report. 932109. 1983-02-01.
TASK 2 _ Boring - Well _
Installation

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INVESTIGATION AND ASSESSMENT OF THE LOCKPORT COAL TAR SITE

TASK 2 REPORT
BORING AND WELL INSTALLATION

Prepared for

New York State Electric and Gas Corporation
4500 Vestal Parkway East
Binghamton, New York 13902

Submitted by

Woodward-Clyde Consultants
201 Willowbrook Boulevard
Wayne, New Jersey 07470

February 1983
82C4495

TABLE OF CONTENTS

1. SUMMARY

Part 1 of the Task 2 boring and well installation program has been completed for the Lockport Coal Tar Site. Four rock monitoring wells, two intermittent wells, and three borings were installed as per our Task 1 recommendations. Results of the boring program indicate that ground water flow direction in the vicinity of the site appears to be to the north-northwest, the same direction as the dip of the bedrock surface. Oil coated rock was found in all borings except B-1 and MW-4, below the Gasport formation at depths ranging from thirty to thirty-eight feet. Coal tar contaminated soils were visually detected only at the site in MW-3 at a depth of 4 to 12 feet. Portable gas chromatograph analyses however, suggest that volatile organic compounds may be present in soils in B-3 and MW-1. A sample of soil apparently contaminated with coal tar from MW-3 was analyzed by General Testing Corporation to establish parameters for the follow-up ground water sampling program.

2. INTRODUCTION

This report presents results of the first part of Woodward-Clyde Consultants' Task 2 investigation at New York State Electric and Gas Corporation's (NYSEG) Lockport Coal Tar Site. Objectives of this part of the Task 2 program were to define the physical properties of soil and rock in the site vicinity, determine local hydrologic conditions, delineate the extent, if any, of contaminated soil, rock and ground water, and determine the chemical nature of contaminants that may be present. Part two of the Task 2 investigation will consist of ground water sampling and analysis.

The study was performed corresponding to Task 2 of the Lockport Coal Tar Site investigation and assessment as described in WCC's revised proposal dated 7 October 1982. Field work was initiated on 22 November 1982, and completed on 17 December 1982.

3. INVESTIGATIONS

Woodward-Clyde Consultants supervised the installation by Earth Dimensions, Inc. of four monitoring wells, two intermittent wells and three exploratory borings in the vicinity of the NYSEG Transit Street substation. The locations of the borings (Figure 1) were based on results of the Task 1 investigation, and were designed to provide information both up-and down-gradient of the site.

Four monitoring wells were installed to provide information on water level and water quality from bedrock aquifers. Wells were installed by advancing 6-inch O.D. hollow stem augers with continuous split spoon sampling through overburden, except as noted on boring logs. A 5-inch roller cone was advanced approximately 12 inches into bedrock. Three-inch (I.D.) black steel riser pipe was then grouted to the rock, and the boring advanced with an NX core barrel with a diamond bit. The riser pipe of wells installed on public property was cut approximately 0.5 ft below grade, and surrounded by a cast iron utility box set flush with the existing ground surface. The riser pipe of wells installed on NYSEG property consists of 4-inch steel with lockable cap extending about three feet of about ground level.

The three exploratory borings were installed in a manner similar to that described above. However, a 5-inch hole was not advanced into rock, and the temporary casing was removed upon grouting. Borings were left open overnight in order to determine more representative ground water elevations, then backfilled to grade with grout.

Intermittent wells were installed in order to sample water that may be present in the overburden and the top few feet of rock. Intermittent wells were constructed by advancing 6-inch O.D. hollow stem augers with continuous split spoon sampling to the top of rock and advancing a 5-inch roller cone approximately 2.5 feet into rock. Approximately 6 inches of sand was placed in the hole followed by a five foot length of stainless steel screen coupled to a length of 3-inch I.D. black riser pipe. Approximately 2 feet of screen was located in rock and 3 feet in overburden. A # 4 sand filter was

placed around the screen and lower foot of riser pipe. A two-foot bentonite seal was installed above the sand pack and the riser pipe was grouted in place.

Figure 1 shows locations and elevations (top of utility box) of all wells and borings installed during the Task 2 investigation as well as bedrock elevations. Boring logs are included in Appendix A, and well installation reports in Appendix B. Table 1 presents relevant elevation data for rock units and ground water encountered in the borings.

Permeability tests were performed at various stratigraphic horizons in both overburden and rock during the installation of borings. Permeability tests were performed by filling the casing with clean fresh water and maintaining a constant head after the flow rate stabilized. Following the constant head test, a failing head test performed by measuring the rate of drop in water level. Results of the permeability tests are summarized in Table 2, and discussed in Section 4.0.

Chemical analyses were performed on selected overburden samples using a Photovac 10A10 portable gas chromatograph. The Photovac 10A10 gas chromatograph is a self-contained portable unit capable of detecting and identifying gaseous compounds to levels of 0.1 part per billion. The instrument incorporates an advanced photoionization detection device. The headspace of the sample jar was sampled with a syringe and injected directly into the on-column injection port of the instrument. Air from an instrument-mounted bottle serves as the carrier gas and results are displayed on a chart recorder. Detectable compounds listed by the manufacturer include: volatile hydrocarbons, chlorinated hydrocarbons, alcohols, aldehydes, ketones, esters, and certain sulfur and nitrogen compounds. The portable gas chromatograph allows for analysis of samples shortly after collection. Results of analyses appear in Table 3.

A soil sample from MW-3, containing coal tar, was delivered to General Testing Corporation for a priority pollutant analysis. Results of the analyses appear in Appendix C.

4.0 RESULTS

Four deep rock wells (MW-1, MW-2, MW-3 and MW-4), two intermittent wells (IW-1 and IW-2), and three borings (B1, B2, and B3) (Figure 1) were installed to monitor ground water conditions and to provide additional information on subsurface conditions in the site vicinity. Detailed stratigraphic descriptions of the site vicinity are provided in WCC's Task 1 report. Boring logs and well installation logs are given in Appendices A and B and a geologic cross section is shown in Figure 2. The contact between the Gasport and DeCew members is very distinct, whereas the DeCew-Rochester contact appears to be gradational. Therefore, the top of the DeCew is used as a reference horizon in discussing depth to hydrocarbons.

MW-1 is located near the canal wall behind Kenyon's Variety Store (see Figure 1), and intercepts the seep zone observed in the canal wall at a depth of 38 feet. Overburden at this location is mainly fill, and does not appear, upon visual inspection, to contain hydrocarbons. However, a layer of black organic silt (6.4-7.4 ft) had a strong sulfurous odor, and yielded a positive response upon analysis by the portable gas chromatograph.

The Gasport member was always observed to be oil free. Hydrocarbons appeared only in the underlying DeCew or Rochester members, generally within 10 feet of the top of the DeCew. The presence of hydrocarbons was not obvious in boring B-1, which was completed approximately 17 feet below the top of the DeCew, and in monitoring well MW-4, completed approximately 26 feet below the top of the DeCew member.

