transducer was attached to the pump's discharge line to a depth of 40 feet. The transducer was connected to a data logger and computer to record and observe changes in hydraulic head. Once water levels in the borehole had stabilized, pumping inside the riser pipe was initiated. Pumping rates started at 2 gpm but increased or decreased based on water level decline. Intervals with sufficient yield were sampled. If water levels dropped to the level of the submersible pump, pumping was terminated and recovery recorded. Under these circumstances, hydraulic conductivity was determined using slug test analyses.

Interval sampling did not occur until the tracer dye concentration within the test interval was below 10 percent of the original coring dye influent concentration as measured by the fluorometer. Groundwater samples from the producing packer intervals were analyzed for TCE and benzene. Analyses were performed in the field, using a Photovac 10S gas chromatograph with a photoionization detector. Following the cessation of pumping, water levels in each interval were allowed to recover to within 80 percent original static level. This procedure was repeated for successively higher zones in the open interval.

3 SINGLE WELL PUMPING TEST OF OMW-218

On November 17, 1995, a pumping test was performed over the entire cored interval of OMW-218 (124 to 253 ft bgs). The purpose of this test was to provide average conductivity hydraulic data for zones that could not be packer tested because of broken rock. The open corehole was pumped at a rate of 3.3 gpm and a total of 340 gallons were removed. During the pumping test, water level declines were detected in OMW-212 indicating that shallow bedrock was in hydraulic connection with the interval tested. During field screening no detectable levels of benzene or TCE were noted.

4 PUMPING TESTS

The location of each of the pumping tests was selected based on the location of known groundwater contaminants immediately outside the containment wall. In the northeast portion of the landfill, BTEX contaminants had been detected outside of the landfill in GMW-11 and GMW-11A. In the south-central and southeastern portions of the landfill, BTEX, TCE, and other contaminants had been detected in groundwater outside of the landfill in bedrock wells OMW-201 and OMW-204.

Prior to the pumping tests, the newly installed wells (PW-1, PW-2, PW-3, and PO-1) were developed using a Grundfos™ submersible (for 2-inch diameter wells) or Waterra™ lift pump (for 1-inch diameter wells). During the development of the pumping wells, water-level decline and flow rates were monitored to provide an estimate of the eventual pumping rate. Following development of the wells, pressure transducers were installed to collect water levels in all test wells for one week prior to pumping tests. Barometric pressure on site was monitored during, and one week prior to, the pumping tests with a digital recording barometer.

Well yields at PW-1 and PO-1 in the southeastern corner of the site were very low. Static water levels in these wells were not reached for at least three days following development. It is possible that either the wells are completed in naturally occurring low yield material, or they are located where wall materials flowed into native materials. In either case, a pumping test was not performed at this cluster because of the potentially long period of time required for a measurable water level response to be detected in the adjacent wells.

Two pumping tests were completed during the week of September 6, 1995. For these tests, water level changes in an overburden well inside the containment wall and a bedrock well outside of the containment wall were monitored for response to pumping an overburden well outside of the containment wall. All water level changes were monitored with pressure transducers and frequent manual water level readings for transducer calibration.

A 24-hour pumping test was performed on September 6 through 7, 1995 at PW-2, an overburden well outside the containment wall, with monitoring at GMW-11B, an overburden well inside the containment wall, and GMW-11A, a shallow bedrock well outside the containment wall. The average discharge rate from PW-2 was 2.75 gpm. Protocols as developed for the Third Work Addendum (GeoTrans, 1995) required that all tests continue for a minimum of eight hours, but could terminate prior to a maximum of 24 hours if a water level decline greater than 0.2 feet was detected on the well inside the containment wall. During this first pumping test, water levels rose in GMW-11B throughout the test. A groundwater sample was taken from PW-2 20 hours into the pumping test for VOC screening. Water level recovery data was collected in each monitoring well for two hours following the cessation of pumping.

The second pumping test was performed on September 7, 1995 at PW-1, an overburden well outside the containment wall, with monitoring at GMW-10B, an overburden well inside the containment wall, and PB-2, a bedrock well outside of the containment wall. Discharge from PW-1 was approximately 0.21 gpm. Nearly two-and-a-half feet of drawdown was detected in GMW-10B and the pumping test was terminated after eight hours. Water-level recovery data was collected for 5.5 hours following the test.

5 SLUG TEST ANALYSES

The analytical solution developed by Cooper et al. (1967) was used to analyze the slug test data from individual well and packer interval testing. This method is included in the commercially available software package AQTESOLV (Version 2.01, Geraghty & Miller, Inc.) for aquifer test analysis. The AQTESOLV program automates the process of curve matching that calculates aquifer transmissivity by relating the change in water level over time to the geometry of the well. Transmissivity is the rate at which groundwater is transmitted through a unit width of an aquifer under a unit hydraulic gradient. Hydraulic conductivity is then calculated by dividing transmissivity by the aquifer (or saturated) thickness. For the bedrock wells and packer intervals, the length of the open interval is taken to be the aquifer thickness, and full penetration is assumed. For the overburden wells, the distance from the top of the water table to the bottom of the screen was used for aquifer thickness. Calculated hydraulic conductivity values are provided in Table 3.2 (Volume I). Water levels during slug testing and analytical curve matches are provided as attached.

6 PACKER AND PUMPING TEST ANALYSES

Pumping test and packer test analyses were performed using AQTESOLV (Version 2.01, Geraghty and Miller, Inc.). Pumping tests were analyzed using the Theis (1935) or Hantush (1960) methods. Packer tests were analyzed using the Theis (1935) method or Cooper et al. (1967).

Results of the packer and pumping test analyses are provided in Volume I (Table 3.2). Water levels during pumping tests and analytical curve matches are provided as attached.

REFERENCES

ASTM, 1991. (Field Procedure) for instantaneous change in head (slug tests) for determining hydraulic properties of aquifers (D4044-91) in ASTM Standards on Groundwater and Vadose Zone Investigations.

Cooper, H.H., J.D. Bredehoeft, and S.S. Papadopulos, 1967. Response of a finite-diameter well to an instantaneous charge of water. *Water Resources Research*, 3(1): 263-269.

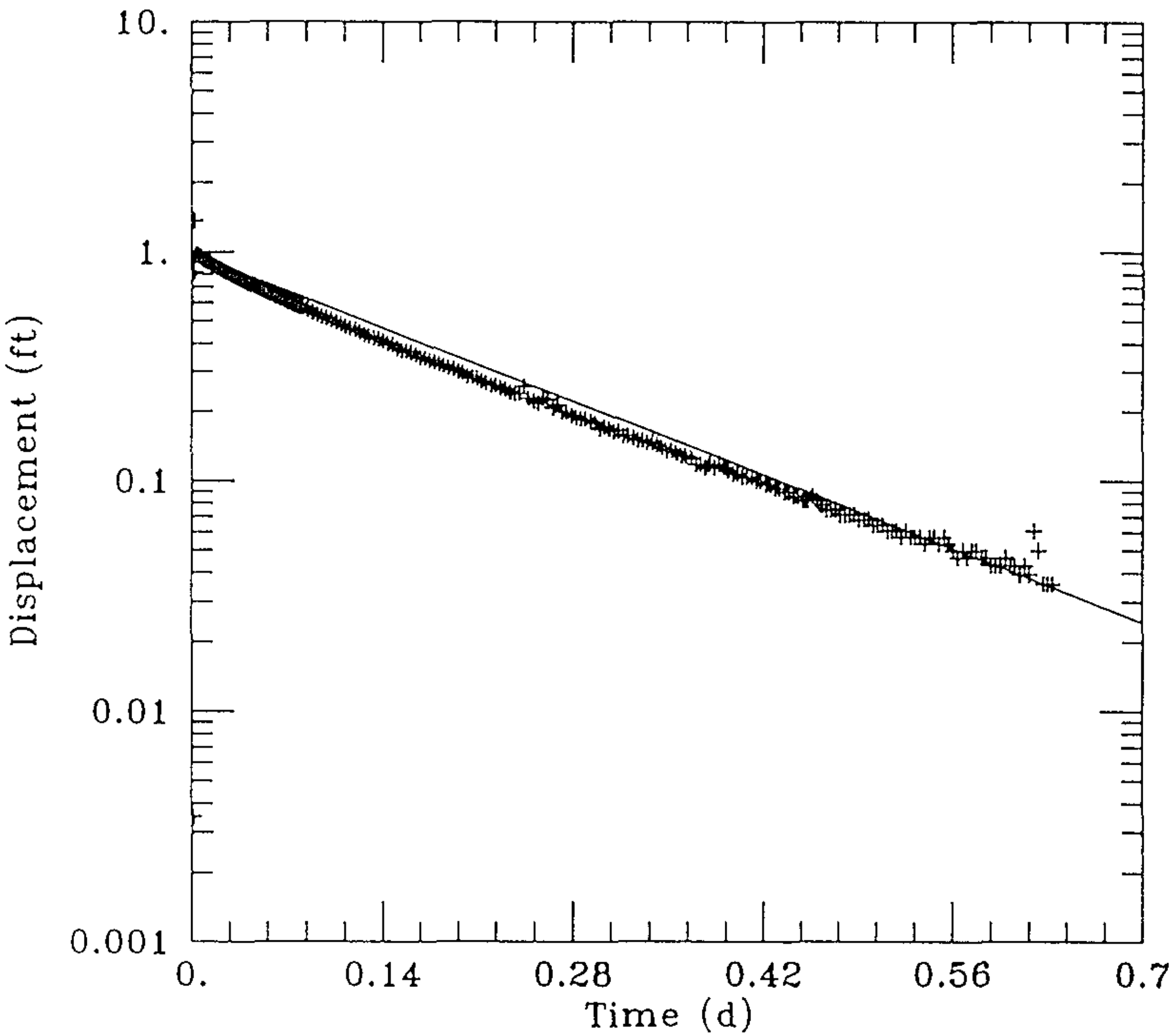
Hantush, M.S., 1960. Modification of the theory of leaky aquifers, *Journal of Geophys. Resources*, 65(11): 3713-3725.

Theis, C.V., 1935. The relation between the lowering of the piezometric surface and the rate and duration of discharge of a well using groundwater storage, Am. Geophys. Union Trans., 16: 519-524.

Client: General Electric	Company: GeoTrans Inc.
Location: GE Loeffel	Project: 7666-006

Slug Test

PB-1



DATA SET:
PB1SLG.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 12/15/95

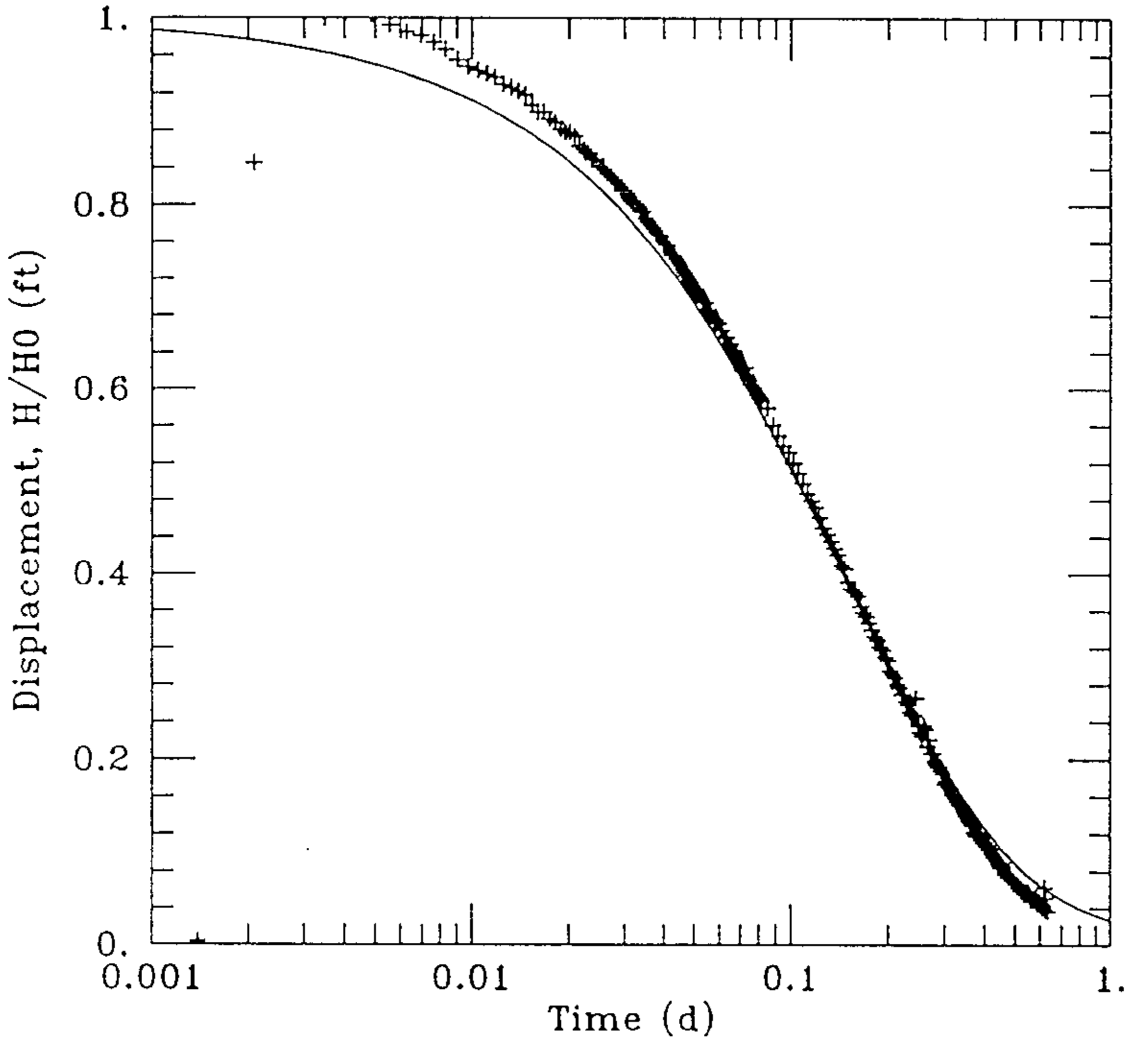
TEST DATA:
H0 = 0.9673 ft
rc = 0.0417 ft
rw = 0.1575 ft
L = 20. ft
b = 20. ft
H = 20. ft

PARAMETER ESTIMATES:
K = 0.005397 ft/d
y0 = 0.9681 ft

AQTESOLV

Client: General Electric	Company: GeoTrans Inc.
Location: GE Loeffel	Project: 7666-006

PB-1



DATA SET:
PB1SLG.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test date: 12/15/95

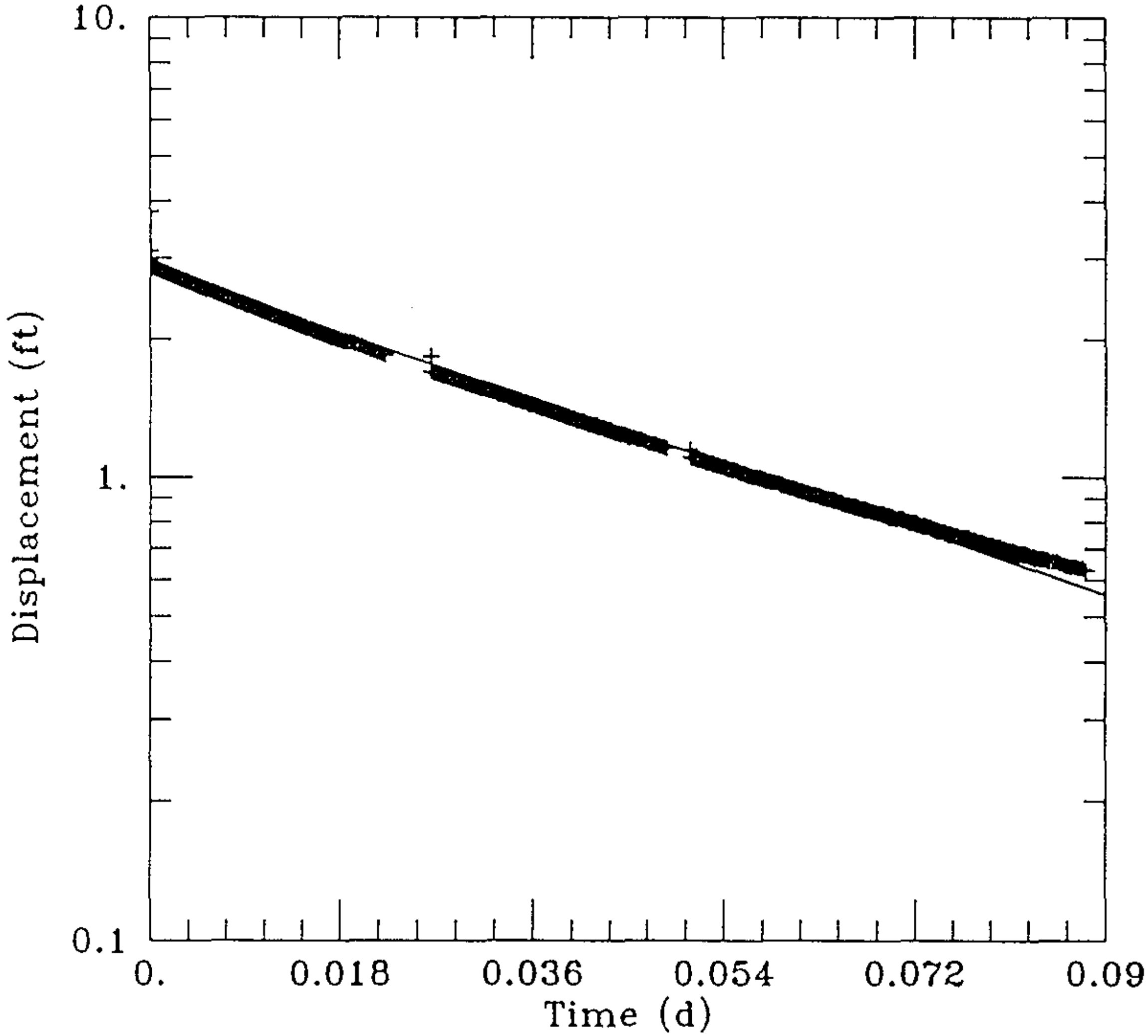
TEST DATA:
H0 = 0.9673 ft
rc = 0.0417 ft
rw = 0.1575 ft

PARAMETER ESTIMATES:
T = 0.02788 ft^2/d
S = 1.E-05

AQTESOLV

lient: General Electric	Company: GeoTrans Inc.
ocation: GE Loeffel	Project: 7666-006

PB-2



DATA SET:
PB2SLG.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Bouwer-Rice

PROJECT DATA:
test date: 12/15/95

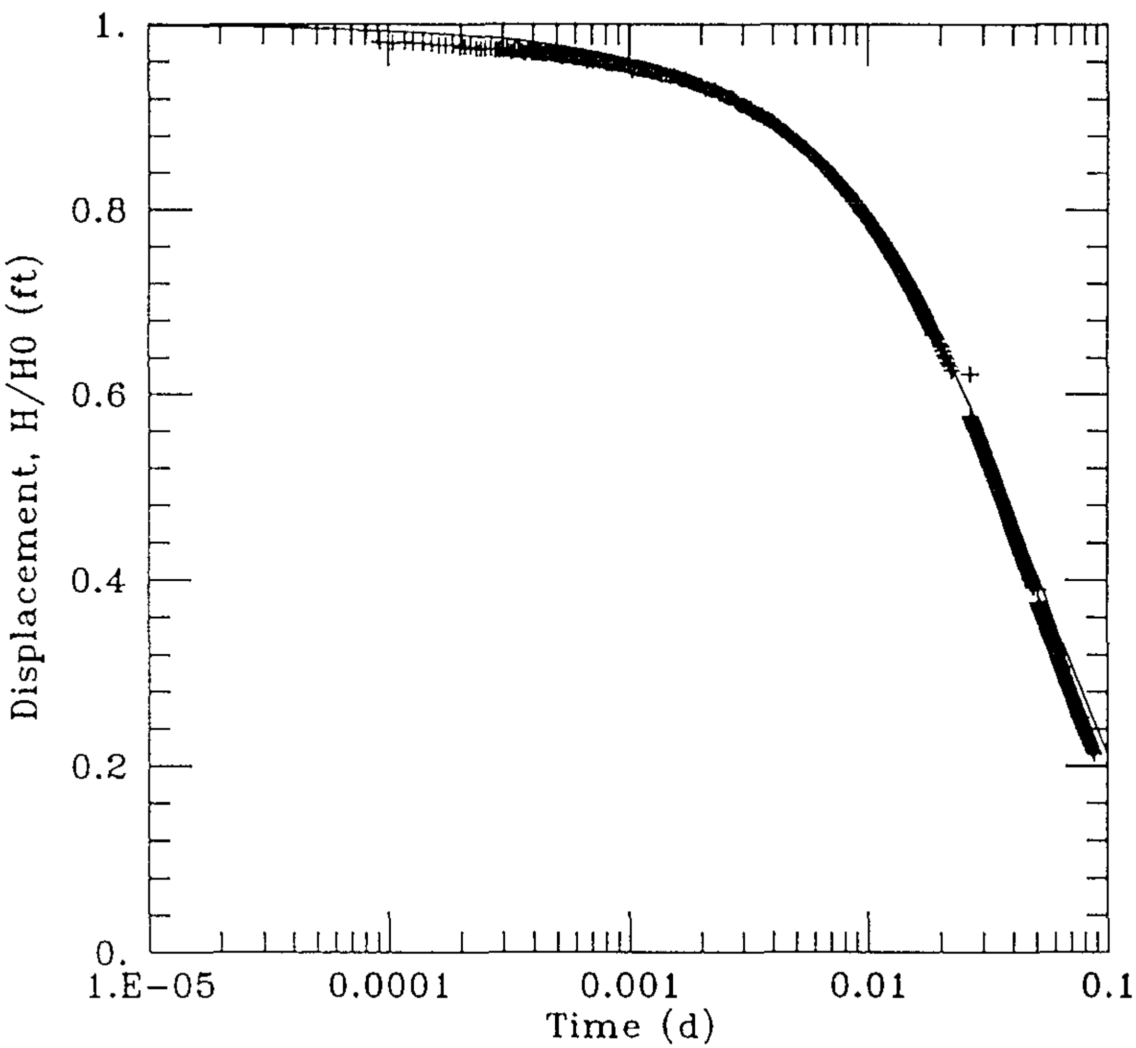
TEST DATA:
H0 = 2.95 ft
rc = 0.1667 ft
rw = 0.1667 ft
L = 10. ft
b = 41.95 ft
H = 41.95 ft

PARAMETER ESTIMATES:
K = 0.1011 ft/d
y0 = 2.849 ft

AQTESOLV

Client: General Electric	Company: GeoTrans Inc.
Location: GE Loeffel	Project: 7666-006

PB-2



DATA SET:
PB2SLG.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test date: 12/15/95

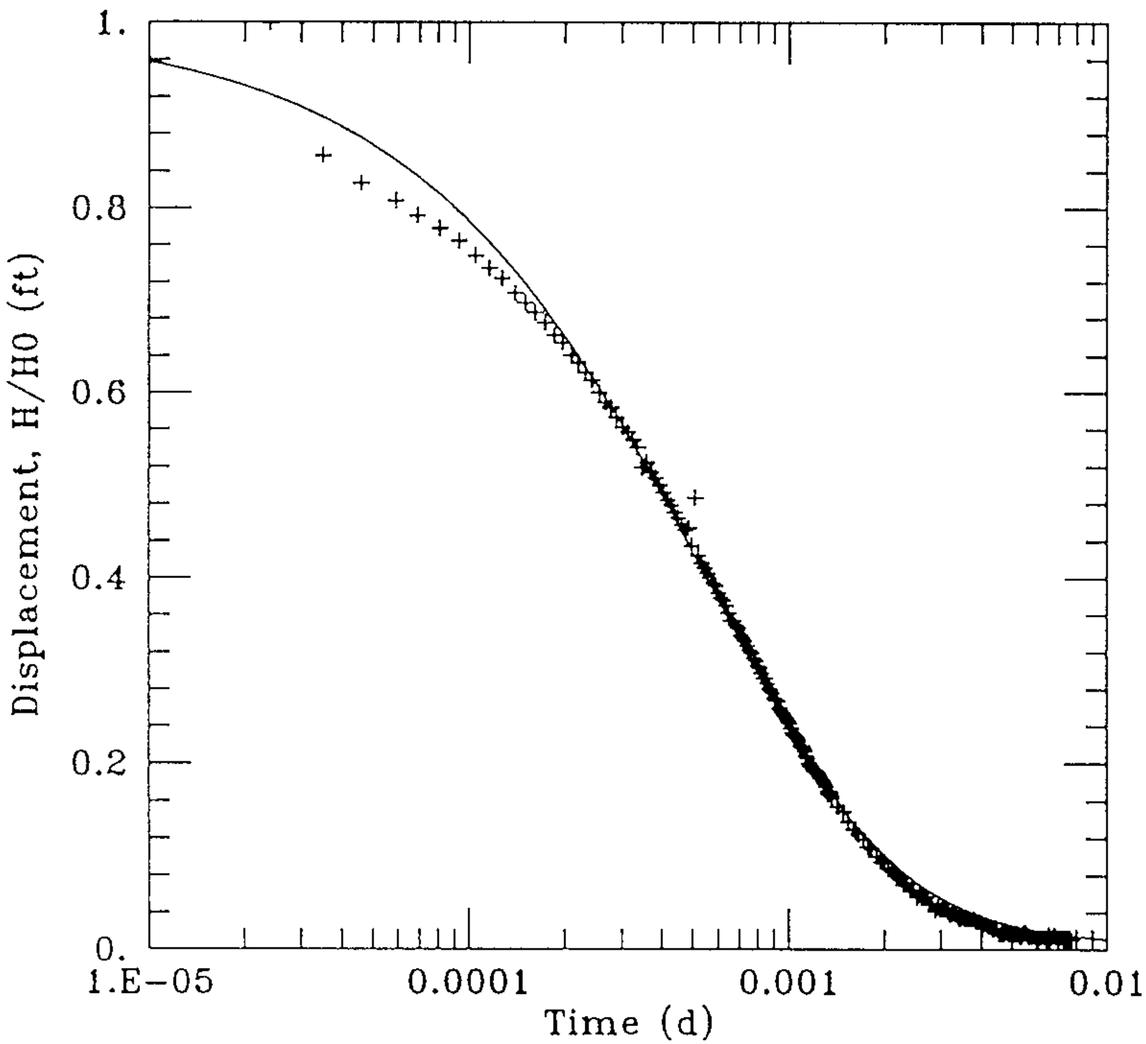
TEST DATA:
H0 = 2.95 ft
rc = 0.1667 ft
rw = 0.1667 ft

PARAMETER ESTIMATES:
T = 0.9985 ft^2/d
S = 0.001

AQTESOLV

Client: General Electric	Company: GeoTrans Inc.
Location: GE Loeffel	Project: 7666-006

OMW-215



DATA SET:
215SLG.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test date: 12/14/95

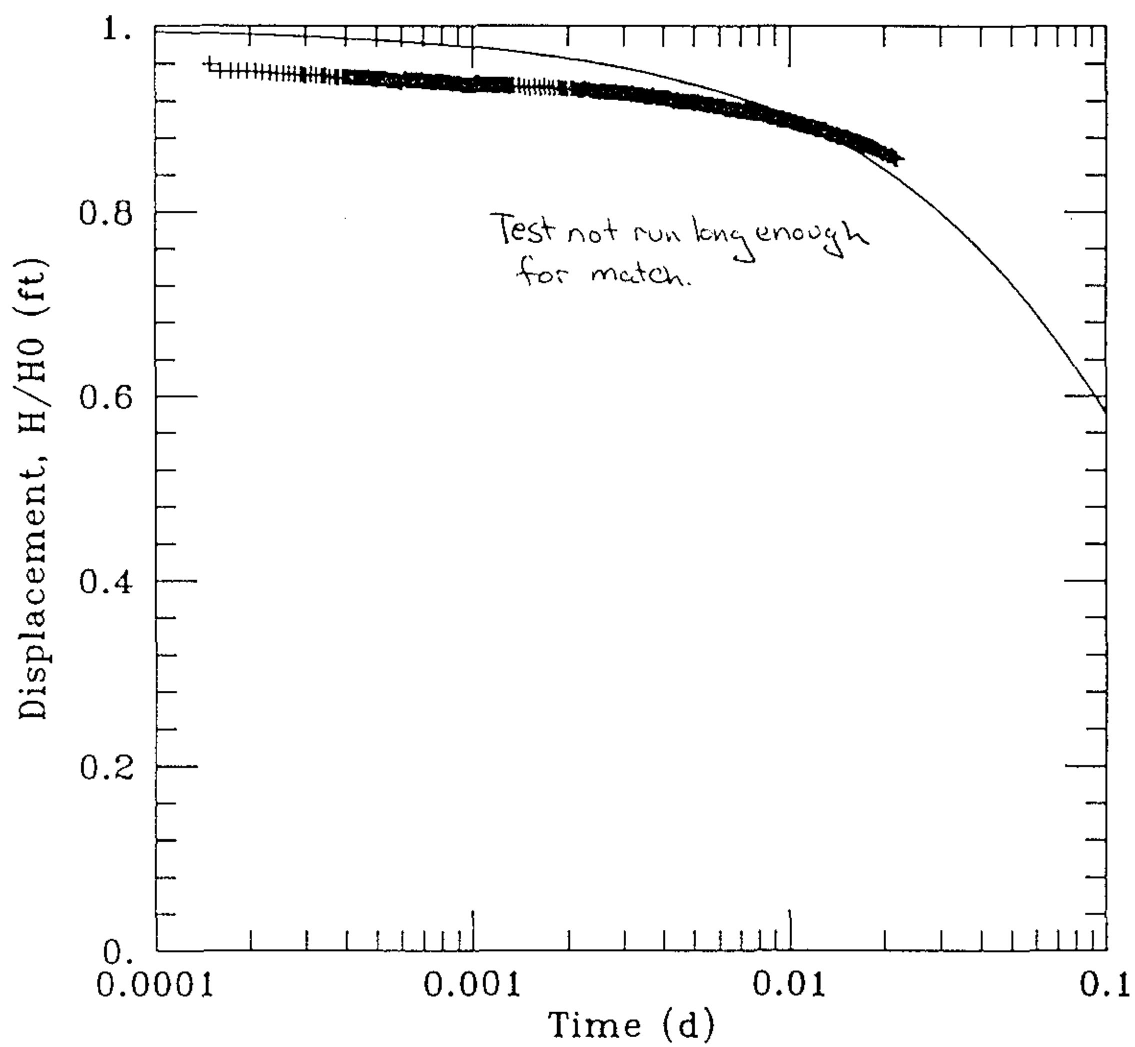
TEST DATA:
H0 = 1.321 ft
rc = 0.042 ft
rw = 0.1575 ft

PARAMETER ESTIMATES:
T = 4.892 ft^2/d
S = 0.0002397

AQTESOLV

Client: General Electric	Company: GeoTrans Inc.
Location: GE Loeffel	Project: 7666-006

OPZ-217



DATA SET:
217SLG.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test date: 12/14/95

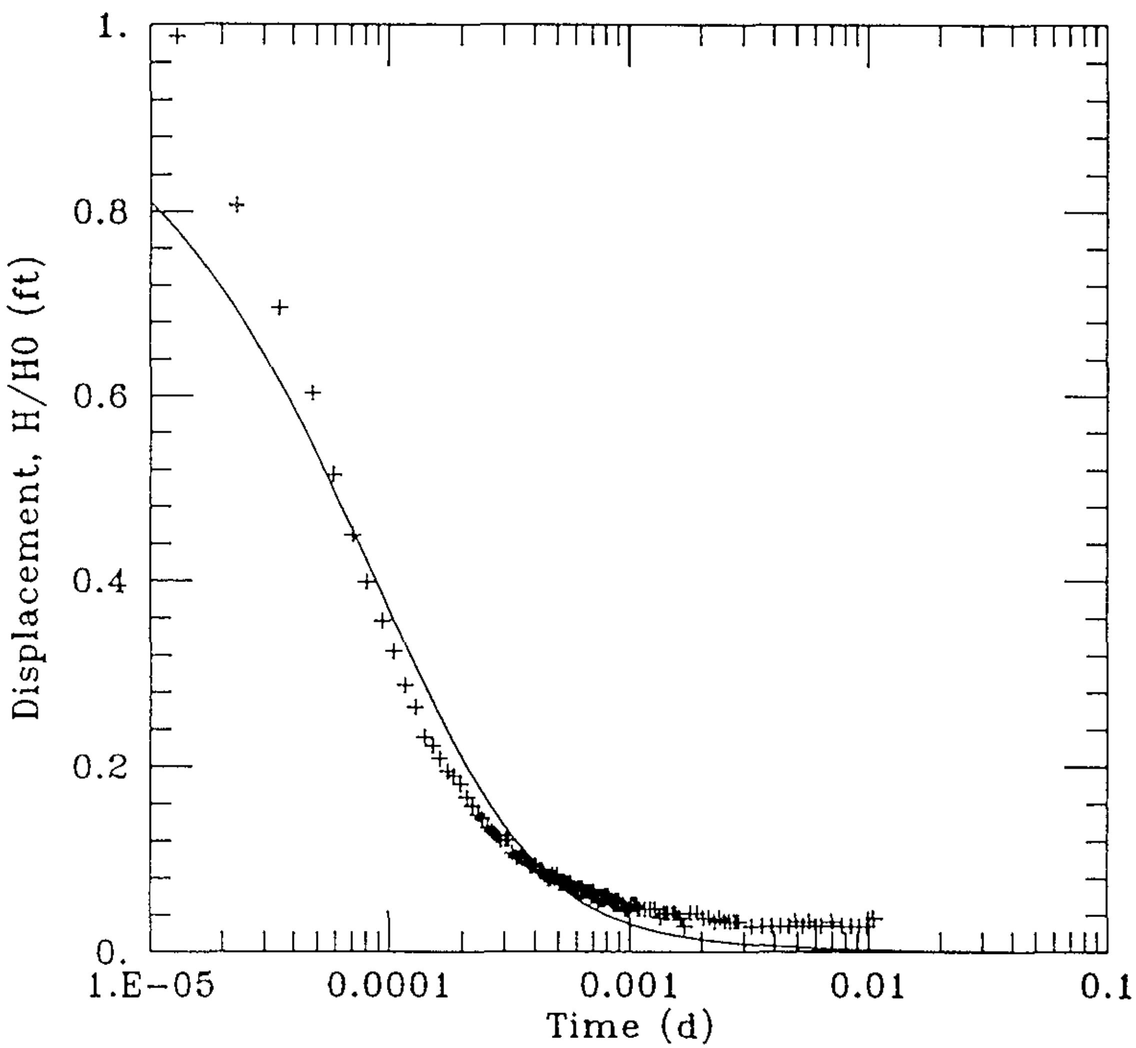
TEST DATA:
H0 = 3.027 ft
rc = 0.3333 ft
rw = 0.3333 ft

PARAMETER ESTIMATES:
T = 0.6849 ft^2/d
S = 0.01

AQTESOLV

Client: General Electric	Company: GeoTrans Inc.
Location: GE Loeffel	Project: 7666-006

OMW-218



DATA SET:
218SLG.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test date: 12/15/95

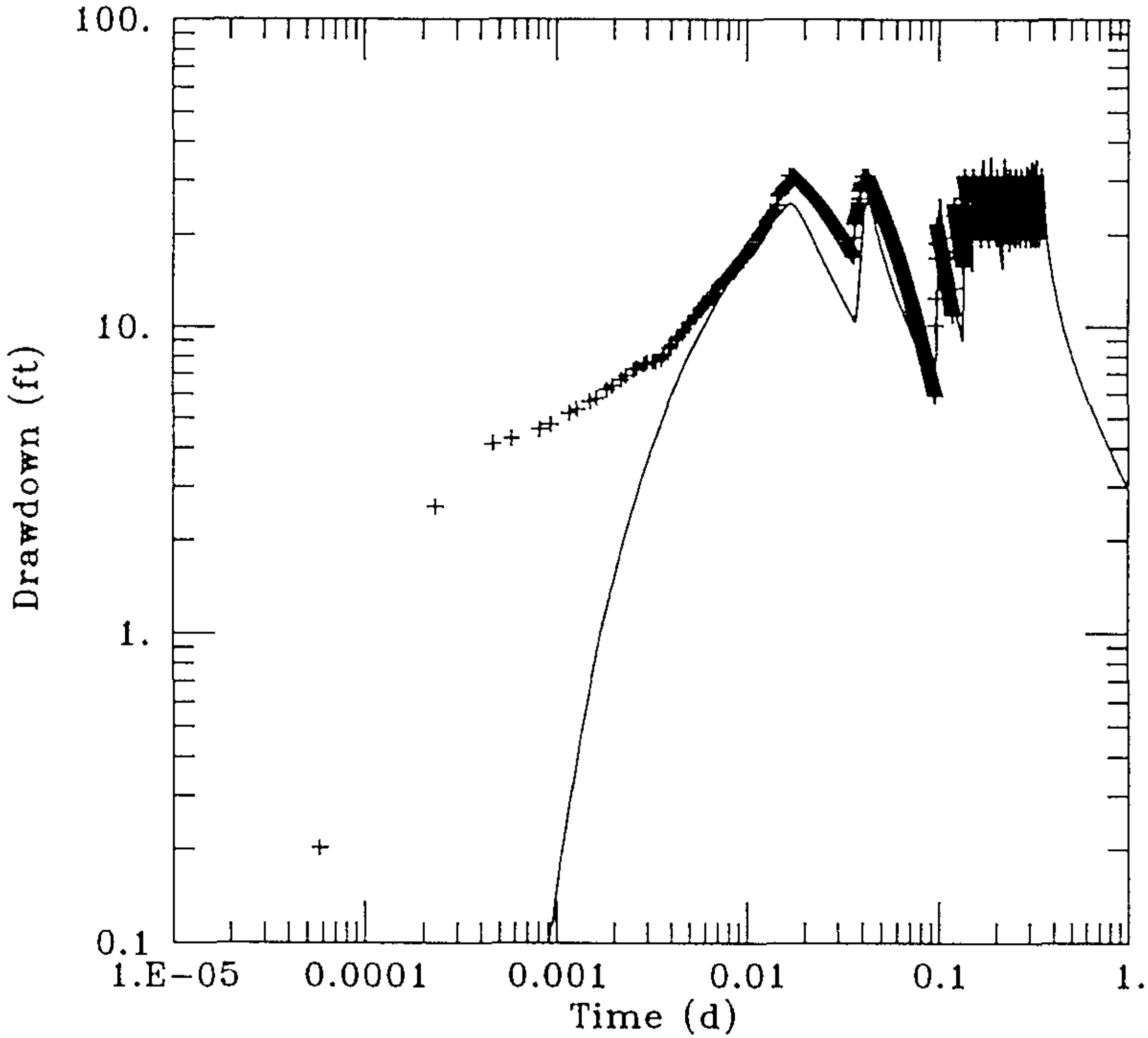
TEST DATA:
H0 = 0.77 ft
rc = 0.0417 ft
rw = 0.1575 ft

PARAMETER ESTIMATES:
T = 19.35 ft^2/d
S = 0.002

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-006

PW-1, Pumping from PW-1



DATA SET:
PW1-PW1.DAT
10/03/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis

PROJECT DATA:
test well: PW-1
obs. well: PW-1

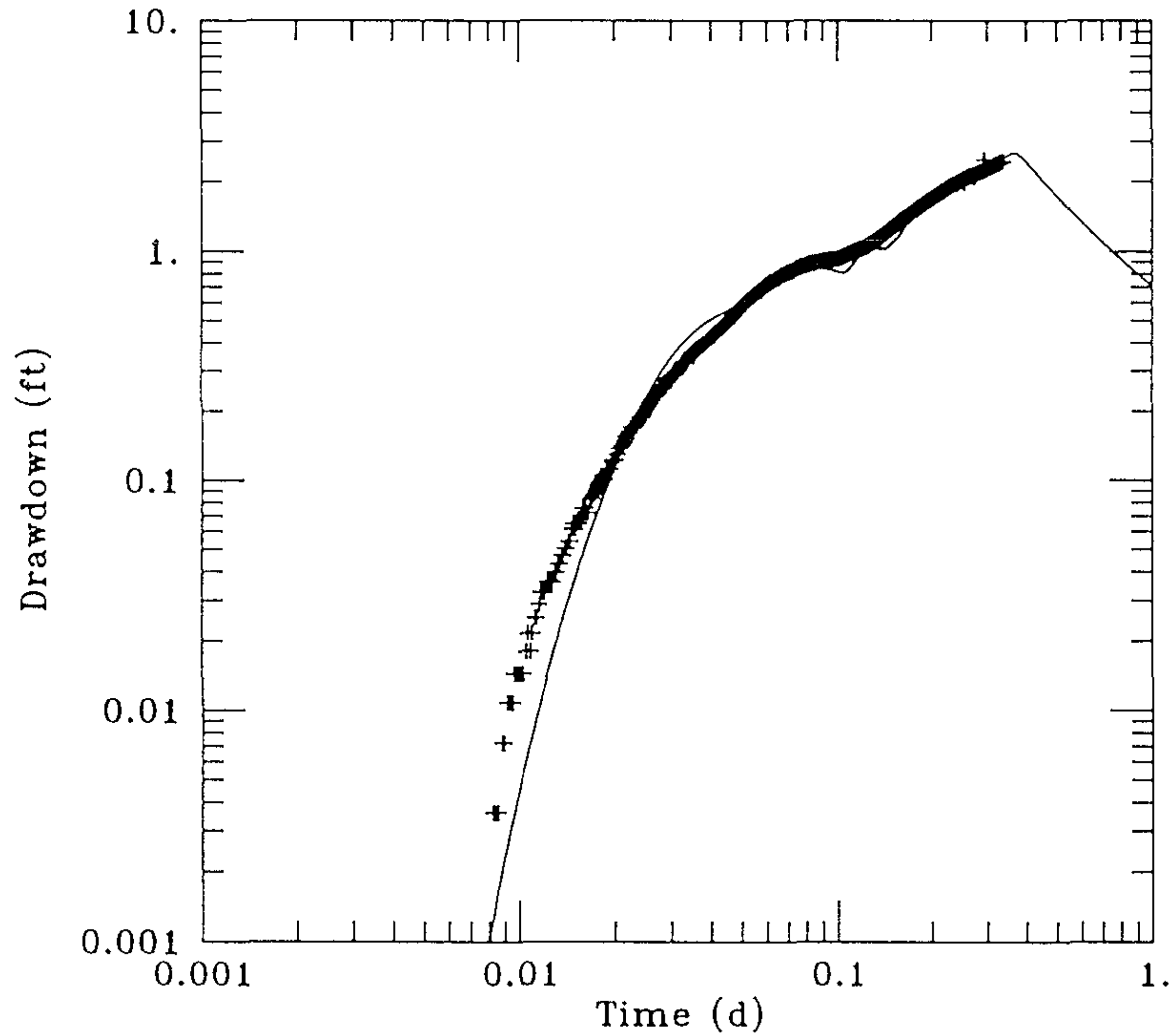
TEST DATA:
Q = 41.22 ft^3/d
r = 0. ft
r_c = 0.0833 ft
r_w = 0.3333 ft
b = 32. ft

PARAMETER ESTIMATES:
T = 0.154 ft^2/d
S = 0.01921

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-006

GMW-10B, Pumping from PW-1



DATA SET:
PW1-M10B.DAT
10/03/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis

PROJECT DATA:
test well: PW-1
obs. well: GMW-10B

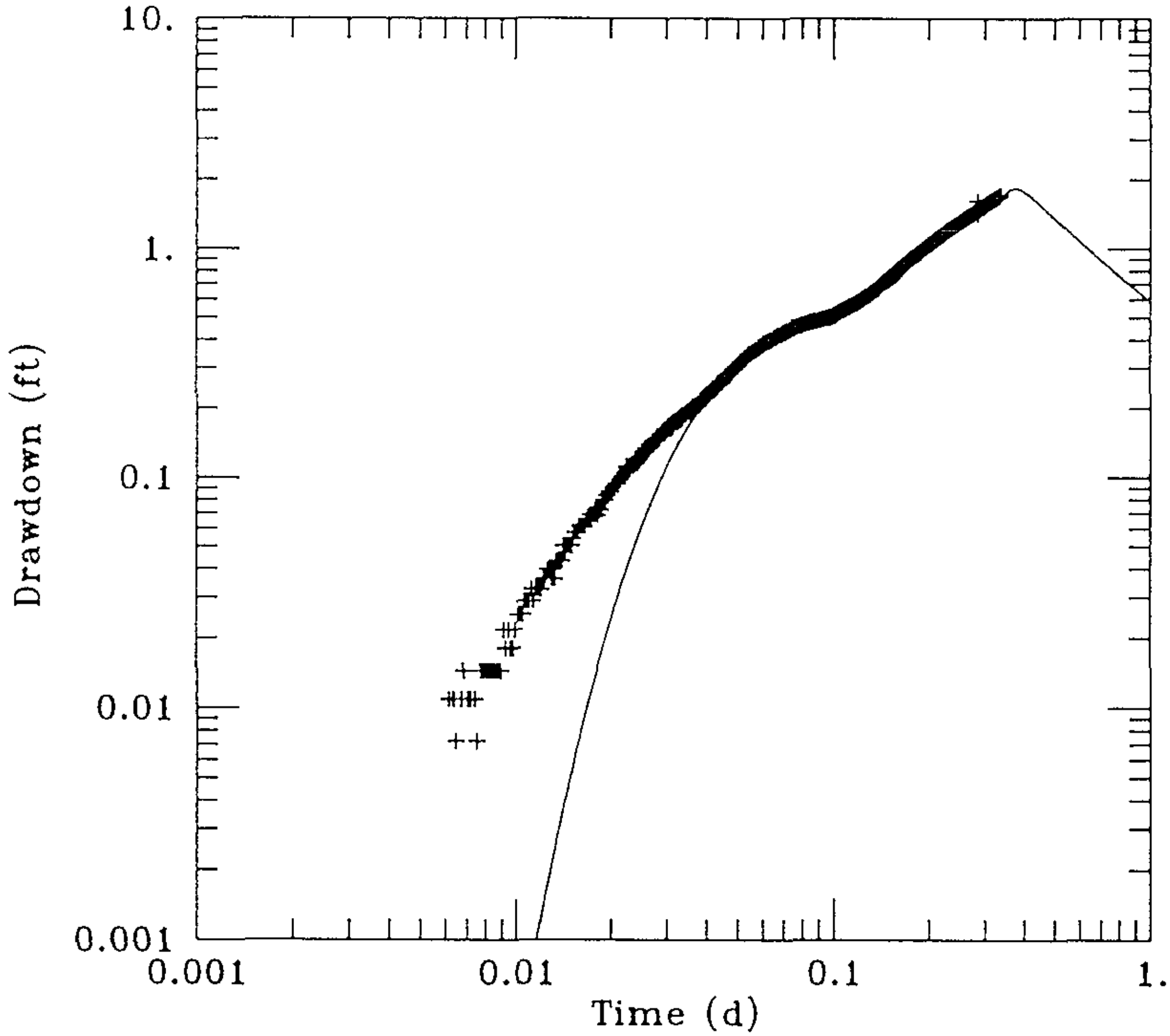
TEST DATA:
$Q = 41.22\ ft^3/d$
$r = 19.2\ ft$
$r_c = 0.0833\ ft$
$r_w = 0.3333\ ft$
$b = 32.\ ft$

PARAMETER ESTIMATES:
$T = 0.6017\ ft^2/d$
$S = 0.0003442$

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-006

PB-1, Pumping from PW-1



DATA SET:
PW1-PB1.DAT
10/03/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis

PROJECT DATA:
test well: PW-1
obs. well: PB-1

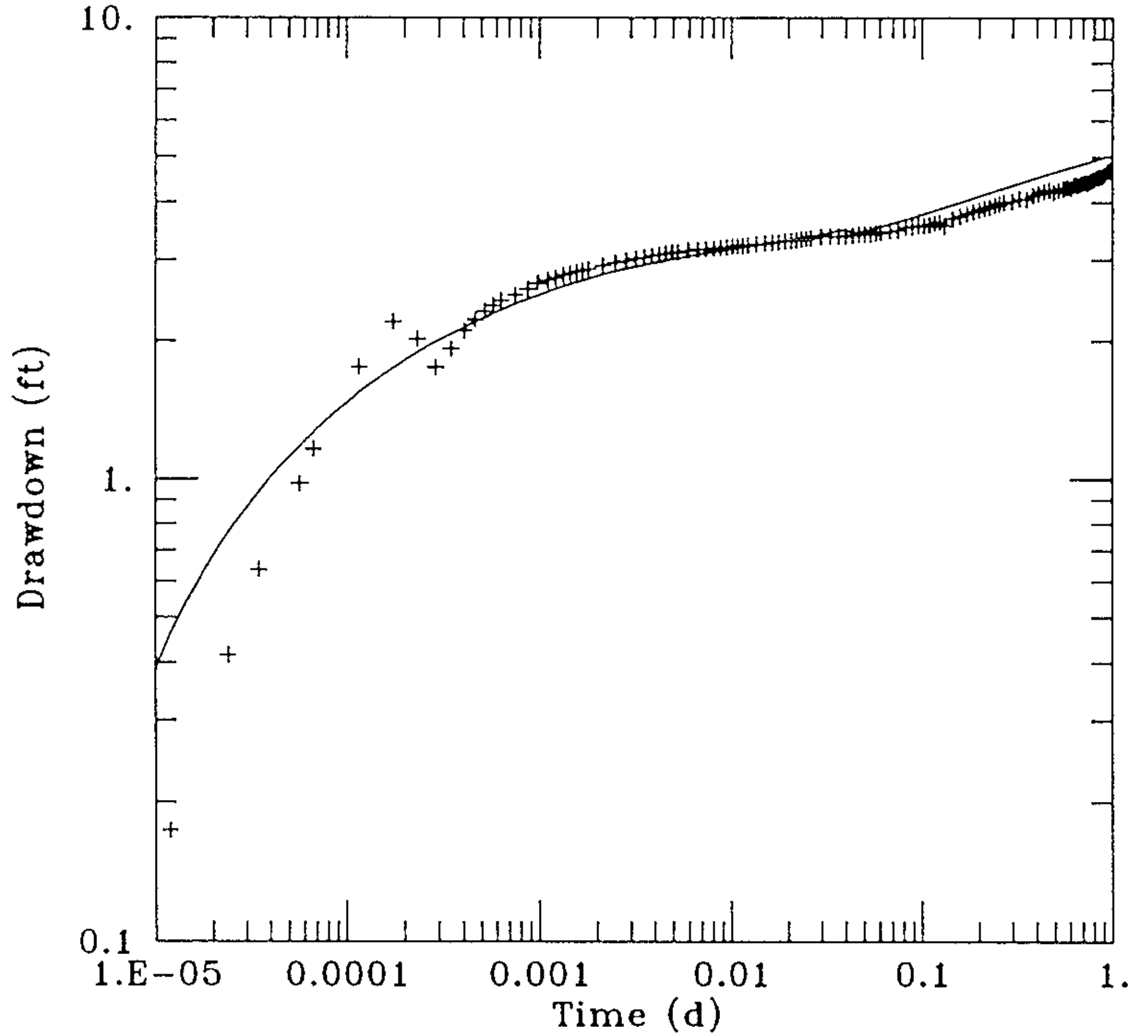
TEST DATA:
Q = 41.22 ft^3/d
r = 19.99 ft
r_c = 0.0833 ft
r_w = 0.3333 ft
b = 32. ft

PARAMETER ESTIMATES:
T = 0.7053 ft^2/d
S = 0.0005286

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-006

PW-2, Pumping from PW-2



DATA SET:
C3-907SP.DAT
10/04/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Neuman (approx.)