As an example, continuous rock core was recovered at MW-1 from the top of rock (8 ft) to a depth of 48 feet. Hydrocarbons first were observed in this boring at a depth of 38 feet in the DeCew formation, approximately 16 feet below the DeCew-Gasport contact. Observed hydrocarbons occurred as an odorous, iridescent, oily coating on both the core barrel and the core. The hydrocarbons appeared to evaporate as the core was exposed to the air, and no oily residue was visible after the core dried. The oil slick was not present on fresh fractures made by the core. However, the rock did

release a hydrocarbon odor on these fractures that was distinct from the odor of the oil coating the core.[1] It is important to note this distinction between the natural hydrocarbons found within the rock (referred to as "oily smell on fresh fractures" or something similar in the boring logs) and the apparently unrelated hydrocarbons in the ground water. In this report, unless otherwise specified, any discussion of hydrocarbons relates to the latter material. Similar conditions were observed in each well and boring in which oil coated rock was encountered (B2, B3, MW-1, MW-2 and MW-3).

Rock core recovered during drilling was generally fresh to slightly weathered with rare 1 to 2-inch thick crushed or pitted zones. Most fractures present were observed in the DeCew and Rochester members and generally were horizontal bedding plane or irregular thin (0.25 inch) shaley (stylolitic) partings. Rare vertical fractures were often filled with sparry calcite. One steeply dipping fracture that was filled with calcite and coated with minor amounts of a black tarry substance was observed in the DeCew member cored from MW-2 This fracture occurred approximately 10 feet above rock coated with hydrocarbons.

Two distinct soil types were observed in the borings. These occur on opposite sides of a north-northeast trending line passing through B-1 and B-2 (Figure 1). Southeast of this line, overburden consists essentially of brick-red silts with some brick-red clay layers. To the northwest, brown and brown-green clays occur with minor organic deposits with the top few feet of soil consisting of man-made fill. Discontinuous gravel layers were observed at various horizons in the overburden, particularly in the layer immediately above bedrock in upgradient borings.

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1. Observations by WCC field personnel suggest the possibility of two types of hydrocarbons present in the subsurface. Hydrocarbons were present as oil coating the core barrel and/or rock core. Additionally, there was hydrocarbon odor present on fresh fractures that was distinct and different from the odor of the oily coatings. In the copies of the field notes (Appendix A) the latter is referred to as an "oily smell on fresh surfaces" or similar phrases.

The overburden in each boring and well (except for MW-3) did not, upon visual inspection, appear to be contaminated. Coal tar like material was present from a depth of 4 feet to the top of rock at 12 feet in MW-3 and occurred as a moist black tarry substance mixed with soil. Photovac analyses were performed on samples from MW-3, as well as on representative soil samples from the other borings and wells. Samples from MW-3, MW-1 and B-3 generated a positive response during portable gas chromatagraph analysis. The sample from B-3 was a brick-red silt that was not obviously contaminated (no visual or olfactory evidence).

A sample of soil and coal tar like material from MW-3, collected from a depth of 8 to 10 feet, was extracted and analyzed by General Testing Corporation for priority pollutants. Results of that analysis appear in Appendix C. Compounds present in relatively high concentrations included base neutrals, volatile aromatics, phenols, and some heavy metals.

Information gathered during the Task 1 site investigation suggests the existence of a bedrock low beneath LaGrange St. The existence of that low was confirmed by drilling However, it appears that its configuration is that of a broad trough trending northwest. An additional north trending low occurs beneath Transit Street. A revised bedrock elevation map, incorporating drilling information, and surveyed topographic information appears in Figure 3.

Permeability values calculated from in-situ testing were generally low (Table 2). Values ranged from 1×10^{-3} to 1×10^{-10} cm/sec (virtually impermeable) in overburden and from 1×10^{-3} to 1×10^{-6} cm/sec in bedrock.

Depth to ground water was measured upon the completion of the borings and wells. Water level elevations are presented in Table 1 and ground water elevation contours are shown in Figure 3. Several monitoring wells are cased to the top of rock. Therefore, water levels reported in those wells reflect the piezometric head in bedrock aquifers. Intermittent wells monitor water levels in the overburden.

Bedrock surface configuration suggests that the flow of water in the overburden and along the bedrock-overburden interface is to the northwest, flowing into the trough and along its axis. The local flow direction of the bedrock aquifer is to the north-northwest, evidenced by ground water levels and the numerous seeps in rock along the canal wall. Average gradients are approximately 5% to the north-northwest. The gradient as shown on the geologic cross sections (Figure 2) drops off steeply near the canal, indicating that the canal excavation probably acts as a long ground water sink, resulting in a drawdown of water levels adjacent to the canal wall.

A reconnaissance of the canal walls was made after the water level in the canal was lowered for the winter season. Observations indicate that at least six oily seeps are present along the south wall between the Transit Street and Lockport Plaza bridges. The seeps, recognizable by a characteristic gray iridescent sheen, occur at a specific stratigraphic horizon just below the DeCew-Rochester contact. The westernmost seep, located near MW-1, appears to contribute the largest volume of hydrocarbons to the canal water. Observations of the surface area of the slick, made at various times of the day on a number of days, suggest that the flow of oily water varies during the day.

5.0 CONCLUSIONS

The boring and well installation program confirmed many of the conclusions drawn from the Task 1 investigation. The site vicinity is underlain by sediments of glacial and lacustrine origin, generally silts and clays with minor, apparently discontinuous, gravel layers.

Detailed stratigraphic and lithologic descriptions are provided in WCC's Task 1 report. Thickness of individual rock units encountered varies, with the elevation of the bottom of the Gasport reaching its lowest point in the vicinity of B-2 (Figure 2). The Gasport is a massive dolomite while the DeCew and Rochester members are predominantly shales. Rock cores were recovered from the Gasport and DeCew members in all borings, except those in which intermittent wells were installed. In addition, the Rochester shale was encountered in all deep borings except B-3 (Figure 2). Coatings

of hydrocarbons were observed on bedrock in core samples from borings on site (B-2, B-3, MW-3) and downgradient from the site (MW-1 and MW-2). Hydrocarbons were not observed in the borings upgradient from the site. In each instance of hydrocarbon occurrence in bedrock, the hydrocarbon was present below the Gasport member, either in the DeCew or Rochester members.

The bedrock surface is essentially planar and slopes at a slight angle towards the northwest. Minor irregularities caused by glacial erosion occur in the bedrock surface including a trough trending to the northwest from LaGrange Street down towards the canal. The rock is generally fresh to slightly weathered with rare, thin (1 to 2 inch) pitted zones. Vertical fractures were infrequently encountered in the core, and horizontal fractures were observed parallel to bedding and along stylolitic partings.