PROJECT DATA:
test well: PW-2
obs. well: PW-2

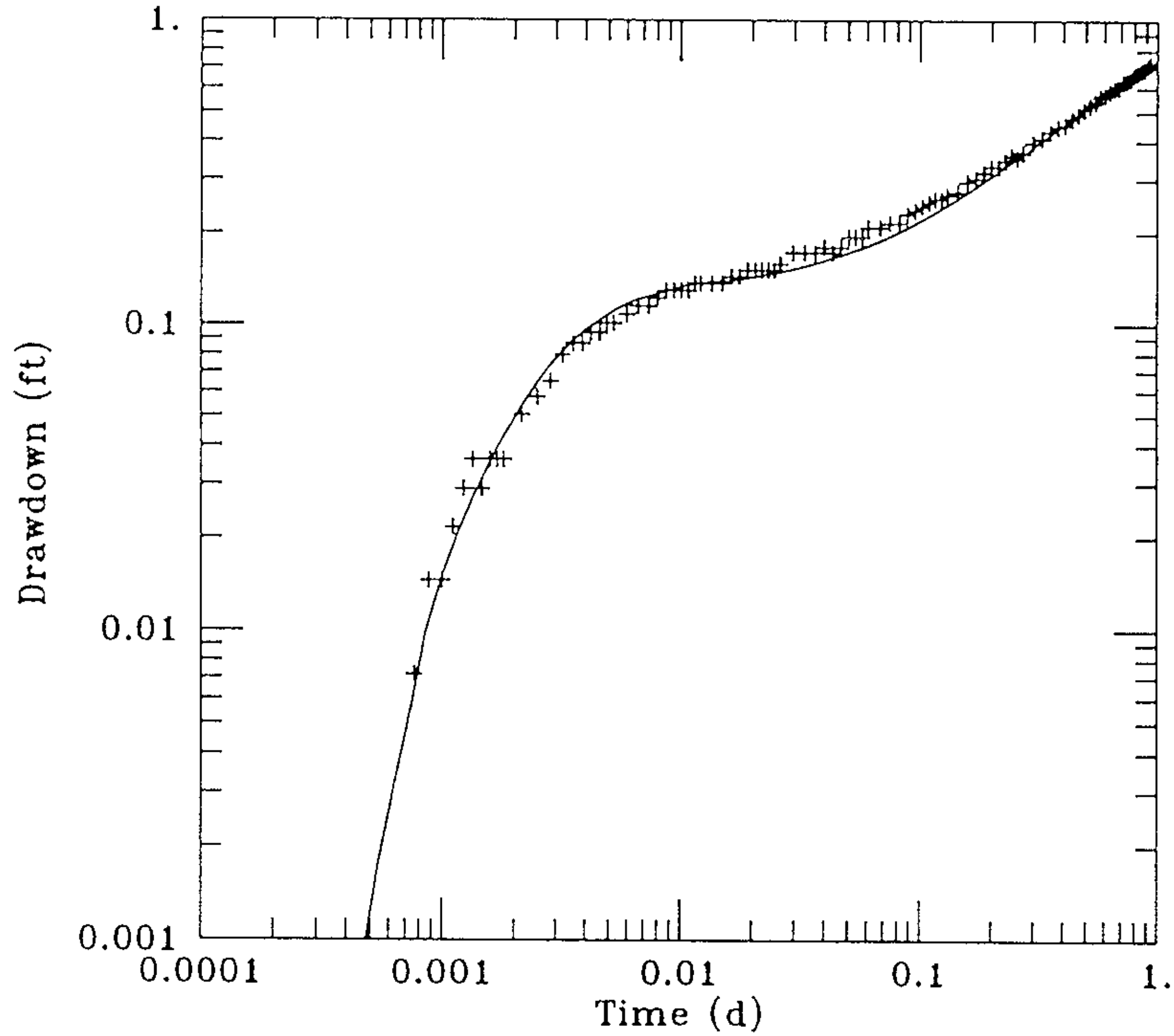
TEST DATA:
$Q = 529.\ ft^3/d$
$r = 0.\ ft$
$r_c = 0.0833\ ft$
$r_w = 0.333\ ft$
$b = 30.\ ft$

PARAMETER ESTIMATES:
$T = 72.11\ ft^2/d$
$S = 0.01068$
$Sy = 0.25$
$\beta = 0.002$

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-000

GMW-11A, Pumping from PW-2



DATA SET:
PW2-M11A.DAT
10/04/95

AQUIFER MODEL:
Unconfined

SOLUTION METHOD:
Neuman (approx.)

PROJECT DATA:
test well: PW-2
obs. well: GMW-11A

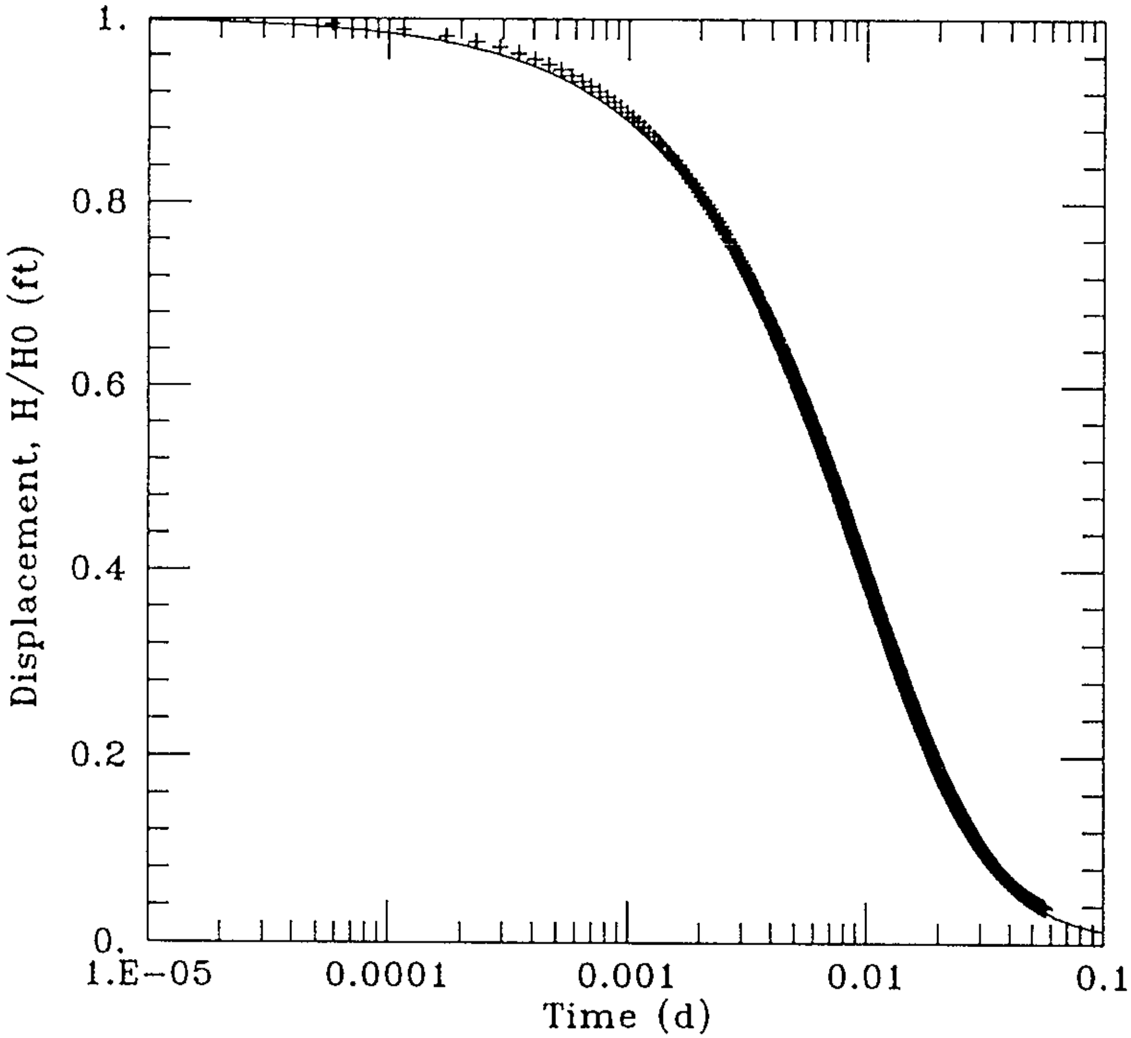
TEST DATA:
Q = 529. ft^3/d
r = 34.19 ft
r_c = 0.0833 ft
r_w = 0.333 ft
b = 30. ft

PARAMETER ESTIMATES:
T = 107.3 ft^2/d
S = 0.0007175
Sy = 0.03504
β = 1.

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-006

OMW-216 (129 - 171)



DATA SET:
MW2163S.DAT
10/04/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test well: OMW-216
obs. well: OMW-216

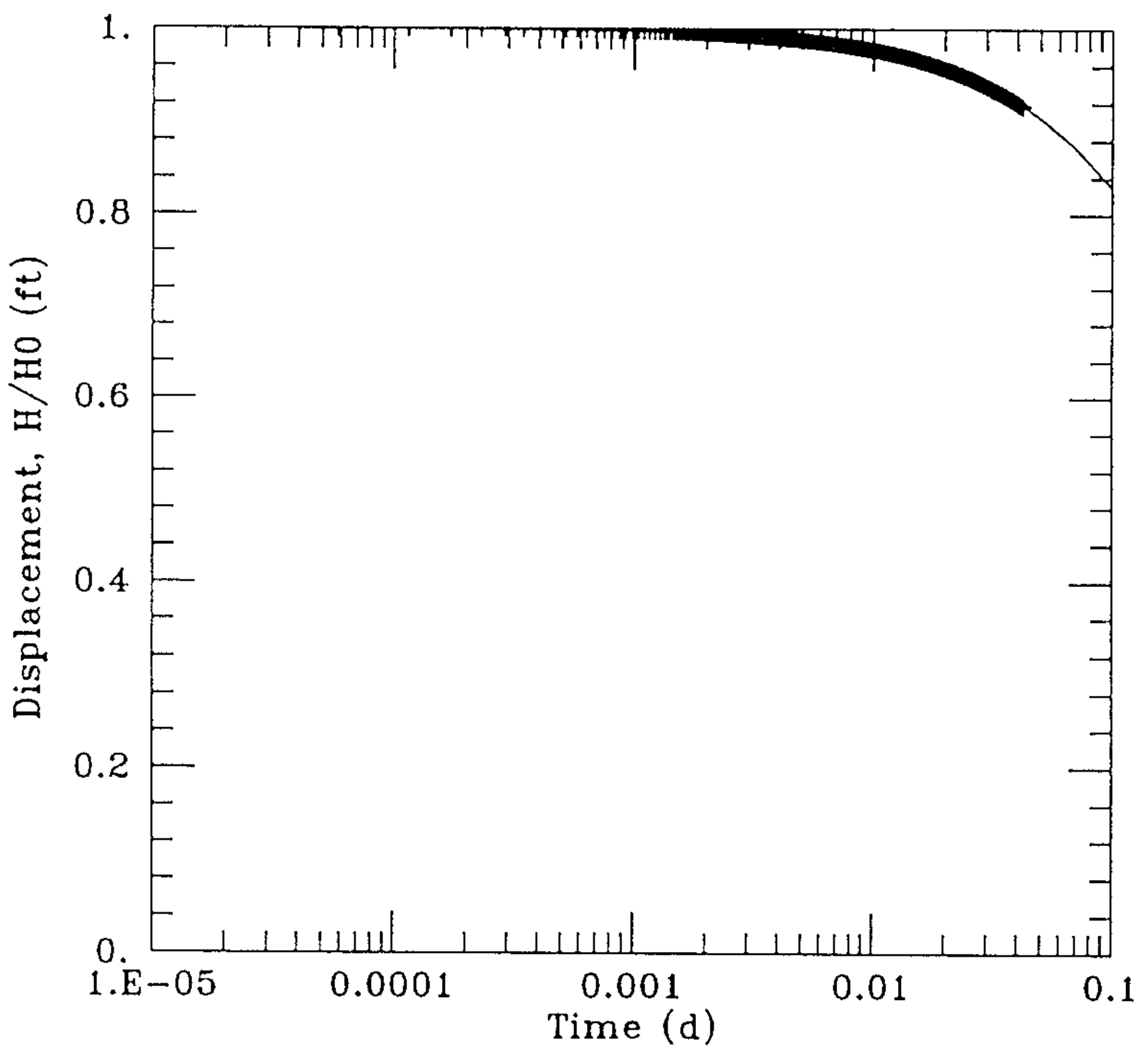
TEST DATA:
H0 = 40.21 ft
rc = 0.0833 ft
rw = 0.1576 ft

PARAMETER ESTIMATES:
T = 1.838 ft^2/d
S = 8.803E-06

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-006

OMW-216 (171 - 213)



DATA SET:
MW2162S.DAT
10/04/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test well: OMW-216
obs. well: OMW-216

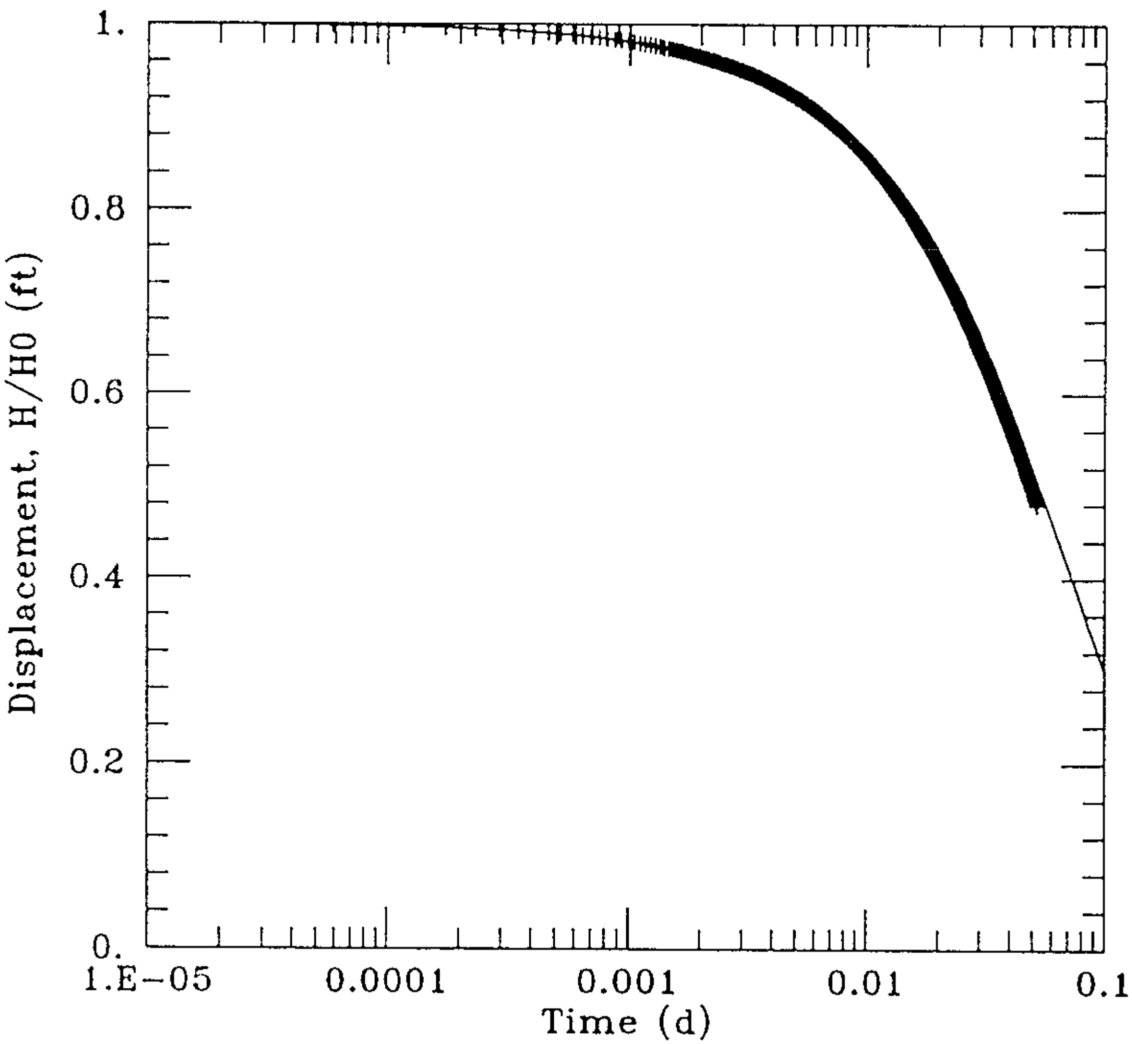
TEST DATA:
H0 = 41.16 ft
rc = 0.0833 ft
rw = 0.1576 ft

PARAMETER ESTIMATES:
T = 0.03784 ft^2/d
S = 1.353E-06

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Loeffel Landfill	Project: 7666-006

OMW-216 (213 - 255)



DATA SET:
MW2161S.DAT
10/04/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test well: OMW-216
obs. well: OMW-216

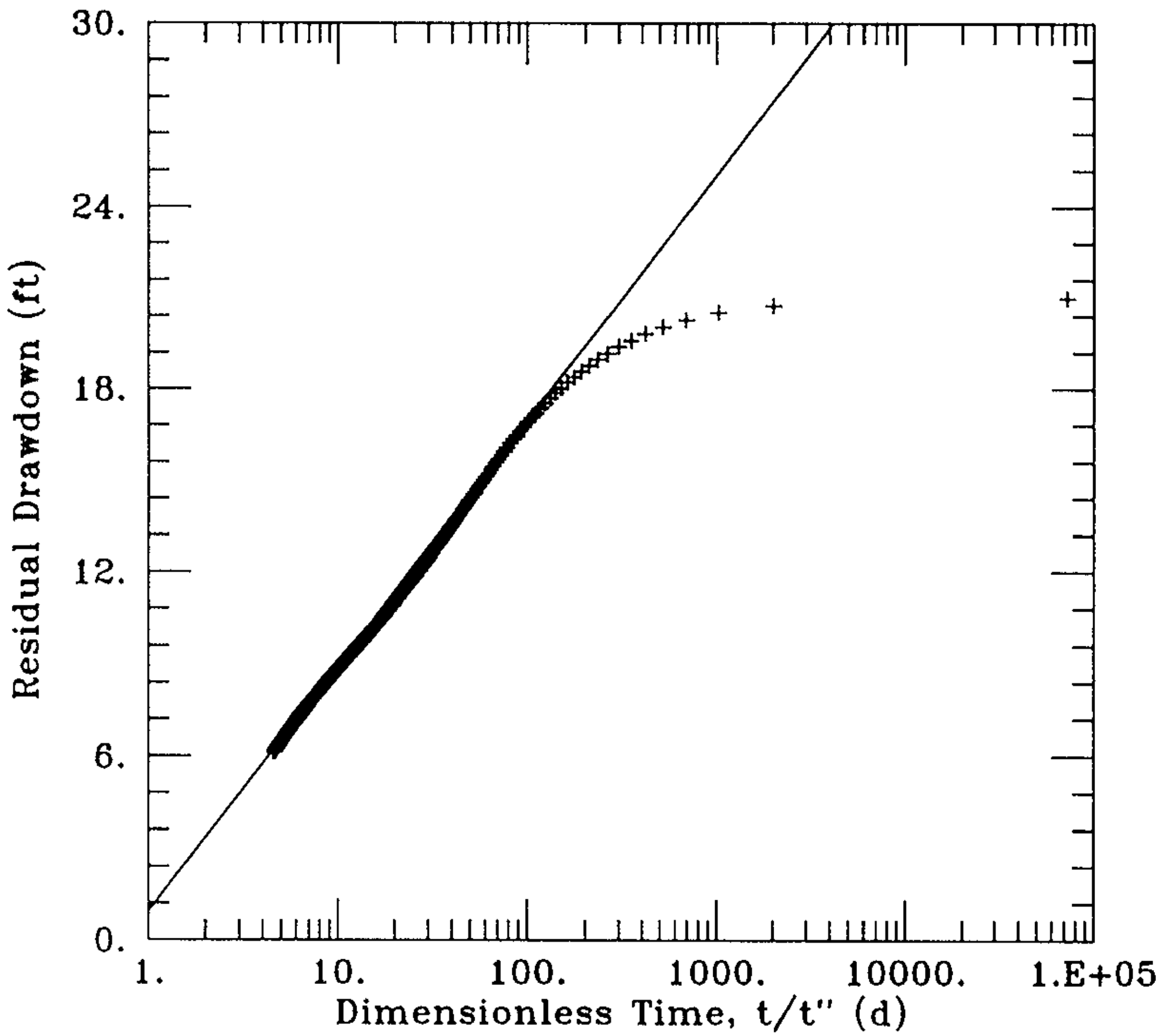
TEST DATA:
H0 = 39.7 ft
rc = 0.0833 ft
rw = 0.1576 ft

PARAMETER ESTIMATES:
T = 0.2984 ft^2/d
S = 1.573E-06

AQTESOLV

Client: **General Electric Co.**	Company: **GeoTrans, Inc.**
Location: **Dewey Loeffel Landfill**	Project: **7666-005**

OMW-218 Recovery 124-253′ BGS



DATA SET:
OMW218N.DAT
11/18/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis Recovery

PROJECT DATA:
test date: November 17, 1995
test well: OMW-218
obs. well: OMW-218

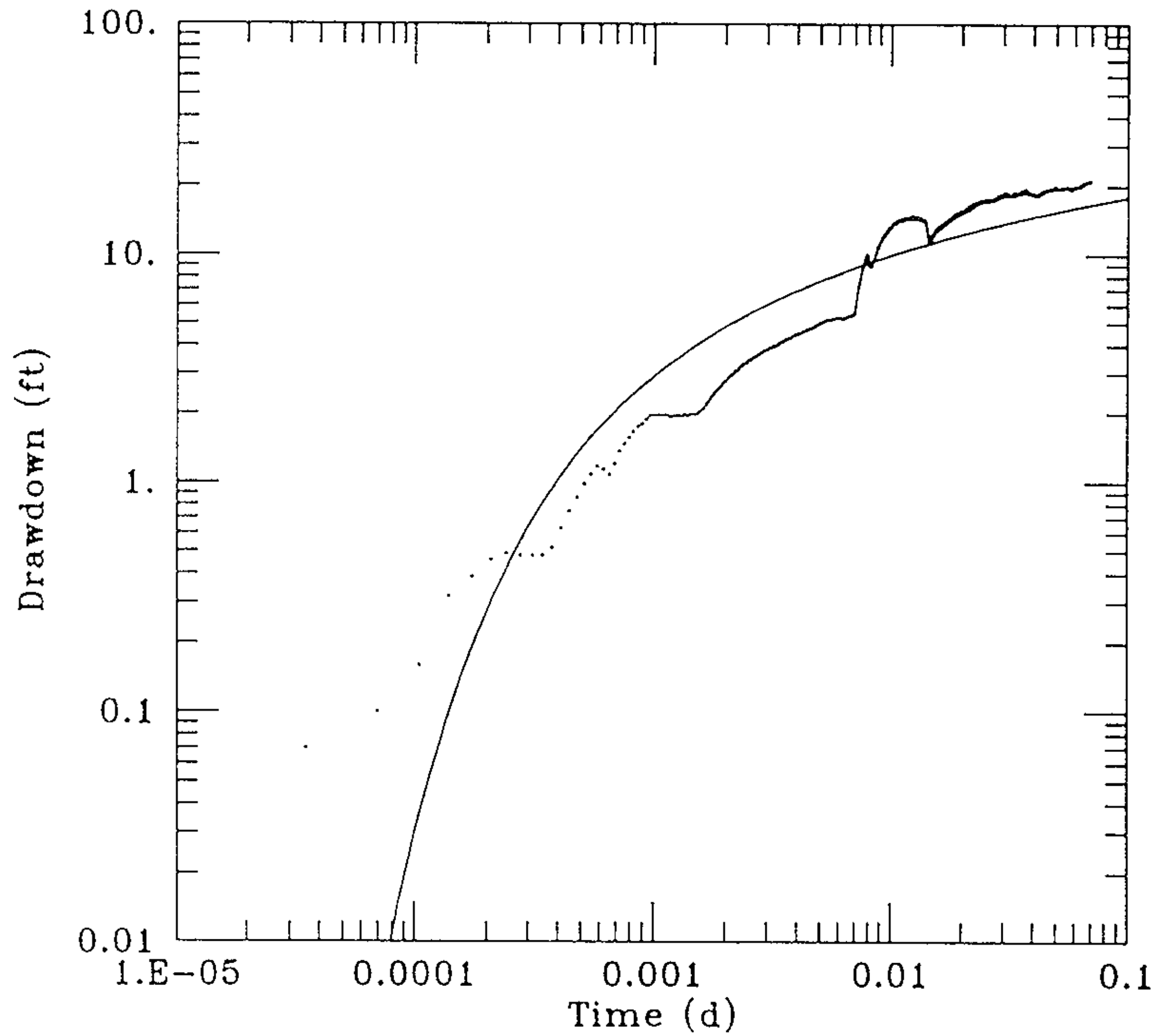
TEST DATA:
Q = 3.27 gal/min
r = 0. ft
r_c = 0.1576 ft
r_w = 0.1576 ft
b = 129. ft

PARAMETER ESTIMATES:
T = 14.35 ft^2/d
S' = 0.7694

AQTESOLV

Client: General Electric Co.	Company: GeoTrans, Inc.
Location: Dewey Loeffel Landfill	Project: 7666-005

OMW-218 Pumping Test 124-253′ BGS



DATA SET:
OMW218P.DAT
11/18/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis

PROJECT DATA:
test date: 11/17/95
test well: OMW-218
obs. well: OMW-218

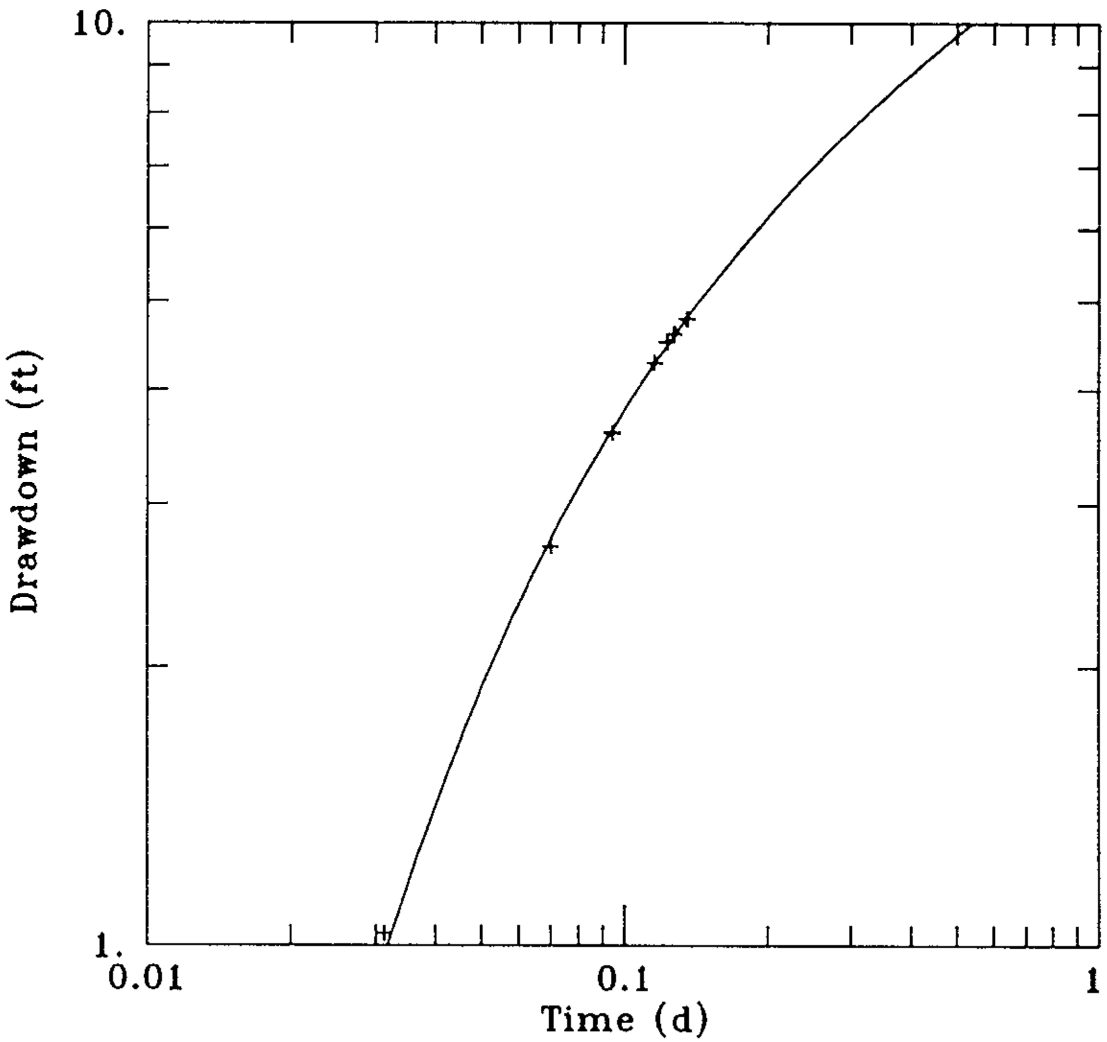
TEST DATA:
Q = 3.27 gal/min
r = 0. ft
r_c = 0.1576 ft
r_w = 0.1576 ft
b = 129. ft

PARAMETER ESTIMATES:
T = 14.35 ft^2/d
S = 0.7694

AQTESOLV

Client: **General Electric Co.**	Company: **GeoTrans, Inc.**
Location: **Dewey Loeffel Landfill**	Project: **7666-006**

Drawdown at OMW-212, Pumping at OMW-218



DATA SET:
0-218OB.DAT
11/21/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Theis

PROJECT DATA:
test date: 11/20/95
test well: OMW-218
obs. well: OMW-212

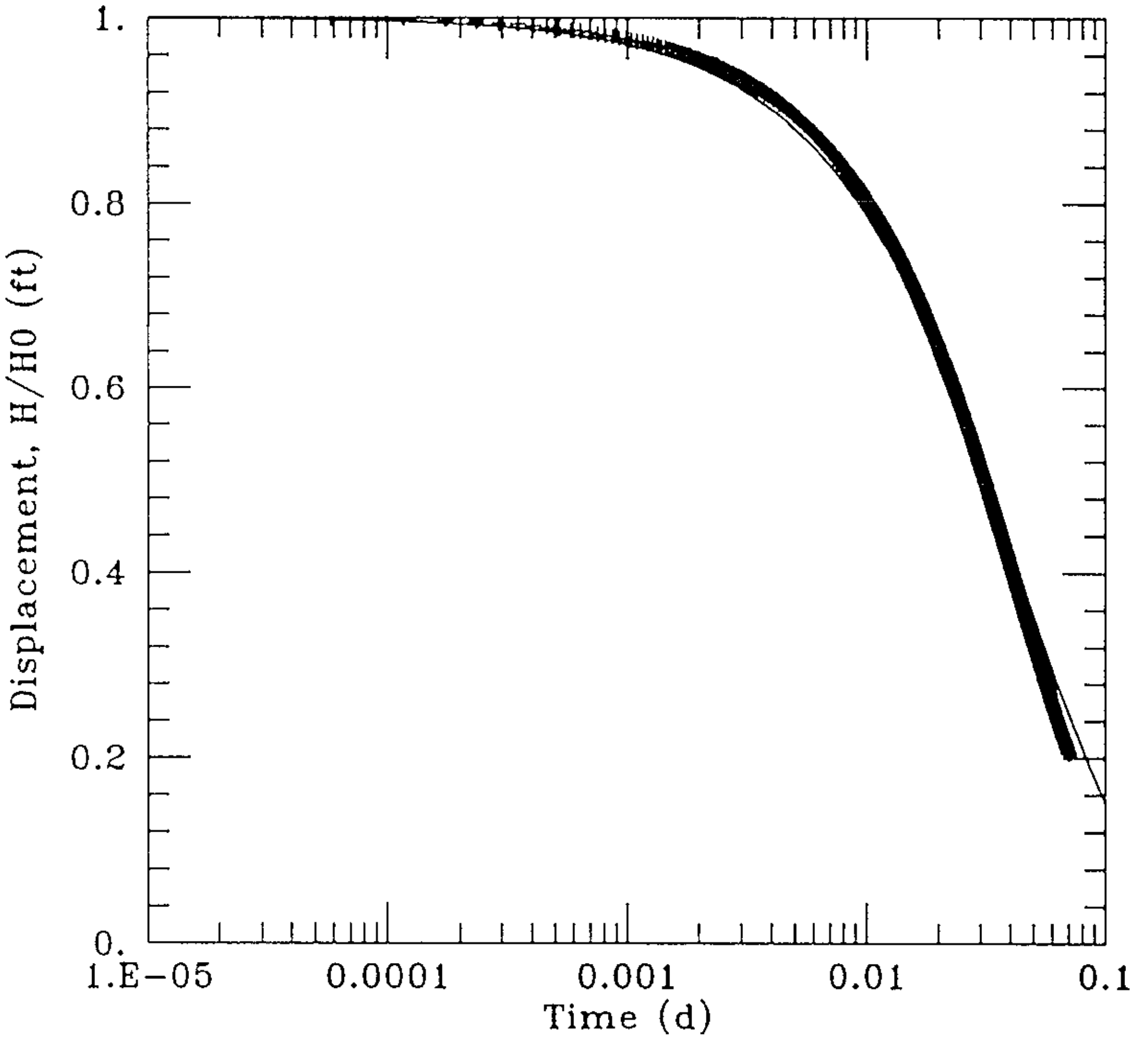
TEST DATA:
Q = 2.923 gal/min
r = 25. ft
r_c = 0.1577 ft
r_w = 0.1577 ft
b = 129. ft

PARAMETER ESTIMATES:
T = 10.52 ft^2/d
S = 0.002054

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Dewey Loeffel Landfill	Project: 7666-006

OMW-219 Interval 4 (95 - 137), Test 1



DATA SET:
2194T1S.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test date: 12/12/95

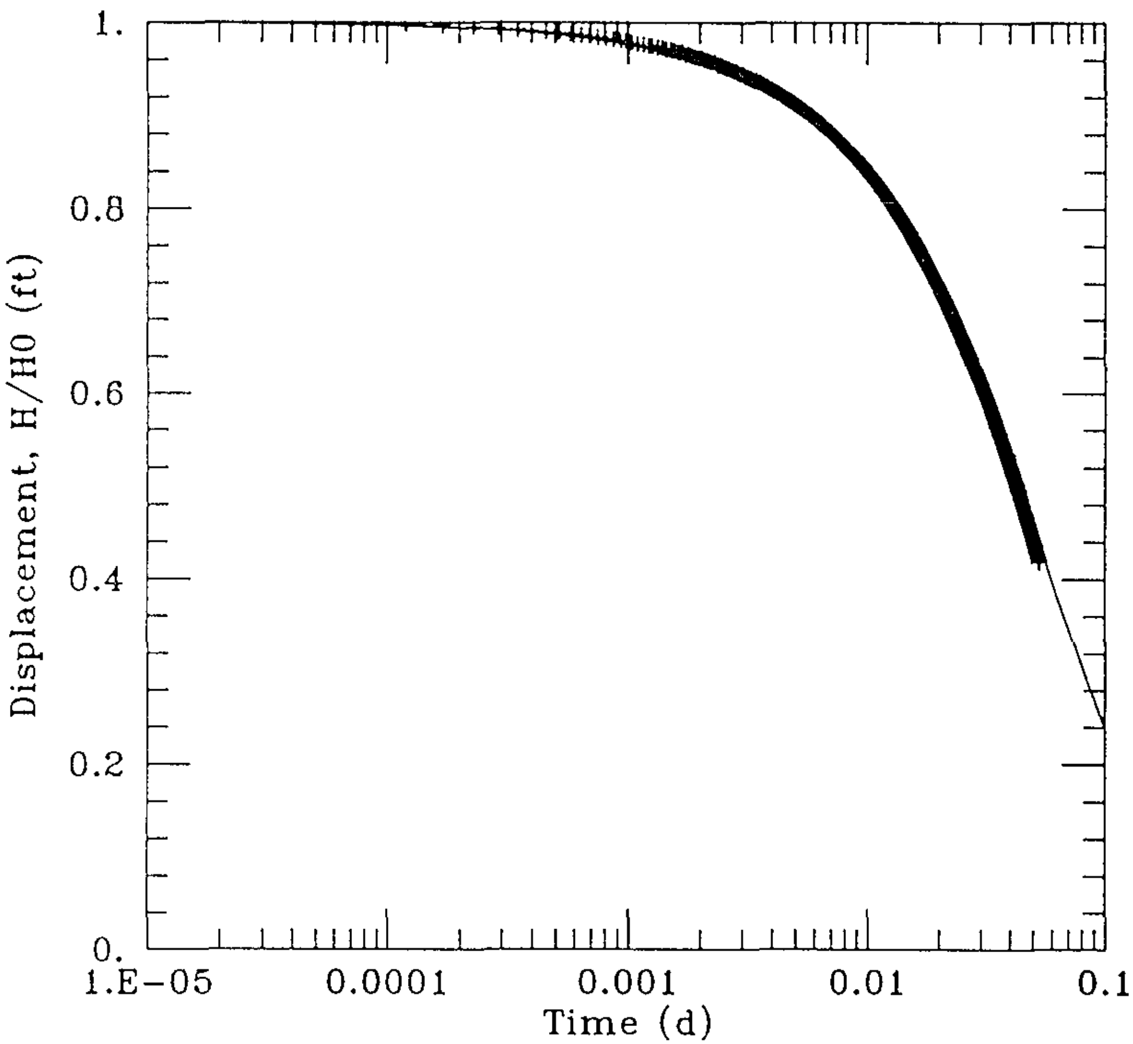
TEST DATA:
H0 = 32.09 ft
rc = 0.153 ft
rw = 0.153 ft

PARAMETER ESTIMATES:
T = 1.911 ft^2/d
S = 1.E-06

AQTESOLV

Client: General Electric	Company: GeoTrans, Inc.
Location: Dewey Loeffel Landfill	Project: 7666-006

OMW-219 Interval 3 (137 - 179), Test 1



DATA SET:
2193T1S.DAT
12/28/95

AQUIFER MODEL:
Confined

SOLUTION METHOD:
Cooper et al.