Overburden beneath the site vicinity varies from 8 to 40 feet in thickness with thicker overburden occurring to the south of the site uphill from the canal. The overburden encountered during boring can be broadly classified into two categories. Where the overburden is thickest, brick-red silts and clays predominate. At lower elevations along the canal, overburden is much more variable consisting of man-made fill, greenish clays, dark silts and sands, and minor (apparently) natural organic deposits (in MW-1). Water was encountered in overburden during boring in B-1, B-3, MW-4 and IW-2. In B-3 and MW-4 saturated sediments are separated from rock by dry impermeable layers. This suggests that a perched water table condition is present beneath at least part of the site. Soils down gradient of the site were dry, suggesting the possibility that perched water infiltrates the bedrock aquifer between the site and the canal. This hypothesis is not supported by water levels obtained in rock wells (see discussion below) that suggest that bedrock aquifers are under artesian head.

Ground water in the overburden and top few feet of rock generally follows the northwest sloping bedrock surface. Ground water flow direction in bedrock aquifers in the site vicinity is not as well understood. Water level data and field observations, however, suggest that ground water in the DeCew and Rochester shales is somewhat confined by the overlying Gasport member and flows to the north-northwest.

In-situ permeability tests, performed during drilling, indicated that permeability is variable for both overburden and bedrock. Permeability values range from 1×10^{-3} to 1×10^{-10} cm/sec (virtually impermeable) for overburden and $1 \times 10^{-3} \times 10^{-6}$ cm/sec for bedrock.

Contamination of soil with coal tar like material was confirmed by visual inspection only in samples recovered from MW-3. Portable gas chromatograph analyses show that volatile organic compounds may be present in soil taken from B-3 and MW-1. Soils from the remaining borings showed no sign of organic compounds (visual or gas chromatograph).

A priority pollutant analysis was performed on an extract of a soil sample containing coal tar like material recovered from MW-3. Compounds present in concentrations well above detection limits include fluoranthene (17 ppm), pyrene (13 ppm), napthalene (63 ppm) and phenathracene (38 ppm).

No conclusions can be made at this time based on physical evidence alone regarding a possible connection between coal tar like material on site, the observed bedrock hydrocarbons which appear to be confined to the DeCew and Rochester shales, and the oily seeps observed in the canal. Physical conditions in the site vicinity do not preclude the possibility of such a relationship. However, the identification of a possible transport mechanism requires the collection of additional information on water chemistry and on the nature of hydraulic conditions near the site. In order to demonstrate conclusively a link between coal tar like material at the site and the oily seep, the two substances must be chemically similar, the contamination must appear only at the site and downgradient from the site, and a hydraulic connection must exist between overburden and bedrock aquifers.

6.0 RECOMMENDATIONS

We recommend that the first round of water sampling and chemical testing proceed. Water samples from the seep zone along the canal should be analyzed in order to compare its chemistry to that of the soil/tar mixture sampled on the site.

Based on the analysis performed on the soil sample from MW-3, the following parameters should be examined.

Base neutrals (including napthalene, phenanthrecene)
602 Scan Aromatics (including benzene and toluene)
Total Phenols
Metals:
- Zinc
- Copper
- Arsenic
- Antimony
- Chromium (total and hexavalent)

Cresol Compounds
BOD
C_5 - C_{22} (carbon chain compounds)

These parameters were selected in order to characterize ground water and seep chemistry in terms of coal tar and other hydrocarbon components. A total of 8 samples should be collected: one from each of the wells, one each from the major seep, and one of the minor seeps.

In addition, water levels should be recorded monthly during the following year in order to establish seasonal variations as well as the extent of the canal's influence on bedrock aquifers in the site vicinity.

TABLE 1

Boring No.	Existing Ground Elev.	Depth of Boring	Elev. of Top of Rock	Elev. of Top of DeCew	Elev. of Top of Rochester	Elev. of Hydro-carbon Layer	Elev. of Water
B-1	607.94	50.0	585.64	574.64	564.74	a	601.54[b]
B-2	596.32	38.8	588.12	568.62	564.02	564.02	a
B-3	607.32	41.8	587.62	574.72	a	574.72	606.02[b]
MW-1	594.33	48.0	586.43	573.13	566.83	556.33	560.13
MW-2	595.00	50.7	578.00	575.2	564.70	564.30	583.00
MW-3	600.95	60.0	588.45	571.95	560.75	570.95	589.65
MW-4	627.57	82.2	588.17	571.77	562.95	a	606.17
IW-1	594.37	11.6	586.47	a	a	a	a
IW-2	604.93	21.0	586.93	a	a	a	594.73
B# 15*	593	69.5	587	568.5	c	c	c
B# 16*	594.5	70	582.5	558	c	c	c
B# 17*	598	73	588.2	549.7	c	c	c

*These borings from 1939 New York State Sewer Improvement Plan.
Ground Elevations from base map by Lockwood Support Services

a - Not encountered

b - Water level before casing was pulled

c - Cannot be interpreted from boring log

TABLE 2

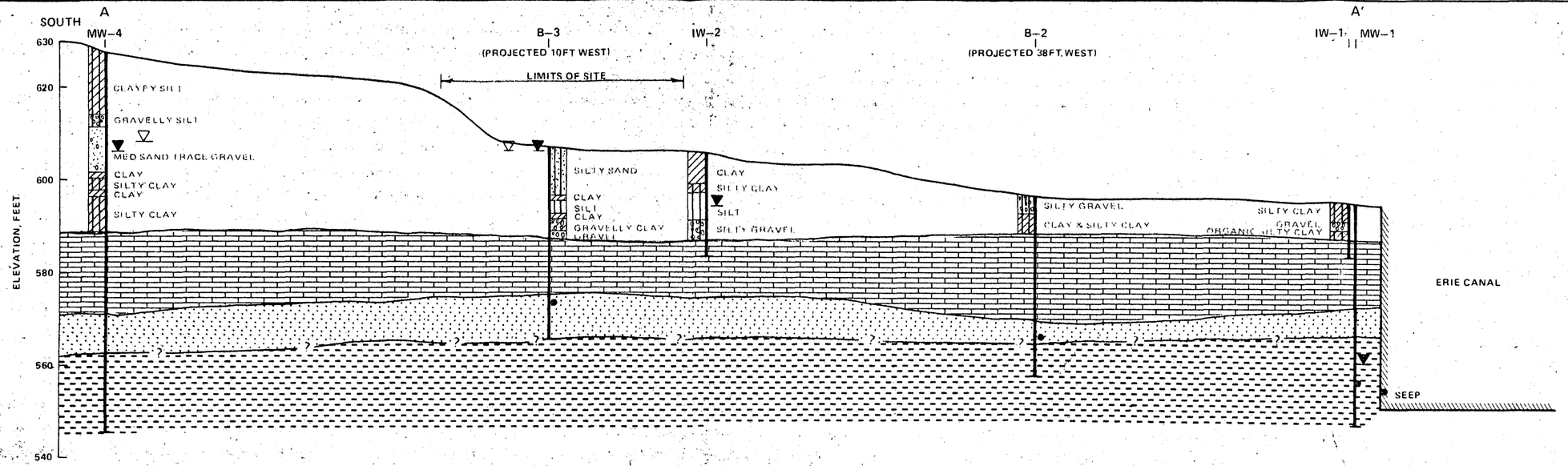
Permeability Values

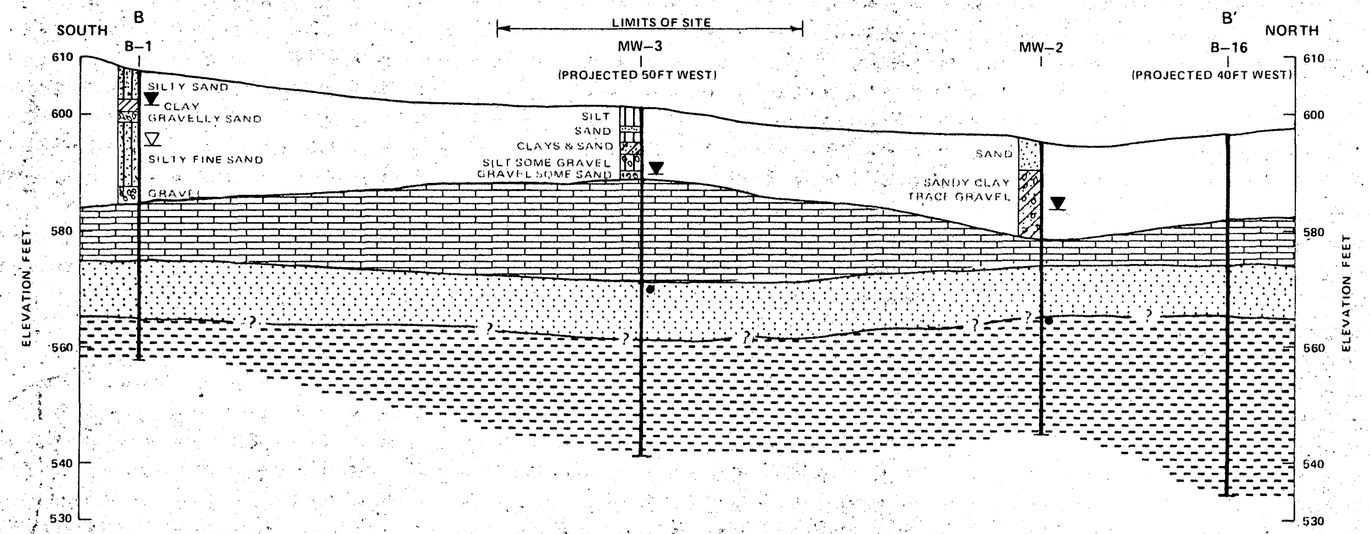
Boring #	Interval Tested	Soil/Rock	Head Falling/Constant	Permeability cm/sec
IW-1	6-7.9	Soil	Constant	1.2×10^{-3}
IW-1	6-7.9	Soil	Falling	6.5×10^{-3}
IW-1	8-11.6 ft.	Rock	Constant	7.1×10^{-3}
IW-2	4-6	Soil	Falling	2.9×10^{-10} (max)
IW-2	16-17.8	Soil	Constant	2.9×10^{-10} (min)
MW-1	2-4	Soil	Falling	5.6×10^{-3}
MW-1	8-23	Rock	Constant	2.6×10^{-5}
MW-1	8-23	Rock	Falling	2.4×10^{-5}
MW-1	8-33	Rock	Constant	8.8×10^{-5}
MW-1	8-33	Rock	Falling	2.6×10^{-5}
MW-1	8-48	Rock	Constant	1.2×10^{-3} (min)
MW-2	40-50	Rock	Constant	8.8×10^{-4} (min)
MW-3	8-12	Soil	Constant	8.8×10^{-5}
MW-3	8-12	Soil	Falling	5.9×10^{-5}
MW-3	12-25	Rock	Constant	2.9×10^{-6}
MW-3	12-25	Rock	Falling	2.9×10^{-6}
MW-3	12-40	Rock	Constant	2.9×10^{-5}
MW-3	12-40	Rock	Constant	5.9×10^{-5}
MW-3	12-60	Rock	Constant	1.5×10^{-4}
MW-3	12-60	Rock	Constant	8.8×10^{-5}

TABLE 3

Photovac Analyses

Boring #	Sample #		Interval	Unidentified Organic Compounds Present
MW-1	S-3	(Soil)	4-6 ft.	no
MW-1	S-4	"	6-8 ft.	yes
MW-2	S-6	"	16-12 ft.	no
MW-3	S-1	"	0-2 ft.	yes
MW-3	S-2	"	2-4 ft.	yes
MW-3	S-4	"	6-8 ft.	yes
MW-3	S-5	"	8-10 ft.	yes
MW-3	Wash water-open rock hole to 60 ft.			yes
MW-4	S-6	(Soil)	12.5-14 ft.	no
IW-1	S-1	(Soil)	0.5-1 ft.	no
IW-1	S-5	"	6-8 ft.	no
IW-2	S-3	"	6-8 ft.	no
B-2	Core	(Rock)	36-36.5 ft.	no
B-3	S-2	(Soil)	2-4 ft.	yes
B-3	Wash water open-rock hole to 41.8 ft.			yes





LEGEND

- OVERBURDEN
- GASPORT MEMBER
- DECEW MEMBER
- ROCHESTER MEMBER
- FIRST WATER ENCOUNTERED DURING DRILLING
- GROUNDWATER ELEVATION OBSERVED UPON COMPLETION OF BORING
- HIGHEST OBSERVED ELEVATION OF HYDROCARBONS IN ROCK

NOTES:

1. SEE FIGURE 3 FOR LOCATION OF SECTIONS
2. GROUND SURFACE ELEVATIONS FROM AERIAL PHOTOGRAMMETRY BY LOCKWOOD SUPPORT SERVICES
3. DEPTH TO ROCK FROM BORINGS BY WOODWARD-CLYDE CONSULTANTS EXCEPT B-16 FROM NEW YORK STATE 1939 SEWER IMPROVEMENT PLAN

0 50 100 FT
HORIZONTAL SCALE
VERTICAL EXAGGERATION = 2.5X

GEOLOGIC CROSS SECTIONS

WOODWARD—CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY: CIG	SCALE: AS SHOWN	PROJ. NO.	82C4495-2
CK'D. BY: HBG	DATE: 20 JANUARY 1983	FIG. NO.	2

SITE LIMITS

ERIE CANAL

MW–4
627.57
(606.1)

MW–1
594.33
(660.1)

IW–1
594.37

IW–2
604.93
(594.7)

B–1
607.94
(601.5)

MW–2
595.00
(583.0)

MW–3
601.82
(589.7)

B–2
596.32

B–3
607.32
(606.0)

B–15

B–16

B–17

TRANSFORMER STATION

PARKING AREA

RUIN

(CONCRETE)