PROJECT DATA:
test date: 12/12/95

TEST DATA:
H0 = 39.14 ft
rc = 0.153 ft
rw = 0.153 ft

PARAMETER ESTIMATES:
T = 1.177 ft^2/d
S = 1.E-05

AQTESOLV

Well ID	OMW-201			OMW-202			OMW-204		
Sample date	9/12/95			9/13/95			9/13/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-	U	400	-	U	11	-	U	430
Dibenz(a,h)anthracene	-		0	-	U	11	-	U	430
Dibenzofuran	-	U	400	-	U	11	-	U	430
Diethylphthalate	-	U	400	-	U	11	-	U	430
Dimethylphthalate	-	U	400	-	U	11	-	U	430
Fluoranthene	-	U	400	-	U	11	-	U	430
Fluorene	-	U	400	-	U	11	-	U	430
Hexachlorobenzene	-	U	400	-	U	11	-	U	430
Hexachlorobutadiene	-	U	400	-	U	11	-	U	430
Hexachlorocyclopentadiene	-	U	400	-	U	11	-	U	430
Hexachloroethane	-	U	400	-	U	11	-	U	430
Indeno(1,2,3-cd)pyrene	-	U	400	-	U	11	-	U	430
Isophorone	-	U	400	-	U	11	-	U	430
N-nitroso-di-n-propylamine	-	U	400	-	U	11	-	U	430
N-Nitrosodimethylamine	-	U	400	-	UJ-C	11	-	UJ-C	430
N-nitrosodiphenylamine	-	U	400	-	U	11	-	U	430
Naphthalene	-	U	400	-	U	11	-	U	430
Nitrobenzene	-	U	400	-	U	11	-	U	430
Pentachlorophenol	-	U	2000	-	U	54	-	U	2200
Phenanthrene	-	U	400	-	U	11	-	U	430
Phenol	-	U	400	-	U	11	1800		0
Pyrene	-	U	400	-	U	11	-	U	430
Pyridine	-	U	400	-	U	11	-	U	430

Well ID	OMW-205			OMW-206			OMW-209		
Sample date	9/13/95			9/13/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-	U	11	-	U	11	-		0
1,2-Dichlorobenzene	-	U	11	-	U	11	-		0
1,3-Dichlorobenzene	-	U	11	-	U	11	-		0
1,4-Dichlorobenzene	-	U	11	-	U	11	-		0
2,2'-oxybis(1-Chloropropane)	-	UJ-C	11	-	UJ-C	11	-		0
2,4,5-Trichlorophenol	-	U	56	-	U	56	-	U	25
2,4,6-Trichlorophenol	-	U	11	-	U	11	-	U	5
2,4-Dichlorophenol	-	U	11	-	U	11	-	U	5
2,4-Dimethylphenol	-	U	11	-	U	11	-	U	5
2,4-Dinitrophenol	-	U	56	-	U	56	-	UJ-C	25
2,4-Dinitrotoluene	-	U	11	-	U	11	-		0
2,6-Dinitrotoluene	-	U	11	-	U	11	-		0
2-Chloronaphthalene	-	U	11	-	U	11	-		0
2-Chlorophenol	-	U	11	-	U	11	-	U	5
2-Methylnaphthalene	-	U	11	-	U	11	-		0
2-Methylphenol	-	U	11	-	U	11	-	U	5
2-Nitroaniline	-	U	56	-	U	56	-		0
2-Nitrophenol	-	U	11	-	U	11	-	U	5
3,3'-Dichlorobenzidine	-	UJ-C	22	-	UJ-C	22	-		0
3-Nitroaniline	-	U	56	-	U	56	-		0
4,6-Dinitro-2-Methylphenol	-	U	56	-	U	56	-	U	25
4-Bromophenyl-Phenylether	-	U	11	-	U	11	-		0
4-Chloro-3-Methylphenol	-	U	11	-	U	11	-	U	5
4-Chloroaniline	-	U	11	-	U	11	-		0
4-Chlorophenyl-Phenylether	-	U	11	-	U	11	-		0
4-Methylphenol	-	U	11	-	U	11	-	U	5
4-Nitroaniline	-	U	56	-	U	56	-		0
4-Nitrophenol	-	UJ-C	56	-	UJ-C	56	-	U	25
Acenaphthene	-	U	11	-	U	11	-		0
Acenaphthylene	-	U	11	-	U	11	-		0
Aniline	-	U	11	-	U	11	-		0
Anthracene	-	U	11	-	U	11	-		0
Azobenzene	-	U	11	-	U	11	-		0
Benzidine	-	R-C	56	-	R-C	56	-		0
Benzo(a)anthracene	-	U	11	-	U	11	-		0
Benzo(a)pyrene	-	U	11	-	U	11	-		0
Benzo(b)fluoranthene	-	U	11	-	U	11	-		0
Benzo(g,h,i)perylene	-	U	11	-	U	11	-		0
Benzo(k)fluoranthene	-	UJ-C	11	-	UJ-C	11	-		0
Benzoic acid	-	U	56	-	U	56	-		0
Benzyl alcohol	-	U	11	-	U	11	-		0
Bis(2-chloroethoxy)-methane	-	U	11	-	U	11	-		0
Bis(2-chloroethyl)ether	-	U	11	-	U	11	-		0
Bis(2-ethylhexyl)phthalate	-	U	11	-	U	11	-		0
Butylbenzylphthalate	-	U	11	-	U	11	-		0
Carbazole	-	U	11	-	U	11	-		0
Chrysene	-	U	11	-	U	11	-		0
Di-n-butylphthalate	-	U	11	-	U	11	-		0

Well ID	OMW-205			OMW-206			OMW-209		
Sample date	9/13/95			9/13/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-	U	11	-	U	11	-		0
Dibenz(a,h)anthracene	-	U	11	-	U	11	-		0
Dibenzofuran	-	U	11	-	U	11	-		0
Diethylphthalate	-	U	11	-	U	11	-		0
Dimethylphthalate	-	U	11	-	U	11	-		0
Fluoranthene	-	U	11	-	U	11	-		0
Fluorene	-	U	11	-	U	11	-		0
Hexachlorobenzene	-	U	11	-	U	11	-		0
Hexachlorobutadiene	-	U	11	-	U	11	-		0
Hexachlorocyclopentadiene	-	U	11	-	U	11	-		0
Hexachloroethane	-	U	11	-	U	11	-		0
Indeno(1,2,3-cd)pyrene	-	U	11	-	U	11	-		0
Isophorone	-	U	11	-	U	11	-		0
N-nitroso-di-n-propylamine	-	UJ-C	11	-	UJ-C	11	-		0
N-Nitrosodimethylamine	-	U	11	-	U	11	-		0
N-nitrosodiphenylamine	-	U	11	-	U	11	-		0
Naphthalene	-	U	11	-	U	11	-		0
Nitrobenzene	-	U	11	-	U	11	-		0
Pentachlorophenol	-	U	56	-	U	56	-	U	25
Phenanthrene	-	U	11	-	U	11	-		0
Phenol	-	U	11	-	U	11	-	U	5
Pyrene	-	U	11	-	U	11	-		0
Pyridine	-	U	11	-	U	11	-		0

Well ID	OMW-209			OMW-209			OMW-210		
Sample date	3/2/95			9/11/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-		0	-	U	74	-		0
1,2-Dichlorobenzene	-		0	-	U	74	-		0
1,3-Dichlorobenzene	-		0	-	U	74	-		0
1,4-Dichlorobenzene	-		0	-	U	74	-		0
2,2'-oxybis(1-Chloropropane)	-		0	-	U	74	-		0
2,4,5-Trichlorophenol	-	U	25	-	R-S	370	-	U	25
2,4,6-Trichlorophenol	-	U	5	-	R-S	74	-	U	5
2,4-Dichlorophenol	-	U	5	-	R-S	74	-	U	5
2,4-Dimethylphenol	-	U	5	-	R-S	74	-	U	5
2,4-Dinitrophenol	-	U	25	-	R-S	370	-	UJ-C	25
2,4-Dinitrotoluene	-		0	-	U	74	-		0
2,6-Dinitrotoluene	-		0	-	U	74	-		0
2-Chloronaphthalene	-		0	-	U	74	-		0
2-Chlorophenol	-	U	5	-	R-S	74	-	U	5
2-Methylnaphthalene	-		0	-	U	74	-		0
2-Methylphenol	-	U	5	-	R-S	74	-	U	5
2-Nitroaniline	-		0	-	U	370	-		0
2-Nitrophenol	-	U	5	-	R-S	74	-	U	5
3,3'-Dichlorobenzidine	-		0	-	U	150	-		0
3-Nitroaniline	-		0	-	UJ-C	370	-		0
4,6-Dinitro-2-Methylphenol	-	U	25	-	R-S	370	-	U	25
4-Bromophenyl-Phenylether	-		0	-	U	74	-		0
4-Chloro-3-Methylphenol	-	U	5	-	R-S	74	-	U	5
4-Chloroaniline	-		0	-	U	74	-		0
4-Chlorophenyl-Phenylether	-		0	-	U	74	-		0
4-Methylphenol	-	U	5	-	R-S	74	-	U	5
4-Nitroaniline	-		0	-	UJ-C	370	-		0
4-Nitrophenol	-	U	25	-	R-S	370	-	U	25
Acenaphthene	-		0	-	U	74	-		0
Acenaphthylene	-		0	-	U	74	-		0
Aniline	-		0	-	U	74	-		0
Anthracene	-		0	-	U	74	-		0
Azobenzene	-		0	-	U	74	-		0
Benzidine	-		0	-	R-C	370	-		0
Benzo(a)anthracene	-		0	-	U	74	-		0
Benzo(a)pyrene	-		0	-	U	74	-		0
Benzo(b)fluoranthene	-		0	-	U	74	-		0
Benzo(g,h,i)perylene	-		0	-	U	74	-		0
Benzo(k)fluoranthene	-		0	-	U	74	-		0
Benzoic acid	-		0	-	R-S	370	-		0
Benzyl alcohol	-		0	-	U	74	-		0
Bis(2-chloroethoxy)-methane	-		0	-	U	74	-		0
Bis(2-chloroethyl)ether	-		0	-	U	74	-		0
Bis(2-ethylhexyl)phthalate	-		0	360		0	-		0
Butylbenzylphthalate	-		0	-	U	74	-		0
Carbazole	-		0	-	U	74	-		0
Chrysene	-		0	-	U	74	-		0
Di-n-butylphthalate	-		0	-	U	74	-		0

Well ID	OMW-209			OMW-209			OMW-210		
Sample date	3/2/95			9/11/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-		0	-	U	74	-		0
Dibenz(a,h)anthracene	-		0	-		0	-		0
Dibenzofuran	-		0	-	U	74	-		0
Diethylphthalate	-		0	-	U	74	-		0
Dimethylphthalate	-		0	-	U	74	-		0
Fluoranthene	-		0	-	U	74	-		0
Fluorene	-		0	-	U	74	-		0
Hexachlorobenzene	-		0	-	U	74	-		0
Hexachlorobutadiene	-		0	-	U	74	-		0
Hexachlorocyclopentadiene	-		0	-	U	74	-		0
Hexachloroethane	-		0	-	U	74	-		0
Indeno(1,2,3-cd)pyrene	-		0	-	U	74	-		0
Isophorone	-		0	-	U	74	-		0
N-nitroso-di-n-propylamine	-		0	-	U	74	-		0
N-Nitrosodimethylamine	-		0	-	U	74	-		0
N-nitrosodiphenylamine	-		0	-	U	74	-		0
Naphthalene	-		0	-	U	74	-		0
Nitrobenzene	-		0	-	U	74	-		0
Pentachlorophenol	-	U	25	-	R-S	370	-	U	25
Phenanthrene	-		0	-	U	74	-		0
Phenol	-	U	5	-	R-S	74	-	U	5
Pyrene	-		0	-	U	74	-		0
Pyridine	-		0	-	U	74	-		0

Well ID	OMW-210			OMW-210			OMW-211		
Sample date	3/2/95			9/13/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-		0	-	U	12	-		0
1,2-Dichlorobenzene	-		0	-	U	12	-		0
1,3-Dichlorobenzene	-		0	-	U	12	-		0
1,4-Dichlorobenzene	-		0	-	U	12	-		0
2,2'-oxybis(1-Chloropropane)	-		0	-	UJ-C	12	-		0
2,4,5-Trichlorophenol	-	U	25	-	R-S	58	-	U	25
2,4,6-Trichlorophenol	-	U	5	-	R-S	12	-	U	5
2,4-Dichlorophenol	-	U	5	-	R-S	12	-	U	5
2,4-Dimethylphenol	-	U	5	-	R-S	12	2	J	0
2,4-Dinitrophenol	-	U	25	-	R-S	58	-	U	25
2,4-Dinitrotoluene	-		0	-	U	12	-		0
2,6-Dinitrotoluene	-		0	-	U	12	-		0
2-Chloronaphthalene	-		0	-	U	12	-		0
2-Chlorophenol	-	U	5	-	R-S	12	2	J	0
2-Methylnaphthalene	-		0	-	U	12	-		0
2-Methylphenol	-	U	5	-	R-S	12	-	U	5
2-Nitroaniline	-		0	-	U	58	-		0
2-Nitrophenol	-	U	5	-	R-S	12	-	U	5
3,3'-Dichlorobenzidine	-		0	-	UJ-C	23	-		0
3-Nitroaniline	-		0	-	U	58	-		0
4,6-Dinitro-2-Methylphenol	-	U	25	-	R-S	58	-	U	25
4-Bromophenyl-Phenylether	-		0	-	U	12	-		0
4-Chloro-3-Methylphenol	-	U	5	-	R-S	12	-	U	5
4-Chloroaniline	-		0	-	U	12	-		0
4-Chlorophenyl-Phenylether	-		0	-	U	12	-		0
4-Methylphenol	-	U	5	-	R-S	12	-	U	5
4-Nitroaniline	-		0	-	U	58	-		0
4-Nitrophenol	-	U	25	-	R-S	58	-	UJ-C	25
Acenaphthene	-		0	-	U	12	-		0
Acenaphthylene	-		0	-	U	12	-		0
Aniline	-		0	-	U	12	-		0
Anthracene	-		0	-	U	12	-		0
Azobenzene	-		0	-	U	12	-		0
Benzidine	-		0	-	R-C	58	-		0
Benzo(a)anthracene	-		0	-	U	12	-		0
Benzo(a)pyrene	-		0	-	U	12	-		0
Benzo(b)fluoranthene	-		0	-	U	12	-		0
Benzo(g,h,i)perylene	-		0	-	U	12	-		0
Benzo(k)fluoranthene	-		0	-	UJ-C	12	-		0
Benzoic acid	-		0	-	R-S	58	-		0
Benzyl alcohol	-		0	-	U	12	-		0
Bis(2-chloroethoxy)-methane	-		0	-	U	12	-		0
Bis(2-chloroethyl)ether	-		0	-	U	12	-		0
Bis(2-ethylhexyl)phthalate	-		0	-	U	12	-		0
Butylbenzylphthalate	-		0	-	U	12	-		0
Carbazole	-		0	-	U	12	-		0
Chrysene	-		0	-	U	12	-		0
Di-n-butylphthalate	-		0	-	U	12	-		0

Well ID	OMW-210			OMW-210			OMW-211		
Sample date	3/2/95			9/13/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-		0	-	U	12	-		0
Dibenz(a,h)anthracene	-		0	-	U	12	-		0
Dibenzofuran	-		0	-	U	12	-		0
Diethylphthalate	-		0	-	U	12	-		0
Dimethylphthalate	-		0	-	U	12	-		0
Fluoranthene	-		0	-	U	12	-		0
Fluorene	-		0	-	U	12	-		0
Hexachlorobenzene	-		0	-	U	12	-		0
Hexachlorobutadiene	-		0	-	U	12	-		0
Hexachlorocyclopentadiene	-		0	-	U	12	-		0
Hexachloroethane	-		0	-	U	12	-		0
Indeno(1,2,3-cd)pyrene	-		0	-	U	12	-		0
Isophorone	-		0	-	U	12	-		0
N-nitroso-di-n-propylamine	-		0	-	UJ-C	12	-		0
N-Nitrosodimethylamine	-		0	-	U	12	-		0
N-nitrosodiphenylamine	-		0	-	U	12	-		0
Naphthalene	-		0	-	U	12	-		0
Nitrobenzene	-		0	-	U	12	-		0
Pentachlorophenol	-	U	25	-	R-S	58	-	U	25
Phenanthrene	-		0	-	U	12	-		0
Phenol	-	U	5	-	R-S	12	5		5
Pyrene	-		0	-	U	12	-		0
Pyridine	-		0	-	U	12	-		0

Well ID	OMW-211			OMW-211			OMW-212		
Sample date	3/2/95			9/13/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-		0	-	U	16	-		0
1,2-Dichlorobenzene	-		0	-	U	16	-		0
1,3-Dichlorobenzene	-		0	-	U	16	-		0
1,4-Dichlorobenzene	-		0	-	U	16	-		0
2,2'-oxybis(1-Chloropropane)	-		0	-	U	16	-		0
2,4,5-Trichlorophenol	-	U	25	-	U	79	-	U	25
2,4,6-Trichlorophenol	-	U	5	-	U	16	-	U	5
2,4-Dichlorophenol	-	U	5	-	U	16	-	U	5
2,4-Dimethylphenol	3	J	0	-	U	16	-	U	5
2,4-Dinitrophenol	-	U	25	-	U	79	-	UJ-C	25
2,4-Dinitrotoluene	-		0	-	U	16	-		0
2,6-Dinitrotoluene	-		0	-	U	16	-		0
2-Chloronaphthalene	-		0	-	U	16	-		0
2-Chlorophenol	2	J	0	2	J	0	-	U	5
2-Methylnaphthalene	-		0	-	U	16	-		0
2-Methylphenol	-	U	5	-	U	16	-	U	5
2-Nitroaniline	-		0	-	U	79	-		0
2-Nitrophenol	-	U	5	-	U	16	-	U	5
3,3'-Dichlorobenzidine	-		0	-	U	32	-		0
3-Nitroaniline	-		0	-	UJ-C	79	-		0
4,6-Dinitro-2-Methylphenol	-	U	25	-	UJ-C	79	-	U	25
4-Bromophenyl-Phenylether	-		0	-	U	16	-		0
4-Chloro-3-Methylphenol	-	U	5	-	U	16	-	U	5
4-Chloroaniline	-		0	-	U	16	-		0
4-Chlorophenyl-Phenylether	-		0	-	U	16	-		0
4-Methylphenol	2	J	0	2	J	0	-	U	5
4-Nitroaniline	-		0	-	UJ-C	79	-		0
4-Nitrophenol	-	U	25	-	U	79	-	U	25
Acenaphthene	-		0	-	U	16	-		0
Acenaphthylene	-		0	-	U	16	-		0
Aniline	-		0	-	U	16	-		0
Anthracene	-		0	-	U	16	-		0
Azobenzene	-		0	-	U	16	-		0
Benzidine	-		0	-	R-C	79	-		0
Benzo(a)anthracene	-		0	-	U	16	-		0
Benzo(a)pyrene	-		0	-	U	16	-		0
Benzo(b)fluoranthene	-		0	-	U	16	-		0
Benzo(g,h,i)perylene	-		0	-	U	16	-		0
Benzo(k)fluoranthene	-		0	-	UJ-C	16	-		0
Benzoic acid	-		0	-	U	79	-		0
Benzyl alcohol	-		0	-	U	16	-		0
Bis(2-chloroethoxy)-methane	-		0	-	U	16	-		0
Bis(2-chloroethyl)ether	-		0	-	U	16	-		0
Bis(2-ethylhexyl)phthalate	-		0	2	J	0	-		0
Butylbenzylphthalate	-		0	-	U	16	-		0
Carbazole	-		0	-	U	16	-		0
Chrysene	-		0	-	U	16	-		0
Di-n-butylphthalate	-		0	-	U	16	-		0

Well ID	OMW-211			OMW-211			OMW-212		
Sample date	3/2/95			9/13/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-		0	-	U	16	-		0
Dibenz(a,h)anthracene	-		0	-	U	16	-		0
Dibenzofuran	-		0	-	U	16	-		0
Diethylphthalate	-		0	-	U	16	-		0
Dimethylphthalate	-		0	-	U	16	-		0
Fluoranthene	-		0	-	U	16	-		0
Fluorene	-		0	-	U	16	-		0
Hexachlorobenzene	-		0	-	U	16	-		0
Hexachlorobutadiene	-		0	-	U	16	-		0
Hexachlorocyclopentadiene	-		0	-	U	16	-		0
Hexachloroethane	-		0	-	U	16	-		0
Indeno(1,2,3-cd)pyrene	-		0	-	U	16	-		0
Isophorone	-		0	-	U	16	-		0
N-nitroso-di-n-propylamine	-		0	-	U	16	-		0
N-Nitrosodimethylamine	-		0	-	UJ-C	16	-		0
N-nitrosodiphenylamine	-		0	-	U	16	-		0
Naphthalene	-		0	-	U	16	-		0
Nitrobenzene	-		0	-	U	16	-		0
Pentachlorophenol	-	U	25	-	U	79	-	U	25
Phenanthrene	-		0	-	U	16	-		0
Phenol	1	J	0	-	U	16	-	U	5
Pyrene	-		0	-	U	16	-		0
Pyridine	-		0	-	U	16	-		0

Well ID	OMW-212			OMW-212			OMW-213		
Sample date	3/2/95			9/14/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-		0	-	U	12	-		0
1,2-Dichlorobenzene	-		0	-	U	12	-		0
1,3-Dichlorobenzene	-		0	-	U	12	-		0
1,4-Dichlorobenzene	-		0	-	U	12	-		0
2,2'-oxybis(1-Chloropropane)	-		0	-	U	12	-		0
2,4,5-Trichlorophenol	-	U	25	-	U	62	-	U	25
2,4,6-Trichlorophenol	-	U	5	-	U	12	-	UJ-C	5
2,4-Dichlorophenol	-	U	5	-	U	12	-	U	5
2,4-Dimethylphenol	-	U	5	-	U	12	-	U	5
2,4-Dinitrophenol	-	U	25	-	J-C	62	-	UJ-C	25
2,4-Dinitrotoluene	-		0	-	U	12	-		0
2,6-Dinitrotoluene	-		0	-	U	12	-		0
2-Chloronaphthalene	-		0	-	U	12	-		0
2-Chlorophenol	-	U	5	-	U	12	-	U	5
2-Methylnaphthalene	-		0	-	U	12	-		0
2-Methylphenol	-	U	5	-	U	12	-	U	5
2-Nitroaniline	-		0	-	U	62	-		0
2-Nitrophenol	-	U	5	-	U	12	-	U	5
3,3'-Dichlorobenzidine	-		0	-	U	25	-		0
3-Nitroaniline	-		0	-	U	62	-		0
4,6-Dinitro-2-Methylphenol	-	U	25	-	U	62	-	U	25
4-Bromophenyl-Phenylether	-		0	-	U	12	-		0
4-Chloro-3-Methylphenol	-	U	5	-	U	12	-	U	5
4-Chloroaniline	-		0	-	U	12	-		0
4-Chlorophenyl-Phenylether	-		0	-	U	12	-		0
4-Methylphenol	-	U	5	-	U	12	-	U	5
4-Nitroaniline	-		0	-	U	62	-		0
4-Nitrophenol	-	U	25	-	U	62	-	U	25
Acenaphthene	-		0	-	U	12	-		0
Acenaphthylene	-		0	-	U	12	-		0
Aniline	-		0	-	U	12	-		0
Anthracene	-		0	-	U	12	-		0
Azobenzene	-		0	-	U	12	-		0
Benzidine	-		0	-	R-C	62	-		0
Benzo(a)anthracene	-		0	-	U	12	-		0
Benzo(a)pyrene	-		0	-	U	12	-		0
Benzo(b)fluoranthene	-		0	-	U	12	-		0
Benzo(g,h,i)perylene	-		0	-	U	12	-		0
Benzo(k)fluoranthene	-		0	-	UJ-C	12	-		0
Benzoic acid	-		0	-	U	62	-		0
Benzyl alcohol	-		0	-	U	12	-		0
Bis(2-chloroethoxy)-methane	-		0	-	U	12	-		0
Bis(2-chloroethyl)ether	-		0	-	U	12	-		0
Bis(2-ethylhexyl)phthalate	-		0	3	J	0	-		0
Butylbenzylphthalate	-		0	-	U	12	-		0
Carbazole	-		0	-	U	12	-		0
Chrysene	-		0	-	U	12	-		0
Di-n-butylphthalate	-		0	1	J	0	-		0

Well ID	OMW-212			OMW-212			OMW-213		
Sample date	3/2/95			9/14/95			12/10/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-		0	-	U	12	-		0
Dibenz(a,h)anthracene	-		0	-	U	12	-		0
Dibenzofuran	-		0	-	U	12	-		0
Diethylphthalate	-		0	-	U	12	-		0
Dimethylphthalate	-		0	-	U	12	-		0
Fluoranthene	-		0	-	U	12	-		0
Fluorene	-		0	-	U	12	-		0
Hexachlorobenzene	-		0	-	U	12	-		0
Hexachlorobutadiene	-		0	-	U	12	-		0
Hexachlorocyclopentadiene	-		0	-	U	12	-		0
Hexachloroethane	-		0	-	U	12	-		0
Indeno(1,2,3-cd)pyrene	-		0	-	U	12	-		0
Isophorone	-		0	-	U	12	-		0
N-nitroso-di-n-propylamine	-		0	-	U	12	-		0
N-Nitrosodimethylamine	-		0	-	U	12	-		0
N-nitrosodiphenylamine	-		0	-	U	12	-		0
Naphthalene	-		0	-	U	12	-		0
Nitrobenzene	-		0	-	U	12	-		0
Pentachlorophenol	-	U	25	-	U	62	-	U	25
Phenanthrene	-		0	-	U	12	-		0
Phenol	-	U	5	-	U	12	-	U	5
Pyrene	-		0	-	U	12	-		0
Pyridine	-		0	-	U	12	-		0

Well ID	OMW-213			OMW-213			OMW-214		
Sample date	3/2/95			9/13/95			12/13/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-		0	-	U	11	-		0
1,2-Dichlorobenzene	-		0	-	U	11	-		0
1,3-Dichlorobenzene	-		0	-	U	11	-		0
1,4-Dichlorobenzene	-		0	-	U	11	-		0
2,2'-oxybis(1-Chloropropane)	-		0	-	U	11	-		0
2,4,5-Trichlorophenol	-	U	25	-	U	56	-	U	25
2,4,6-Trichlorophenol	-	U	5	-	U	11	-	U	5
2,4-Dichlorophenol	-	U	5	-	U	11	-	U	5
2,4-Dimethylphenol	-	U	5	-	U	11	-	U	5
2,4-Dinitrophenol	-	U	25	-	U	56	-	UJ-C	25
2,4-Dinitrotoluene	-		0	-	U	11	-		0
2,6-Dinitrotoluene	-		0	-	U	11	-		0
2-Chloronaphthalene	-		0	-	U	11	-		0
2-Chlorophenol	-	U	5	-	U	11	-	U	5
2-Methylnaphthalene	-		0	-	U	11	-		0
2-Methylphenol	-	U	5	-	U	11	-	U	5
2-Nitroaniline	-		0	-	U	56	-		0
2-Nitrophenol	-	U	5	-	U	11	-	U	5
3,3'-Dichlorobenzidine	-		0	-	U	22	-		0
3-Nitroaniline	-		0	-	UJ-C	56	-		0
4,6-Dinitro-2-Methylphenol	-	U	25	-	UJ-C	56	-	U	25
4-Bromophenyl-Phenylether	-		0	-	U	11	-		0
4-Chloro-3-Methylphenol	-	U	5	-	U	11	-	U	5
4-Chloroaniline	-		0	-	U	11	-		0
4-Chlorophenyl-Phenylether	-		0	-	U	11	-		0
4-Methylphenol	-	U	5	-	U	11	-	U	5
4-Nitroaniline	-		0	-	UJ-C	56	-		0
4-Nitrophenol	-	U	25	-	U	56	-	UJ-C	25
Acenaphthene	-		0	-	U	11	-		0
Acenaphthylene	-		0	-	U	11	-		0
Aniline	-		0	-	U	11	-		0
Anthracene	-		0	-	U	11	-		0
Azobenzene	-		0	-	U	11	-		0
Benzidine	-		0	-	R-C	56	-		0
Benzo(a)anthracene	-		0	-	U	11	-		0
Benzo(a)pyrene	-		0	-	U	11	-		0
Benzo(b)fluoranthene	-		0	-	U	11	-		0
Benzo(g,h,i)perylene	-		0	-	U	11	-		0
Benzo(k)fluoranthene	-		0	-	UJ-C	11	-		0
Benzoic acid	-		0	-	U	56	-		0
Benzyl alcohol	-		0	-	U	11	-		0
Bis(2-chloroethoxy)-methane	-		0	-	U	11	-		0
Bis(2-chloroethyl)ether	-		0	-	U	11	-		0
Bis(2-ethylhexyl)phthalate	-		0	-	U	11	-		0
Butylbenzylphthalate	-		0	-	U	11	-		0
Carbazole	-		0	-	U	11	-		0
Chrysene	-		0	-	U	11	-		0
Di-n-butylphthalate	-		0	1	J	0	-		0

Well ID	OMW-213			OMW-213			OMW-214		
Sample date	3/2/95			9/13/95			12/13/94		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-		0	-	U	11	-		0
Dibenz(a,h)anthracene	-		0	-	U	11	-		0
Dibenzofuran	-		0	-	U	11	-		0
Diethylphthalate	-		0	-	U	11	-		0
Dimethylphthalate	-		0	-	U	11	-		0
Fluoranthene	-		0	-	U	11	-		0
Fluorene	-		0	-	U	11	-		0
Hexachlorobenzene	-		0	-	U	11	-		0
Hexachlorobutadiene	-		0	-	U	11	-		0
Hexachlorocyclopentadiene	-		0	-	U	11	-		0
Hexachloroethane	-		0	-	U	11	-		0
Indeno(1,2,3-cd)pyrene	-		0	-	U	11	-		0
Isophorone	-		0	-	U	11	-		0
N-nitroso-di-n-propylamine	-		0	-	U	11	-		0
N-Nitrosodimethylamine	-		0	-	UJ-C	11	-		0
N-nitrosodiphenylamine	-		0	-	U	11	-		0
Naphthalene	-		0	-	U	11	-		0
Nitrobenzene	-		0	-	U	11	-		0
Pentachlorophenol	-	U	25	-	U	56	-	U	25
Phenanthrene	-		0	-	U	11	-		0
Phenol	-	U	5	-	U	11	-	U	5
Pyrene	-		0	-	U	11	-		0
Pyridine	-		0	-	U	11	-		0

Well ID	OMW-214			OMW-214			OMW-215		
Sample date	3/2/95			9/11/95			9/14/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-		0	-	U	10	-	U	12
1,2-Dichlorobenzene	-		0	-	U	10	-	U	12
1,3-Dichlorobenzene	-		0	-	U	10	-	U	12
1,4-Dichlorobenzene	-		0	-	U	10	-	U	12
2,2'-oxybis(1-Chloropropane)	-		0	-	U	10	-	U	12
2,4,5-Trichlorophenol	-	U	25	-	U	50	-	U	62
2,4,6-Trichlorophenol	-	U	5	-	U	10	-	U	12
2,4-Dichlorophenol	-	U	5	-	U	10	-	U	12
2,4-Dimethylphenol	-	U	5	-	U	10	-	U	12
2,4-Dinitrophenol	-	U	25	-	U	50	-	U	62
2,4-Dinitrotoluene	-		0	-	U	10	-	U	12
2,6-Dinitrotoluene	-		0	-	U	10	-	U	12
2-Chloronaphthalene	-		0	-	U	10	-	U	12
2-Chlorophenol	-	U	5	-	U	10	-	U	12
2-Methylnaphthalene	-		0	-	U	10	-	U	12
2-Methylphenol	-	U	5	-	U	10	-	U	12
2-Nitroaniline	-		0	-	U	50	-	U	62
2-Nitrophenol	-	U	5	-	U	10	-	U	12
3,3'-Dichlorobenzidine	-		0	-	U	20	-	U	25
3-Nitroaniline	-		0	-	U	50	-	U	62
4,6-Dinitro-2-Methylphenol	-	U	25	-	U	50	-	U	62
4-Bromophenyl-Phenylether	-		0	-	U	10	-	U	12
4-Chloro-3-Methylphenol	-	U	5	-	U	10	-	U	12
4-Chloroaniline	-		0	-	U	10	-	U	12
4-Chlorophenyl-Phenylether	-		0	-	U	10	-	U	12
4-Methylphenol	-	U	5	-	U	10	-	U	12
4-Nitroaniline	-		0	-	U	50	-	U	62
4-Nitrophenol	-	U	25	-	U	50	-	U	62
Acenaphthene	-		0	-	U	10	-	U	12
Acenaphthylene	-		0	-	U	10	-	UJ-C	12
Aniline	-		0	-	U	10	-	U	12
Anthracene	-		0	-	U	10	-	U	12
Azobenzene	-		0	-	U	10	-	U	12
Benzidine	-		0	-	UJ-C	50	-	UJ-C	62
Benzo(a)anthracene	-		0	-	U	10	-	U	12
Benzo(a)pyrene	-		0	-	U	10	-	U	12
Benzo(b)fluoranthene	-		0	-	U	10	-	U	12
Benzo(g,h,i)perylene	-		0	-	U	10	-	U	12
Benzo(k)fluoranthene	-		0	-	U	10	-	U	12
Benzoic acid	-		0	3	J	0	-	U	62
Benzyl alcohol	-		0	-	U	10	-	U	12
Bis(2-chloroethoxy)-methane	-		0	-	U	10	-	U	12
Bis(2-chloroethyl)ether	-		0	-	U	10	-	U	12
Bis(2-ethylhexyl)phthalate	-		0	3	J	0	-	U	12
Butylbenzylphthalate	-		0	-	U	10	-	U	12
Carbazole	-		0	-	U	10	-	U	12
Chrysene	-		0	-	U	10	-	U	12
Di-n-butylphthalate	-		0	-	U	10	2	J	0

Well ID	OMW-214			OMW-214			OMW-215		
Sample date	3/2/95			9/11/95			9/14/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-		0	-	U	10	-	U	12
Dibenz(a,h)anthracene	-		0	-		0	-	U	12
Dibenzofuran	-		0	-	U	10	-	U	12
Diethylphthalate	-		0	-	U	10	-	U	12
Dimethylphthalate	-		0	-	U	10	-	U	12
Fluoranthene	-		0	-	U	10	-	U	12
Fluorene	-		0	-	U	10	-	U	12
Hexachlorobenzene	-		0	-	U	10	-	U	12
Hexachlorobutadiene	-		0	-	U	10	-	U	12
Hexachlorocyclopentadiene	-		0	-	U	10	-	U	12
Hexachloroethane	-		0	-	U	10	-	U	12
Indeno(1,2,3-cd)pyrene	-		0	-	U	10	-	U	12
Isophorone	-		0	-	U	10	-	U	12
N-nitroso-di-n-propylamine	-		0	-	U	10	-	U	12
N-Nitrosodimethylamine	-		0	-	U	10	-	U	12
N-nitrosodiphenylamine	-		0	-	U	10	-	U	12
Naphthalene	-		0	-	U	10	-	U	12
Nitrobenzene	-		0	-	U	10	-	U	12
Pentachlorophenol	-	U	25	-	U	50	-	U	62
Phenanthrene	-		0	-	U	10	-	U	12
Phenol	-	U	5	-	U	10	-	U	12
Pyrene	-		0	-	U	10	-	U	12
Pyridine	-		0	-	U	10	-	U	12

Well ID	OMW-215			OMW-216			OMW-216		
Sample date	10/13/95			9/11/95			10/12/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-	U	10	-	U	10	-	U	10
1,2-Dichlorobenzene	-	U	10	-	U	10	-	U	10
1,3-Dichlorobenzene	-	U	10	-	U	10	-	U	10
1,4-Dichlorobenzene	-	U	10	-	U	10	-	U	10
2,2'-oxybis(1-Chloropropane)	-	U	10	-	U	10	-	U	10
2,4,5-Trichlorophenol	-	U	50	-	U	50	-	U	50
2,4,6-Trichlorophenol	-	U	10	-	U	10	-	U	10
2,4-Dichlorophenol	-	U	10	-	U	10	-	U	10
2,4-Dimethylphenol	-	U	10	-	U	10	-	U	10
2,4-Dinitrophenol	-	U	50	-	U	50	-	U	50
2,4-Dinitrotoluene	-	U	10	-	U	10	-	U	10
2,6-Dinitrotoluene	-	U	10	-	U	10	-	U	10
2-Chloronaphthalene	-	U	10	-	U	10	-	U	10
2-Chlorophenol	-	U	10	-	U	10	-	U	10
2-Methylnaphthalene	-	U	10	-	U	10	-	U	10
2-Methylphenol	-	U	10	-	U	10	-	U	10
2-Nitroaniline	-	U	50	-	U	50	-	U	50
2-Nitrophenol	-	U	10	-	U	10	-	U	10
3,3'-Dichlorobenzidine	-	UJ-C	20	-	U	20	-	U	20
3-Nitroaniline	-	UJ-C	50	-	U	50	-	U	50
4,6-Dinitro-2-Methylphenol	-	U	50	-	U	50	-	U	50
4-Bromophenyl-Phenylether	-	U	10	-	U	10	-	U	10
4-Chloro-3-Methylphenol	-	U	10	-	U	10	-	U	10
4-Chloroaniline	-	U	10	-	U	10	-	U	10
4-Chlorophenyl-Phenylether	-	U	10	-	U	10	-	U	10
4-Methylphenol	-	U	10	-	U	10	-	U	10
4-Nitroaniline	-	U	50	-	U	50	-	U	50
4-Nitrophenol	-	U	50	-	U	50	-	U	50
Acenaphthene	-	U	10	-	U	10	-	U	10
Acenaphthylene	-	U	10	-	U	10	-	U	10
Aniline	-	U	10	-	U	10	-	U	10
Anthracene	-	U	10	-	U	10	-	U	10
Azobenzene	-	U	10	-	U	10	-	U	10
Benzidine	-	U	10	-	UJ-C	50	-	U	10
Benzo(a)anthracene	-	U	10	-	U	10	-	U	10
Benzo(a)pyrene	-	U	10	-	U	10	-	U	10
Benzo(b)fluoranthene	-	U	10	-	U	10	-	U	10
Benzo(g,h,i)perylene	-	U	10	-	U	10	-	U	10
Benzo(k)fluoranthene	-	U	10	-	U	10	-	U	10
Benzoic acid	-	U	10	-	U	50	-	U	10
Benzyl alcohol	-	U	10	-	U	10	-	U	10
Bis(2-chloroethoxy)-methane	-	U	10	-	U	10	-	U	10
Bis(2-chloroethyl)ether	-	U	10	-	U	10	-	U	10
Bis(2-ethylhexyl)phthalate	-	U	10	11		0	-	U	10
Butylbenzylphthalate	-	U	10	-	U	10	-	U	10
Carbazole	-	U	10	-	U	10	-	U	10
Chrysene	-	U	10	-	U	10	-	U	10
Di-n-butylphthalate	-	U	10	1	J	0	-	U	10

Well ID	OMW-215			OMW-216			OMW-216		
Sample date	10/13/95			9/11/95			10/12/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-	U	10	-	U	10	-	U	10
Dibenz(a,h)anthracene	-		0	-		0	-		0
Dibenzofuran	-	U	10	-	U	10	-	U	10
Diethylphthalate	-	U	10	-	U	10	-	U	10
Dimethylphthalate	-	U	10	-	U	10	-	U	10
Fluoranthene	-	U	10	-	U	10	-	U	10
Fluorene	-	U	10	-	U	10	-	U	10
Hexachlorobenzene	-	U	10	-	U	10	-	U	10
Hexachlorobutadiene	-	U	10	-	U	10	-	U	10
Hexachlorocyclopentadiene	-	U	10	-	U	10	-	U	10
Hexachloroethane	-	U	10	-	U	10	-	U	10
Indeno(1,2,3-cd)pyrene	-	U	10	-	U	10	-	U	10
Isophorone	-	U	10	-	U	10	-	U	10
N-nitroso-di-n-propylamine	-	U	10	-	U	10	-	U	10
N-Nitrosodimethylamine	-	U	10	-	U	10	-	U	10
N-nitrosodiphenylamine	-	U	10	-	U	10	-	U	10
Naphthalene	-	U	10	-	U	10	-	U	10
Nitrobenzene	-	U	10	-	U	10	-	U	10
Pentachlorophenol	-	U	50	-	U	50	-	U	50
Phenanthrene	-	U	10	-	U	10	-	U	10
Phenol	-	U	10	-	U	10	-	U	10
Pyrene	-	U	10	-	U	10	-	U	10
Pyridine	-	U	10	-	U	10	-	U	10

Well ID	PB-1			PB-2			PO-1		
Sample date	9/13/95			9/12/95			9/12/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-	U	11	390	J	0	-	U	14
1,2-Dichlorobenzene	-	U	11	-	U	590	-	U	14
1,3-Dichlorobenzene	-	U	11	-	U	590	-	U	14
1,4-Dichlorobenzene	-	U	11	-	U	590	-	U	14
2,2'-oxybis(1-Chloropropane)	-	U	11	-	U	590	-	U	14
2,4,5-Trichlorophenol	-	R-S	55	-	U	2900	-	U	70
2,4,6-Trichlorophenol	-	R-S	11	-	U	590	-	U	14
2,4-Dichlorophenol	-	R-S	11	-	U	590	-	U	14
2,4-Dimethylphenol	-	R-S	11	100	J	0	-	U	14
2,4-Dinitrophenol	-	R-S	55	-	UJ-C	2900	-	U	70
2,4-Dinitrotoluene	-	U	11	-	U	590	-	U	14
2,6-Dinitrotoluene	-	U	11	-	U	590	-	U	14
2-Chloronaphthalene	-	U	11	-	U	590	-	U	14
2-Chlorophenol	-	R-S	11	-	U	590	-	U	14
2-Methylnaphthalene	-	U	11	-	U	590	-	U	14
2-Methylphenol	-	R-S	11	320	J	0	-	U	14
2-Nitroaniline	-	U	55	-	UJ-C	2900	-	U	70
2-Nitrophenol	-	R-S	11	-	U	590	-	U	14
3,3'-Dichlorobenzidine	-	U	22	-	UJ-C	1200	-	U	28
3-Nitroaniline	-	UJ-C	55	-	U	2900	-	UJ-C	70
4,6-Dinitro-2-Methylphenol	-	R-S	55	-	UJ-C	2900	-	UJ-C	70
4-Bromophenyl-Phenylether	-	U	11	-	U	590	-	U	14
4-Chloro-3-Methylphenol	-	R-S	11	-	U	590	-	U	14
4-Chloroaniline	-	U	11	-	U	590	-	U	14
4-Chlorophenyl-Phenylether	-	U	11	-	U	590	-	U	14
4-Methylphenol	6	J-S	0	2500		0	-	U	14
4-Nitroaniline	-	UJ-C	55	-	U	2900	-	UJ-C	70
4-Nitrophenol	-	R-S	55	-	UJ-C	2900	-	U	70
Acenaphthene	-	U	11	-	U	590	-	U	14
Acenaphthylene	-	U	11	-	U	590	-	U	14
Aniline	-	U	11	-	U	590	-	U	14
Anthracene	-	U	11	-	U	590	-	U	14
Azobenzene	-	U	11	-	U	590	-	U	14
Benzidine	-	R-C	55	-	R-C	2900	-	R-C	70
Benzo(a)anthracene	-	U	11	-	U	590	-	U	14
Benzo(a)pyrene	-	U	11	-	U	590	-	U	14
Benzo(b)fluoranthene	-	U	11	-	U	590	-	U	14
Benzo(g,h,i)perylene	-	U	11	-	U	590	-	U	14
Benzo(k)fluoranthene	-	UJ-C	11	-	U	590	-	U	14
Benzoic acid	-	R-S	55	3100		0	-	U	70
Benzyl alcohol	-	U	11	-	U	590	-	U	14
Bis(2-chloroethoxy)-methane	-	U	11	-	U	590	-	U	14
Bis(2-chloroethyl)ether	-	U	11	-	U	590	-	U	14
Bis(2-ethylhexyl)phthalate	-	U	11	-	U	590	-	U	14
Butylbenzylphthalate	-	U	11	-	U	590	-	U	14
Carbazole	-	U	11	-	U	590	-	UJ-C	14
Chrysene	-	U	11	-	U	590	-	U	14
Di-n-butylphthalate	2	J	0	-	U	590	-	U	14

Well ID	PB-1			PB-2			PO-1		
Sample date	9/13/95			9/12/95			9/12/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-	U	11	-	U	590	-	U	14
Dibenz(a,h)anthracene	-	U	11	-		0	-		0
Dibenzofuran	-	U	11	-	U	590	-	U	14
Diethylphthalate	-	U	11	-	U	590	-	U	14
Dimethylphthalate	-	U	11	-	U	590	-	U	14
Fluoranthene	-	U	11	-	U	590	-	U	14
Fluorene	-	U	11	-	U	590	-	U	14
Hexachlorobenzene	-	U	11	-	U	590	-	U	14
Hexachlorobutadiene	-	U	11	-	U	590	-	U	14
Hexachlorocyclopentadiene	-	U	11	-	U	590	-	U	14
Hexachloroethane	-	U	11	-	U	590	-	U	14
Indeno(1,2,3-cd)pyrene	-	U	11	-	U	590	-	U	14
Isophorone	-	U	11	-	U	590	-	U	14
N-nitroso-di-n-propylamine	-	U	11	-	U	590	-	U	14
N-Nitrosodimethylamine	-	UJ-C	11	-	U	590	-	U	14
N-nitrosodiphenylamine	-	U	11	-	U	590	-	U	14
Naphthalene	-	U	11	-	U	590	-	U	14
Nitrobenzene	-	U	11	-	U	590	-	U	14
Pentachlorophenol	-	R-S	55	-	U	2900	-	U	70
Phenanthrene	-	U	11	-	U	590	-	U	14
Phenol	-	R-S	11	2500		0	-	U	14
Pyrene	-	U	11	-	U	590	-	U	14
Pyridine	-	U	11	-	U	590	-	U	14

Well ID	PW-1			PW-2			PW-3		
Sample date	9/12/95			9/11/95			9/12/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-	U	12	-	U	10	-	U	14
1,2-Dichlorobenzene	-	U	12	-	U	10	-	U	14
1,3-Dichlorobenzene	-	U	12	-	U	10	-	U	14
1,4-Dichlorobenzene	-	U	12	2	J	0	-	U	14
2,2'-oxybis(1-Chloropropane)	-	U	12	-	U	10	-	U	14
2,4,5-Trichlorophenol	-	R-S	59	-	R-S	51	-	U	68
2,4,6-Trichlorophenol	-	R-S	12	-	R-S	10	-	U	14
2,4-Dichlorophenol	-	R-S	12	-	R-S	10	-	U	14
2,4-Dimethylphenol	-	R-S	12	-	R-S	10	-	U	14
2,4-Dinitrophenol	-	R-S	59	-	R-S	51	-	U	68
2,4-Dinitrotoluene	-	U	12	-	U	10	-	U	14
2,6-Dinitrotoluene	-	U	12	-	U	10	-	U	14
2-Chloronaphthalene	-	U	12	-	U	10	-	U	14
2-Chlorophenol	-	R-S	12	-	R-S	10	-	U	14
2-Methylnaphthalene	-	U	12	-	U	10	-	U	14
2-Methylphenol	-	R-S	12	-	R-S	10	-	U	14
2-Nitroaniline	-	U	59	-	U	51	-	U	68
2-Nitrophenol	-	R-S	12	-	R-S	10	-	U	14
3,3'-Dichlorobenzidine	-	U	23	-	U	20	-	U	27
3-Nitroaniline	-	UJ-C	59	-	U	51	-	UJ-C	68
4,6-Dinitro-2-Methylphenol	-	R-S	59	-	R-S	51	-	UJ-C	68
4-Bromophenyl-Phenylether	-	U	12	-	U	10	-	U	14
4-Chloro-3-Methylphenol	-	R-S	12	-	R-S	10	-	U	14
4-Chloroaniline	-	U	12	-	U	10	-	U	14
4-Chlorophenyl-Phenylether	-	U	12	-	U	10	-	U	14
4-Methylphenol	3	J-S	0	-	R-S	10	-	U	14
4-Nitroaniline	-	UJ-C	59	-	U	51	-	UJ-C	68
4-Nitrophenol	-	R-S	59	-	R-S	51	-	U	68
Acenaphthene	-	U	12	-	U	10	-	U	14
Acenaphthylene	-	U	12	-	U	10	-	U	14
Aniline	-	U	12	-	U	10	-	U	14
Anthracene	-	U	12	-	U	10	-	U	14
Azobenzene	-	U	12	-	U	10	-	U	14
Benzidine	-	R-C	59	-	U	51	-	R-C	68
Benzo(a)anthracene	-	U	12	-	U	10	-	U	14
Benzo(a)pyrene	-	U	12	-	U	10	-	U	14
Benzo(b)fluoranthene	-	U	12	-	U	10	-	U	14
Benzo(g,h,i)perylene	-	U	12	-	U	10	-	U	14
Benzo(k)fluoranthene	-	U	12	-	U	10	-	U	14
Benzoic acid	-	R-S	59	-	R-S	51	-	U	68
Benzyl alcohol	-	U	12	-	U	10	-	U	14
Bis(2-chloroethoxy)-methane	-	U	12	-	U	10	-	U	14
Bis(2-chloroethyl)ether	-	U	12	-	U	10	-	U	14
Bis(2-ethylhexyl)phthalate	-	U	12	1	J-C	0	-	U	14
Butylbenzylphthalate	-	U	12	-	UJ-C	10	-	U	14
Carbazole	-	UJ-C	12	-	U	10	-	UJ-C	14
Chrysene	-	U	12	-	U	10	-	U	14
Di-n-butylphthalate	-	U	12	5	J	0	-	U	14

Well ID	PW-1			PW-2			PW-3		
Sample date	9/12/95			9/11/95			9/12/95		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-	U	12	-	U	10	-	U	14
Dibenz(a,h)anthracene	-		0	-		0	-		0
Dibenzofuran	-	U	12	-	U	10	-	U	14
Diethylphthalate	-	U	12	-	U	10	-	U	14
Dimethylphthalate	-	U	12	-	U	10	-	U	14
Fluoranthene	-	U	12	-	U	10	-	U	14
Fluorene	-	U	12	-	U	10	-	U	14
Hexachlorobenzene	-	U	12	-	U	10	-	U	14
Hexachlorobutadiene	-	U	12	-	U	10	-	U	14
Hexachlorocyclopentadiene	-	U	12	-	U	10	-	U	14
Hexachloroethane	-	U	12	-	U	10	-	U	14
Indeno(1,2,3-cd)pyrene	-	U	12	-	U	10	-	U	14
Isophorone	-	U	12	-	U	10	-	U	14
N-nitroso-di-n-propylamine	-	U	12	-	U	10	-	U	14
N-Nitrosodimethylamine	-	U	12	-	U	10	-	U	14
N-nitrosodiphenylamine	-	U	12	-	U	10	-	U	14
Naphthalene	-	U	12	-	U	10	-	U	14
Nitrobenzene	-	U	12	-	U	10	-	U	14
Pentachlorophenol	-	R-S	59	-	R-S	51	-	U	68
Phenanthrene	-	U	12	-	U	10	-	U	14
Phenol	-	R-S	12	-	R-S	10	-	U	14
Pyrene	-	U	12	-	U	10	-	U	14
Pyridine	-	U	12	-	U	10	-	U	14

Well ID	OMW-218			OMW-218		
Sample Date	1/3/96			2/2/96		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-	U	10	-	U	10
1,2-Dichlorobenzene	-	U	10	-	U	10
1,3-Dichlorobenzene	-	U	10	-	U	10
1,4-Dichlorobenzene	-	U	10	-	U	10
2,2'-oxybis(1-Chloropropane)	-	U	10	-	U	10
2,4,5-Trichlorophenol	-	U	51	-	U	50
2,4,6-Trichlorophenol	-	U	10	-	U	10
2,4-Dichlorophenol	-	U	10	-	U	10
2,4-Dimethylphenol	-	U	10	-	U	10
2,4-Dinitrophenol	-	U	51	-	UJ-C	50
2,4-Dinitrotoluene	-	U	10	-	U	10
2,6-Dinitrotoluene	-	U	10	-	U	10
2-Chloronaphthalene	-	U	10	-	U	10
2-Chlorophenol	-	U	10	-	U	10
2-Methylnaphthalene	-	U	10	-	U	10
2-Methylphenol	-	U	10	-	U	10
2-Nitroaniline	-	U	51	-	UJ-C	50
2-Nitrophenol	-	U	10	-	U	10
3,3'-Dichlorobenzidine	-	U	20	-	U	20
3-Nitroaniline	-	U	51	-	UJ-C	50
4,6-Dinitro-2-Methylphenol	-	U	51	-	UJ-C	50
4-Bromophenyl-Phenylether	-	U	10	-	U	10
4-Chloro-3-Methylphenol	-	U	10	-	U	10
4-Chloroaniline	-	U	10	-	U	10
4-Chlorophenyl-Phenylether	-	U	10	-	U	10
4-Methylphenol	-	U	10	-	U	10
4-Nitroaniline	-	U	51	-	UJ-C	50
4-Nitrophenol	-	UJ-C	51	-	UJ-C	50
Acenaphthene	-	U	10	-	U	10
Acenaphthylene	-	U	10	-	U	10
Aniline	-	U	10	-	U	10
Anthracene	-	U	10	-	U	10
Azobenzene	-	U	10	-	U	10
Benzidine	-	R-C	51	-	UJ-C	50
Benzo(a)anthracene	-	U	10	-	U	10
Benzo(a)pyrene	-	U	10	-	U	10
Benzo(b)fluoranthene	-	U	10	-	U	10
Benzo(g,h,i)perylene	-	U	10	-	U	10
Benzo(k)fluoranthene	-	U	10	-	UJ-C	10
Benzoic acid	-	UJ-C	51	-	UJ-C	50
Benzyl alcohol	-	U	10	-	U	10
Bis(2-chloroethoxy)-methane	-	U	10	-	U	10
Bis(2-chloroethyl)ether	-	U	10	-	U	10
Bis(2-ethylhexyl)phthalate	-	U	10	-	U	10
Butylbenzylphthalate	-	U	10	-	U	10
Carbazole	-	U	10	-	U	10
Chrysene	-	U	10	-	U	10
Di-n-butylphthalate	-	U	10	-	U	10

Well ID	OMW-218			OMW-218		
Sample Date	1/3/96			2/2/96		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-	U	10	-	U	10
Dibenz(a,h)anthracene	-	U	10	-	U	10
Dibenzofuran	-	U	10	-	U	10
Diethylphthalate	-	U	10	-	U	10
Dimethylphthalate	-	U	10	-	U	10
Fluoranthene	-	U	10	-	U	10
Fluorene	-	U	10	-	U	10
Hexachlorobenzene	-	U	10	-	U	10
Hexachlorobutadiene	-	U	10	-	U	10
Hexachlorocyclopentadiene	-	U	10	-	U	10
Hexachloroethane	-	U	10	-	U	10
Indeno(1,2,3-cd)pyrene	-	U	10	-	U	10
Isophorone	-	U	10	-	U	10
N-nitroso-di-n-propylamine	-	U	10	-	U	10
N-Nitrosodimethylamine	-	UJ-C	10	-	U	10
N-nitrosodiphenylamine	-	U	10	-	U	10
Naphthalene	-	U	10	-	U	10
Nitrobenzene	-	U	10	-	U	10
Pentachlorophenol	-	U	51	-	U	50
Phenanthrene	-	U	10	-	U	10
Phenol	-	U	10	-	U	10
Pyrene	-	U	10	-	U	10
Pyridine	-	UJ-C	10	-	U	10

Well ID	OMW-219			OMW-219		
Sample Date	1/3/96			2/2/96		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL
1,2,4-Trichlorobenzene	-	U	20	-	U	33
1,2-Dichlorobenzene	-	U	20	-	U	33
1,3-Dichlorobenzene	-	U	20	-	U	33
1,4-Dichlorobenzene	-	U	20	-	U	33
2,2'-oxybis(1-Chloropropane)	-	U	20	-	U	33
2,4,5-Trichlorophenol	-	U	100	-	U	170
2,4,6-Trichlorophenol	-	U	20	-	U	33
2,4-Dichlorophenol	-	U	20	-	U	33
2,4-Dimethylphenol	5	J	0	7	J	0
2,4-Dinitrophenol	-	U	100	-	UJ-C	170
2,4-Dinitrotoluene	-	U	20	-	U	33
2,6-Dinitrotoluene	-	U	20	-	U	33
2-Chloronaphthalene	-	U	20	-	U	33
2-Chlorophenol	-	U	20	-	U	33
2-Methylnaphthalene	-	U	20	-	U	33
2-Methylphenol	6	J	0	9	J	0
2-Nitroaniline	-	U	100	-	UJ-C	170
2-Nitrophenol	-	U	20	-	U	33
3,3'-Dichlorobenzidine	-	U	40	-	U	67
3-Nitroaniline	-	U	100	-	UJ-C	170
4,6-Dinitro-2-Methylphenol	-	U	100	-	UJ-C	170
4-Bromophenyl-Phenylether	-	U	20	-	U	33
4-Chloro-3-Methylphenol	-	U	20	-	U	33
4-Chloroaniline	-	U	20	-	U	33
4-Chlorophenyl-Phenylether	-	U	20	-	U	33
4-Methylphenol	130		0	260		0
4-Nitroaniline	-	U	100	-	UJ-C	170
4-Nitrophenol	-	UJ-C	100	-	UJ-C	170
Acenaphthene	-	U	20	-	U	33
Acenaphthylene	-	U	20	-	U	33
Aniline	-	U	20	-	U	33
Anthracene	-	U	20	-	U	33
Azobenzene	-	U	20	-	U	33
Benzidine	-	R-C	100	-	UJ-C	170
Benzo(a)anthracene	-	U	20	-	U	33
Benzo(a)pyrene	-	U	20	-	U	33
Benzo(b)fluoranthene	-	U	20	-	U	33
Benzo(g,h,i)perylene	-	U	20	-	U	33
Benzo(k)fluoranthene	-	U	20	-	UJ-C	33
Benzoic acid	-	UJ-C	100	-	UJ-C	170
Benzyl alcohol	-	U	20	-	U	33
Bis(2-chloroethoxy)-methane	-	U	20	-	U	33
Bis(2-chloroethyl)ether	-	U	20	-	U	33
Bis(2-ethylhexyl)phthalate	-	U	20	-	U	33
Butylbenzylphthalate	-	U	20	-	U	33
Carbazole	-	U	20	-	U	33
Chrysene	-	U	20	-	U	33
Di-n-butylphthalate	-	U	20	-	U	33

Well ID	OMW-219			OMW-219		
Sample Date	1/3/96			2/2/96		
Semi-Volatiles (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL
Di-n-octylphthalate	-	U	20	-	U	33
Dibenz(a,h)anthracene	-	U	20	-	U	33
Dibenzofuran	-	U	20	-	U	33
Diethylphthalate	-	U	20	-	U	33
Dimethylphthalate	-	U	20	-	U	33
Fluoranthene	-	U	20	-	U	33
Fluorene	-	U	20	-	U	33
Hexachlorobenzene	-	U	20	-	U	33
Hexachlorobutadiene	-	U	20	-	U	33
Hexachlorocyclopentadiene	-	U	20	-	U	33
Hexachloroethane	-	U	20	-	U	33
Indeno(1,2,3-cd)pyrene	-	U	20	-	U	33
Isophorone	-	U	20	-	U	33
N-nitroso-di-n-propylamine	-	U	20	-	U	33
N-Nitrosodimethylamine	-	UJ-C	20	-	U	33
N-nitrosodiphenylamine	-	U	20	-	U	33
Naphthalene	-	U	20	-	U	33
Nitrobenzene	-	U	20	-	U	33
Pentachlorophenol	-	U	100	-	U	170
Phenanthrene	-	U	20	-	U	33
Phenol	-	U	20	-	U	33
Pyrene	-	U	20	-	U	33
Pyridine	-	UJ-C	20	-	U	33

Well ID	192-01-3B			GMW-10B			GMW-11		
Sample date	9/13/95			9/12/95			9/11/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	UJ-S	0.023	-	U	0.023
Aroclor 1221	-	U	0.022	-	UJ-S	0.023	-	U	0.023
Aroclor 1232	-	U	0.022	-	UJ-S	0.023	-	U	0.023
Aroclor 1242	-	UJ-C	0.022	-	UJ-CS	0.023	-	UJ-C	0.023
Aroclor 1248	-	U	0.022	-	UJ-S	0.023	-	U	0.023
Aroclor 1254	-	U	0.022	-	UJ-S	0.023	-	U	0.023
Aroclor 1260	-	U	0.022	-	UJ-S	0.023	-	U	0.023

Well ID	GMW-11A			GMW-11B			GMW-12B		
Sample date	9/11/95			9/11/95			9/12/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	3.4	-	U	0.11	-	U	0.023
Aroclor 1221	-	U	3.4	-	U	0.11	-	U	0.023
Aroclor 1232	-	U	3.4	-	U	0.11	-	U	0.023
Aroclor 1242	-	UJ-C	3.4	-	UJ-C	0.11	-	UJ-C	0.023
Aroclor 1248	-	U	3.4	-	U	0.11	-	U	0.023
Aroclor 1254	-	U	3.4	-	U	0.11	-	U	0.023
Aroclor 1260	4.4		0	0.41		0	-	U	0.023

Well ID	GMW-1B			GMW-1C			GMW-1D		
Sample date	9/13/95			9/13/95			9/13/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.038	-	U	0.04
Aroclor 1221	-	U	0.022	-	U	0.038	-	U	0.04
Aroclor 1232	-	U	0.022	-	U	0.038	-	U	0.04
Aroclor 1242	-	UJ-C	0.022	0.25	J-C	0	-	UJ-C	0.04
Aroclor 1248	-	U	0.022	-	U	0.038	-	U	0.04
Aroclor 1254	-	U	0.022	-	U	0.038	-	U	0.04
Aroclor 1260	-	U	0.022	0.48		0	0.26		0

Well ID	GMW-2B			GMW-9B			OMW-101		
Sample date	9/14/95			9/14/95			9/12/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.026	-	U	0.022	-	U	0.022
Aroclor 1221	-	U	0.026	-	U	0.022	-	U	0.022
Aroclor 1232	-	U	0.026	-	U	0.022	-	U	0.022
Aroclor 1242	-	UJ-C	0.026	-	UJ-C	0.022	-	UJ-C	0.022
Aroclor 1248	-	U	0.026	-	U	0.022	-	U	0.022
Aroclor 1254	-	U	0.026	-	U	0.022	-	U	0.022
Aroclor 1260	0.34		0	-	U	0.022	-	U	0.022

Well ID	OMW-102			OMW-103			OMW-105		
Sample date	9/12/95			9/13/95			9/13/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1221	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1232	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.022	-	UJ-C	0.022
Aroclor 1248	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1254	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1260	-	U	0.022	-	U	0.022	-	U	0.022

Well ID	OMW-106			OMW-107			OMW-108		
Sample date	9/13/95			9/13/95			9/13/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1221	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1232	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.022	-	UJ-C	0.022
Aroclor 1248	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1254	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1260	-	U	0.022	-	U	0.022	-	U	0.022

Well ID	OMW-201			OMW-202			OMW-204		
Sample date	9/12/95			9/13/95			9/13/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1221	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1232	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.022	-	UJ-C	0.022
Aroclor 1248	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1254	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1260	-	U	0.022	-	U	0.022	-	U	0.022

Well ID	OMW-205			OMW-206			OMW-209		
Sample date	9/13/95			9/13/95			9/11/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1221	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1232	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.022	-	UJ-C	0.023
Aroclor 1248	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1254	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1260	-	U	0.022	-	U	0.022	-	U	0.023

Well ID	OMW-210			OMW-211			OMW-212		
Sample date	9/13/95			9/13/95			9/14/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1221	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1232	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.022	-	UJ-C	0.022
Aroclor 1248	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1254	-	U	0.022	-	U	0.022	-	U	0.022
Aroclor 1260	-	U	0.022	-	U	0.022	-	U	0.022

Well ID	OMW-213			OMW-214			OMW-215		
Sample date	9/13/95			9/11/95			9/14/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1221	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1232	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.023	-	UJ-C	0.026
Aroclor 1248	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1254	-	U	0.022	-	U	0.023	0.4		0
Aroclor 1260	-	U	0.022	-	U	0.023	-	U	0.026

Well ID	OMW-215			OMW-216			OMW-216		
Sample date	10/13/95			9/11/95			10/13/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1221	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1232	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.022	-	UJ-C	0.023
Aroclor 1248	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1254	-	U	0.022	-	U	0.022	-	U	0.023
Aroclor 1260	-	U	0.022	-	U	0.022	-	U	0.023

Well ID	PB-1			PB-2			PO-1		
Sample date	9/13/95			9/12/95			9/12/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1221	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1232	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1242	-	UJ-C	0.022	-	UJ-C	0.023	-	UJ-C	0.026
Aroclor 1248	-	U	0.022	-	U	0.023	-	U	0.026
Aroclor 1254	-	U	0.022	0.01	J	0.01	-	U	0.026
Aroclor 1260	-	U	0.022	-	U	0.023	-	U	0.026

Well ID	PW-1			PW-2			PW-3		
Sample date	9/12/95			9/11/95			9/12/95		
PCB's (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.025	-	U	2.3	-	U	0.034
Aroclor 1221	-	U	0.025	-	U	2.3	-	U	0.034
Aroclor 1232	-	U	0.025	-	U	2.3	-	U	0.034
Aroclor 1242	-	UJ-C	0.025	-	UJ-C	2.3	-	UJ-C	0.034
Aroclor 1248	-	U	0.025	-	U	2.3	-	U	0.034
Aroclor 1254	-	U	0.025	-	U	2.3	0.015	J	0
Aroclor 1260	-	U	0.025	12		0	-	U	0.034

Well ID	OMW-218			OMW-218		
Sample Date	1/3/96			2/2/96		
PCBs (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.0220
Aroclor 1221	-	U	0.022	-	U	0.0220
Aroclor 1232	-	U	0.022	-	U	0.0220
Aroclor 1242	-	U	0.022	-	U	0.0220
Aroclor 1248	0.0780	U	0.022	-	U	0.0220
Aroclor 1254	-	U	0.022	-	U	0.0220
Aroclor 1260	-	U	0.022	-	U	0.0220

Well ID	OMW-219			OMW-219		
Sample Date	1/3/96			2/2/96		
PCBs (ug/L)	Value	Qualifier	DL	Value	Qualifier	DL
Aroclor 1016	-	U	0.022	-	U	0.0220
Aroclor 1221	-	U	0.022	-	U	0.0220
Aroclor 1232	-	U	0.022	-	U	0.0220
Aroclor 1242	-	U	0.022	-	U	0.0220
Aroclor 1248	0.1100	U	0.022	-	U	0.0220
Aroclor 1254	-	U	0.022	-	U	0.0220
Aroclor 1260	-	U	0.022	-	U	0.0220

ATTACHMENT I

DATA QUALIFIER DEFINITIONS

ORGANIC DATA QUALIFIER DEFINITIONS

The first five qualifier codes following are specified for use by the National Functional Guidelines for Organic Data Review.

U The analyte was not detected during laboratory analysis. The associated numerical value is the reported sample Quantitation Limit (QL). If present, the compound concentration may be presumed to be less than this amount.

J The analyte was positively identified; the associated numerical value is the **approximate** concentration of the analyte in the sample, either because its concentration was lower than the QL (laboratory "J" flag), or because QC criteria were not met (validation "J," plus subqualifier listed below).

UJ The analyte was not detected above the reported sample QL. However, the reported sample QL is **approximate**; the compound concentration may not reliably be presumed to be less than the QL value.

R The sample results are rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.

N The analysis indicates the presence of an analyte for which there is presumptive evidence to make a tentative identification. Further analysis would be necessary for positive identification and accurate quantitation.

The following subqualifiers provide further detail about the type and number of deficiencies leading to qualification of a given data point.

-H The value reported was qualified due to excessive holding time.

-C The value reported was qualified due to instrument calibration or resolution problems. A laboratory "C" flag indicates GC/MS confirmation of a Pesticide/PCB target compound identity.

-B The compound was detected in an associated blank as well as in the sample.

UJ-B The compound is considered to be undetected and the value reported is an estimated sample QL. The value of this reported QL is determined by the amount of the compound found in the sample:

- The sample value was less than the CRQL and less than 5 times the amount of the compound found in the blank (less than 10 times for the common laboratory contaminants Methylene Chloride, Acetone, 2-Butanone, Toluene, and Phthalates): the sample QL has been adjusted by the reviewer to be equal to the CRQL.

- The sample value was greater than the CRQL but less than 5 times (less than 10 times for common lab contaminants): the sample QL is reported as equal to the reported sample value.

- The sample value was greater than 5 times the blank value (10 times for common contaminants), see J-B qualifier.

J-B The reported value is an estimated amount with a potential high bias. The compound was detected in the blank and the quantity reported in the sample is greater than 5 times the amount found in the blank (greater than 10 times for common lab contaminants), but less than 100 times the blank amount.

-S The value reported was qualified due to surrogate or matrix spike recovery problems.

-I The value reported was qualified due to internal standard response or retention time deficiencies.

-M Compounds could not be separated or were subject to interference problems attributable to sample matrix.

-A The TIC was identified as a laboratory artifact or aldol condensation product.

-P The lab uses this flag for a Pesticide or Aroclor when there is greater than 25% difference for detected concentrations between the two GC columns (see Form X). The lower of the two values is reported on Form I. The reviewer applies this flag when chromatographic methods using two columns differ in quantitation between the columns by 25% or more.

-Q Please see validation report text for a discussion of this qualifier.

APPENDIX H

GROUND PENETRATING RADAR SURVEY REPORT
(DETECTION SCIENCES, 1996)

FINAL REPORT

GROUND-PENETRATING RADAR SURVEY

DEWEY LOEFFEL SITE
NASSAU, NEW YORK

Prepared for:

GeoTrans, Inc.
Sterling, VA 20166

April 4, 1995

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FINAL REPORT

GROUND-PENETRATING RADAR SURVEY

DEWEY LOEFFEL SITE
NASSAU, NEW YORK

Prepared for:

GEOTRANS, INC.
46050 Manekin Plaza, Suite 100
Sterling, VA 20166

Report No. J369-95

April 4, 1995

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INTRODUCTION AND SUMMARY

On March 20 and March 23-24, 1995, Detection Sciences, Inc. performed a ground-penetrating radar (GPR) survey at the Dewey Loeffel Landfill site, Nassau, New York. The purpose of the ground-penetrating radar survey was to locate the inner and outer margins of a slurry wall that surrounds the site. The electrical conductivity characteristics of the slurry wall were also investigated with a Geonics EM-31 terrain conductivity instrument. The geotechnical survey work was conducted according to the requirements of GEOTRANS, Inc. under the field direction of Mr. Charles Spalding and Mr. Jaime Zera of GEOTRANS, Inc.

The survey utilized the high-performance ground-penetrating radar equipment developed by Detection Sciences, Inc. over the past fifteen years. Starting with a commercial GSSI SIR System-8 purchased in 1980, various proprietary design modifications have been incorporated that have increased the penetration depth by nearly an order of magnitude, with comparable improvements in the clarity and resolution of the radar records. The increased performance has made it possible to obtain data under difficult circumstances, including the ability to penetrate clay to a degree that was previously impossible with the unmodified commercial GPR equipment.

The terrain conductivity measurements showed the slurry wall to be slightly less conductive than the clay cap and/or the host material in which the slurry wall is placed. This observation was confirmed by the radar data that showed no evidence of increased electrical conductivity within the slurry wall. The principal attributes by which the slurry wall was visible on radar ware a result of its structural, or mechanical properties, rather than its electrical contrast.

Using a custom-designed 120 MHz radar antenna towed by an all terrain vehicle (ATV), traverses were made across the slurry wall at intervals of approximately 100 feet. Where the slurry wall had significant curvature (i.e., at the corners of the site), the intervals between traverses were less than 50 feet. A fifth-wheel odometer attached to the rear of the ATV automatically logged increments of 5 feet along the line of traverse.

Prior to initiating radar traverses, temporary yellow wire flags (pin-flags) were placed in the ground at the estimated location of the slurry wall. When the center of the radar antenna passed the temporary flags, the operator used a hand-held electronic event-marker switch to annotate the radar record. Upon completion of each traverse, the printed record was examined to determine the true location of the slurry wall relative to the estimated location. Two red marker flags, one for the inner boundary of the wall, the other for the outer boundary, were then positioned to mark the true location of the slurry wall. These pin-flags are sequentially numbered, and are also marked with the legend "GPR." As a precaution against accidental loss or removal of a pin-flag, the ground was also sprayed with a circle of orange-red fluorescent paint to mark the location of each pin-flag.

Upon completion of the radar survey, a crew of land surveyors from BLASLAND, BOUCK, AND LEE ENVIRONMENTAL established the New York State planar coordinates for the location of each red pin-flag on the site. This coordinate data was provided to GEOTRANS by the land surveyors. GEOTRANS mapped the surveyor's coordinates and provided Detection Sciences with a copy of the map showing the true position of the slurry wall, as determined by the radar survey. Drawing No. 369-95-01 (attached) is a computer-scanned version of the GEOTRANS map to which has been added the identification number and location of each radar survey line. **Table I** is a companion document that describes the observations made on each radar survey line. A copy of the vertical profile (strip chart) along each survey line has been provided to GEOTRANS. Together, these documents comprise the set of data for the radar survey. The original, tape-recorded radar data has been consigned for permanent storage in the project archives maintained by Detection Sciences.

DESCRIPTION OF THE SURVEY

On Monday, March 20, the ground conditions at the site were wet and soft. Ordinarily, a GMC van, which is equipped as a mobile laboratory, would be used to tow the 120 MHz radar antenna over the ground. Because of concern about the van possibly causing damage to the landfill cap, as well as concern about the ability of the van to get past the soft run-off ditch at the entrance gate and to climb the relatively steep, soft grade beyond the ditch, it was decided not to take the van on site. Instead, the hand-held EM-31 terrain conductivity (EM) instrument was used to test the electrical characteristics of the slurry wall, and to compare the results with the EM-31 survey performed by ECOLOGY AND ENVIRONMENT on September 27, 1993. A preliminary radar assessment was also run by hand-pulling the 120 MHz radar antenna through the entrance gate, traversing up the slope past the location of the slurry wall.

With the weather forecast calling for two more days of rain, it was decided to return to the site on Thursday, March 23, and to mobilize our all-terrain vehicle (ATV) to tow the radar antenna. The ATV is equipped with flotation tires having only 3.5 psi ground pressure (less than a human footprint). The ATV is a John Deere AMT 600 All Material Transporter, as shown in **Figure 1**. This five-wheeled vehicle has four drive wheels under the small truck bed. There is also a locking differential that can supply power simultaneously to all four drive wheels. The ATV cargo bed is capable of holding up to 600 pounds of cargo. The cargo bed is used to carry the scanning chart recorder, instrumentation tape recorder, radar power supply and radar controls. All of the data were tape-recorded. (The data tapes are consigned to our project archives for permanent storage.) The scanning chart recorder and other instruments are shown in **Figure 2**. A small, 600-watt portable generator mounted in the cargo bed of the ATV supplies power to the radar system.

On Thursday, March 23, continuing through Friday, 24, a total of 41 radar transects were run across the slurry wall, using the methodology and techniques described in the following section.

Figure 1.

AMT 600 ALL-TERRAIN VEHICLE

The ground-penetrating radar (GPR) equipment is carried in the bed of the John Deere AMT 600 all-terrain vehicle. The AMT 600 is a four-wheel-drive vehicle with a locking differential. The radar antenna is being pulled on a wooden skid behind the vehicle. The odometer wheel mounted at the rear of the vehicle automatically logs the distance traveled along the radar survey line.

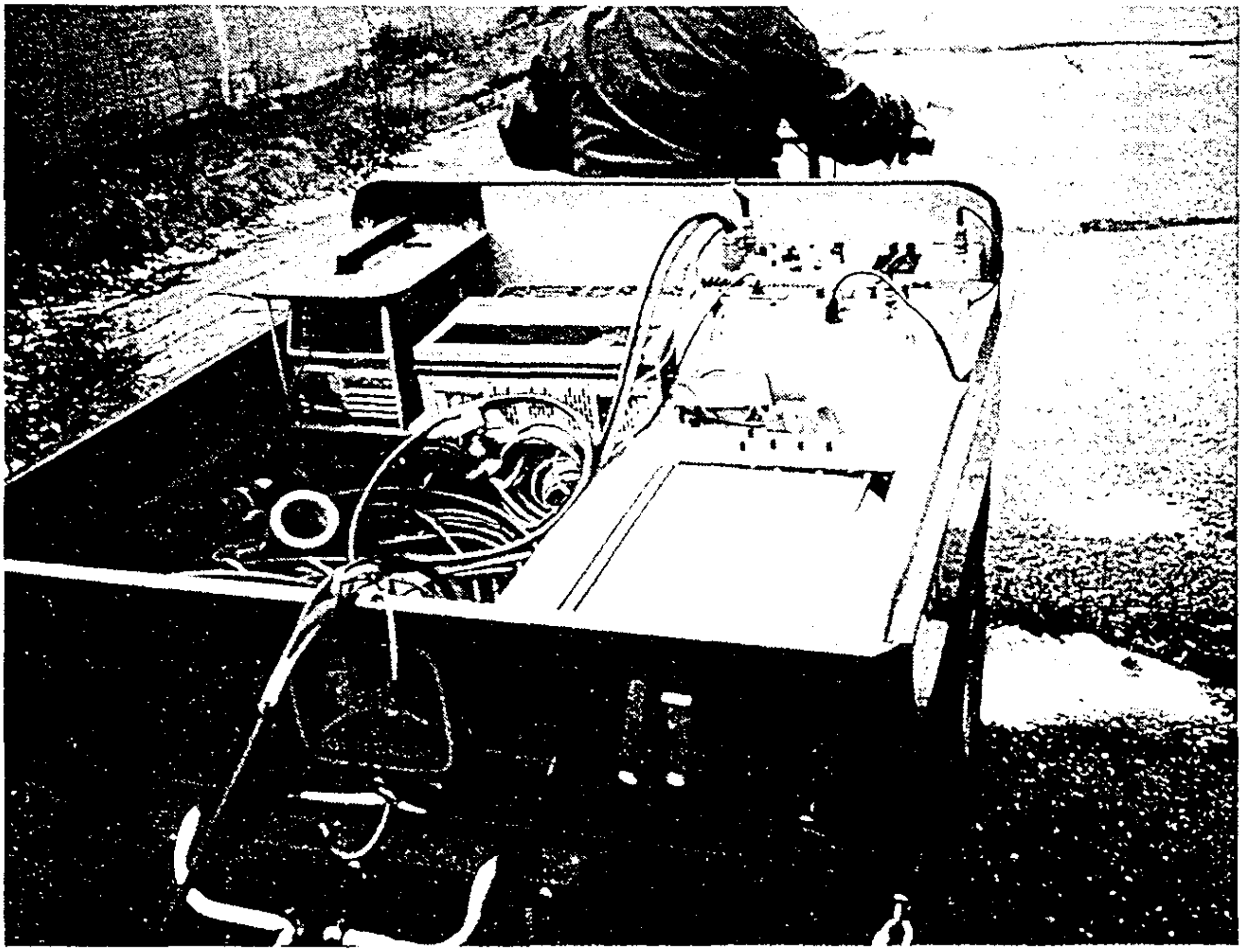


Figure 2.

CHART RECORDER AND RADAR CONTROLS

The EPC scanning chart recorder (right foreground) produces the hard-copy vertical-profile radar records. All data is tape-recorded on the four-channel Hewlett-Packard instrumentation tape recorder (center background). The radar control unit (right background) also provides the operator with a CRT display. The ac generator (left background) provides the electrical power for the system.

METHODOLOGY

Vertical Profiles

The ground-penetrating radar system generates a vertical profile along the line of traverse. The vertical profile is displayed by the chart recorder. For this survey, the 120 MHz radar antenna was set to probe to a depth of 24 feet. Anecdotal information suggested that the top of the slurry wall would be found about 5 feet below grade, corresponding to roughly one-fifth of the display scale. (Otherwise, if a more normal depth-setting of 48 feet been chosen, the critical information would have been compressed into the upper one-tenth of the chart display.)

On this site, the radar transects started close to the fence and ran inward, away from the fence, at an angle of approximately 90 degrees relative to the alignment of the fence. At the corners of the fence, the radar lines were positioned so as to bisect the internal angle of the fence corner. These angles are not critical; as long as the angle of crossing of the slurry wall deviates no more than 10 or 15 degrees from a 90 degree crossing, the apparent thickness of the slurry wall will not be significantly different from the true thickness of the slurry wall. For each radar transect across the slurry wall, therefore, the resulting radar vertical profile showed both the inner and outer margins of the slurry wall, allowing the width of the wall to be determined at each location.

Along the straight sections of the slurry wall, the individual radar traverses were spaced as much as 125 feet apart, thereby providing a sufficient number of crossings to accurately define the location of the wall. At the corners of the site, the radar survey lines were run as close as 50 feet apart or less, to achieve better accuracy in defining the corners of the wall. Because the slurry wall was found to closely follow the fence line, the strategy of bisecting the angle made by the internal corners of the fence, as well as visually observing the contours of the landfill at the corners of the site, were both helpful in positioning the radar survey lines to cross the slurry wall at, or close to, the corners of the wall.

At five locations on the site, the radar image of the slurry wall was not as distinct as the prevailing radar image observed at most locations. When this occurred, one or more radar transects were made a few feet away from the initial transect so as to obtain a better radar image of the wall. Otherwise, for most locations, a single pass was sufficient to obtain a distinct response.

Grid Control

In lieu of establishing a formal grid on the ground, a more direct method was chosen for mapping the slurry wall. As previously stated, the angle at which a radar survey line crosses the wall is not critical, as long as the angle falls within a few degrees of a 90-degree crossing. Similarly, the exact crossing point at which a radar survey line intersects the wall is not critical, as long as sufficient points are generated to accurately delineate the wall. What *is* important is to accurately catalog the grid coordinate locations where these wall crossings took place. For this purpose, a team of land surveyors (BLASLAND, BOUCK, AND LEE ENVIRONMENTAL) came to the site after completion of the radar survey and accurately established the coordinate locations of each pin-flag marking the locations where the radar crossings had taken place. In principle, it makes no difference whether the ground coordinates are established before or after the radar survey. In practice, however, it would have been necessary to establish hundreds principal grid stations, each of which would have to be individually marked with stakes or flags. Because the ground survey was done after the completion of the radar work, the surveyors needed to locate a total of only 72 data points (2 for each radar crossing). This approach improves the overall accuracy of the ground survey by eliminating the need to measure the offset distance from principal grid stations.

METHODOLOGY (Cont.)

Distance Control

Before starting a survey line, the approximate location of the edges of the slurry wall were estimated by visual inspection. As the number of radar transects increased, it became progressively easier to estimate the position of the slurry wall. Yellow pin-flags were placed along the visually-estimated border. The radar survey lines were then run across the boundary zone. When the center point of the radar antenna passed a yellow flag, the location of the yellow pin-flag was marked on the radar chart by using a hand-held event-marker switch to record a pair of electronically-generated vertical dashed lines. At the end of each survey run, the towing vehicle was stopped, and the radar chart was examined to see where the actual, radar-determined boundary was located with respect to the visually-estimated boundary marked by the yellow pin-flag.

A 20-inch diameter "fifth-wheel" odometer attached to the rear bumper of the survey vehicle automatically logged distance traveled along the survey line. A microswitch attached to the frame of the odometer wheel triggers an electronically generated "tick-mark" at the top of the radar record. Each revolution of the odometer wheel is an incremental distance of 5 feet. Although the odometer wheel has been calibrated over long distances, its principal use is to record incremental distance traveled from a known reference point, such as the temporary yellow pin-flags.

Because the location of the temporary (yellow) pin-flags on the radar chart is shown by the vertical dashed lines, it is easy to determine how much the actual location is displaced with respect to the estimated location. Using the data obtained from the radar chart, the physical location of the radar-determined subsurface boundaries were measured along the ground. Starting at the yellow pin-flag, the offset was established by laying a surveyor's tape on the ground. Red pin-flags were placed at the actual location of the inner and outer walls. The yellow pin-flag that had served as a temporary marker was then removed, leaving numbered red pin-flags marked "GPR." The accuracy of this process is better than ±0.5 foot along the line of traverse (i.e., within ±10 percent of the 5-foot increments measured by the fifth-wheel odometer).

Clay Soils

Experience gained over the past sixteen years of using ground-penetrating radar for subsurface investigations has shown both the capability and the limitations of this technology. The principal limitation has been clay soils; historically, clay has always proven to be a major impediment to the use of GPR. The problem is the electrical ions typically present in clay, which produce high attenuation losses of the radar signal. This attenuation is a direct function of the electrical conductivity of the ground. Conversely, radar transparency is a direct function of the electrical resistivity of the ground (resistivity being the inverse of conductivity). The equipment modifications made by Detection Sciences are currently providing about 110 to 114 dB of dynamic range — enough to detect a return echo that has been attenuated to about 0.000005 (1 part in 200,000) of the original transmitted signal.

The improvement of our radar system has come about through a three-fold attack: (1) increasing the power of the transmitter; (2) increasing the sensitivity of the receiver; and, (3) reducing the internal noise of the receiver. The net result is that most clays are now amenable to investigation with GPR.

PRINCIPLES OF OPERATION

The ground-penetrating radar system is an echo-location system that emits a brief impulse of radio energy lasting only a few billionths of a second. The time for the radar echoes to return to the radar antenna corresponds to the depth below the surface. By recording these depth-dependent echoes on a scanning time-based chart recorder, a vertical profile of the ground is generated. This vertical profile shows the longitudinal distribution of subsurface strata and other features over which the radar antenna has passed.

Velocity and Depth

The radar impulse travels into the ground at an average speed of about 40 percent of the speed of light. The exact speed depends on the nature of the material through which the impulse is traveling. The slowest medium is water, where the speed is about 11 percent of the speed of light. The fastest material is dry sand, where the speed is about 50 percent of the speed of light. In air, such as an underground cavity, the radar impulse travels almost exactly at the speed of light, taking one nanosecond (one billionth of a second) to travel one foot.

The ground-penetrating radar equipment is designed to measure and display the time-based echoes down to a fraction of a nanosecond. To convert to depth, it is necessary to know the exact velocity of the radar impulse as it travels through the ground. Over the past decade, Detection Sciences has developed a proprietary database of the radar velocities of various materials. This database makes it possible to electronically calibrate the radar system within about 1 percent of local depth. Borings, test trenches and the common point method (a time-based geometric triangulation method) can also be used to depth-calibrate the radar. The ultimate limit of accuracy is determined by lateral variations in soil moisture content and the inhomogeneity of soil materials. Because of these limits, Detection Sciences has come to rely on electronic calibration. This method has proven to be at least as good as, or better than, the accuracy of depth measurements based on soil borings.

Subsurface Reflections

At the interface of two materials, the radar impulse typically undergoes an abrupt change in velocity. It is this change in velocity that causes some of the radar energy to be reflected back to the surface of the ground where it is detected by the antenna. The amount of energy that is reflected, or the reflection coefficient, depends on the contrast between the two materials; i.e., the difference between their respective radar velocities. Because the radar velocity is proportional to the inverse square root of the dielectric constant, the fundamental parameter to which the radar is responding is the difference in the dielectric constants at the reflecting surface.

All materials with the exception of metals are relatively transparent to the passage of radar energy. Metals reflect all of the energy striking their surface; buried metal objects like pipes or metal containers are therefore excellent targets. The fact that most materials are relatively transparent means that the radar impulse can continue to send back reflection after reflection as it propagates downward into the ground, thus revealing the various subsurface strata and profiles.

Subsurface Materials

In effect, the radar functions as a "difference meter" by drawing a boundary at the interface of two different materials. The "texture" of the radar reflections also vary with different materials. With experience it is possible to interpret the radar reflections to accurately identify common subsurface materials such as clay, peat, glacial till, and bedrock. Certain special situations, such as ionic constituents, non-ionic constituents, and gasoline in the soil are also relatively easy to identify. Other situations such as interspersed layers of organic silt, silty sands, etc., are impossible to identify without direct visual inspection by means of a test trench or core sample.

Use of Borings

The radar can be "calibrated" by using available boring logs to identify the types of subsurface materials. The best strategy is to first perform the radar survey and then use the radar data to specify the locations for a few strategically-placed borings. Although borings are useful for direct physical examination of subsurface materials and for confirming suspected low-density zones, the use of radar can largely supplant the use of borings. In this regard, it is useful to think of the radar system as a means of making a continuous profile of "electronic borings" spaced 1 to 3 inches apart. Each radar impulse and its successive train of echoes constitute a single scan, or sounding. At a rate of 52 vertical soundings per second, the radar is capable of generating millions of "electronic boreholes" in the course of a day. Using radar in conjunction with a few diagnostic borings is more economical than a complete schedule of borings. Radar also provides continuous subsurface profiles that is much more accurate than having to interpolate between borings.

Penetration Depth

The penetration depth of the radar system depends on the operating frequency and the electrical conductivity of the ground. For shallow penetration of a few feet, the optimum choice is an operating frequency of 600 MHz. This small, lightweight antenna can penetrate to a depth of about 5 feet under the most adverse ground conditions, and as much as 25 to 30 feet under good conditions. "Adverse" refers to highly conductive materials having a resistivity of less than 10 ohm-meters. "Good" radar conditions are resistivities of several hundred ohm-meters or more.

Shifting to a lower operating frequency provides greater penetration, the improvement being the square root of the ratio of the respective wavelength. An operating frequency of 120 MHz is a good general-purpose frequency for reaching depths that are beyond the capability of the 600 MHz antenna. This antenna is routinely used to probe to a depth of 48 feet. The 48-foot depth setting provides a convenient vertical scale of 1 inch = 4 feet on the 12-inch vertical profile strip charts. In general, multiples of 12 feet allow the vertical scale factor on a 12-inch chart to adhere to a convenient engineering scale (instead of using arbitrary time-based scales that have long been the custom in this field).

Although lower-frequency antennas provide greater depth of penetration, there is a corresponding loss of detail, or spatial resolution, due to the longer wavelength. The optimum is to use as high an operating frequency as possible consistent with the depth requirements, thus providing the best possible detail under the operating conditions. The useful range of ground-penetrating radar frequencies is limited to about 10 MHz at the lower end, up to a maximum of about 1200 MHz (1.2 GHz) at the upper end. The penetration of the 1.2 GHz antenna is limited to a few inches. The 10 MHz antenna can penetrate hundreds of feet into the ground but the corresponding loss of detail limits its usefulness to large features such as geologic strata. Fortunately, the most demanding spatial resolution requirements are usually small, near-surface targets such as wire reinforcing-mesh in concrete or the shallow burial of electric wires. The more deeply-buried targets are nearly always larger objects such as sewer pipes or storm drains.