EXPLANATION

- ■ MW–4 – WCC BORINGS & WELLS WITH; 627.57 – ELEVATION OF TOP OF UTILITY BOX (606.07) – ELEVATION OF GROUNDWATER
- B–16 – BORING LOCATION FROM 1939 NEW YORK STATE SEWER IMPROVEMENT PLAN

NOTES:

1. BASE MAP BY LOCKWOOD SUPPORT SERVICES
2. SEE FIGURE 2 FOR SECTIONS

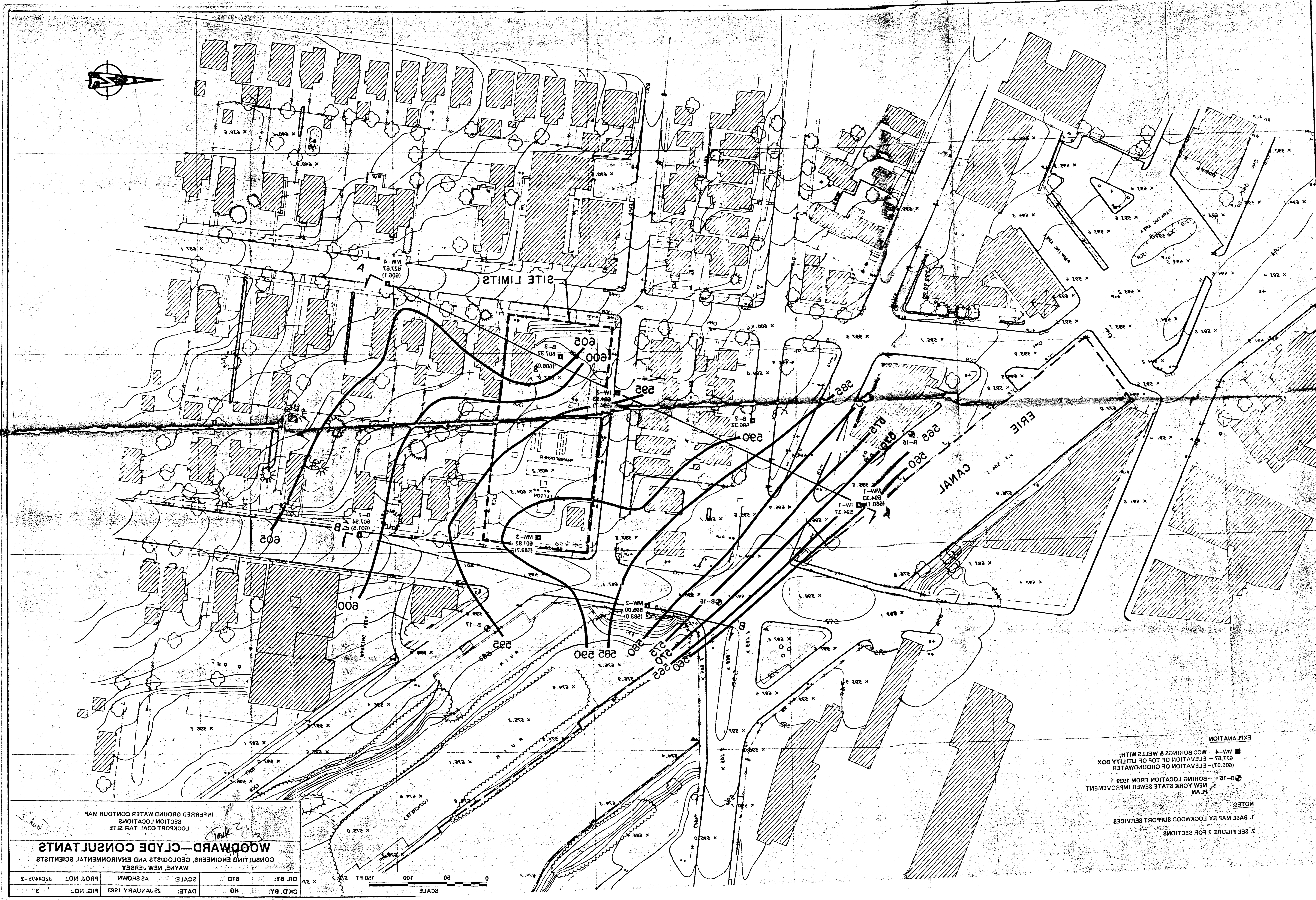
SCALE 0 50 100 150 FT

INFERRED GROUND WATER CONTOUR MAP
SECTION LOCATIONS
LOCKPORT COAL TAR SITE

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY:	BTD	SCALE:	AS SHOWN	PROJ. NO.:	82C4495–2
CK'D. BY:	HG	DATE:	25 JANUARY 1983	FIG. NO.:	3



EXPLANATION

■ MW-4 – WCC BORINGS & WELLS WITH;
627.57 – ELEVATION OF TOP OF UTILITY BOX
(606.07) – ELEVATION OF GROUNDWATER

◕ B-16 – BORING LOCATION FROM 1939 NEW YORK STATE SEWER IMPROVEMENT PLAN

NOTES:

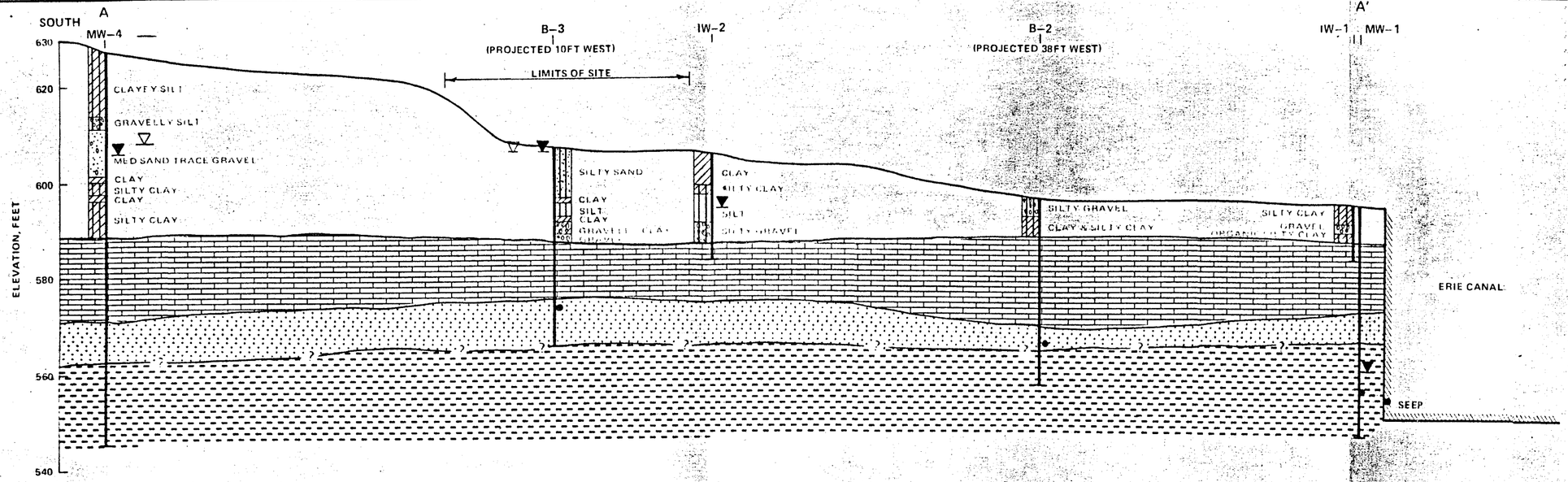
1. BASE MAP BY LOCKWOOD SUPPORT SERVICES
2. SEE FIGURE 2 FOR SECTIONS

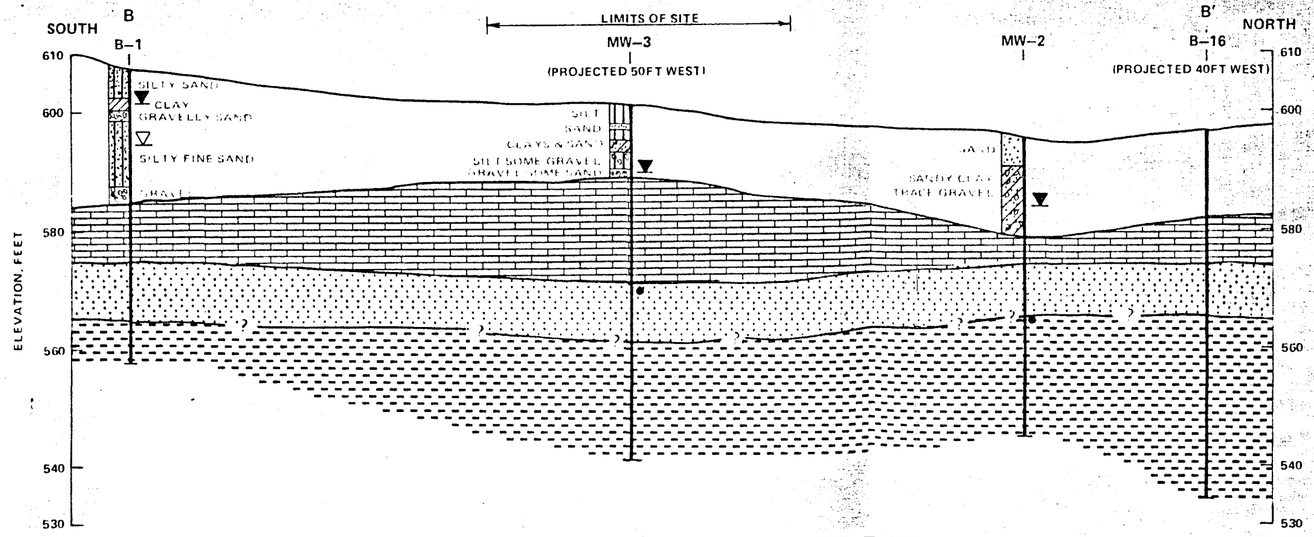
INFERRED GROUND WATER CONTOUR MAP
SECTION LOCATIONS
LOCKPORT COAL TAR SITE

WOODWARD—CLYDE CONSULTANTS
CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY:	BTD	SCALE:	AS SHOWN	PROJ. NO.:	32C4495-2
CK'D. BY:	HG	DATE:	25 JANUARY 1983	FIG. NO.:	3

SCALE 0 50 100 150 FT





LEGEND

- OVERBURDEN
- GASPORT MEMBER
- DECEW MEMBER
- ROCHESTER MEMBER
- FIRST WATER ENCOUNTERED DURING DRILLING
- GROUNDWATER ELEVATION OBSERVED UPON COMPLETION OF BORING
- HIGHEST OBSERVED ELEVATION OF HYDROCARBONS IN ROCK

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0 50 100 FT

HORIZONTAL SCALE
VERTICAL EXAGGERATION = 2.5X

GEOLOGIC CROSS SECTIONS

WOODWARD—CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY.	CIG	SCALE	AS SHOWN	PROJ. NO.	82C4495-2
CK'D. BY	HBG	DATE: 20 JANUARY 1983		FIG. NO.	2

Task 2
Figure 2

SITE LIMITS

ERIE CANAL

MW–4
627.57
(588.2)

B–3
607.32
(587.6)

IW–2
604.93
(586.9)

B–2
596.32
(588.1)

B–15
595
(587)

MW–1
594.33
(586.4)

IW–1
594.37
(586.5)

SEEP #2

SEEP #1

MW–3
601.82
(588.5)

B–1
607.94
(585.6)

B–16
597
(582)

MW–2
595.00
(578.0)

B–17
598
(589)

TRANSFORMER

SUBSTATION

DOCK

RUIN

PARKING AREA

(CONCRETE)

SCALE 0 50 100 150 FT

EXPLANATION

- ■ MW–4 – WCC BORINGS & WELLS WITH;
  627.57 – ELEVATION OF TOP OF CASING AND;
  (588) – ELEVATION OF TOP OF ROCK
- ◔ – BORING INFORMATION FROM 1939 NEW YORK STATE SEWER IMPROVEMENT PLAN
- ✱ – SEEP SAMPLES

NOTES:

1. DEPTH TO ROCK COMPILED FROM BORING INFORMATION AND GEOPHYSICAL DATA
2. GROUND SURFACE TOPOGRAPHY FROM AERIAL PHOTOGRAMMETRY BY LOCKWOOD SUPPORT SERVICES.

BEDROCK ELEVATIONS AND
LOCATION OF SAMPLING POINTS
LOCKPORT COAL TAR SITE

Page 2

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR.BY:	BTD	SCALE:	AS SHOWN	PROJ. NO.:	82C4495–2
CK'D. BY:	HG	DATE:	25 JANUARY 1983	FIG. NO.:	1

SITE LIMITS

ERIE CANAL

EXPLANATION

- MW-4 – WCC BORINGS & WELLS WITH; 627.57 – ELEVATION OF TOP OF CASING AND; (588) – ELEVATION OF TOP OF ROCK
- – BORING INFORMATION FROM 1933 NEW YORK STATE SEWER IMPROVEMENT PLAN
- * – SEEP SAMPLES

NOTES:

1. DEPTH TO ROCK COMPILED FROM BORING INFORMATION AND GEOPHYSICAL DATA
2. GROUND SURFACE TOPOGRAPHY FROM AERIAL PHOTOGRAMMETRY BY LOCKWOOD SUPPORT SERVICES.