The discussion regarding penetration depth assumes that all antennas have the same power. The penetration depth at any given frequency can be improved with increased power, but the improvement suffers from inverse-square losses as a function of depth, so that a quantum jump in power is necessary to gain any significant improvement. For this reason, Detection Sciences, Inc. has focused its research efforts on improving the sensitivity of the radar receiver and reducing the internal noise of the receiver. These efforts have paid off by increasing the penetration depth of our equipment by about a factor of 5 compared to standard, commercially-available systems. This improved capability allows Detection Sciences, Inc. to obtain data under conditions that were previously impossible for ground-penetrating radar.

EQUIPMENT

The radar equipment consists of a custom-modified GSSI SIR System-8 Subsurface Interface Radar. **Detection Sciences** has developed proprietary circuit designs and other proprietary modifications that have increased the depth of penetration by nearly an order of magnitude compared to the original commercial equipment purchased in 1980. There are also corresponding improvements in spatial resolution and the clarity of the radar records. A major advantage of our modified radar system is its ability to penetrate clay and work in other difficult environments that have high electrical conductivity (ionic materials) where it would otherwise be impossible to obtain data with an ordinary, unmodified radar system.

All data is tape-recorded on a Hewlett-Packard Model 3964A Instrumentation Tape Recorder. These magnetic data tapes are kept in permanent storage in our archives. The radar graphic charts ("hard-copy" charts) consist of vertical-profile strip charts generated on a scanning graphic chart recorder. To facilitate analysis, the radar graphic charts, or strip charts, are calibrated with a vertical scale showing feet of depth (rather than using arbitrary time scales for vertical depth). The specific list of radar equipment is:

CONTROL UNIT. The control unit is a custom-modified GSSI Model 4800. This unit contains the bulk of all the radar electronics and system controls, and has an oscilloscope that shows the amplitude of each radar impulse and its corresponding echoes.

MOTOROLA MODEL M68MM01A MONOBOARD MICROCOMPUTER. The microcomputer has real-time processing capability for background removal, digital filtering, running averages, stacking and other radar signal-processing algorithms.

HEWLETT-PACKARD MODEL 3964A TAPE RECORDER. This high quality, four-channel instrumentation tape recorder provides master tapes of all data recorded in the field.

EPC LABORATORIES, INC. MODEL 2200S CHART RECORDER. This high-resolution electrostatic scanning chart recorder generates 12-inch hard-copy radar graphic charts (vertical profiles) which are used to interpret the radar data.

EPC LABORATORIES, INC. MODEL 8700 CHART RECORDER. Our high-speed thermal scanning chart recorder can generate hard-copy radar graphic charts (vertical profiles) to facilitate "live" interpretation in real time in the field.

RADAR ANTENNA UNITS. The custom-designed radar antennas have proprietary high-performance electronic circuits. The antennas operate at different frequencies; the depth requirements determine the operating frequency selected for the survey.
[ ] 900 MHz [ ] 600 MHz [ ] 300 MHz [X] 120 MHz [ ] 80 MHz [ ] 10 MHz

TRIPPE 550VA SOLID STATE INVERTER. This power supply unit provides both 120 volt ac power as well as 12 volt dc power for operating all field equipment from the survey vehicle's electrical system.

REMOTE STOP/START UNIT. The remote stop/start feature allows the operator to control the radar system from the antenna location.

ODOMETER WHEEL ASSEMBLY. The custom-built, 20-inch diameter "fifth wheel" odometer attached to the rear bumper of the survey vehicle provides automatic logging of 5-foot increments traveled along the survey path. Each 5-foot increment is recorded as a "tick mark" along the top of the radar chart.

SUPPORT EQUIPMENT. The various support equipment includes the Micro-computer Control Box, the Remote Control/Marker Unit, Hand-held Marker Unit, towing sled, towing harness and miscellaneous electrical cables and connectors.

RESULTS OF THE SURVEY

General

The EM-31 measurements (terrain conductivity) showed the electrical conductivity of the slurry wall to be somewhat less than its surroundings. For this reason, the slurry wall did not exhibit a strong electrical contrast on the radar profiles, wherein a lighter-than-normal response (higher attenuation) had been expected to be observed at the slurry wall. Instead, the slurry wall was apparent by its mechanical properties. Specifically, the sharply defined edges of the trench, the interruption of the soil horizons,† and the slumping, or infilling of cover material, that had occurred on top of the trench were the features by which the slurry wall was apparent. This tell-tale evidence made it possible to locate the slurry wall and determine the width of the wall.

EM-31 Results

At a location near the eastern entrance gate, starting about 80 feet from the fence, the initial traverse with the EM-31 was made by walking in the direction of the fence with the 12-foot boom of the instrument aligned parallel to the fence. This orientation was chosen for the purpose of eliciting the maximum response from crossing over a relatively narrow, linear feature (the slurry wall).

The conductivity at the start of the traverse was 15 millimhos. By standing stationary and swinging the instrument horizontally in a ±90° arc, the instrument showed no change in the reading, indicating that the underlying ground is relatively uniform in its electrical conductivity. Likewise, raising the instrument to chest height and lowering the instrument down to the ground produced no change, indicating that the ground is relatively uniform in its upper layers; more specifically, it did not appear necessary to employ a two-layer model to analyze the results. Subsequently, a more sensitive test was used, wherein the instrument is placed on the ground and then turned on its side. In this configuration, the effective penetration when the instrument is turned on its side is about half the penetration when the instrument is normally deployed. If layering were present, there should be a change in the instrument reading. There was none. Satisfied that the baseline electrical properties of the landfill materials were relatively uniform, the search for the slurry wall could proceed.

† When fill material is applied in lifts, particularly if the lifts are compacted, the fill appears to have horizons, much like natural soils. The interruption of these horizons, whether in fill or natural soil, is an indication that an excavation has been made in the parent material.

RESULTS OF THE SURVEY (Cont.)

EM-31 (Cont.)

At first, the only change in conductivity that was observed was a gradual, monotonic increase to about 20 millimhos when descending the slope of the overburden. There was no abrupt peak (or valley) when crossing the presumed location of the slurry wall. The transect was repeated several times in both directions, including orienting the 12-foot boom perpendicular to the fence, looking for some type of response. At different stations along the path, the instrument was also swung in a ±90° arc. None of these techniques produced a strong response.

Finally, on a slow, careful traverse toward the fence, it was noted that onset of the increase in the baseline level of conductivity (15 millimhos) began at a point about 20 feet from the crest of the slope; anecdotal information indicates that this was the mixing zone where the bentonite was dry-mixed and hydrated before being placed in the trench. Evidently, the instrument was responding to the residue left in the mixing zone. Still more probing showed a subtle dip in the conductivity level before the onset of the rising conductivity produced by traversing down the slope. The maximum response that could be elicited was -1.5 millimhos to a low of 13.5 millimhos, a deviation no more than 10 percent of the baseline reading. The center of this dip was located at a point that was subsequently established (with radar) to the slurry wall.

This finding was contrary to expectations. The bentonite slurry wall was expected to be more conductive than the host material, not less. This result, however, does agree with earlier work done on the site wherein it was reported that the observed anomaly (presumably, the location of the slurry wall) had lower conductivity over a 15-foot span. The 15-foot span is consistent with the 12-foot overall length of the EM-31, because the effective length of the conductivity measurement does extend beyond the tips of the 12-foot boom of the EM-31. If the EM-31 is turned sideways relative to the direction of traverse, the 15-foot transition zone would be effectively cut in half, but the spatial resolution of the EM-31 is nowhere near the resolution of the radar system, which is a small fraction of 1 foot.

It turned out, however, that the horizontal orientation of the EM-31 had virtually no effect on the apparent width of the conductivity anomaly. Instead of measuring a localized anomaly produced by the relatively narrow slurry wall, it is likely that the bentonite residue left in the slurry mixing zone located adjacent to the slurry wall is contributing significantly to the apparent 15-foot width of the conductivity anomaly.

RESULTS OF THE SURVEY (Cont.)

Radar Results

The results of the radar survey were reported in the field at the time of the survey. The subsurface boundaries of the slurry wall were marked by numbered red pin-flags marked "GPR." As a precaution against flags possibly being removed or otherwise disturbed, the ground at the base of each flag was also sprayed with a circle of orange-red fluorescent paint. In the straight sections of the slurry wall, the pair of pin-flags marking the inner and outer boundary of the slurry wall occur at intervals of approximately 100 feet. At the corners of the site, the intervals are approximately 50 feet or less.

Sample Profiles

Figures 3, 4 and 5 show the vertical profiles along radar survey lines #29, #30 and #33, respectively. The "tick marks" along the top of the chart are increments of 5 feet logged by the "fifth wheel" odometer attached to the rear of the survey vehicle (see Figure 2). Radar survey lines #29 and #30 (Figure 3 and 4) are "average" lines, representative of the majority of the vertical profiles on this site. Line #33 (Figure 5) was chosen to illustrate the obvious slumping that occurs at a depth of about 5 feet. The width of the slurry wall at the location of Line #33 is also wider than most other vertical profiles. The vertical dashed lines at or near the slurry wall boundaries are the locations of the temporary (yellow) pin-flags used to estimate the location of the wall.

Description of Table I

Table I catalogs the radar observations for each radar transect. A complete set of vertical profiles (i.e., the raw data from the field) has been provided to GEOTRANS. In most cases, the radar transects showed excavation scars, wherein the horizons in the landfill are seen to be interrupted by the sharply delineated excavation for the slurry wall. In other cases, the sharp delineation is less apparent, but the discontinuities in the landfill horizons are still apparent. Table I also tabulates the locations where slumping can be seen at the top of the slurry wall.

Slurry Wall Location

GEOTRANS provided Detection Sciences with a map showing the location of the slurry wall as determined by the land survey coordinates (pin-flag locations) supplied to GEOTRANS by BLASLAND, BOUCK, AND LEE ENVIRONMENTAL. This map was computer-scanned and was used as the template for generating Drawing No. 369-95-01 (attached). This drawing shows the identification number and location of each radar transect. Because this drawing is intended to serve as a pictorial guide to show the location of the radar transects, some of the information shown on the GEOTRANS map has been omitted for clarity.

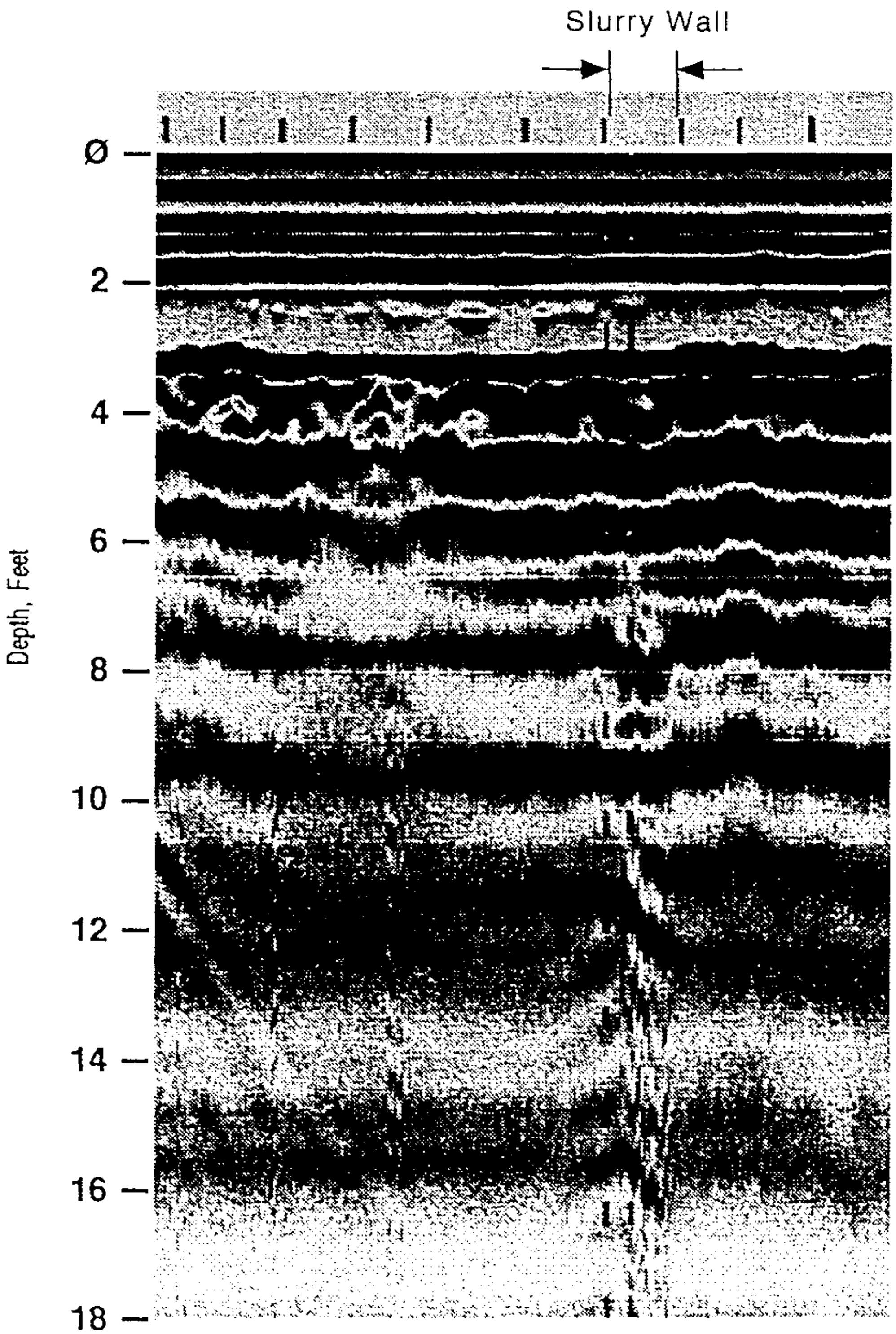


Figure 3.

RADAR SURVEY LINE #29

The vertical dashed lines show the estimated position of the wall. The true location of the wall is shown at the top of the chart.

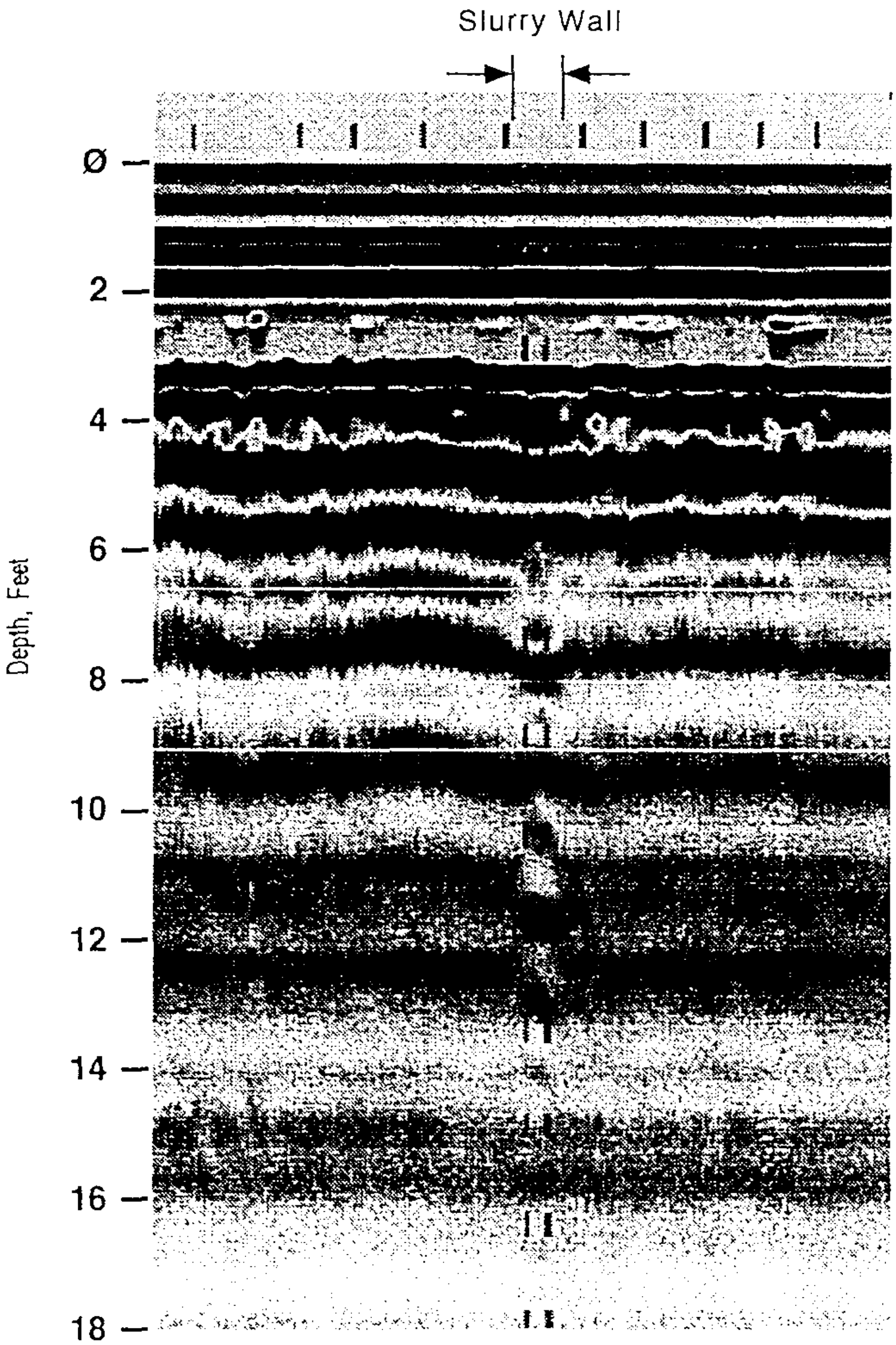


Figure 4.

RADAR SURVEY LINE #30

The "tick-marks" at the top of the chart show each increment of 5 feet recorded by the odometer wheel.

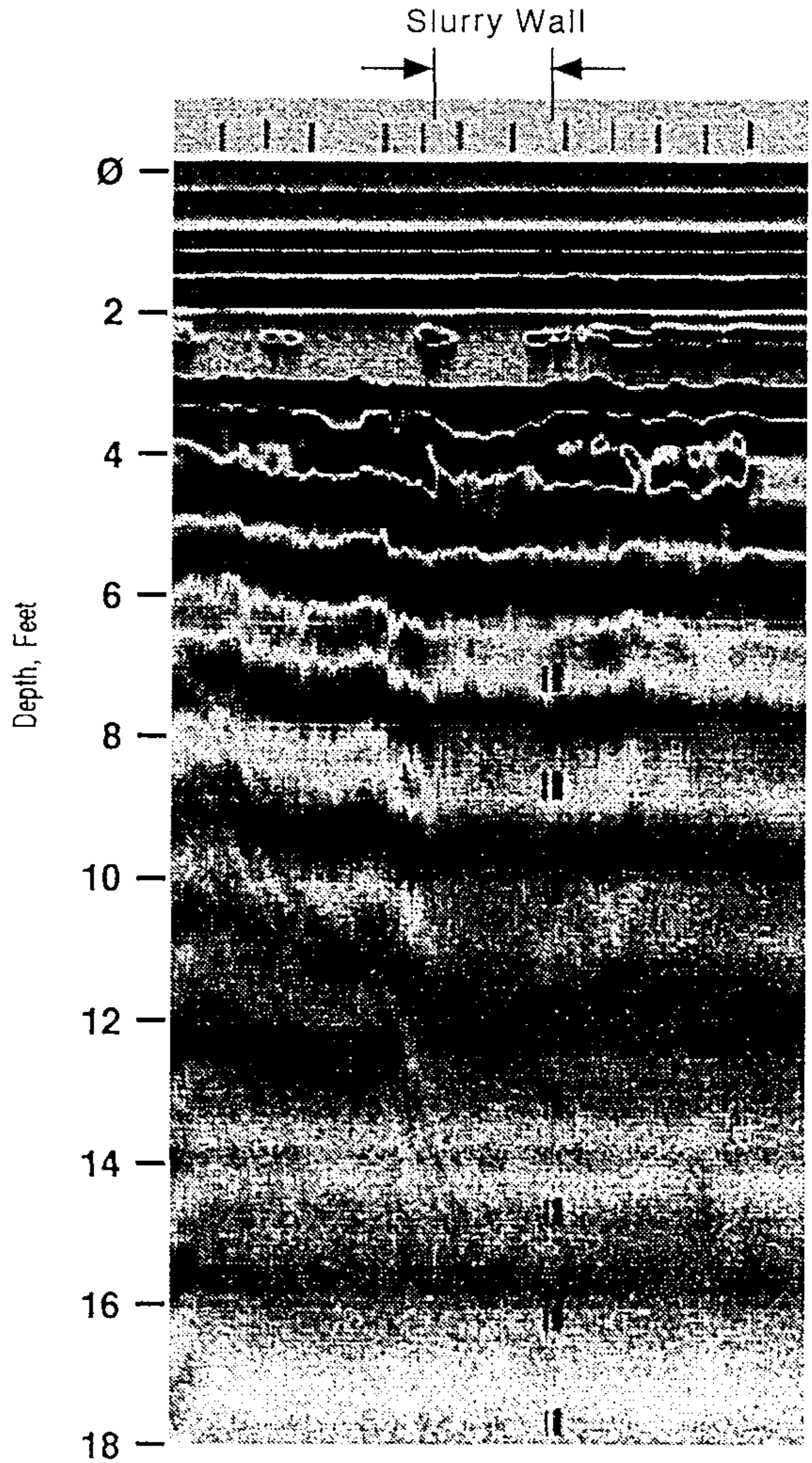


Figure 5.

RADAR SURVEY LINE #33

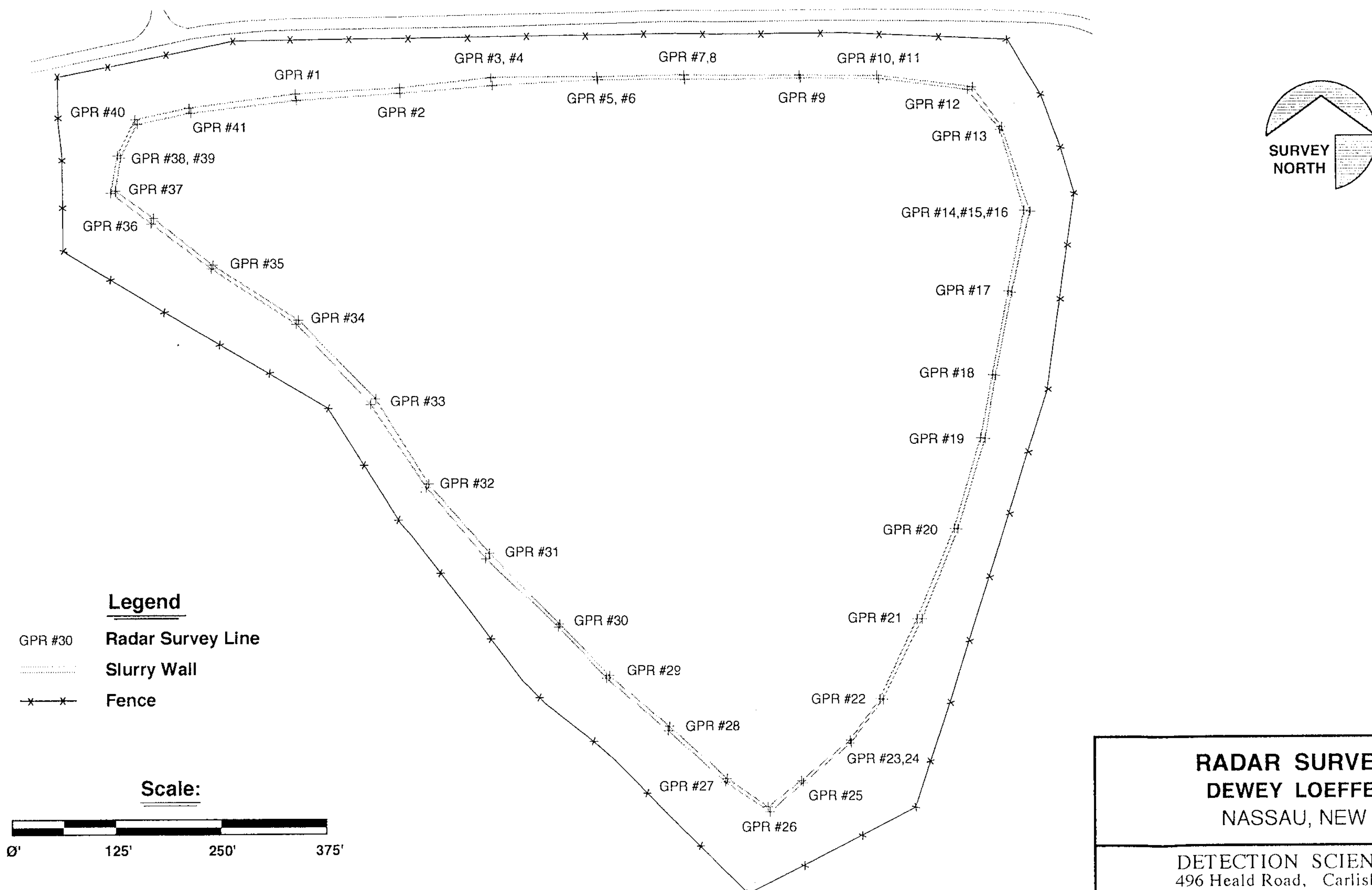
Slumping in the upper fill is evident at depths of 3 to 4 feet below grade (BG).

Table I.

DEWEY LOEFFEL SITE, NASSAU, NEW YORK

GPR OBSERVATIONS

GPR Line	Radar Observation at Slurry Wall
GPR #1	Excavation scars
GPR #2	Excavation scars, minor slumping
GPR #3	Faint excavation scars
GPR #4	Excavation scars, minor slumping
GPR #5	Faint excavation scars
GPR #6	Faint excavation scars, horizontal discontinuity
GPR #7	Excavation scars, minor slumping
GPR #8	Void; re-run line as GPR #9
GPR #9	Excavation scars, minor slumping
GPR #10	Faint excavation scars
GPR #11	Faint excavation scars, horizontal discontinuity
GPR #12	Excavation scars, minor slumping
GPR #13	Excavation scars, horizontal discontinuity
GPR #14	Faint excavation scars
GPR #15	Faint excavation scars
GPR #16	Excavation scars, near-surface slumping
GPR #17	Excavation scars, near-surface slumping
GPR #18	Excavation scars, horizontal discontinuity
GPR #19	Excavation scars
GPR #20	Excavation scars, minor slumping
GPR #21	Excavation scars, horizontal discontinuity
GPR #22	Excavation scars
GPR #23	Excavation scars
GPR #24	Horizontal discontinuity
GPR #25	Excavation scars, minor slumping
GPR #26	Excavation scars, minor slumping
GPR #27	Excavation scars, horizontal discontinuity
GPR #28	Excavation scars, minor slumping
GPR #29	Excavation scars, horizontal discontinuity
GPR #30	Excavation scars, minor slumping
GPR #31	Excavation scars, minor slumping, inner wall indistinct
GPR #32	Faint excavation scars, horizontal discontinuity
GPR #33	Excavation scars, near surface slumping
GPR #34	Excavation scars, minor slumping
GPR #35	Excavation scars, minor slumping
GPR #36	Excavation scars, horizontal discontinuity
GPR #37	Excavation scars, minor slumping
GPR #38	Faint excavation scars
GPR #39	Excavation scars, horizontal discontinuity
GPR #40	Excavation scars
GPR #41	Excavation scars



RADAR SURVEY MAP
DEWEY LOEFFEL SITE
NASSAU, NEW YORK

DETECTION SCIENCES, INC.
496 Heald Road, Carlisle, MA 01741

Date: March 21, 1995	Drawing No.: **369–95–01**

Reissued. 12/15/95

APPENDIX I

ANGLED BORING REPORT
(GDR, INC., 1996)

LOEFFEL SITE SLURRY WALL LOCATION VERIFICATION: Results of Soil Sample Tests

Performed for

GENERAL ELECTRIC COMPANY
Corporate Environmental Programs
Albany, New York

by

GEOENVIRONMENTAL DESIGN AND RESEARCH (GDR, Inc.)
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March, 1996

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1. INTRODUCTION

This brief report is a summary and analysis of the results of field sampling of soils and related laboratory tests conducted to verify the location of a slurry wall at the Loeffel Landfill Site in Nassau, New York. The soils were sampled on Friday, July 21, 1995, and laboratory tests were completed in December, 1995. This report is an addendum to a more comprehensive investigation being performed under contract by Geotrans, Inc. of Sterling, Virginia for the General Electric Company.

The purpose of the laboratory tests reported herein was to verify the slurry wall location delineated through the use of Ground-Penetrating Radar (GPR) at the Loeffel Site in March, 1995, by Detection Sciences, Inc. GPR is a relatively new and innovative non-contact and non-destructive technique. In consistence with the practice with other geophysical techniques, it was deemed necessary to conduct verification tests on actual samples from two locations along the GPR-delineated alignment. The results of these tests were then used to verify the alignment of the slurry wall.

2. TECHNICAL BASIS

(a) Approach to Slurry Wall Location Verification

Slurry walls are subsurface vertical barriers. Contact with a slurry wall can be made underground if a hole is drilled at an angle towards the wall. This technique was used at the Loeffel Site as illustrated in Figure 1. Delineation of the wall location was based on the assumption that samples of the slurry wall would exhibit different properties from those of the surrounding soil medium. The slurry wall mix (backfill) was designed to attain a low permeability. Bentonite was added to clayey soils to form the backfill. With the addition of the Bentonite, the backfill texture was altered, making the wall material discernable from the surrounding soil (glacial till). This textural difference is observable through fines content and mineralogy. The increase in the soil fines results in changes in soil parameters which are observable through conventional geotechnical testing (i.e. grainsize distribution and Atterberg limit Tests). Soil mineralogy is able to be identified through advanced methods such as X-ray diffractometry. These three methods were used in this investigation.

(b) Drilling and Sample Acquisition

Two locations (P-1 and P-2) outside the GPR-delineated wall alignment were selected for drilling and sample acquisition. These points, surveyed in New York State Planer coordinates and elevations, are shown in Figure 2. Location P-1 was close to STA 27+00 and between GPR stations #31 and #32. Location P-2 was close to STA 25+00 and at the same location as GPR station #28. Based on existing data, it was determined that the approximate depths to the water table at P-1 and P-2 were 20.47 feet and 12.5 feet respectively (GeoTrans, 1995). The horizontal distance between the drill entry point and the approximate external boundary of the slurry wall as indicated by GPR (known as L_i) was selected such that the drill hole would not penetrate the ground below the water table. The drill angle for both holes was 45°, measured from the horizontal as illustrated in Figures 1 and 3. Drilling progressed toward the slurry wall from locations outside the containment system. Samples were retrieved at various points along the inclined borehole (known as l_i). It was possible to establish the corresponding horizontal distance towards the wall through the use of simple trigonometrical relationships shown in Figure 1.

Glacial till at the Loeffel Site contains many different gradations of soil, up to and including boulders. During drilling, it was difficult to obtain samples from some of the pre-selected sampling points along the drill hole. This was particularly the case with hole P-1. Since portions of the subsurface consisted of loose glacial till, the soil collected within the 2-foot long Shelby tubes did not always retain its exact location in the tube during sample retrieval. Consequently, relevant information is provided in the field notes, presented in Table 1, for 2 feet-depth ranges rather than specific depths. This system suffices for the purposes of this investigation. Where the glacial till samples were plastic and amenable to exact positioning after retrieval, tests were conducted on more than a single sample from each Shelby tube.

Each sample was visually inspected, remolded and viewed through a x10-magnification hand lens to discern plasticity characteristics that would give preliminary indication that the slurry wall had been contacted. Laboratory test results on the samples were then used to confirm these preliminary assessments. When it was estimated that the slurry wall had been reached, additional drilling was limited to less than 1.5 ft to minimize the potential of drilling through the slurry wall to the interior of the containment system. The design thickness of the slurry wall was reportedly 2.5 feet, although it may have been thicker at some locations due to cave-in and permeation of the trench wall by the slurry during construction.

After soil sampling, the drill hole was backfilled with a Bentonite-cement grout with a marsh cone viscosity of 38 seconds. At this level of viscosity, the grout was fluid enough to penetrate the hole effectively. A picture of the completely backfilled hole at P-1 is shown in Figure 4. The grout consisted of 2 bags of Magnolia Brand/Blue-Circle Portland Cement Type I/II, one half bag of Baroid Quick Gel Fast-mixing Bentonite and 16-20 gallons of water. All drilling and sample acquisition activities were accomplished above the water table and contact was not made with the interior of the slurry wall.

(c) Selection of Laboratory Tests

The following laboratory tests were selected because they were most likely to show differences between a slurry material and glacial till:

- Grainsize Distribution Tests
- Atterberg Limit Tests for Plasticity Index
- X-ray Diffraction Tests for Mineralogy

It was assumed that the slurry wall would be finer-grained than the surrounding glacial till. During the construction of the wall, Bentonite was added to the slurry mix to increase its plasticity and lower its hydraulic conductivity. This implies that the slurry wall materials should exhibit a plasticity index that is higher than that of the glacial till. Although X-ray diffraction tests were conducted to discern differences in the mineralogies of the glacial till and slurry wall samples, a distinct difference in the diffraction patterns of samples from the slurry backfill and the glacial till was not expected. Although the primary constituent of Bentonite is sodium montmorillonite, glacial till also may contain montmorillonitic clay. XRD testing is valid as high concentrations of montmorillonite (as is expected in the slurry wall) is rare. In fact, concentrated sodium montmorillonite is so uncommon that virtually all of the Bentonite used in the United States is mined from a single source (Wyoming). Therefore, the determination of the degree of correlation between the laboratory test results and the GPR delineation (Detection Sciences, 1995) is based on the general patterns exhibited by the suite of tests selected, and not on a single test.

3. RESULTS AND CONCLUSION

(a) Results

The results of tests on soil samples taken from borings P-1 and P-2 are summarized in Tables 2 and 3, respectively. At P-1, due to sample recovery problems during drilling, it was not possible to run grainsize distribution tests on most of the samples. However, on the basis of high plasticity index and visual inspection, samples 1-4, 1-5, and 1-6 were identified as slurry wall material. Plasticity Index (PI) values for samples 1-5 and 1-6 are 14.8 and 13.2, respectively.

By definition, the Plasticity Index is the moisture content over which a soil remains plastic. Grained soils (gravel, sand, and silt) have negligible PI values (below 3). Clayey soils can remain plastic over a wider range of moisture content. Consequently, they have higher PI values (as high as 30). At the same clay content, soils that contain sodium montmorillonite (a highly plastic clay mineral) tend to have higher PI values than soils with other clay minerals (illite, chlorite, kaolinite, etc.) Sodium montmorillonite makes up more than 95% of the Bentonite that was added to the Slurry Wall material. The PI values of 14.8 and 13.2 obtained for samples 1.5 and 1.6, respectively, are higher than the values obtained for the glacial till samples tested. These results indicate that samples 1.5 and 1.6 are more plastic than samples from the surrounding glacial till (glacial till is a mixture of sand, silt, gravel, and cobbles).

At boring P-2, samples 2-6, 2-7 and 2-8 were identified as slurry wall material on the basis of visual inspection and plasticity index. In Figure 5, PI values for samples taken beyond a distance of 7 feet from drill points tend to match for both borings P-1 and P-2. At P-2 for which data is complete, PI values of soils that are farther away from the wall (nearer to the drill point; 1-6.9 ft from the drill point) are lower than 12.9. Samples 1-4, 1-5, 1-6, 2-6, 2-7, and 2-8 were retrieved from points along the inclined drill holes which lie within the slurry wall width delineated on the basis of Ground Penetrating Radar (GPR).

The results of grainsize distribution tests are not dependable if they are used as the sole basis for differentiating between the slurry wall material and the glacial till. As stated above, glacial till is usually a mixture of pockets of clay, silt, sand and gravel. Silty soil was also included in the backfill. Thus, coarse particles also exist in the slurry mix as evident in the grain size distribution curves attached. Greater reliance was placed on visual observation of retrieved samples through a handlens. The slurry wall samples caked upon drying. In addition, a color change from grey to white of samples 1-4, 1-5, 1-6, 2-6, 2-7, and 2-8. Pure samples of Bentonite exhibited this color change as well. These textural and desiccation-induced color changes were not observed in other samples. The latter category of samples are glacial till.

The diffraction patterns obtained for a few samples from both borings P-1 and P-2 are shown in Figures 6 and 7, respectively. The minus #200 (sieve size) fraction of the samples were used, which means that the mineralogy of only the clay fractions of the samples was evaluated. In Figure 6, the patterns labelled 1-6 (P1 11-12') and 1-2 (P1 1-3') are for materials considered to be slurry backfill and glacial till, respectively. The diffraction patterns are somewhat similar, mostly due to the fact that the larger grainsizes that would have imposed a more diverse mineralogy on the glacial till samples had to be sieved out before diffraction testing. Nevertheless, a comparison of the diffraction patterns obtained for fine fractions does show that

Bentonite is present in the slurry material and glacial till. Figure 7 shows similar results for Boring P-2. The reader should note that the vertical axes for both Figures 6 and 7 are sliding scales.

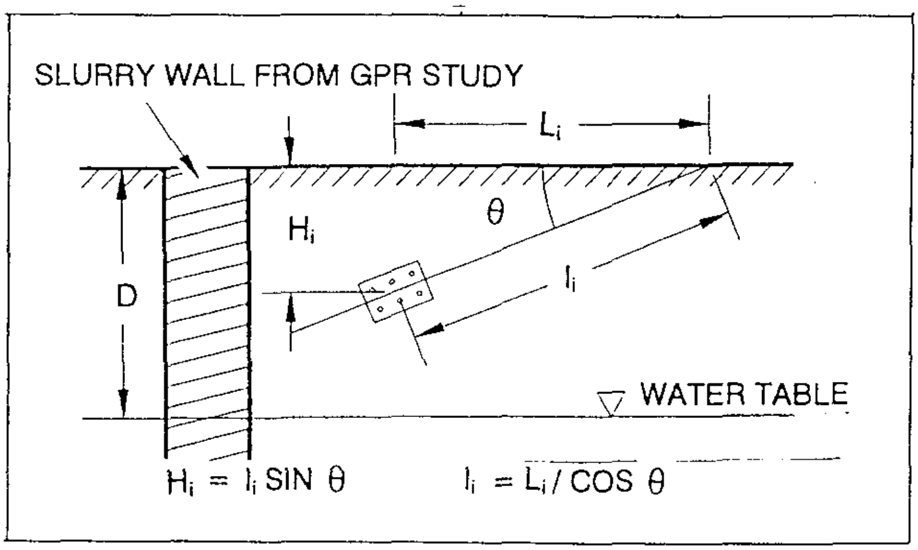
(b) Conclusion

The combination of visual inspection of samples on site and laboratory testing of the samples taken from the Loeffel Site indicate that the locations of the slurry wall demarcated through the use of GPR appears to be correct at GPR survey locations # 29 and between GPR #31 and 32. Confirmation of the reasonable accuracy of the GPR delineation at these two locations implies that the entire Loeffel Site slurry wall should be justifiably assumed to exist as delineated in the GPR study. Figures 8 and 9 show GPR data plots for the subsurface at survey locations#29 (near P-2) and #33 (near P-1), respectively.

4. REFERENCES

GeoTrans. 1995. Personal Communications with Chuck Spalding. June, 1995.

Detection Sciences. 1995. Ground-Penetrating Radar Survey: Dewey Loeffel Site, Nassau, New York. Final report of an investigation conducted by Detection Sciences, Inc. for Geotrans, Inc., Sterling, Virginia. 17 pages.



EXPLANATION OF TERMS:

θ = Drilling Angle (degrees).
D = Estimated depth to water table (ft).
l_i = Inclined length of drill hole from ground surface to center of sample i (ft).
H_i = Vertical depth from ground surface to center of sample i (ft).
L_i = Horizontal distance between hole entry and sample i projection point on ground surface (ft).

Figure 1. Orientation of drill holes at boring locations P-1 and P-2 at the Loeffel Site and method of calculation of locations of sample retrieval points in the subsurface.

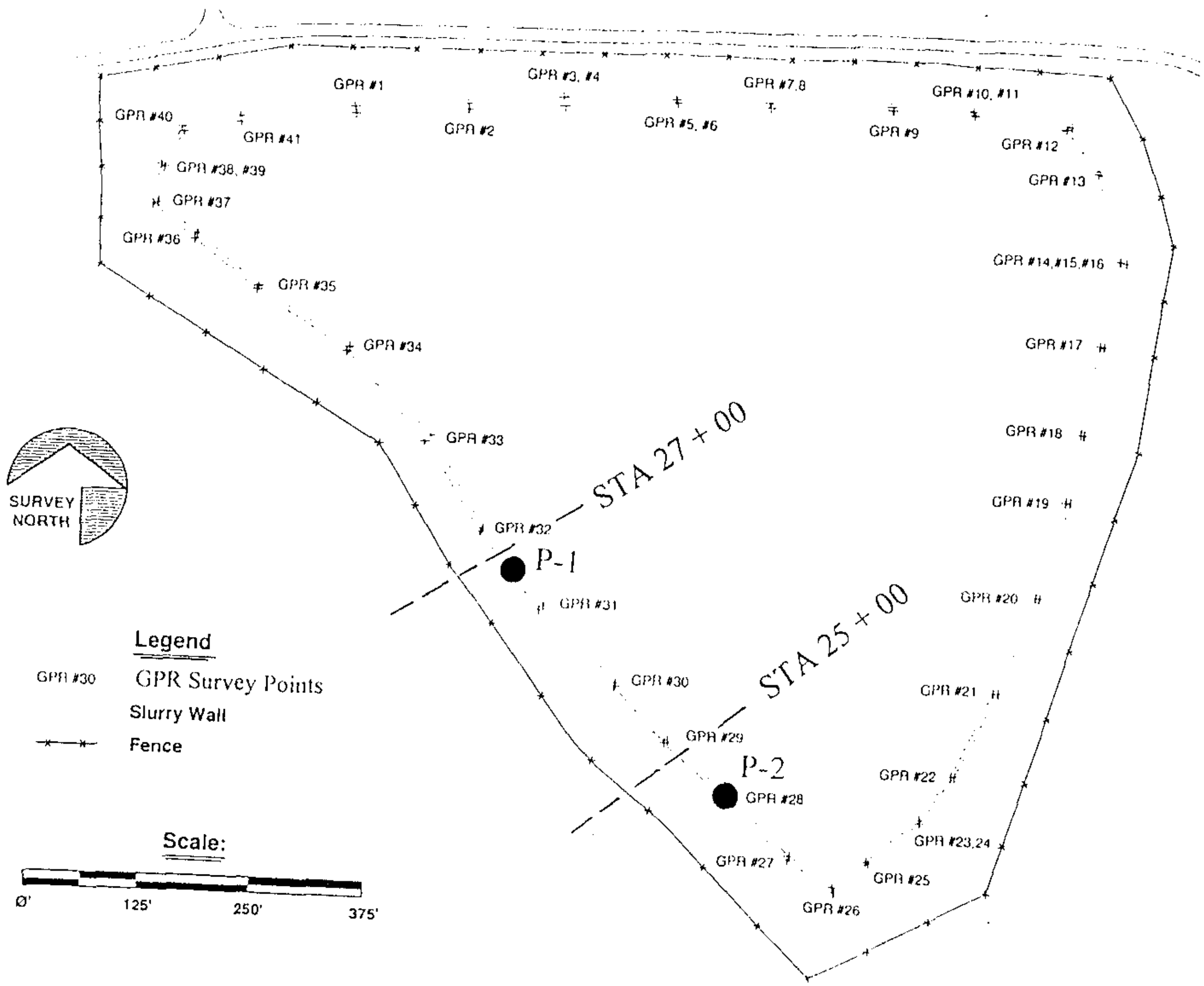


Figure 2. Locations of inclined borings for confirmation of GPR-delineated slurry wall location.

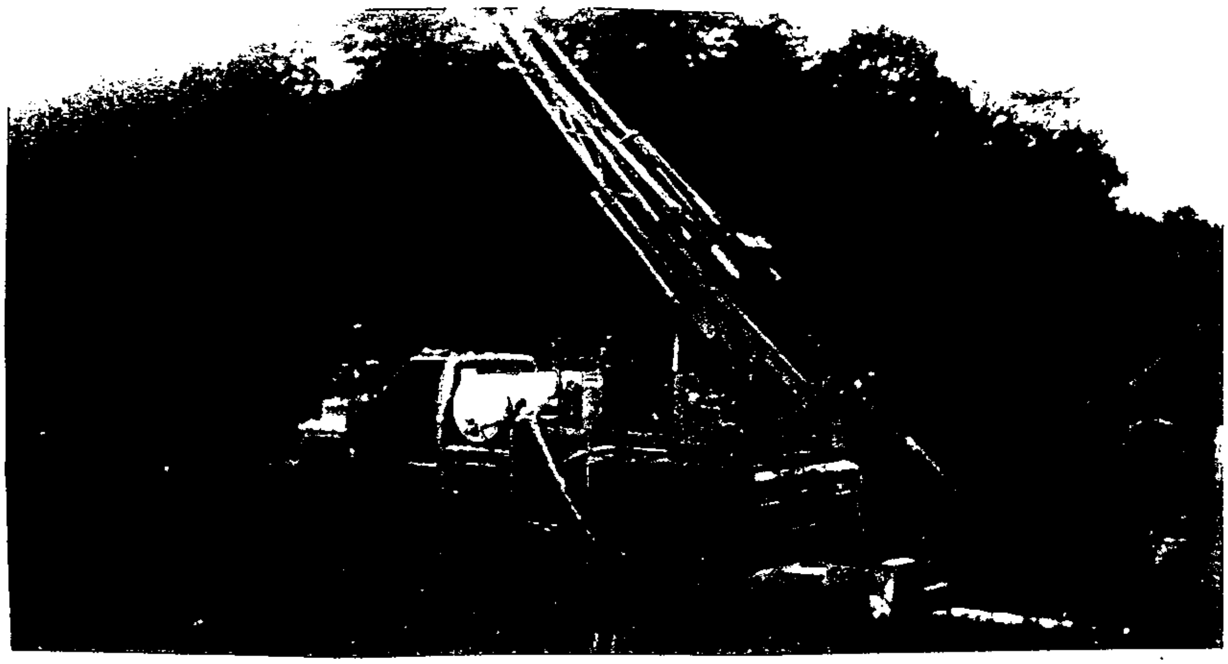


Figure 3. Photograph revealing the 45° inclination of the drill stem during the slurry wall location verification study at Loeffel Site.

Figure 4. Photograph of the drill hole after backfilling with a cement-bentonite grout and covering with topsoil at the Loeffel Site.

LOCATION NUMBER: P-1			
DRILL ANGLE, θ: 45°			
ESTIMATED DEPTH TO WATER TABLE: 639.07 - 618.66 = 20.47'			
POSITION	SAMPLE INTERVAL ALONG I_i	GENERAL DESCRIPTION OF SAMPLE IN THE FIELD PENDING TESTING*	CORRES-PONDING SAMPLES
1	1' - 3'	CLAY AND GRAVEL MIXTURE (TILL)	1-1, 1-2
2	5' - 8'	SPLIT SPOON UNABLE TO RETRIEVE SAMPLE, AND A SHELBY TUBE WAS USED INSTEAD. BENTONITE FIRST VISIBLE AT I_i = 7.5 FEET. SAMPLE IS MOSTLY CLAY WITH SOME BENTONITE.	1-3
3	10' - 12'	CLAY-BENTONITE MIXTURE FOUND	1-4
4	10' - 12' (TOP)	SAMPLE IS CLAY-BENTONITE MIX. OVM READING 1 PPM ABOVE BACKGROUND.	1-5
5	10' - 12' (BOTTOM)	CLAY-BENTONITE MIX. ENTIRE SAMPLE COLLECTED. THE WALL WAS PENETRATED BY THE SHELBY TUBE, BUT NOT THE AUGER.	1-6

GENERAL NOTES:
I_i = INCLINED LENGTH OF DRILL HOLE FROM GROUND SURFACE TO TOP OF SAMPLE.
THE AUGER HOLE WAS FILLED BY BENTONITE-CEMENT GROUT. TWO BAGS OF MAGNOLIA BRAND / BLUE CIRCLE PORTLAND CEMENT TYPE I/II, 1/2 BAG OF BAROID QUICK GEL FAST MIXING HIGH VISCOSITY BENTONITE, AND BETWEEN 16-20 GALLONS OF WATER WERE USED IN THE GROUT MIX. THE GROUT HAD A MARSH CONE VISCOSITY OF 38 SECONDS.

* DIAGNOSIS IS VERY PRELIMINARY PENDING CONFIRMATION THROUGH MATERIAL TESTING.

LOCATION NUMBER: P-2			
DRILL ANGLE, θ: 45°			
ESTIMATED DEPTH TO WATER TABLE: 647.5 - 635.0 = 12.5'.			
POSITION	SAMPLE INTERVAL ALONG I_i	GENERAL DESCRIPTION OF SAMPLE IN THE FIELD PENDING TESTING*	CORRES-PONDING SAMPLES
1	2' - 4'	RESEMBLES CLAYEY TILL	2-1, 2-2
2	4' - 6'	RESEMBLES CLAYEY TILL	2-3
3	6' - 8'	SOIL AT 8' CONTAINS CLAY.	2-4
4	8' - 10'	SOIL AT 10' IS CLAY, BENTONITE AND GRAVEL MIXTURE.	2-5, 2-6
5	10' - 12'	CLAY-BENTONITE MIX BY 12'. THE WALL WAS PENETRATED BY THE SHELBY, NOT THE AUGER.	2-7, 2-8

GENERAL NOTES:
THE DRILL RIG WAS NOT ALIGNED PERPENDICULAR TO THE SLURRY WALL. IT'S EXACT LOCATION AND THE ANGLE OF DRILL INSERTION WILL BE BACK-CALCULATED FROM KNOWN DISTANCES TO THE DRILL POINT.
I_i = INCLINED LENGTH OF DRILL HOLE FROM GROUND SURFACE TO TOP OF SAMPLE.
SOIL WAS COLLECTED BY SHELBY TUBES, WHICH WERE EXTRUDED IN THE LAB.
THE AUGER HOLE WAS FILLED BY BENTONITE-CEMENT GROUT. TWO BAGS OF MAGNOLIA BRAND / BLUE CIRCLE PORTLAND CEMENT TYPE I/II, 1/2 BAG OF BAROID QUICK GEL FAST MIXING HIGH VISCOSITY BENTONITE, AND BETWEEN 16-20 GALLONS OF WATER WERE USED IN THE GROUT MIX. THE GROUT HAD A MARSH CONE VISCOSITY OF 38 SECONDS.

* DIAGNOSIS IS VERY PRELIMINARY PENDING CONFIRMATION THROUGH MATERIAL TESTING.

Table 1. Data recorded during drilling and soil sample acquisition at the Loeffel Site.

FIELD DATA RECORDING SHEET FOR THE LOEFFEL SITE SLURRY WALL LOCATION PROJECT
LOCATION: BORING P-1

DRILL ANGLE, θ: 45°

ESTIMATED DEPTH TO WATER TABLE, D: 639.07' - 618.66' = 20.47'

DETERMINED		OBTAINED BY COMPUTATION		OBTAINED IN LABORATORY				IDENTIFICATION
Sample Number	l_i (ft)	H_i (ft)	L_i (ft)	C_u	C_c	P.I. (%)	Indication from XRD	
1-1	2.0	1.414	1.414	n/a	n/a	n/a	-	Glacial Till
1-2	2.0	1.414	1.414	n/a	n/a	n/a	Glacial Till	Glacial Till
1-3	6.5	4.596	4.596	15.0	1.067	n/a	-	Glacial Till
1-4	11.0	7.778	7.778	n/a	n/a	n/a	-	Slurry Wall
1-5	10.5	7.425	7.425	n/a	n/a	14.8	-	Slurry Wall
1-6	11.5	8.132	8.132	n/a	n/a	13.2	Bentonite	Slurry Wall

EXPLANATION OF TERMS:

- θ = Drilling angle (degrees).
- D = Estimated depth to water table (ft).
- l_i = Inclined length of drill hole from ground surface to center of sample i (ft).
- H_i = Vertical depth from ground surface to center of sample i (ft).
- L_i = Horizontal distance between hole entry and sample i projection point on ground surface (ft).
- C_u = Coefficient of uniformity
- C_c = Coefficient of gradation

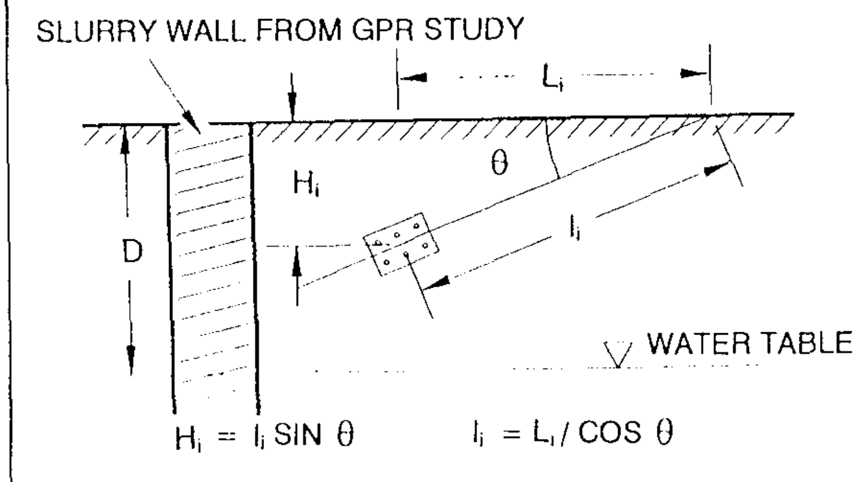


Table 2. Summary of laboratory test results and material classification for Boring P-1.

FIELD DATA RECORDING SHEET FOR THE LOEFFEL SITE SLURRY WALL LOCATION PROJECT

LOCATION: BORING P-2

DRILL ANGLE, θ: 45°

ESTIMATED DEPTH TO WATER TABLE, D: 647.5' - 635.0' = 12.5'

DETERMINED		OBTAINED BY COMPUTATION		OBTAINED IN LABORATORY				IDENTIFICATION
Sample Number	l_i (ft)	H_i (ft)	L_i (ft)	C_u	C_c	P.I. (%)	Indication from XRD	
2-1	2.5	1.768	1.768	n/a	n/a	4.30	-	**Glacial Till**
2-2	3.5	2.475	2.475	n/a	n/a	11.4	-	**Glacial Till**
2-3	5	3.536	3.536	20.0	0.988	12.0	-	**Glacial Till**
2-4	7	4.950	4.950	31.25	1.25	11.8	**Glacial Till**	**Glacial Till**
2-5	8	5.657	5.657	20.0	4.05	n/a	-	**Glacial Till**
2-6	10	7.071	7.071	n/a	n/a	8.30	**Bentonitic**	**Slurry Wall Edge**
2-7	10.5	7.425	7.425	20	1.54	14.2	-	**Slurry Wall**
2-8	11.5	8.132	8.132	28.33	1.57	12.9	-	**Slurry Wall**

EXPLANATION OF TERMS:

- θ = Drilling angle (degrees).
- D = Estimated depth to water table (ft).
- l_i = Inclined length of drill hole from ground surface to center of sample i (ft).
- H_i = Vertical depth from ground surface to center of sample i (ft).
- L_i = Horizontal distance between hole entry and sample i projection point on ground surface (ft).
- C_u = Coefficient of uniformity
- C_c = Coefficient of gradation

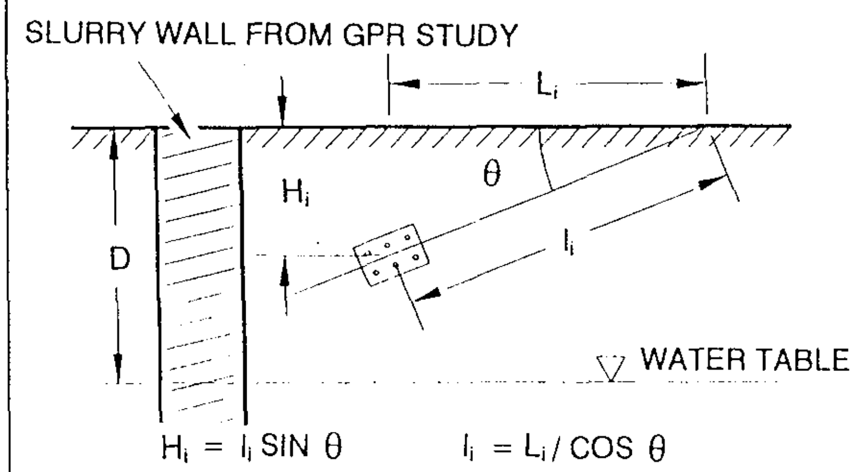


Table 3. Summary of laboratory test results and material classification for Boring P-2.

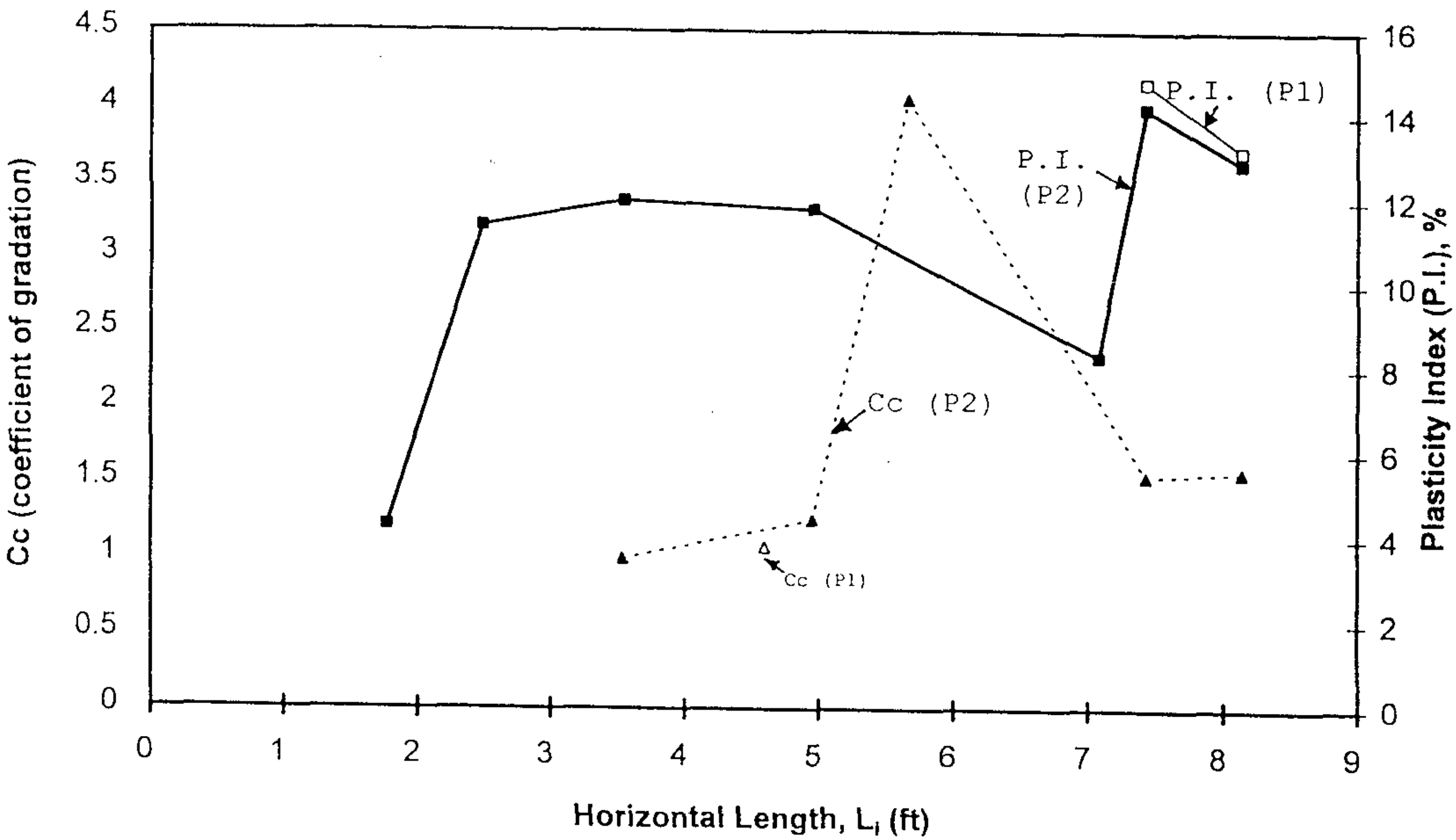


Figure 5. Variation of Plasticity Index (PI) and Coefficient of gradation (C) with horizontal distance from borings P-1 and P-2 toward he GPR-delineated location of the Loeffel Site slurry wall.

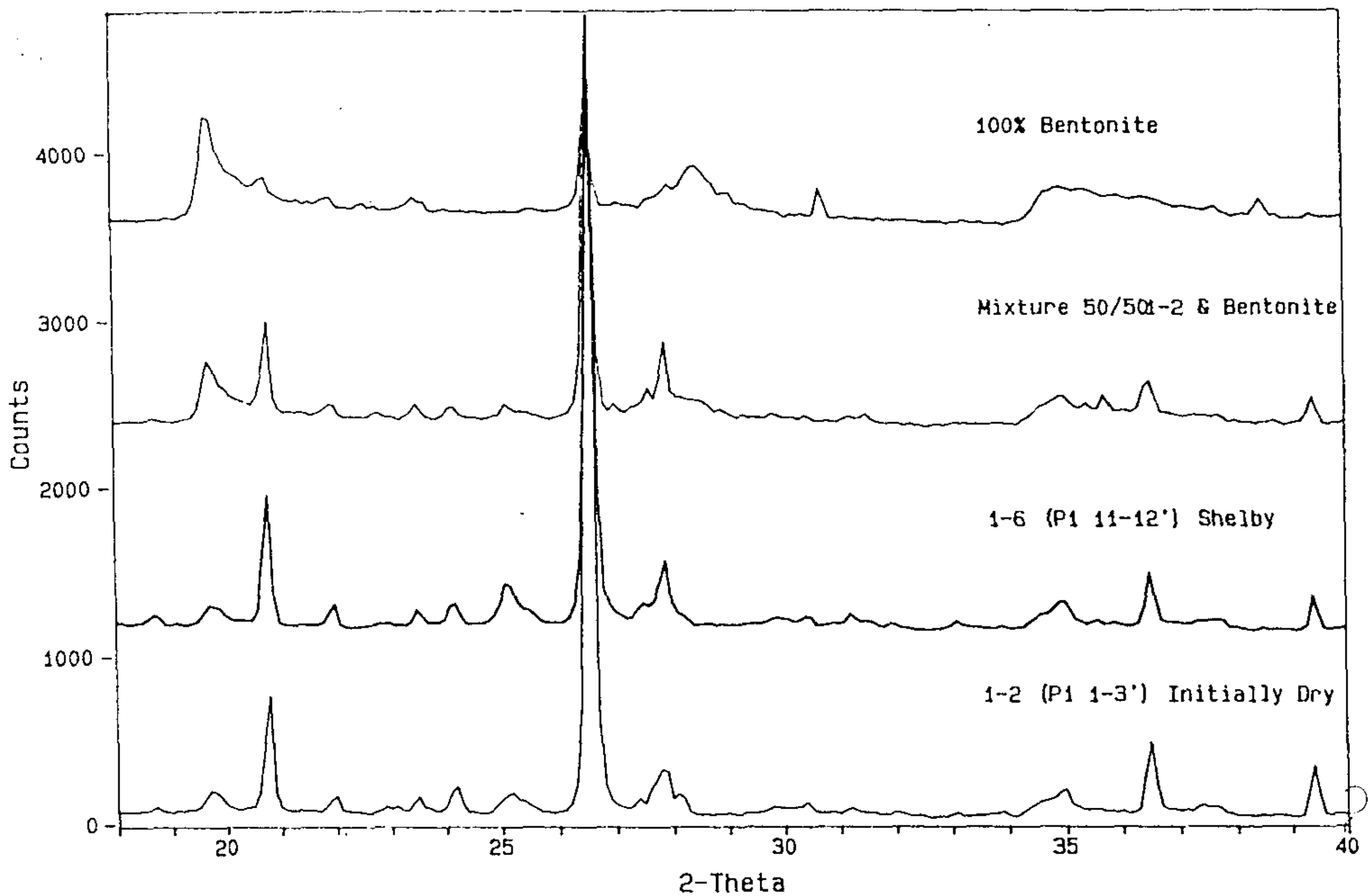


Figure 6. X-ray diffraction patterns for suspected glacial till (1-2: P1 1-3') and Slurry wall (1-6: P1 11-12') samples from boring 1. Note: Vertical axis is on a sliding scale.

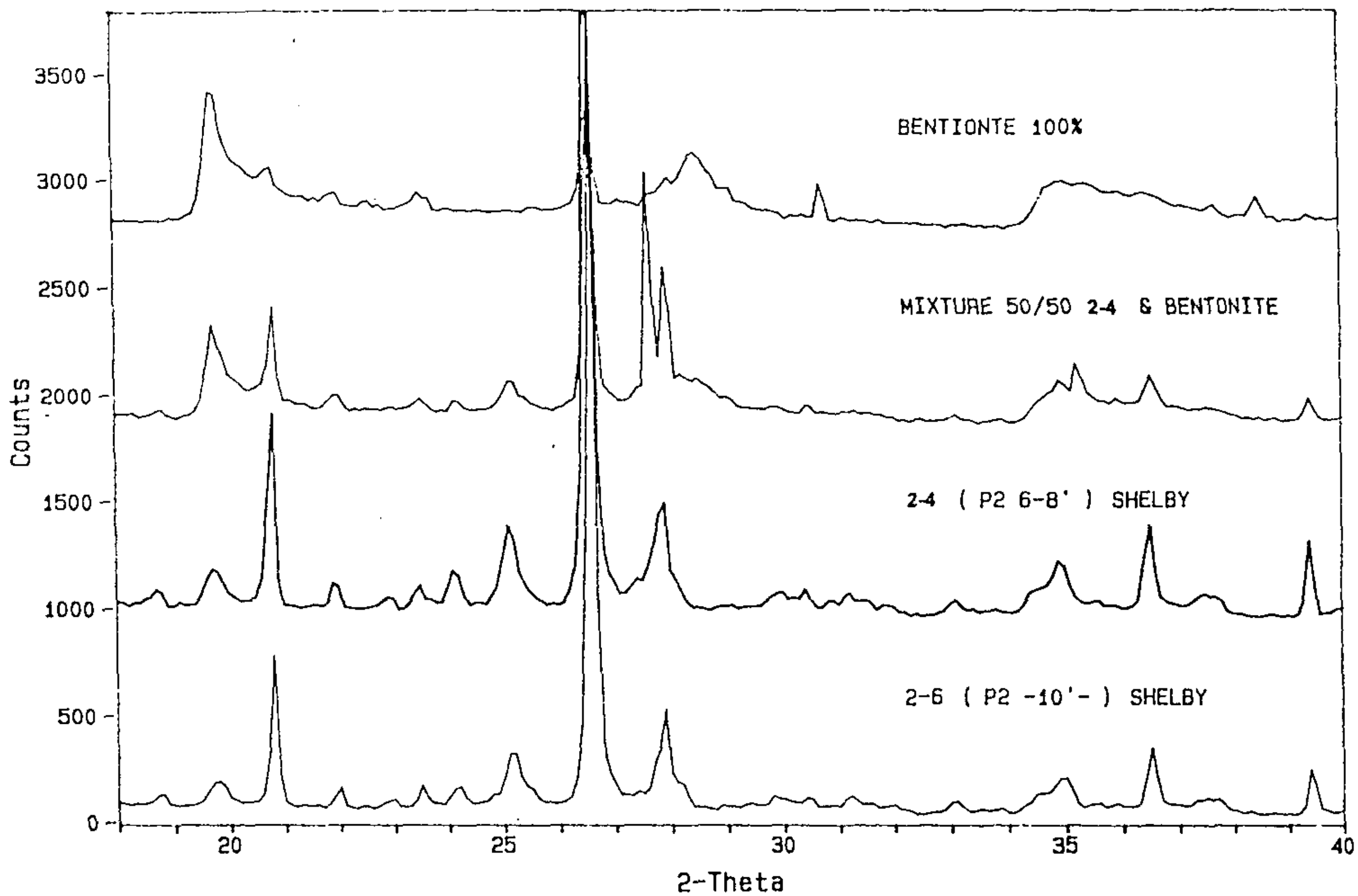


Figure 7. X-ray diffraction patterns for suspected glacial till (2-4: P2 6-8') and Slurry wall (2-6: P2 10') samples from boring 2. Note: Vertical axis is on a sliding scale.

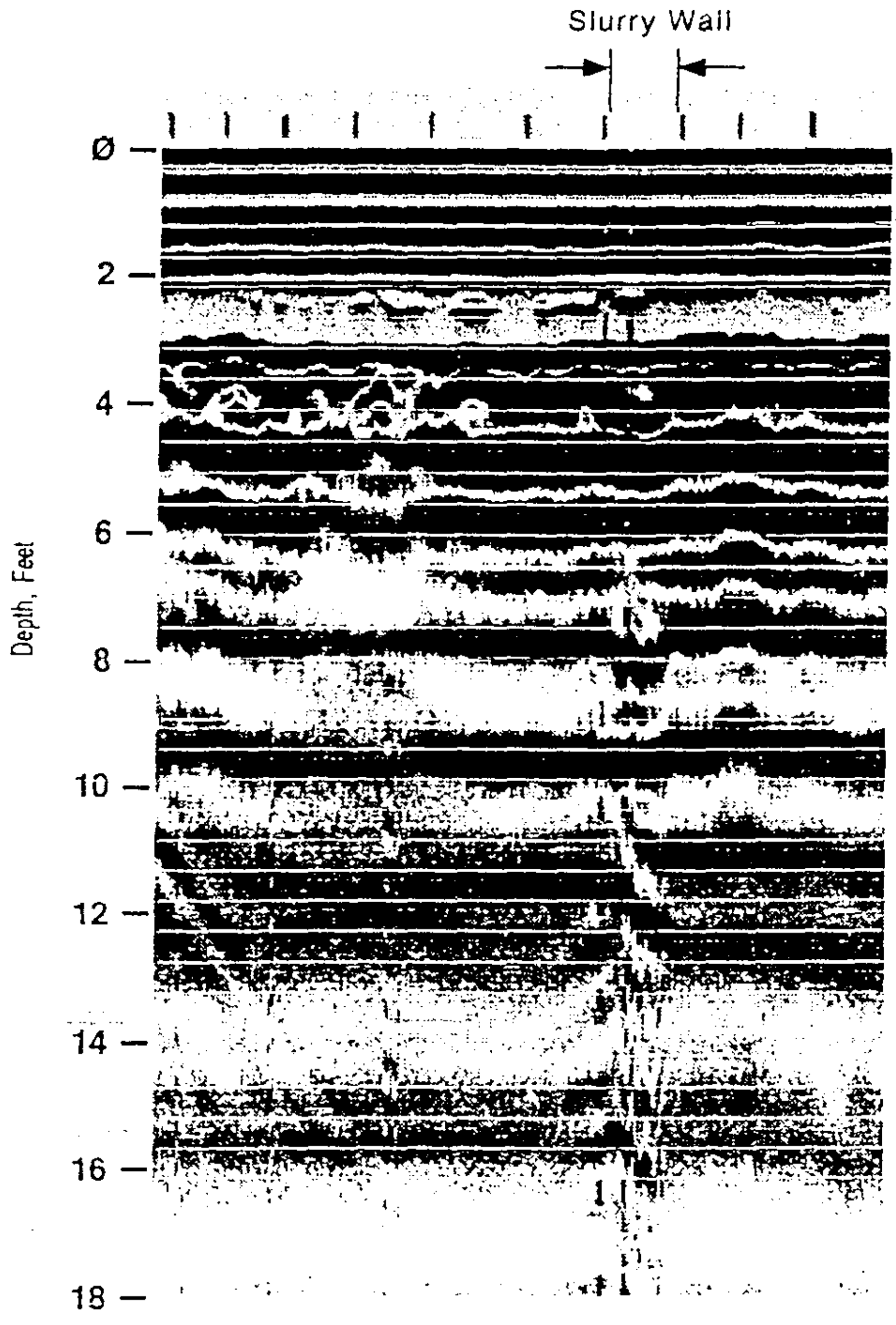


Figure 8. Radar Survey line #29 showing the estimated position of the slurry wall as dashed lines (extracted from Detection Sciences, 1995). This survey line is close to Boring P-2.

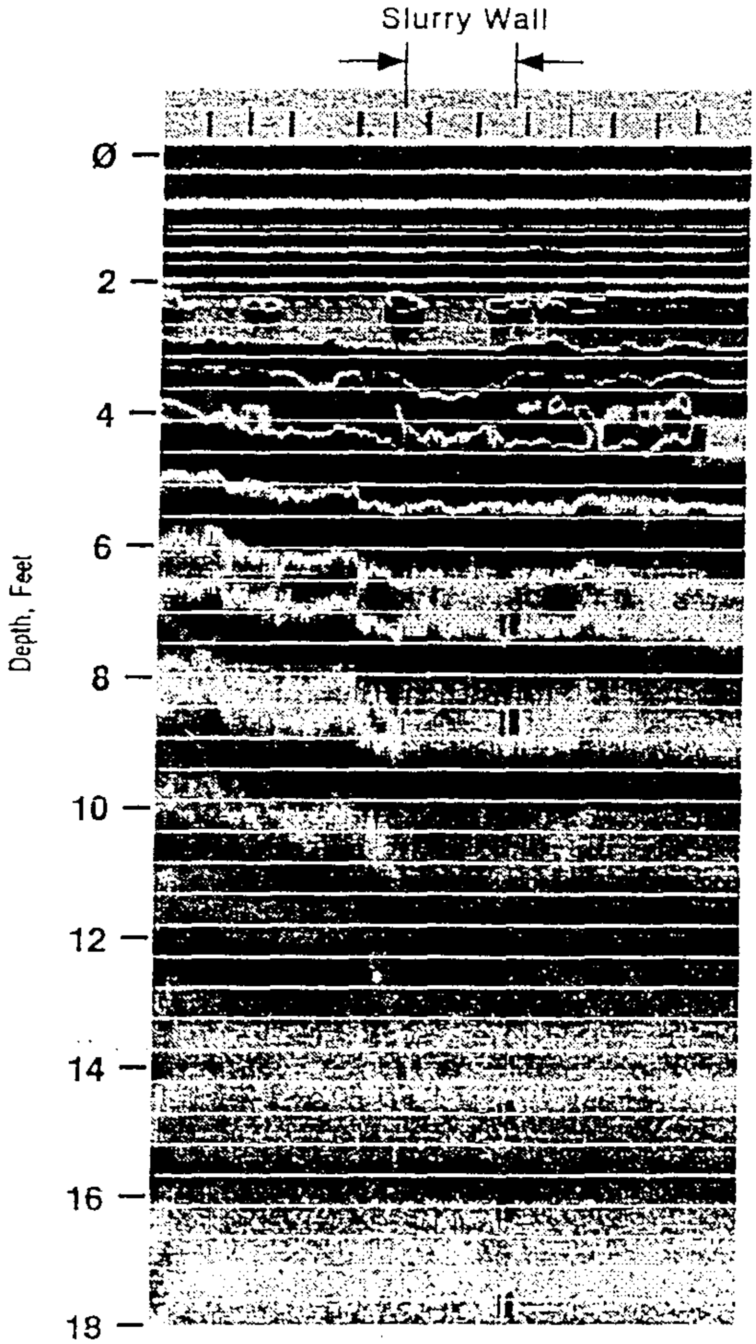


Figure 9. Radar Survey line #33 showing slumping at depth 3-4 feet below grade as interpreted by Detection Sciences (1995). This survey line is close to Boring P-1.

6. APPENDIX

Laboratory Test Data

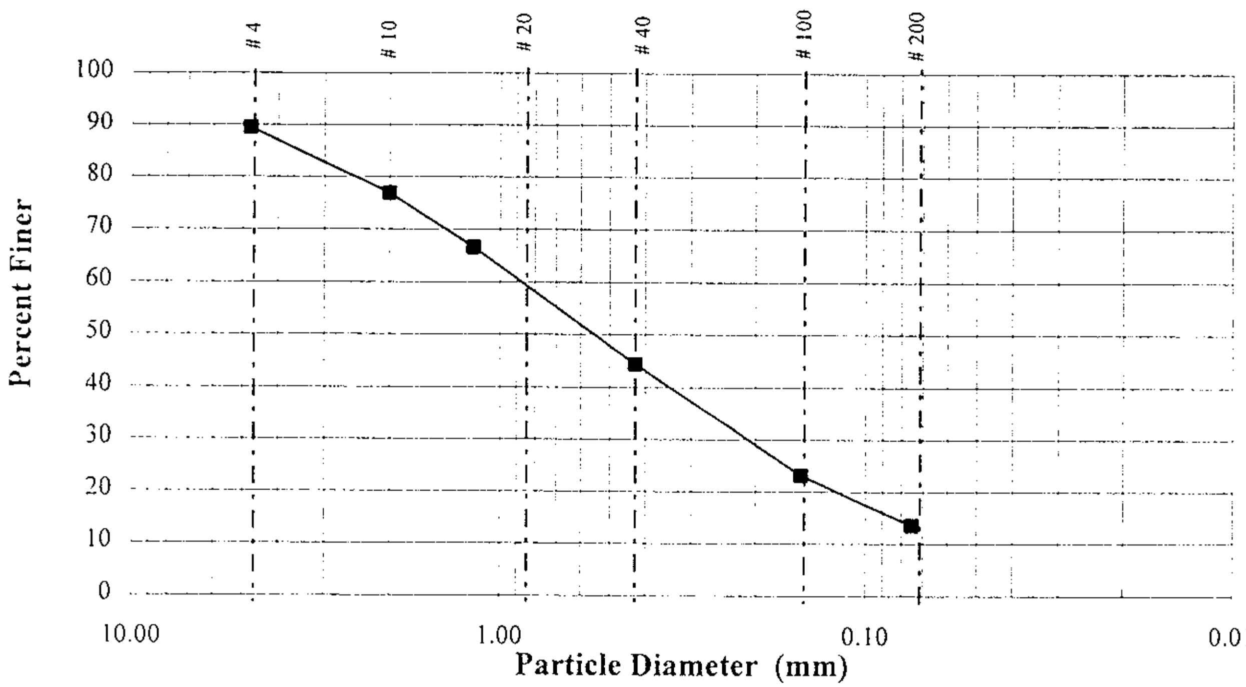
on Soil Samples

Sieve Analysis Data and Computation Sheet

Project: Albany Site | Sample No: 1-1
Test by: E&L | Boring No: P1
Date: 8-Sep-95 | Depth: Top 3 ft (moist)
Soil Description: Fine grain cohesionless soil w/ one clump cohesive soil (moist)

Weight of Sample: 240.2 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	24.6	10.5	89.5
10	2.000	29.5	12.6	76.9
16	1.180	24.1	10.3	66.6
40	0.425	51.7	22.1	44.4
100	0.150	49.9	21.3	23.1
200	0.075	22.4	9.6	13.5
Sieve Pan		31.6	13.5	0.0
Total		233.8		
	% Error	-2.664		



Soil Parameters:

D_{10}: Unk C_u: Unk
D_{30}: 0.2 C_c: Unk
D_{60}: 0.9

Soil Classification:

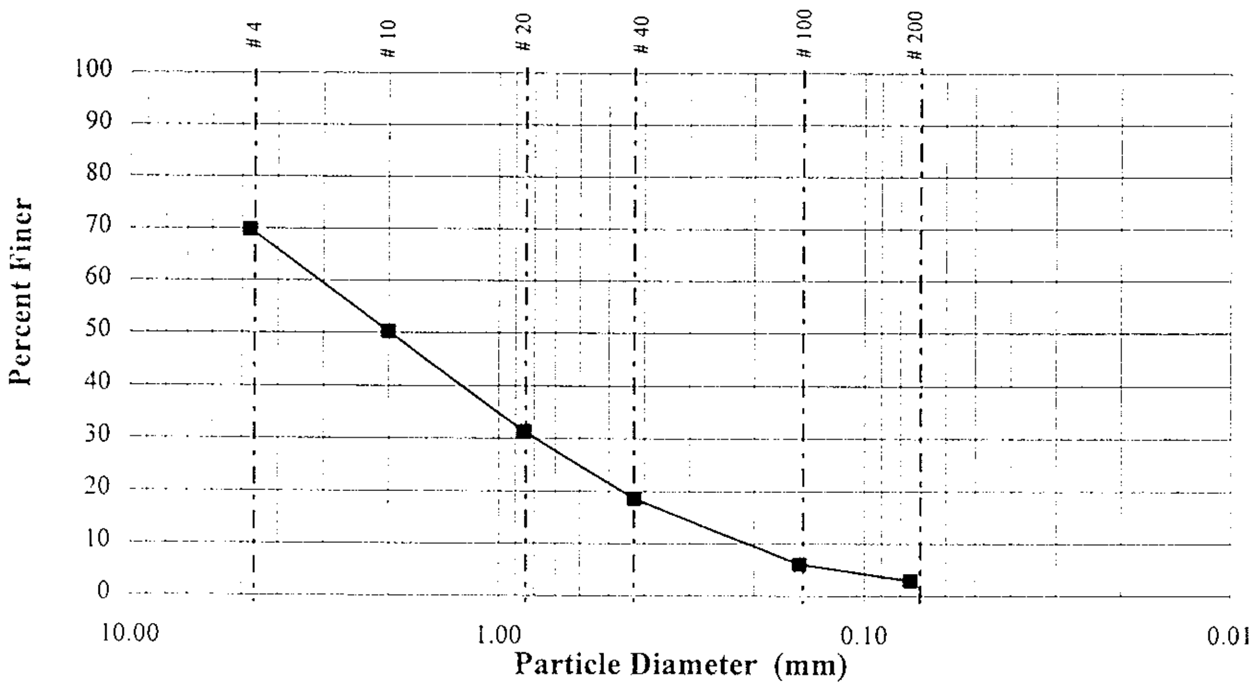
Sieve Analysis Data and Computation Sheet

Project: Albany Site
Test by: E&L
Date: 8-Sep-95
Soil Description: Clayey Sand with Some Gravel

Sample No: 1-3
Boring No: P1
Depth: 5 - 8 ft

Weight of Sample: 487.0 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	147.1	30.3	69.7
10	2.000	94.7	19.5	50.2
20	0.850	92.3	19.0	31.3
40	0.425	61.7	12.7	18.6
100	0.150	60.9	12.5	6.0
200	0.075	15.5	3.2	2.8
Sieve Pan		13.8	2.8	0.0
Total		486.0		
% Error		-0.205		



Soil Parameters:

D_{10}: 0.2
D_{30}: 0.8
D_{60}: 3

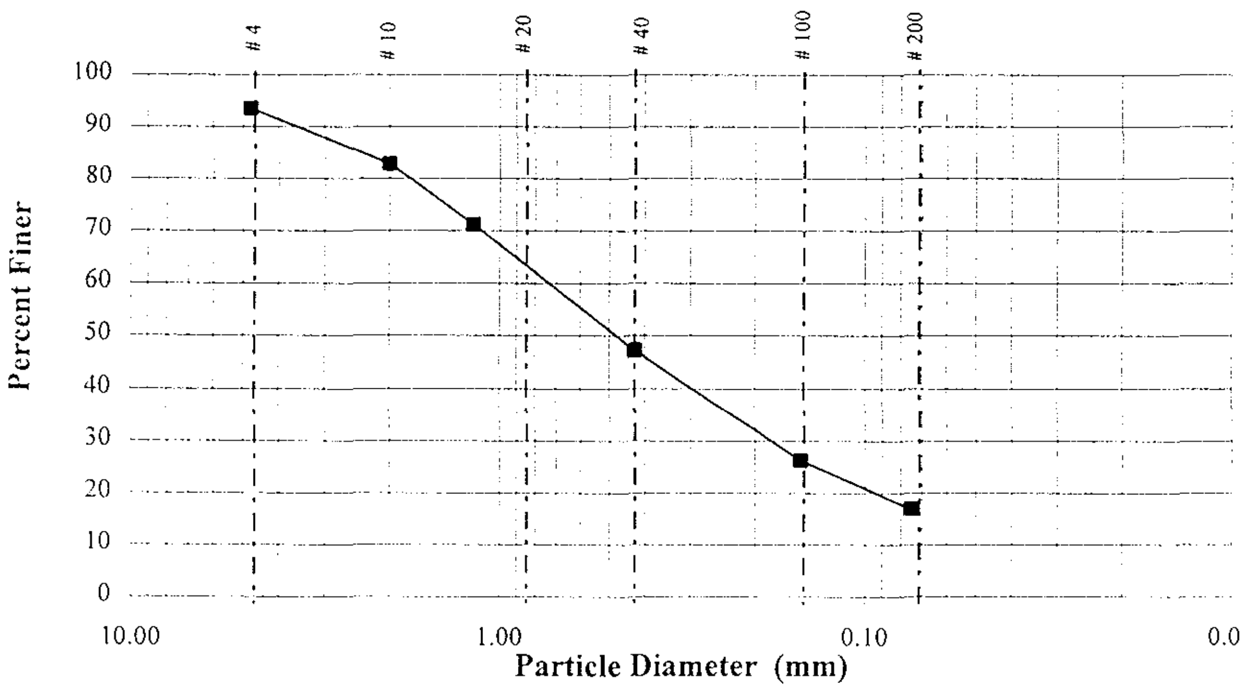
C_u: 15.0
C_c: 1.1

Sieve Analysis Data and Computation Sheet

Project: Albany Site
Test by: E&L
Date: 8-Sep-95
Sample No: 1-4
Boring No: P1
Depth: 10-12 ft
Soil Description: Brownish Clay with some Gravel.

Weight of Sample: 279.8 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	18.0	6.5	93.5
10	2.000	29.6	10.6	82.9
16	1.180	32.5	11.7	71.2
40	0.425	66.6	23.9	47.3
100	0.150	58.6	21.1	26.2
200	0.075	25.8	9.3	17.0
Sieve Pan		47.2	17.0	0.0
Total		278.3		
% Error		-0.536		



Soil Parameters:

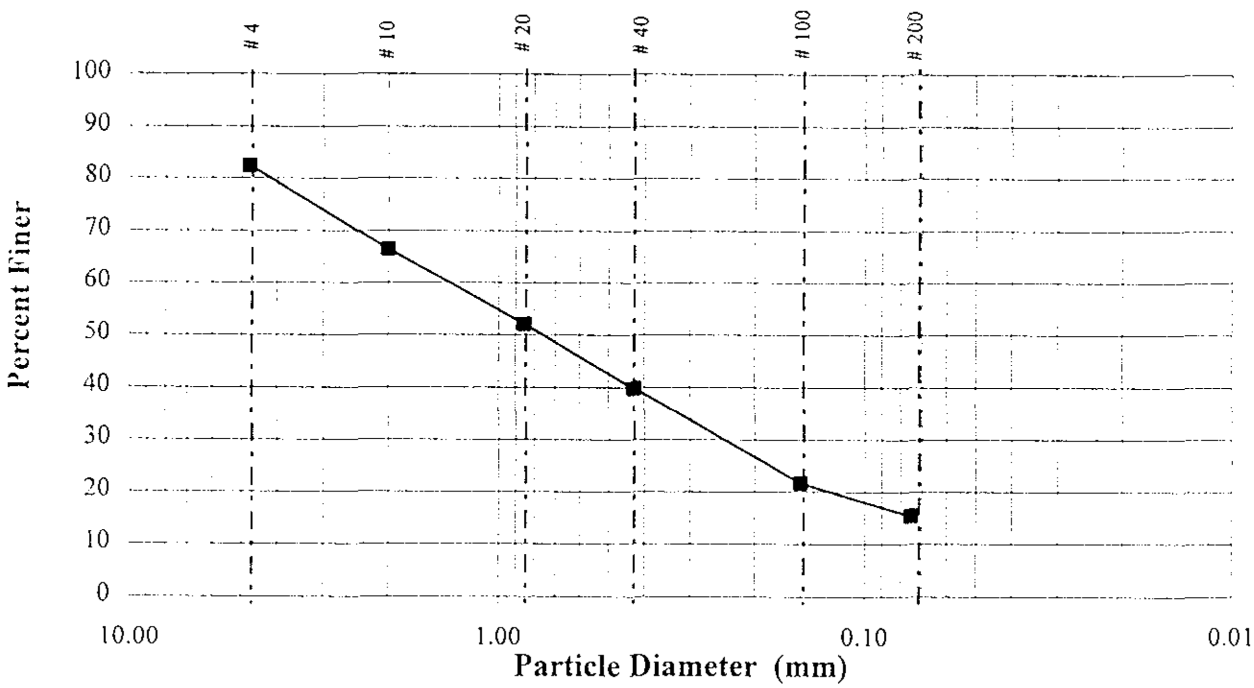
D_{10}: Unk
D_{30}: 0.18
D_{60}: 0.7
C_u: Unk
C_c: Unk

Sieve Analysis Data and Computation Sheet

Project: Albany Site
Sample No: 1-2
Test by: E&L
Boring No: P1
Date: 8-Sep-95
Depth: Top 3 ft (dry)
Soil Description: Fine grain cohesionless soil w/ one clump cohesive soil (dry)

Weight of Sample: 79.8 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	13.8	17.6	82.4
10	2.000	12.6	16.1	66.4
20	0.850	11.2	14.3	52.1
40	0.425	9.7	12.4	39.7
100	0.150	14.2	18.1	21.7
200	0.075	4.9	6.2	15.4
Sieve Pan		12.1	15.4	0.0
Total		78.5		
	% Error	-1.629		



Soil Parameters:

D_{10}: Unk
C_u: Unk
D_{30}: 0.23
C_c: Unk
D_{60}: 1.4

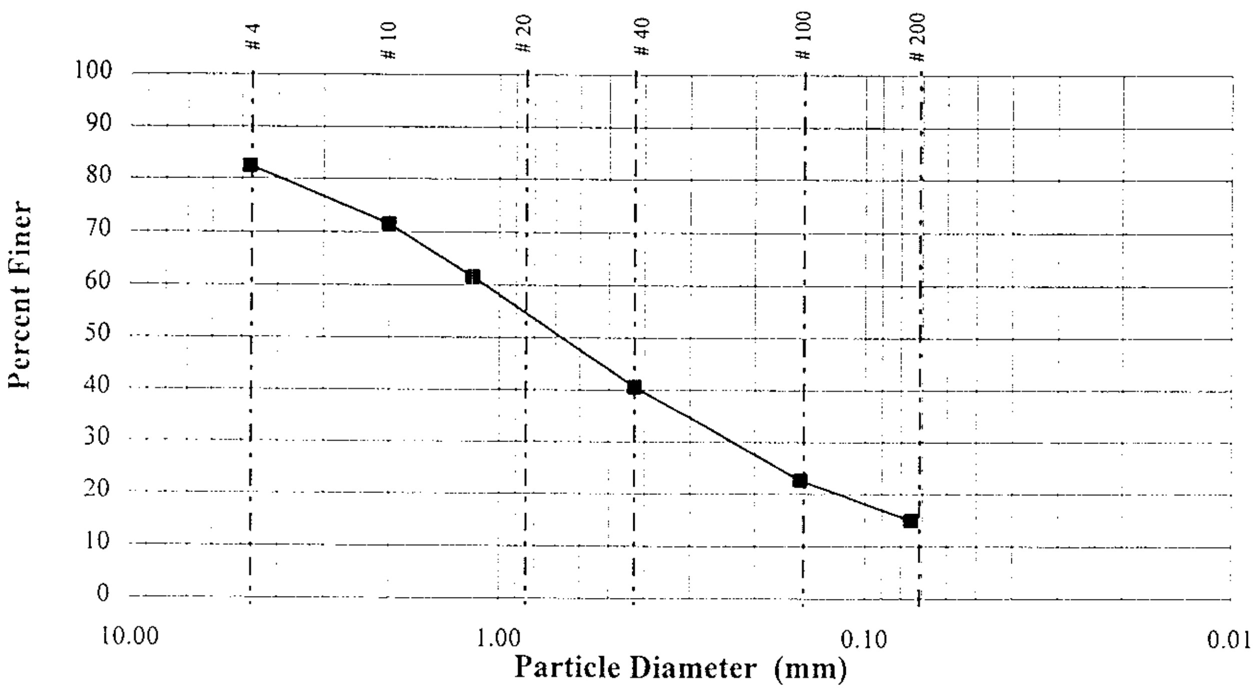
Note: Jar marked "P-1 Top=3'"

Sieve Analysis Data and Computation Sheet

Project: Albany Site | Sample No: 1-5
Test by: E&L | Boring No: P1
Date: 8-Sep-95 | Depth: 10 - 11 ft
Soil Description: Brownish Clay with some Gravel.