SCALE 0 50 100 150 FT

BEDROCK ELEVATIONS AND LOCATION OF SAMPLING POINTS LOCKPORT COAL TAR SITE

WOODWARD—CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR.BY: BTD	SCALE: AS SHOWN	PROJ. NO.:	82C4459-2
CK'D. BY: HO	DATE: 25 JANUARY 1983	FIG. NO.:	1

SITE LIMITS

ERIE CANAL

MW–4
627.57
(606.1)

MW–1
594.33
(560.1)

IW–1
594.37

IW–2
604.93
(594.7)

B–1
607.94
(601.5)

B–2
596.32

B–3
607.32
(606.0)

MW–2
595.00
(583.0)

MW–3
601.82
(589.7)

B–15

B–16

B–17

TRANSFORMER STATION

PARKING AREA

RUIN

(CONCRETE)

595 590 585 580 575 570 565 560 605 600

0 50 100 150 FT
SCALE

EXPLANATION

■ MW–4 – WCC BORINGS & WELLS WITH;
627.57 – ELEVATION OF TOP OF UTILITY BOX
(606.07) – ELEVATION OF GROUNDWATER

B–16 – BORING LOCATION FROM 1939 NEW YORK STATE SEWER IMPROVEMENT PLAN

NOTES:

1. BASE MAP BY LOCKWOOD SUPPORT SERVICES

2. SEE FIGURE 2 FOR SECTIONS

INFERRED GROUND WATER CONTOUR MAP
SECTION LOCATIONS
LOCKPORT COAL TAR SITE

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS
WAYNE, NEW JERSEY

DR. BY:	BTD	SCALE:	AS SHOWN	PROJ. NO.:	82C4495–2
CK'D. BY:	HG	DATE:	25 JANUARY 1983	FIG. NO.:	3

Large Format

Box # _____

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IMAGE DATA

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING B-1 **SHEET** 1 **OF** 4

PROJECT AND LOCATION: NYSEG - LOCKPORT		ELEVATION AND DATUM: 607.94'	PROJECT NO.: 8264495
COORDINATES: N 204.87 E 1522.63			
DRILLING AGENCY: PITTSBURGH TESTING (EARTH DIMENSIONS)	FOREMAN: S. MISNER	DATE STARTED: 12/14/82	DATE FINISHED: 12/17/82
DRILLING EQUIPMENT: TRUCK MOUNTED MOBIL B40L		COMPLETION DEPTH: 50 ft.	ROCK DEPTH: 22.3
SIZE AND TYPE OF BIT: 6" O.D. Auger	SIZE AND TYPE CORE BARREL: NX	NO. SAMPLES: DIST. 11	UNDIST. - CORE 25 ft.
CASING: 3" I.D. STEEL		WATER LEVEL: FIRST 13.5	COMP. 24 HR. 12.8
CASING HAMMER: WEIGHT 300 lbs	DROP 30"	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2 in. O.D. SPLIT SPOON		INSPECTOR: H. GOLD	
SAMPLER HAMMER: WEIGHT 140 lbs	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	PENETR. RESIST. BL/6IN.	SAMPLES RECOV., %	ROCK CORE ROD	ROCK CORE BEDDING	ROCK CORE FRACTURE SKETCH	ROCK CORE FRACTURE COND.	ROCK CORE WEATHERING	WATER TEST	REMARKS
ASPHALT Concrete Crushed stone } Road Bed												
Brown silty fine SAND some c-f gravel (moist)		2	S-1	14 16 12	70							
SAA		4	S-2	6 7 9 6	60							
Red-brown CLAY (dry)		6	S-3	2 5 5 23	50							
Red brown gravelly fine SAND (moist)		8	S-4	7 6 9 10	75							
Red brown silty fine SAND (moist)		10	S-5	6 12 22 23	75							
SAA		12	S-6	17 17 24 27	50							

1

WOODWARD–CLYDE CONSULTANTS

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LOG OF BORING B-1 SHEET 2 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	SAMPLES PENETR. RESIST. BL/6IN.	SAMPLES RECOV, %	ROCK CORE ROD	ROCK CORE BEDDING	ROCK CORE FRACTURE SKETCH	ROCK CORE FRACTURE COND.	ROCK CORE WEATHERING	WATER TEST	REMARKS
SAA (wet)		14	S-7	19, 27, 18, 32	100							WATER at 13.5 ft
SAA		16	S-8	8, 9, 9, 8	100							
SAA		18	S-9	6, 15, 17, 12	100							
Brick red CLAY (wet)		20	S-10	16, 27, 24, 82	100							
Brick red coarse gravelly CLAY (wet) Gray coarse GRAVEL (wet)		22	S-11	100	60							Refusal @ 21.3 ft 100 bl/0.3 ft. Driller reports boulder from 21.3–22 ft. Depth to rock is 22.3 ft.
Light gray crinoidal DOLOMITE, m-f grained matrix (Gaspport member) highly fractured and moderately weathered		24	R-1		4.2/4.4 = 95%	1.5/4.2 = 36%	HORIZONTAL		G, G			Crushed zone
SAA Not as fractured Not as weathered		30	R-2		3.1/3.1 = 100%	2.9/3.1 = 94%	Horizontal		G, G			

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING B-1 SHEET 3 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
		32										Roller cone from 31.7-35 ft
		34										
Dark gray fine grained shaley DOLOMITE (De Cew MEMBER) Thinly bedded horizontal laminae, some light gray layers, slightly weathered, petroleum SMELL on fresh fractures		36	R-3		47/5 = 94%	42/42 = 89%	HORIZONTAL		F S			
		38							C			
		40							G F			
SAA		42	R-4		4/5 = 80%	35/4 = 88%	HORIZONTAL		G F			
		44							G P			
Dark gray LIMEY SHALE (Rochester Member) Fresh, fine horizontal bedding, petroleum odor on fresh fractures		46					HORIZONTAL					CRUSHED ZONE
		48										

WOODWARD–CLYDE CONSULTANTS

CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING B-1 SHEET 4 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
		50										
Boring terminated at 50 ft. Backfilled with grout to 0.3 below grade - asphalt patch to grade												

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LOG OF BORING B-2 **SHEET** 1 **OF** 3

PROJECT AND LOCATION: NYSEG - LOCKPORT		ELEVATION AND DATUM: 596.32	PROJECT NO.: 82C4495
COORDINATES: N706.34 E 1659.76			
DRILLING AGENCY: Dominion Soils (Earth Dimension)	FOREMAN: S. Leschyshian	DATE STARTED: 12/17/82	DATE FINISHED: 12/17/82
DRILLING EQUIPMENT: ATV MOUNTED, BOA RIG		COMPLETION DEPTH: 38.8 ft.	ROCK DEPTH: 8.2 ft
SIZE AND TYPE OF BIT: 8" O.D. AUGER	SIZE AND TYPE CORE BARREL: NX	NO. SAMPLES: DIST. 3	UNDIST. — CORE 30 ft.
CASING: 3" ID STEEL		WATER LEVEL: FIRST	COMP. 24 HR.
CASING HAMMER:	WEIGHT:	DROP:	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: 2 IN O.D. SPLIT SPOON			INSPECTOR: H. Gold
SAMPLER HAMMER:	WEIGHT:	DROP:	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN	SAMPLES: RECOV, %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
Asphalt Sand + coarse gravel fill		0										
Brick red SILT, and C-f GRAVEL (dry)		2	S-1	11 20 9/2	50%							
Brick red CLAY (dry)		4	S-2	4 4 5 8	75%							
Brick red silty CLAY trace fine sand (dry)		6	S-3	5 4 7 14	75%							
Gray crinoidal Dolomite m-f grained matrix (Gasport Member) bedding is indistinct some stylolites present Fresh to slightly weathered SAP		8	R-1		2.4/2.6 = 92% 1.7/2.4 = 71%							Refusal at 8.2 ft.
		10										
		12	R-2									