Weight of Sample: 828.5 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	145.1	17.5	82.5
10	2.000	90.5	10.9	71.5
16	1.180	82.9	10.0	61.5
40	0.425	173.4	20.9	40.6
100	0.150	149.0	18.0	22.6
200	0.075	63.6	7.7	14.9
Sieve Pan		123.5	14.9	0.0
Total		828.0		
	% Error	-0.060		



Soil Parameters:

D_{10}: Unk | C_u: Unk
D_{30}: 0.22 | C_c: Unk
D_{60}: 1.1

Atterburg Limits Worksheet

Project:	**Albany Site**	**Sample No:**	**1-5**
Test by:	**E&L**	**Boring No:**	**P1**
Date:	**14-Sep-95**	**Depth:**	**10 - 11 ft**
Soil Description:	**Brownish Clay with some Gravel.**		

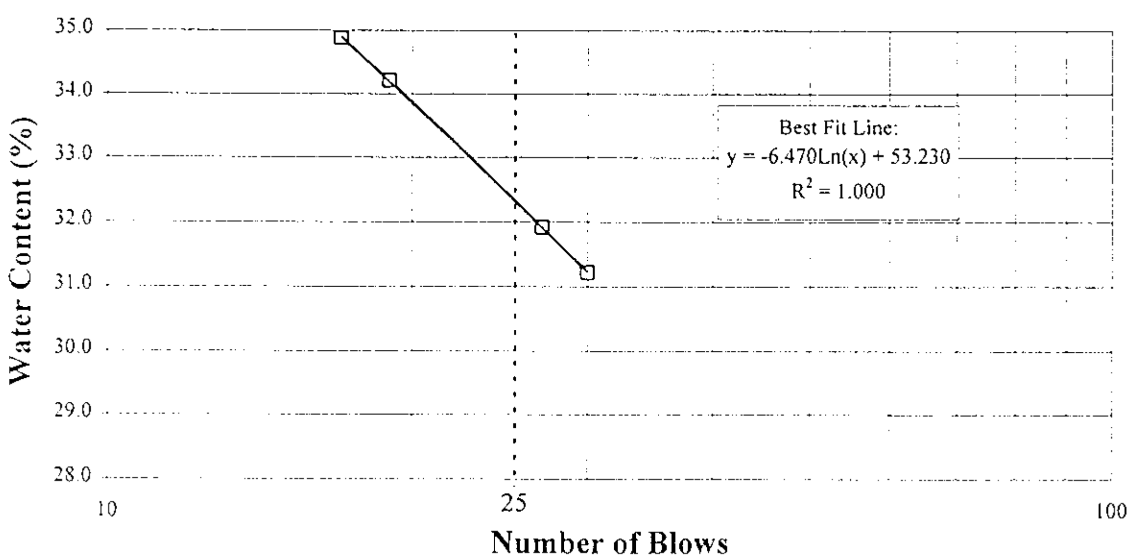
Liquid Limit:

Container	Z9	F8	Z5	B68
Number of Blows	17	19	27	30
Mass cup & wet soil (g)	24.05	22.16	26.94	24.66
Mass cup & dry soil (g)	20.81	19.42	23.19	21.52
Mass of Cup (g)	11.52	11.41	11.44	11.46
Mass of dry soil (M_s) (g)	9.29	8.01	11.75	10.06
Mass of Water (M_w) (g)	3.24	2.74	3.75	3.14
Water Content w (%)	34.88	34.21	31.91	31.21

Plastic Limit

Container	S9	T-5	B855
Mass cup & wet soil (g)	22.92	23.88	20.23
Mass cup & dry soil (g)	21.16	22.02	18.92
Mass of Cup (g)	11.44	11.50	11.25
Mass of dry soil (M_s) (g)	9.72	10.52	7.67
Mass of Water (M_w) (g)	1.76	1.86	1.31
Water Content *w* (%)	18.11	17.68	17.08

Flow Curve for Liquid Limit



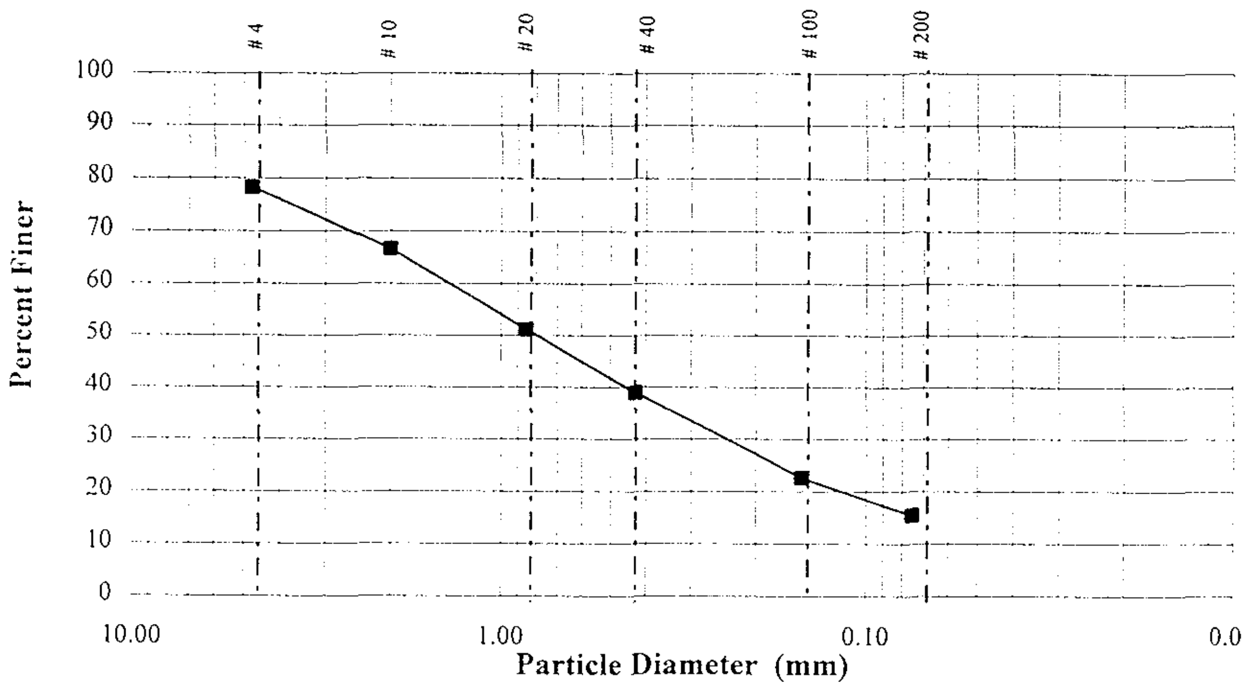
Liquid Limit (w_l):	32.4
Plastic Limit (w_p):	17.6

Sieve Analysis Data and Computation Sheet

Project: Albany Site
Sample No: 1-6
Test by: E&L
Boring No: P1
Date: 8-Sep-95
Depth: 11 - 12 ft
Soil Description: Brownish Clay with Large Gravel

Weight of Sample: 763.1 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	165.84	21.8	78.2
10	2.000	88.27	11.6	66.6
20	0.850	117.42	15.4	51.2
40	0.425	93.37	12.3	39.0
100	0.150	125.06	16.4	22.5
200	0.075	54.14	7.1	15.4
Sieve Pan		117.52	15.4	0.0
Total		761.62		
	% Error	-0.194		



Soil Parameters:

D_{10}: Unk
C_u: Unk
D_{30}: 0.4
C_c: Unk
D_{60}: 1.7

Atterburg Limits Worksheet

Project:	Albany Site	Sample No:	1-6
Test by:	E&L	Boring No:	P1
Date:	11-Sep-95	Depth:	11 - 12 ft

Soil Description: Brownish Clay with Large Gravel

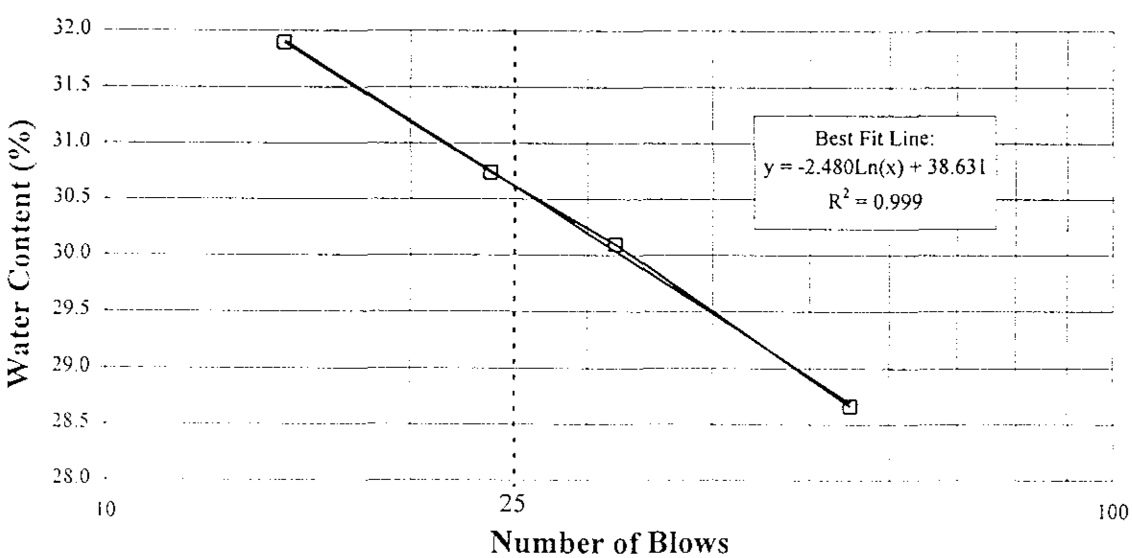
Liquid Limit:

Container	B77	B95	Z9	F7
Number of Blows	55	32	24	15
Mass cup & wet soil (g)	30.50	33.23	37.04	39.00
Mass cup & dry soil (g)	26.33	28.21	31.04	32.27
Mass of Cup (g)	11.78	11.53	11.52	11.17
Mass of dry soil (M_s) (g)	14.55	16.68	19.52	21.10
Mass of Water (M_w) (g)	4.17	5.02	6.00	6.73
Water Content w (%)	28.66	30.10	30.74	31.90

Plastic Limit

Container	B68	F8	S9
Mass cup & wet soil (g)	26.59	29.24	27.23
Mass cup & dry soil (g)	24.38	26.58	24.88
Mass of Cup (g)	11.47	11.41	11.44
Mass of dry soil (M_s) (g)	12.91	15.17	13.44
Mass of Water (M_w) (g)	2.21	2.66	2.35
Water Content *w* (%)	17.12	17.53	17.49

Flow Curve for Liquid Limit



Liquid Limit (w_l):	30.6
Plastic Limit (w_p):	17.4
Plasticity Index (PI):	13.3

Natural Water Content

Project:	**Albany Site**	**Sample No:**	**1-6**
Test by:	**E&L**	**Boring No:**	**P1**
Date:	**8-Sep-95**	**Depth:**	**11 - 12 ft**

Soil Description: **Brownish Clay with Large Gravel**

Natural Water Content

Container	B4	Z41	B77
Mass cup & wet soil (g)	34.50	47.29	41.43
Mass cup & dry soil (g)	31.17	42.21	37.03
Mass of Cup (g)	11.89	11.53	11.77
Mass of dry soil (M_s) (g)	19.28	30.68	25.26
Mass of Water (M_w) (g)	3.33	5.08	4.40
Water Content w (%)	17.27	16.56	17.42

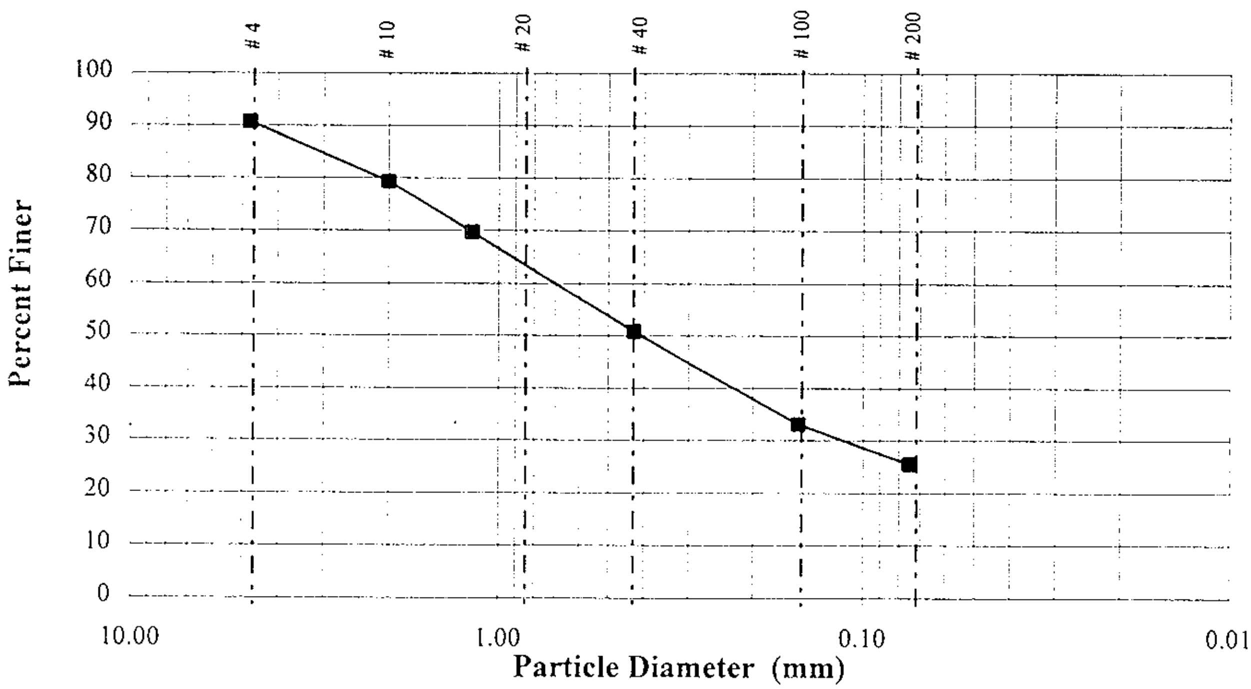
w_{ave}: 17.08

Sieve Analysis Data and Computation Sheet

Project: Albany Site
Sample No: 2-1
Test by: E&L
Boring No: P2
Date: 10-Sep-95
Depth: 2 - 3 ft
Soil Description: Yellowish Clay with Organics and Gravel

Weight of Sample: 1438.8 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	134.7	9.4	90.6
10	2.000	162.8	11.3	79.3
16	1.180	139.3	9.7	69.7
40	0.425	271.9	18.9	50.8
100	0.150	255.0	17.7	33.1
200	0.075	109.7	7.6	25.4
Sieve Pan		366.3	25.4	0.0
Total		1439.7		
	% Error	0.063		



Soil Parameters:

D_{10}: Unk
C_u: Unk
D_{30}: 0.11
C_c: Unk
D_{60}: 0.7

Atterburg Limits Worksheet

Project:	Albany Site	Sample No:	2-1
Test by:	E&L	Boring No:	P2
Date:	14-Sep-95	Depth:	2 - 3 ft

Soil Description: Yellowish Clay with Organics and Gravel

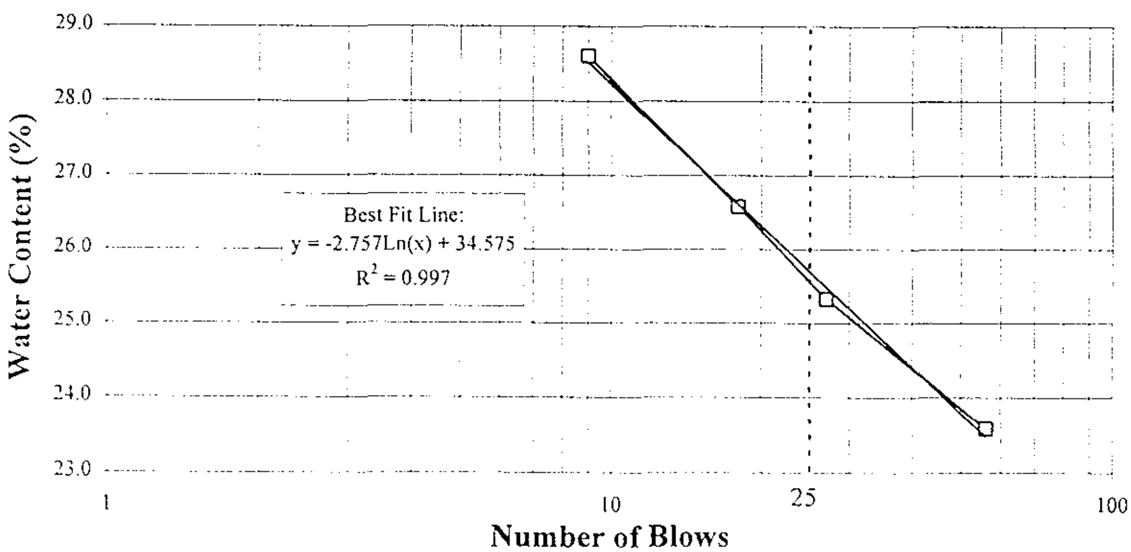
Liquid Limit:

Container	F00	F6	B66	B68
Number of Blows	9	18	27	56
Mass cup & wet soil (g)	36.59	43.53	36.50	31.58
Mass cup & dry soil (g)	31.03	36.79	31.45	27.70
Mass of Cup (g)	11.59	11.43	11.51	11.25
Mass of dry soil (M_s) (g)	19.44	25.36	19.94	16.45
Mass of Water (M_w) (g)	5.56	6.74	5.05	3.88
Water Content w (%)	28.60	26.58	25.33	23.59

Plastic Limit

Container	X5	B93	B83
Mass cup & wet soil (g)	17.42	17.25	17.80
Mass cup & dry soil (g)	16.39	16.22	16.72
Mass of Cup (g)	11.42	11.58	11.62
Mass of dry soil (M_s) (g)	4.97	4.64	5.10
Mass of Water (M_w) (g)	1.03	1.03	1.08
Water Content *w* (%)	20.72	22.20	21.18

Flow Curve for Liquid Limit



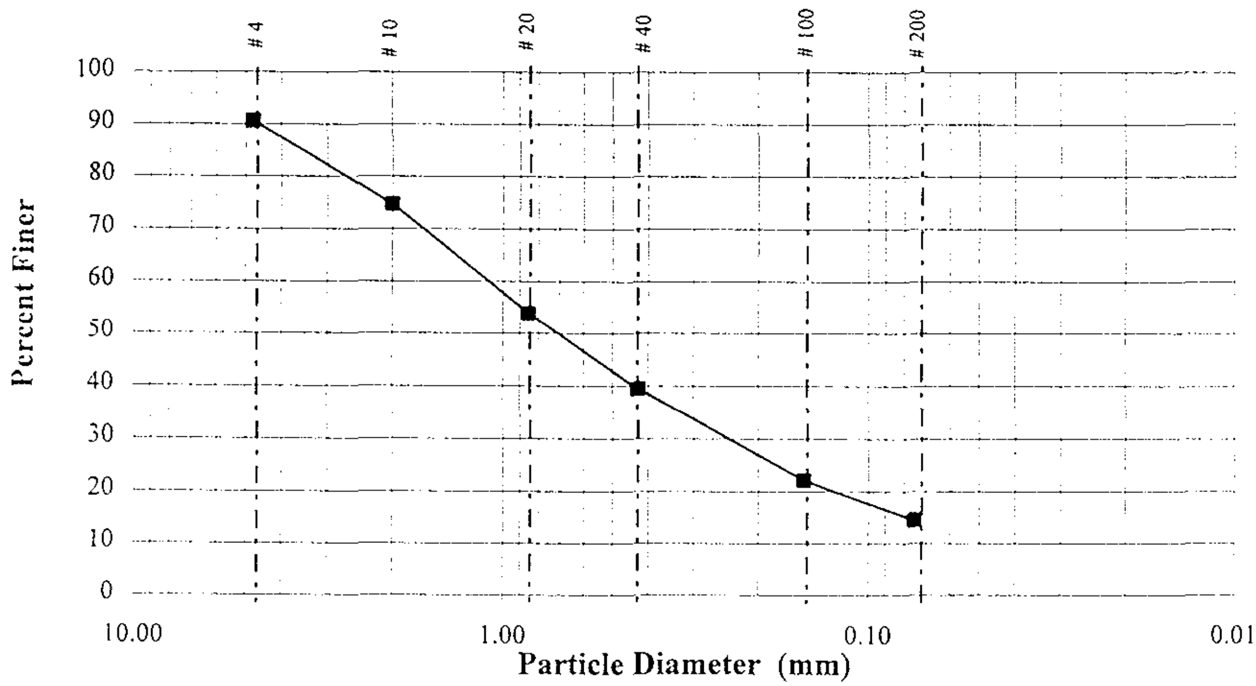
Liquid Limit (w_l):	25.7
Plastic Limit (w_p):	21.4
Plasticity Index (PI):	4.3

Sieve Analysis Data and Computation Sheet

Project: Albany Site
Sample No: 2-2
Test by: E&L
Boring No: P2
Date: 10-Sep-95
Depth: 3 - 4 ft
Soil Description: Brownish Clay with Gravel

Weight of Sample: 750.8 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	70.4	9.4	90.6
10	2.000	119.2	15.9	74.8
20	0.850	156.8	20.9	53.9
40	0.425	108.1	14.4	39.5
100	0.150	130.7	17.4	22.1
200	0.075	56.6	7.5	14.6
Sieve Pan		109.5	14.6	0.0
Total		751.3		
	% Error	0.067		



Soil Parameters:

D_{10}: Unk
C_u: Unk
D_{30}: 0.24
C_c: Unk
D_{60}: 1.1

Atterburg Limits Worksheet

Project: Albany Site
Sample No: 2-2
Test by: E&L
Boring No: P2
Date: 14-Sep-95
Depth: 3 - 4 ft
Soil Description: Brownish Clay with Gravel

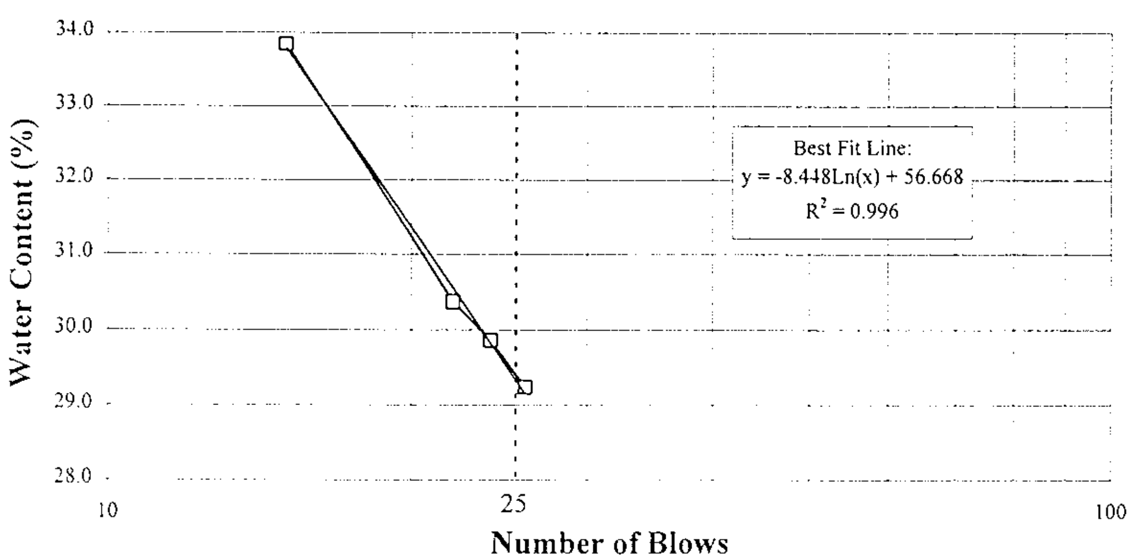
Liquid Limit:

Container	185	4-12	B74	B76
Number of Blows	15	22	24	26
Mass cup & wet soil (g)	20.62	20.32	20.32	19.22
Mass cup & dry soil (g)	18.40	18.24	18.37	17.53
Mass of Cup (g)	11.84	11.39	11.84	11.75
Mass of dry soil (M_s) (g)	6.56	6.85	6.53	5.78
Mass of Water (M_w) (g)	2.22	2.08	1.95	1.69
Water Content w (%)	33.84	30.36	29.86	29.24

Plastic Limit

Container	T2	U68	U5
Mass cup & wet soil (g)	20.41	25.23	24.87
Mass cup & dry soil (g)	19.00	23.11	22.89
Mass of Cup (g)	11.27	11.20	12.02
Mass of dry soil (M_s) (g)	7.73	11.91	10.87
Mass of Water (M_w) (g)	1.41	2.12	1.98
Water Content w (%)	18.24	17.80	18.22

Flow Curve for Liquid Limit



Liquid Limit (w_l): 29.5
Plastic Limit (w_p): 18.1
Plasticity Index (PI): 11.4

Sieve Analysis Data and Computation Sheet

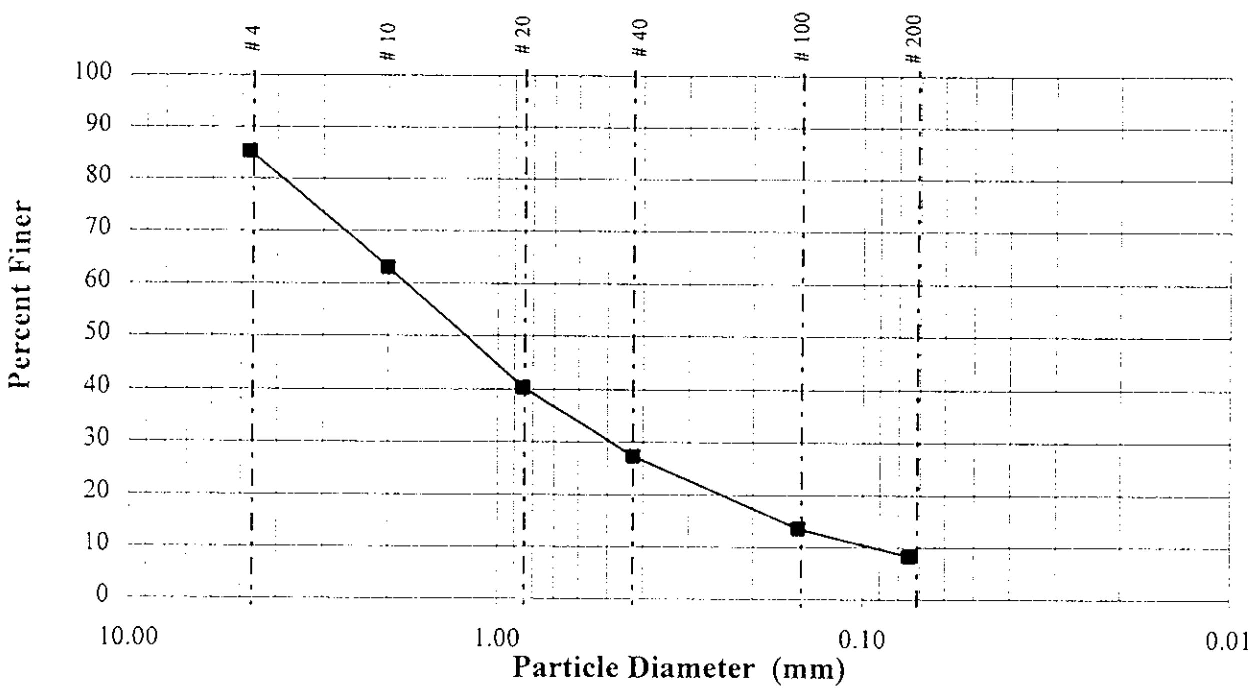
Project: Albany Site
Test by: E&L
Date: 10-Sep-95
Soil Description: Brownish Clay with some Gravel

Sample No: 2-3
Boring No: P2
Depth: 4 - 6 ft

Weight of Sample: 1405.7 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	206.6	14.7	85.3
10	2.000	315.0	22.4	62.9
20	0.850	318.3	22.6	40.3
40	0.425	183.4	13.0	27.3
100	0.150	193.1	13.7	13.6
200	0.075	74.7	5.3	8.3
Sieve Pan		116.5	8.3	0.0
Total		1407.6		

% Error 0.135



Soil Parameters:

D_{10}: 0.09
D_{30}: 0.4
D_{60}: 1.8

C_u: 20.0
C_c: 1.0

Atterburg Limits Worksheet

Project:	Albany Site	Sample No:	2-3
Test by:	E&L	Boring No:	P2
Date:	14-Sep-95	Depth:	4 - 6 ft

Soil Description: Brownish Clay with some Gravel

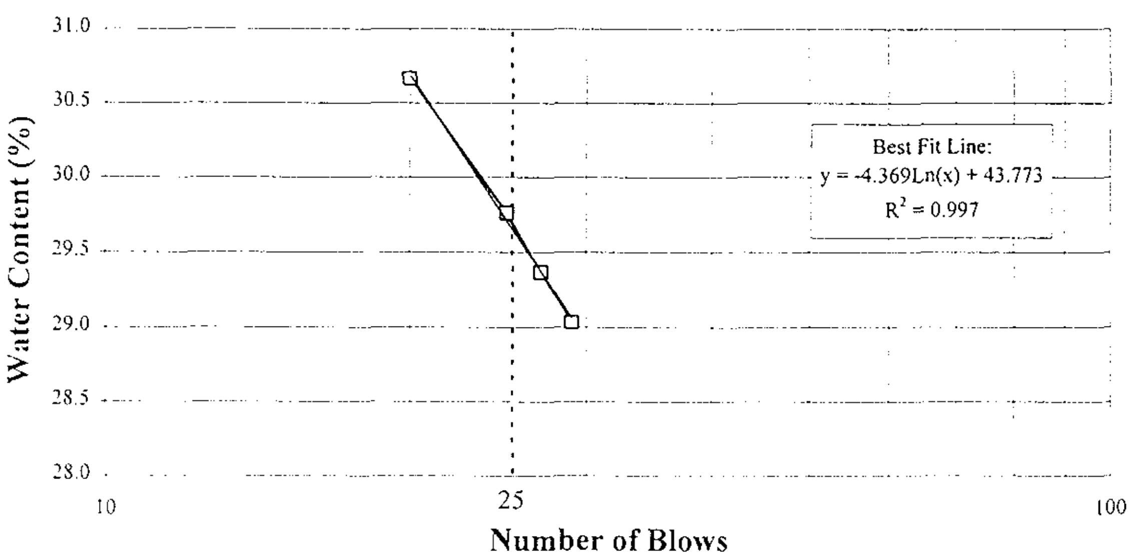
Liquid Limit:

Container	F3	B733	B91	B73
Number of Blows	20	25	27	29
Mass cup & wet soil (g)	21.95	24.24	25.25	26.43
Mass cup & dry soil (g)	19.50	21.35	22.14	23.10
Mass of Cup (g)	11.51	11.64	11.55	11.63
Mass of dry soil (M_s) (g)	7.99	9.71	10.59	11.47
Mass of Water (M_w) (g)	2.45	2.89	3.11	3.33
Water Content w (%)	30.66	29.76	29.37	29.03

Plastic Limit

Container	B12	F9	B59
Mass cup & wet soil (g)	28.49	37.10	25.47
Mass cup & dry soil (g)	25.94	33.20	23.38
Mass of Cup (g)	11.40	11.42	11.58
Mass of dry soil (M_s) (g)	14.54	21.78	11.80
Mass of Water (M_w) (g)	2.55	3.90	2.09
Water Content w (%)	17.54	17.91	17.71

Flow Curve for Liquid Limit



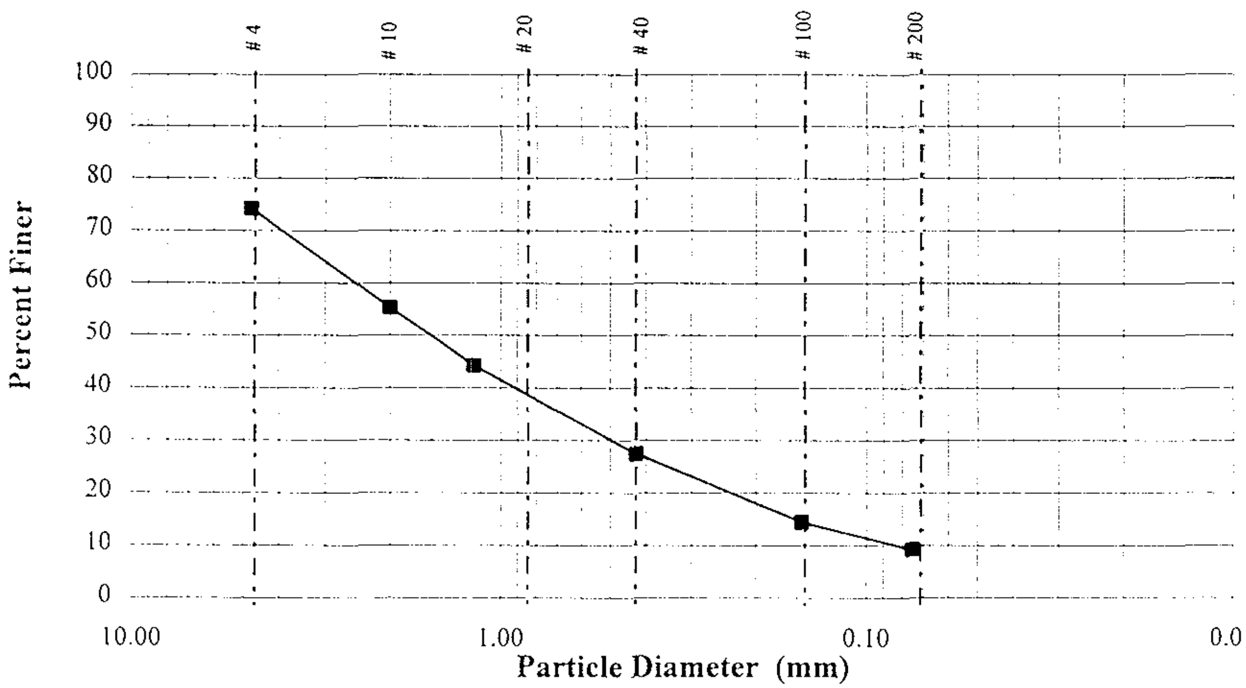
Liquid Limit (w_l):	29.7
Plastic Limit (w_p):	17.7
Plasticity Index (PI):	12.0

Sieve Analysis Data and Computation Sheet

Project: Albany Site
Sample No: 2-4
Test by: E&L
Boring No: P2
Date: 10-Sep-95
Depth: 6 - 8 ft
Soil Description: Brownish Clay with Gravel.

Weight of Sample: 1277.8 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	330.6	25.9	74.1
10	2.000	240.1	18.8	55.3
16	1.180	140.1	11.0	44.3
40	0.425	216.1	16.9	27.4
100	0.150	165.7	13.0	14.4
200	0.075	65.5	5.1	9.3
Sieve Pan		118.5	9.3	0.0
Total		1276.6		
	% Error	-0.094		



Soil Parameters:

D_{10}: 0.08
C_u: 31.3
D_{30}: 0.5
C_c: 1.3
D_{60}: 2.5

Atterburg Limits Worksheet

Project:	Albany Site	Sample No:	2-4
Test by:	E&L	Boring No:	P2
Date:	14-Sep-95	Depth:	6 - 8 ft

Soil Description: Brownish Clay with Gravel.

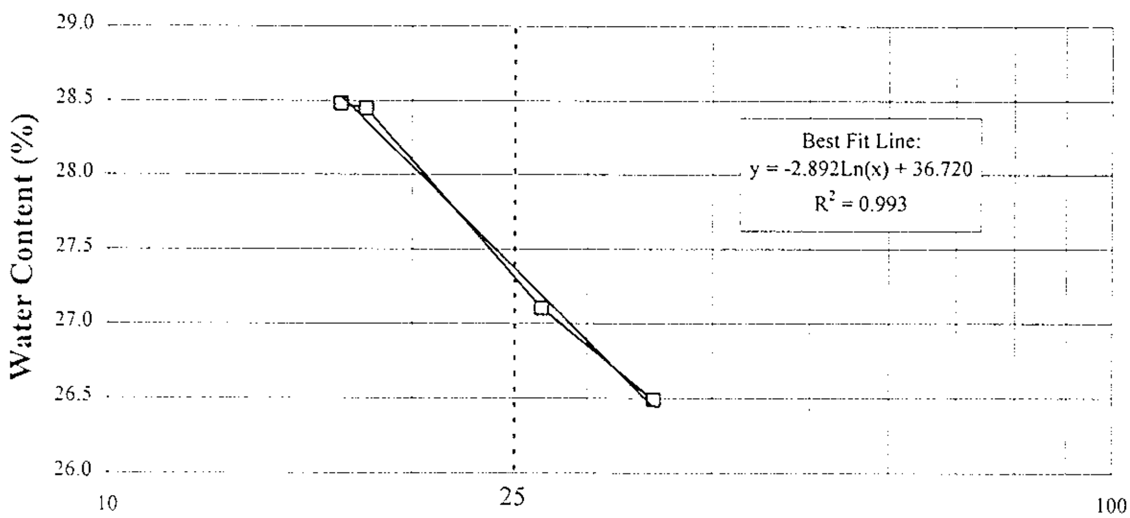
Liquid Limit:

Container	B73	B94	6	3
Number of Blows	17	18	27	35
Mass cup & wet soil (g)	27.82	25.12	21.46	28.55
Mass cup & dry soil (g)	24.26	22.17	19.30	25.08
Mass of Cup (g)	11.76	11.80	11.33	11.98
Mass of dry soil (M_s) (g)	12.50	10.37	7.97	13.10
Mass of Water (M_w) (g)	3.56	2.95	2.16	3.47
Water Content w (%)	28.48	28.45	27.10	26.49

Plastic Limit

Container	T1	S1	X10
Mass cup & wet soil (g)	25.28	28.20	24.58
Mass cup & dry soil (g)	23.47	25.97	22.75
Mass of Cup (g)	11.46	11.53	11.53
Mass of dry soil (M_s) (g)	12.01	14.44	11.22
Mass of Water (M_w) (g)	1.81	2.23	1.83
Water Content w (%)	15.07	15.44	16.31

Flow Curve for Liquid Limit



Liquid Limit (w_l):	27.4
Plastic Limit (w_p):	15.6
Plasticity Index (PI):	11.8

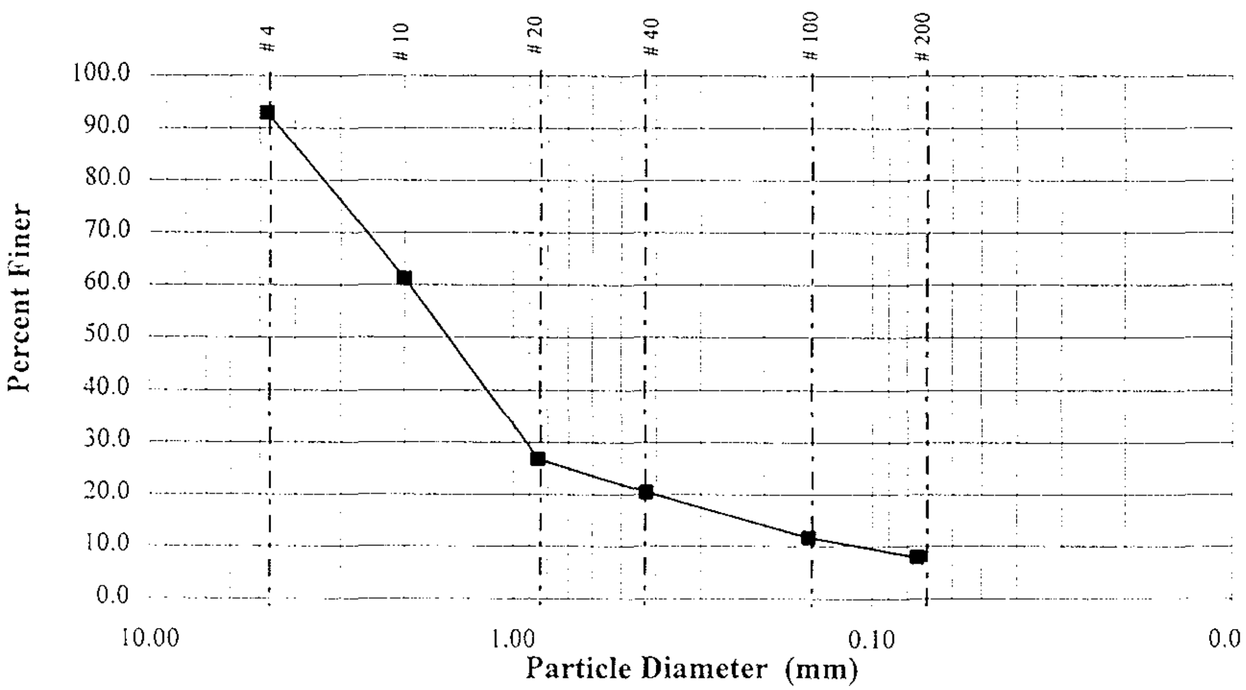
Sieve Analysis Data and Computation Sheet

Project: Albany Site
Test by: E&L
Date: 8-Sep-95
Soil Description: Brownish Clay with some Gravel.

Sample No: 2-5
Boring No: P2
Depth: 8 ft

Weight of Sample: 313.9 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	21.8	7.1	92.9
10	2.000	97.5	31.7	61.3
20	0.850	106.0	34.4	26.8
40	0.425	19.7	6.4	20.4
100	0.150	26.9	8.7	11.7
200	0.075	11.4	3.7	8.0
Sieve Pan		24.6	8.0	0.0
Total		307.9		
	% Error	-1.911		



Soil Parameters:

D_{10}: 0.1
D_{30}: 0.9
D_{60}: 2

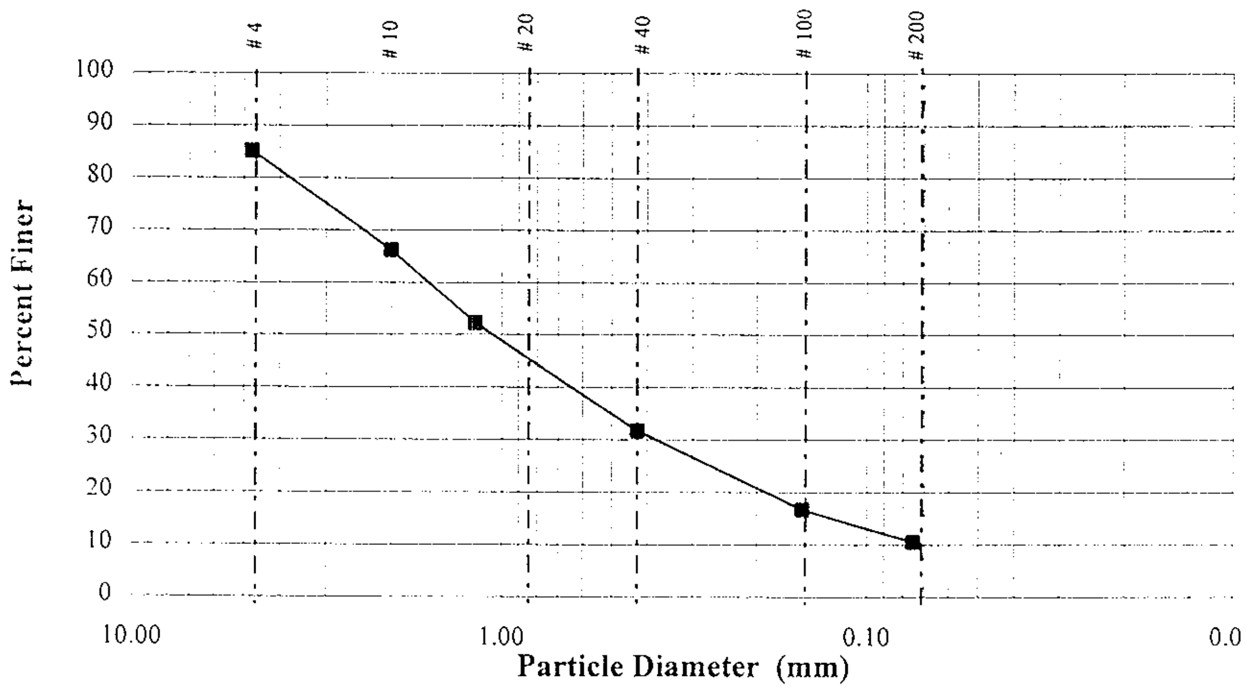
C_u: 20.0
C_c: 4.1

Sieve Analysis Data and Computation Sheet

Project: Albany Site | Sample No: 2-6
Test by: E&L | Boring No: P2
Date: 8-Sep-95 | Depth: 10 ft.
Soil Description: Brownish Clay with small Gravel

Weight of Sample: 564.3 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	83.0	14.9	85.1
10	2.000	105.8	18.9	66.2
16	1.180	78.5	14.0	52.2
40	0.425	114.3	20.5	31.7
100	0.150	83.9	15.0	16.7
200	0.075	34.5	6.2	10.5
Sieve Pan		58.7	10.5	0.0
Total		558.6		
	% Error	-1.012		



Soil Parameters:

D_{10}: Unk | C_u: Unk
D_{30}: 0.38 | C_c: Unk
D_{60}: 1.6

Note: Sieves came apart during testing, acccounting for loss of sample.

Atterburg Limits Worksheet

Project:	Albany Site	Sample No:	2-6
Test by:	E&L	Boring No:	P2
Date:	14-Sep-95	Depth:	10 ft.
Soil Description:	Brownish Clay with small Gravel		

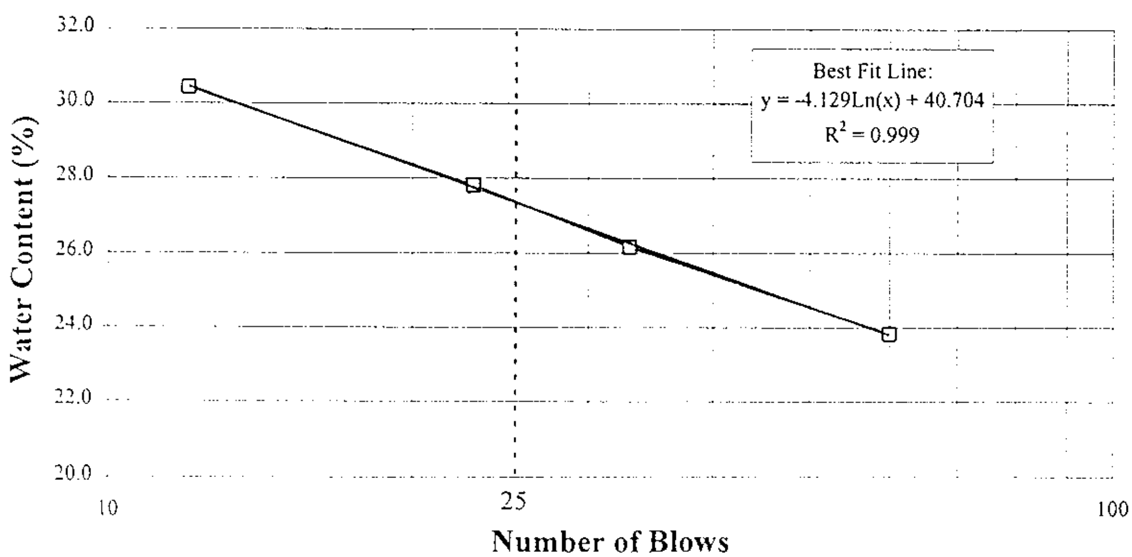
Liquid Limit:

Container	B4	Z2	B87	Z41	B88
Number of Blows	12	23	23	33	60
Mass cup & wet soil (g)	34.31	30.78	33.38	26.09	28.43
Mass cup & dry soil (g)	29.08	26.59	28.63	23.07	25.19
Mass of Cup (g)	11.89	11.52	11.55	11.53	11.59
Mass of dry soil (M_s) (g)	17.19	15.07	17.08	11.54	13.60
Mass of Water (M_w) (g)	5.23	4.19	4.75	3.02	3.24
Water Content w (%)	30.42	27.80	27.81	26.17	23.82

Plastic Limit

Container	B65	B95	B77
Mass cup & wet soil (g)	18.77	18.55	16.75
Mass cup & dry soil (g)	17.65	17.41	15.93
Mass of Cup (g)	11.49	11.54	11.79
Mass of dry soil (M_s) (g)	6.16	5.87	4.14
Mass of Water (M_w) (g)	1.12	1.14	0.82
Water Content *w* (%)	18.18	19.42	19.81

Flow Curve for Liquid Limit



Liquid Limit (w_l):	27.4
Plastic Limit (w_p):	19.1
Plasticity Index (PI):	8.3

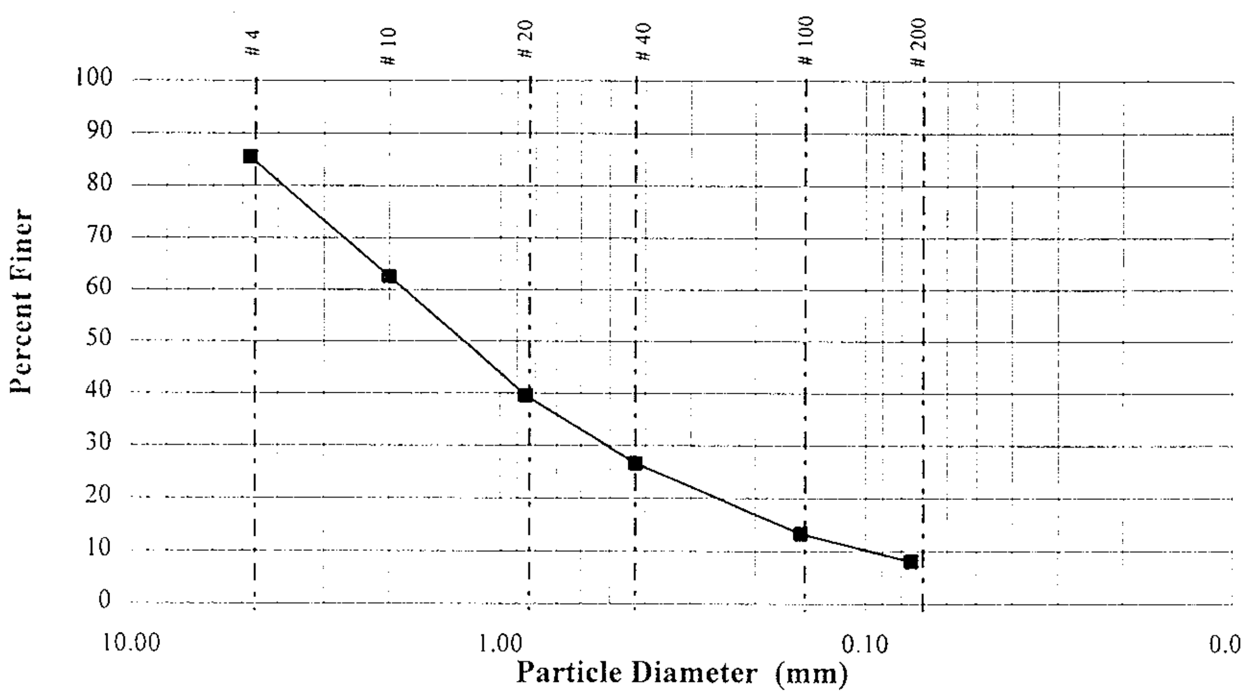
Sieve Analysis Data and Computation Sheet

Project:	Albany Site	Sample No:	2-7
Test by:	E&L	Boring No:	P2
Date:	8-Sep-95	Depth:	10.5

Soil Description: Brownish Clay;Smelled of Gas

Weight of Sample: 1418.8 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	206.8	14.6	85.4
10	2.000	324.5	22.9	62.6
20	0.850	326.5	23.0	39.5
40	0.425	183.3	12.9	26.6
100	0.150	189.3	13.3	13.3
200	0.075	73.7	5.2	8.1
Sieve Pan		114.6	8.1	0.0
Total		1418.7		
	% Error	-0.007		



Soil Parameters:

D_{10}:	0.09	C_u:	20.0
D_{30}:	0.5	C_c:	1.5
D_{60}:	1.8		

Atterburg Limits Worksheet

Project:	Albany Site	Sample No:	2-7
Test by:	E&L	Boring No:	P2
Date:	11-Sep-95	Depth:	10.5

Soil Description: Brown Clay;End of tube blackish color and smelled like waste

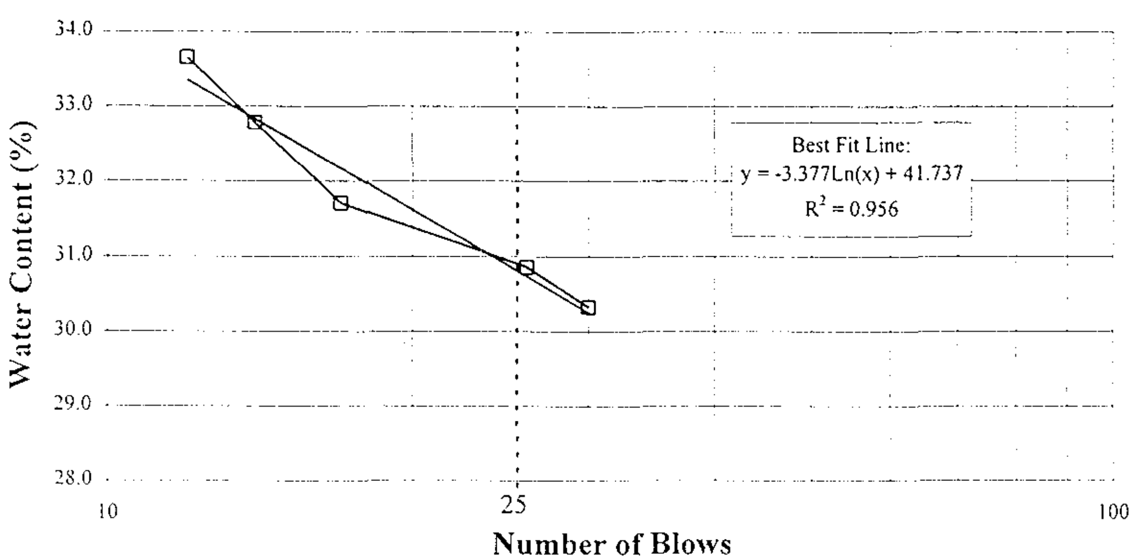
Liquid Limit:

Container	X5	B66	B98	B83	F6
Number of Blows	12	14	17	26	30
Mass cup & wet soil (g)	28.37	27.44	25.82	28.71	32.52
Mass cup & dry soil (g)	24.10	23.51	22.37	24.68	27.61
Mass of Cup (g)	11.41	11.52	11.49	11.62	11.42
Mass of dry soil (M_s) (g)	12.69	11.99	10.88	13.06	16.19
Mass of Water (M_w) (g)	4.27	3.93	3.45	4.03	4.91
Water Content w (%)	33.65	32.78	31.71	30.86	30.33

Plastic Limit

Container	F00	B93	B86
Mass cup & wet soil (g)	17.32	20.87	20.62
Mass cup & dry soil (g)	16.50	19.53	19.29
Mass of Cup (g)	11.59	11.58	11.25
Mass of dry soil (M_s) (g)	4.91	7.95	8.04
Mass of Water (M_w) (g)	0.82	1.34	1.33
Water Content w (%)	16.70	16.86	16.54

Flow Curve for Liquid Limit



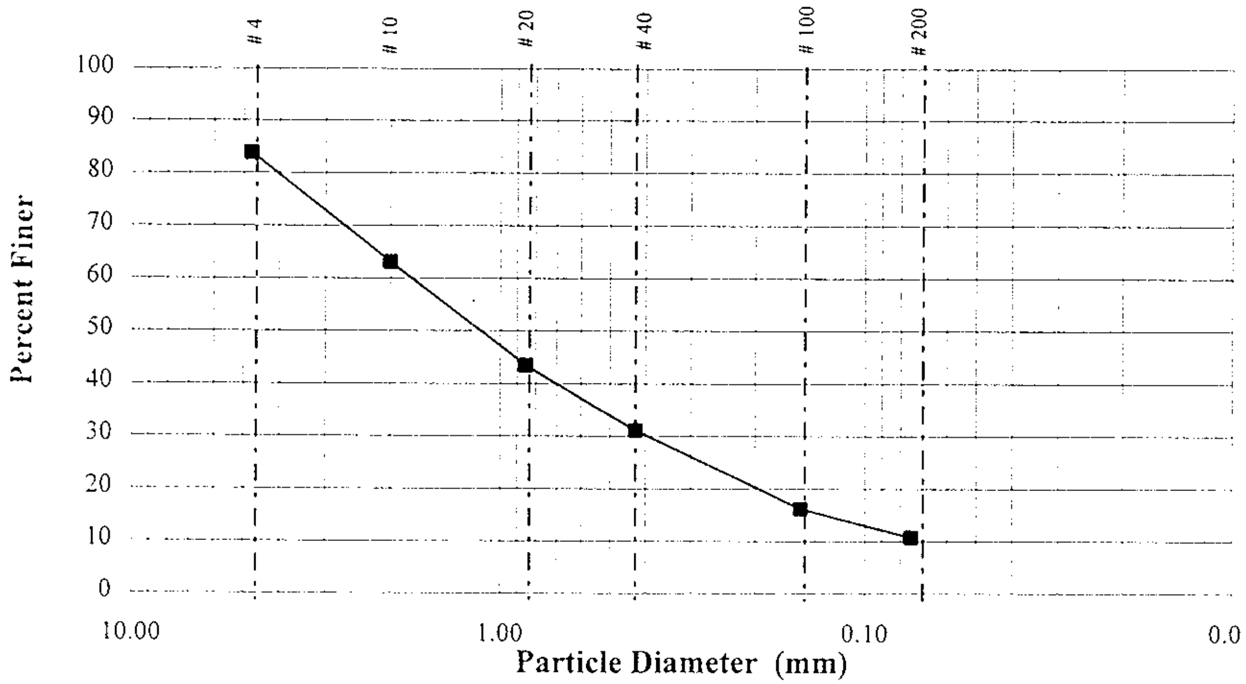
Liquid Limit (w_l):	30.9
Plastic Limit (w_p):	16.7
Plasticity Index (PI):	14.2

Sieve Analysis Data and Computation Sheet

Project: Albany Site — Sample No: 2-8
Test by: E&L — Boring No: P2
Date: 8-Sep-95 — Depth: 11.5
Soil Description: Brownish Clay;End of tube blackish color and smelled like waste

Weight of Sample: 730.7 g

Sieve Size	Sieve Opening (mm)	Weight Retained (g)	% Retained	Cum. % Finer
4	4.750	118.05	16.2	83.8
10	2.000	151.29	20.7	63.1
20	0.850	143.71	19.7	43.5
40	0.425	90.68	12.4	31.0
100	0.150	108.38	14.8	16.2
200	0.075	40.37	5.5	10.7
Sieve Pan		78	10.7	0.0
Total		730.48		
	% Error	-0.030		



Soil Parameters:

D_{10}: 0.06 — C_u: 28.3
D_{30}: 0.4 — C_c: 1.6
D_{60}: 1.7

Atterburg Limits Worksheet

Project:	Albany Site	Sample No:	2-8
Test by:	E&L	Boring No:	P2
Date:	11-Sep-95	Depth:	11.5

Soil Description: Brown Clay;End of tube blackish color and smelled like waste

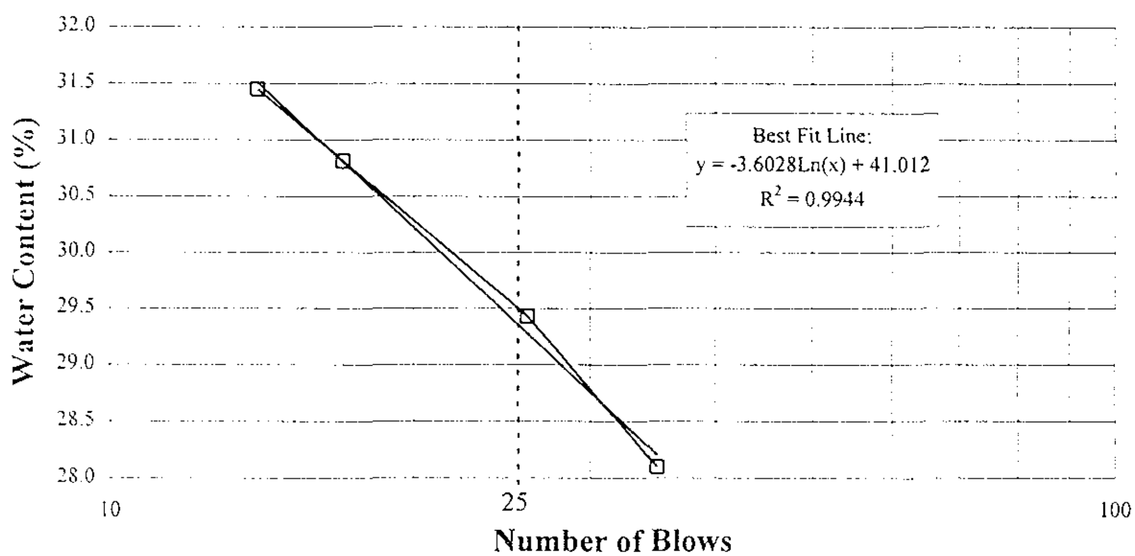
Liquid Limit:

Container	B733	W1	B91	F3
Number of Blows	14	17	26	35
Mass cup & wet soil (g)	30.23	33.11	32.08	39.72
Mass cup & dry soil (g)	25.78	28.10	27.41	33.53
Mass of Cup (g)	11.63	11.84	11.54	11.50
Mass of dry soil (M_s) (g)	14.15	16.26	15.87	22.03
Mass of Water (M_w) (g)	4.45	5.01	4.67	6.19
Water Content w (%)	31.45	30.81	29.43	28.10

Plastic Limit

Container	F9	B72	B12
Mass cup & wet soil (g)	23.55	27.80	20.89
Mass cup & dry soil (g)	21.81	25.54	19.55
Mass of Cup (g)	11.41	11.63	11.40
Mass of dry soil (M_s) (g)	10.40	13.91	8.15
Mass of Water (M_w) (g)	1.74	2.26	1.34
Water Content w (%)	16.73	16.25	16.44

Flow Curve for Liquid Limit



Liquid Limit (w_l):	29.4
Plastic Limit (w_p):	16.5
Plasticity Index (PI):	12.9

Natural Water Content

Project: Albany Site **Sample No:** 2-8
Test by: E&L **Boring No:** P2
Date: 8-Sep-95 **Depth:** 11.5
Soil Description: Brown Clay;End of tube blackish color and smelled like waste

Liquid Limit:

Container	B68	Z9	B73
Mass cup & wet soil (g)	46.48	48.89	49.73
Mass cup & dry soil (g)	40.72	43.56	43.52
Mass of Cup (g)	11.47	11.52	11.77
Mass of dry soil (M_s) (g)	29.25	32.04	31.75
Mass of Water (M_w) (g)	5.76	5.33	6.21
Water Content w (%)	19.69	16.64	19.56

w_{ave}: 18.63

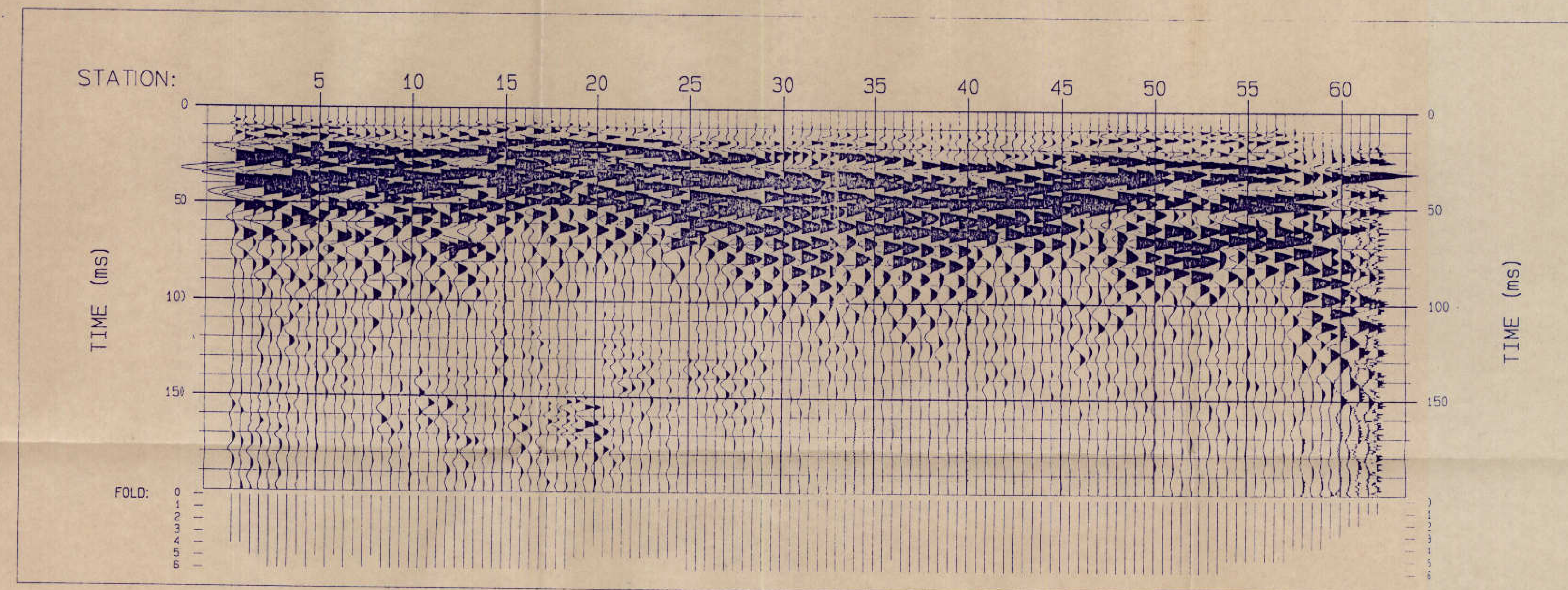
NOTES:

1. MAP COMPILED BY PHOTOGRAMMETRIC METHODS FROM PHOTOGRAPHY DATED MARCH 31, 1988 AND SUPPLEMENTED WITH ACTUAL FIELD SURVEY.
2. PLAN PROVIDED BY GEOTRANS, INC.
3. LOCATIONS OF MONITORING WELLS PROVIDED BY GEOTRANS, INC.

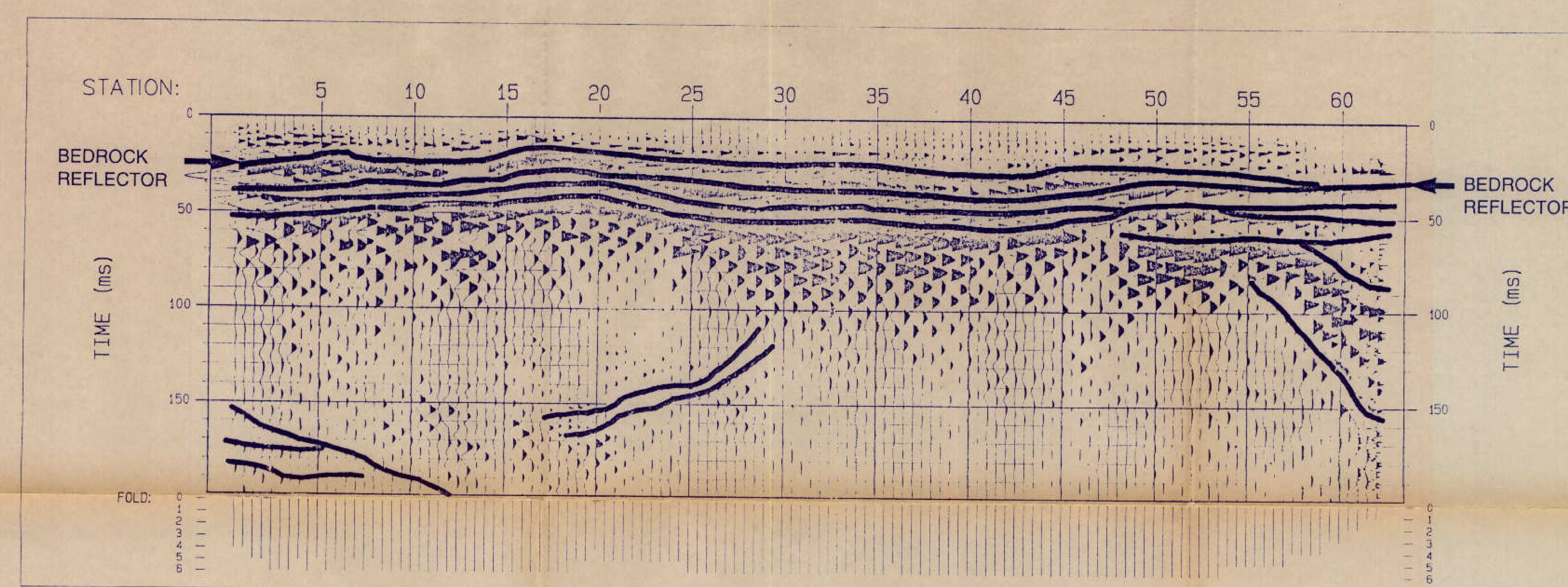
PLATE 1
SITE PLAN
LOEFFEL LANDFILL SITE
NASSAU, NEW YORK

FILE 95J91 | JANUARY, 1996

HAGER-RICHTER GEOSCIENCE, INC.
SALEM, NEW HAMPSHIRE



PROCESSED SEISMOGRAM



INTERPRETATION

LEGEND

REFLECTOR

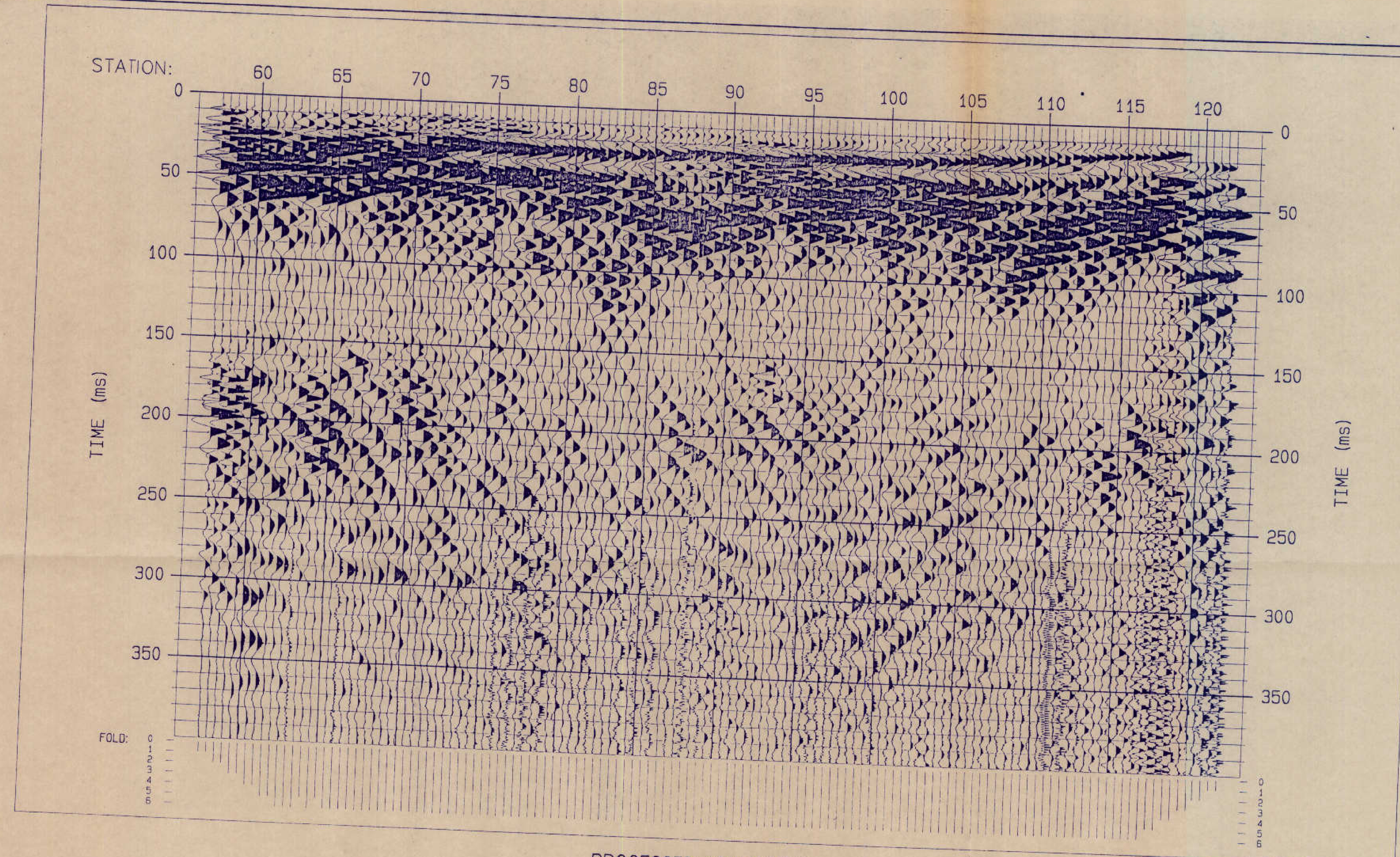
SCALE (feet)
0 50 100

NOTES:

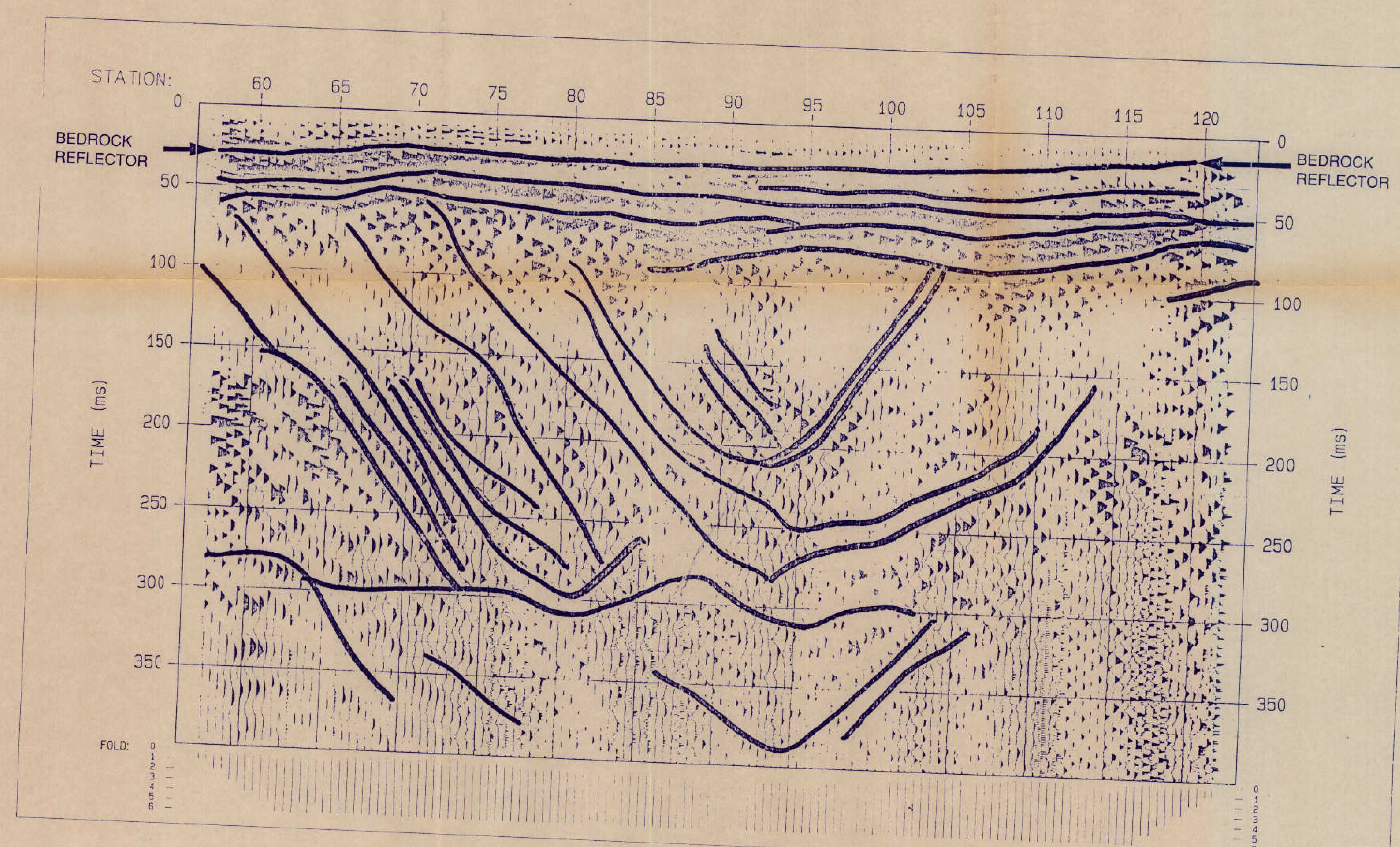
1. THE TIME-TO-DEPTH CONVERSION DEPENDS ON THE ELASTIC PROPERTIES OF THE MATERIALS IN THE SUBSURFACE AND IS NOT NECESSARILY UNIFORM. THE APPROXIMATE DEPTH SCALE WAS DETERMINED BY EQUATION 1, FOUND ON PAGE 3 OF THE REPORT.

2. ACCURACY OF DISTANCES ALONG THE SEISMIC PROFILES ARE APPROXIMATELY 2 FEET.

PLATE 2 SEISMIC LINE 1 SECTION A LOEFFEL LANDFILL SITE NASSAU, NEW YORK	
FILE 95J91	JANUARY, 1996
HAGER-RICHTER GEOSCIENCE, INC. SALEM, NEW HAMPSHIRE	



PROCESSED SEISMOGRAM



INTERPRETATION

LEGEND

REFLECTOR

SCALE (feet)

0 50 100

NOTES:

1. THE TIME-TO-DEPTH CONVERSION DEPENDS ON THE ELASTIC PROPERTIES OF THE MATERIALS IN THE SUBSURFACE AND IS NOT NECESSARILY UNIFORM. THE APPROXIMATE DEPTH SCALE WAS DETERMINED BY EQUATION 1, FOUND ON PAGE 3 OF THE REPORT.
2. ACCURACY OF DISTANCES ALONG THE SEISMIC PROFILES ARE APPROXIMATELY 2 FEET.

PLATE 3
SEISMIC LINE 1 SECTION B
LOEFFEL LANDFILL SITE
NASSAU, NEW YORK

FILE 95J91	JANUARY, 1996

HAGER-RICHTER GEOSCIENCE, INC.
SALEM, NEW HAMPSHIRE

LEGEND:

- ○ 13A TIE / FENCE POST & NUMBER
- 20 + CONTAINMENT WALL LOCATION & FLAG NUMBER

NOTES:

TIE DISTANCES ARE SLOPE MEASUREMENTS TAKEN FROM A PAINTED MARK ON FENCE POST TO GROUND LEVEL LOCATION OF CONTAINMENT WALL.

6/9/95 DIV.05 TMW
F: \WIP\10024\CONTWALL.DWG

80 0 80 160
SCALE: 1" = 80'

NO ALTERATIONS PERMITTED HEREON EXCEPT AS PROVIDED UNDER SECTION 7209 SUBDIVISION 2 OF THE NEW YORK STATE EDUCATION LAW

No.	Date	Revisions	Init

In charge of
Designed by
Drawn by
Checked by

BLASLAND, BOUCK & LEE, INC.
ENGINEERS & SCIENTISTS

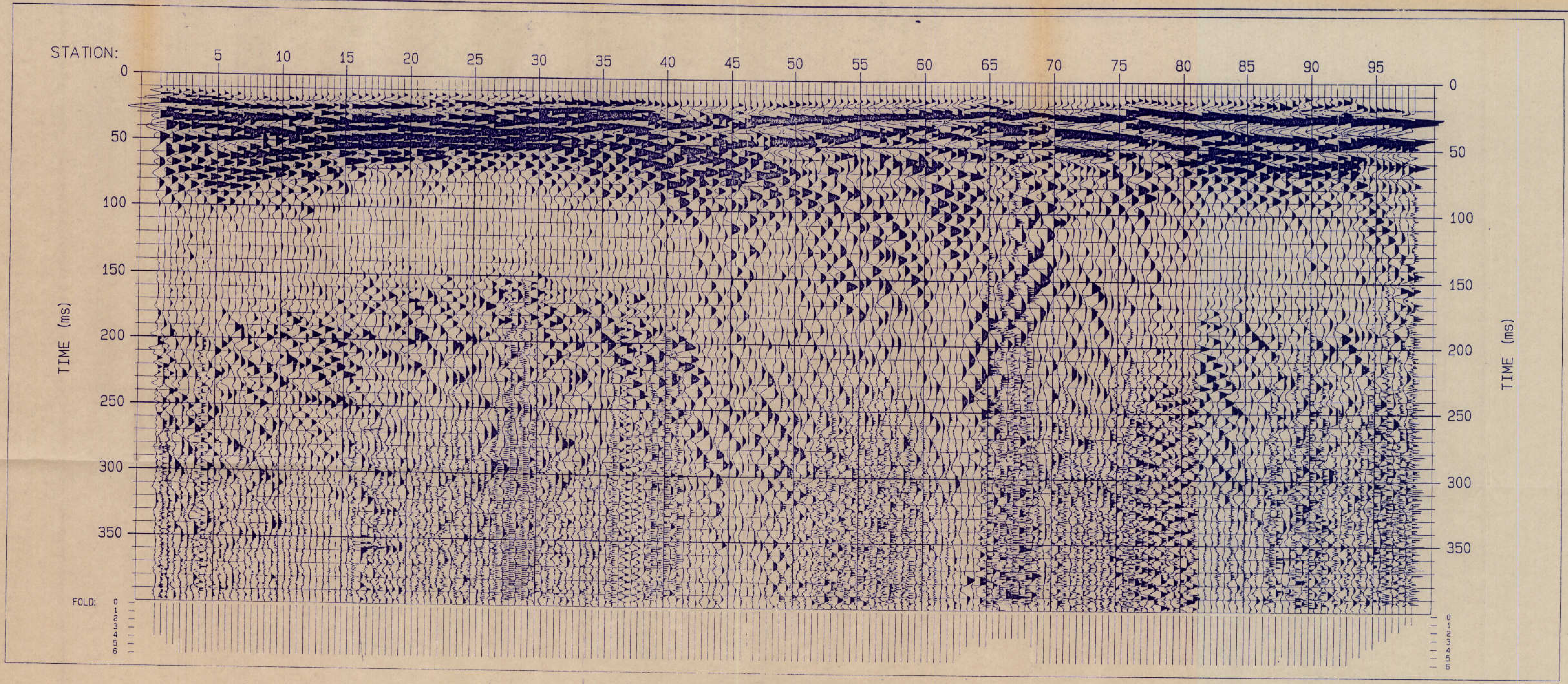
GENERAL ELECTRIC COMPANY
LOEFFEL SITE ENVIRONS

CONTAINMENT WALL PHYSICAL TIES

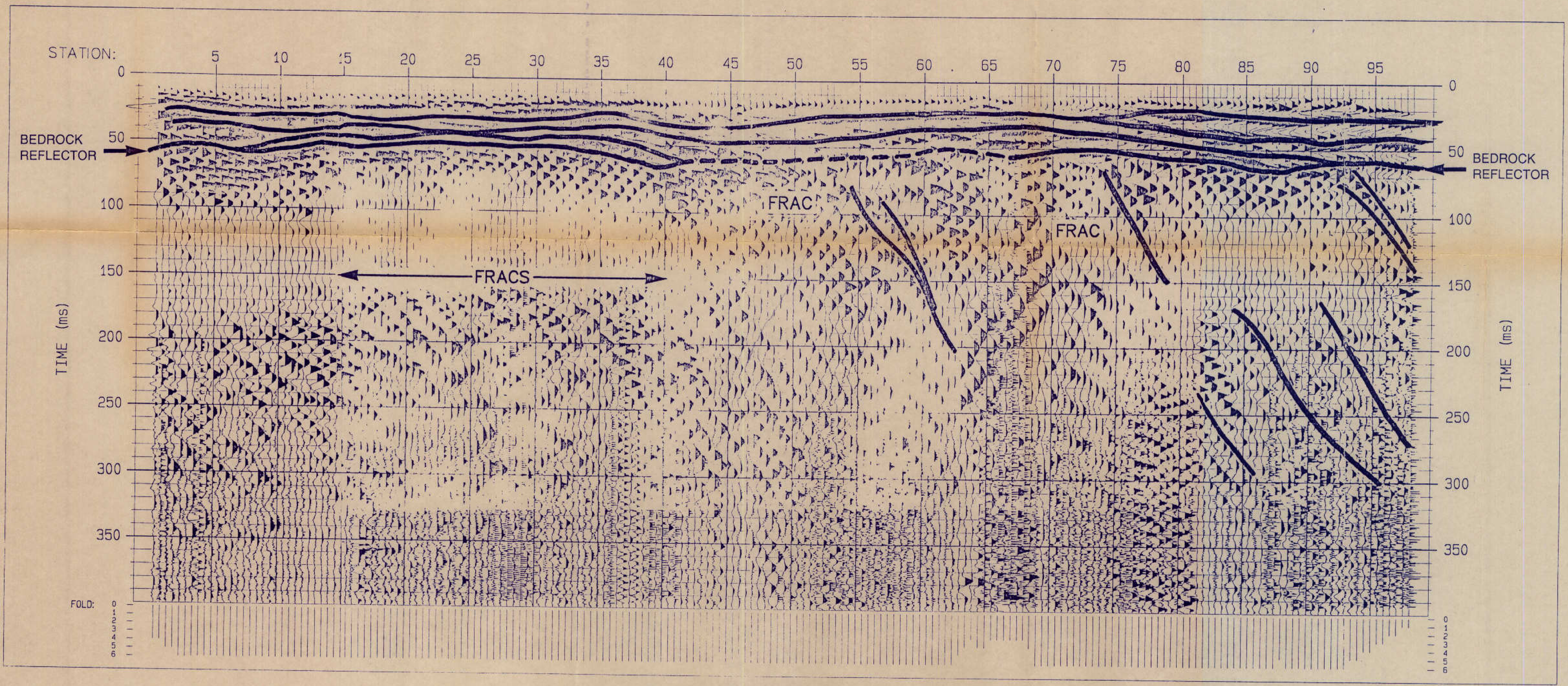
SURVEYING

File Number 100.32
Date 6/1/95

309



PROCESSED SEISMOGRAM



INTERPRETATION

LEGEND

(solid line)	REFLECTOR
(dashed line)	APPROXIMATE LOCATION OF BEDROCK REFLECTOR
FRAC	POSSIBLE NEAR-VERTICAL BEDROCK FRACTURE
FRACS	POSSIBLE ZONE NEAR-VERTICAL FRACTURES

SCALE (feet)
0 50 100

NOTES:

1. THE TIME-TO-DEPTH CONVERSION DEPENDS ON THE ELASTIC PROPERTIES OF THE MATERIALS IN THE SUBSURFACE AND IS NOT NECESSARILY UNIFORM. THE APPROXIMATE DEPTH SCALE WAS DETERMINED BY EQUATION 1, FOUND ON PAGE 3 OF THE REPORT.
2. ACCURACY OF DISTANCES ALONG THE SEISMIC PROFILES ARE APPROXIMATELY 2 FEET.

PLATE 4
SEISMIC LINE 2
LOEFFEL LANDFILL SITE
NASSAU, NEW YORK

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HAGER-RICHTER GEOSCIENCE, INC.
SALEM, NEW HAMPSHIRE