WOODWARD–CLYDE CONSULTANTS

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LOG OF BORING B-2 SHEET 2 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
SAA		14							P			
									P			
									P			
									P			
		16							P			
									M			
			R-2		100%	81%			P			
		18							P			
									M			
		20							M			
SAA		22										
		24										
		26	R-3		100%	98%	HORIZONTAL					
		28										
Dark gray fine grained Shaley Dolomite (Da Cew MEMber) thinly bedded, horizontal laminae, petroleum odor on fresh fractures: Fresh		30										Fractures filled with Calcite

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CONSULTING ENGINEERS, GEOLOGISTS AND ENVIRONMENTAL SCIENTISTS

LOG OF BORING B-2 SHEET 3 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
		32										
Dark gray limey SHALE fine horizontal laminae petroleum odor on fresh fractures: Fresh (Rochester Shale) slight coating of oil on CORE		34	R-4		7.4/7.4 = 100 %	6.8/7.4 = 92 %	HORIZONTAL		G			
		36							G			
		38							G			
Boring terminated at 38.8 ft. Back filled with grout to 0.3' below grade. Asphalt patch to grade									G			

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LOG OF BORING B-3 **SHEET** 1 **OF** 3

PROJECT AND LOCATION: NYSEG – LOCKPORT		ELEVATION AND DATUM: 607.32	PROJECT NO.: 8264495
COORDINATES: N 4617 E 1745.18			
DRILLING AGENCY: Pittsburgh Testing Lab (Earth Dimensions)	FOREMAN: S. Misner	DATE STARTED: 12/10/82	DATE FINISHED: 12/14/82
DRILLING EQUIPMENT: Truck Mounted Mobil B-40L		COMPLETION DEPTH: 41.8	ROCK DEPTH: 19.7
SIZE AND TYPE OF BIT: 6" O.D. Auger	SIZE AND TYPE CORE BARREL: NX	NO. SAMPLES: DIST. 9	UNDIST. CORE 22'
CASING: 3" I.D. Steel		WATER LEVEL: FIRST 1.3	COMP. 1.3 24 HR. 1.3
CASING HAMMER: WEIGHT 140 lbs	DROP 30"	BORING ANGLE AND DIRECTION: Vertical	
SAMPLER: 2 in O.D. Split Spoon		INSPECTOR: H. Gold	
SAMPLER HAMMER: WEIGHT 140 lbs	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	SAMPLES PENETR. RESIST. BL/6IN.	SAMPLES RECOV, %	ROCK CORE RQD	ROCK CORE BEDDING	ROCK CORE FRACTURE SKETCH	ROCK CORE FRACTURE COND.	ROCK CORE WEATHERING	WATER TEST	REMARKS
Concrete												
No sample recovered, very fine brown SAND on Augers Split Spoon wet		2	S-1	7	0							water in hole at 1.3H
Red brown very fine Silty SAND (water saturated)			S-2	5 8 11 11	100%							
SAA		4	S-3	7 10 14 18	100%							
SAA		6	S-4	9 17 20 25	100%							
SAA		8	S-5	8 18 28 31	100%							
SAA		10	S-6	7 15 21 91	100%							
Mottled green brown CLAY (dry)		12										
RED brown SILT (moist)			S-7	66 19								

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LOG OF BORING B-3 SHEET 2 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
Red brown SILT (moist)		14	S-7	18 31	100%							
SAA			S-8	14 29 100/5"	100%							
Mottled green brown + red brown CLAY with broken rock fragments												Refusal at 15.4' 100 bl/3"
Red brown c-f gravelly CLAY some silt (moist)		16	S-9	100/4"								Refusal at 16.3' 100 bl/3"
		18										Roller cone to 18 ft
Well rounded coarse GRAVEL not derived from underlying rocks in core barrel												
Light gray crinoidal DOLOMITE (GASPORT MEMBER) Moderately weathered, fractured and pitted, some stylolites		20	R-1									
		22	R-2		5.1/5.0 = 102%	4.7/5.0 = 94%	HORIZONTAL					
SAA, not as fractured or as weathered		24							M			
		26							C			
SAA		28	R-3		5/5 = 100%	5/5 = 100%	Horizontal					
		30										

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LOG OF BORING B-3 SHEET 3 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
SAA		32										
Dark gray fine grained shaley DOLOMITE (De Cew Member) pockets of sparry calcite, some STYLOLITES. Core coated with oil		34	R-4		S/S= 100%	S/S= 100%	Horizontal		G			
		36							G			
SAA		38	R-5		S/S= 100%	47 S/S= 94%	Horizontal		P/G			
		40							G			
									G			
Boring terminated at 41.8 Ft Back filled to grade with grout												

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LOG OF BORING MW-1a **SHEET** 1 **OF** 2

PROJECT AND LOCATION: NYSEG - LOCKPORT		ELEVATION AND DATUM	PROJECT NO.: 8264495
COORDINATES			
DRILLING AGENCY: PITTSBURGH TESTING LABS (Eastern Division)	FOREMAN: S. MISLER	DATE STARTED: 11/30/82	DATE FINISHED: 12/1/82
DRILLING EQUIPMENT: TRUCK MOUNTED MOBIL B40L		COMPLETION DEPTH: 18 Ft.	ROCK DEPTH: 7.8 FT
SIZE AND TYPE OF BIT: 6" AUGER	SIZE AND TYPE CORE BARREL	NO. SAMPLES: DIST. 4	UNDIST. — CORE 2
CASING: 3" I.D. BLACK STEEL	NY	WATER LEVEL: FIRST	COMP. 24 HR.
CASING HAMMER: WEIGHT 140 LBS	DROP 30"	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2" O.D. SPLIT SPOON		INSPECTOR: H. GOLD	
SAMPLER HAMMER: WEIGHT 140 LBS	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
ASPHALT + CONCRETE (Road bed)												
Orange brown fine SAND (dry)			S-1	9								Probable Fill
Black fine SAND (cinders? - dry)				8	66							
Brown silty CLAY (dry)				6								
Brown silty CLAY (moist) (Fill)		2	S-2	6								
				9								
				8	75							
				7								
Gray c-m GRAVEL, some sand - (dry - Fill)		4	S-3	5								
				4	60							
				6								
SAA				7								
Black organic SILT - sulferous smell (Peat? - dry)		6	S-4	7								
				5								
Brown CLAY (dry)				15	50							
				60/3"								Refusal at 7.8' 60 blows/3" Augered to 8.1' Set casing 8.3' in rock - R-1 on 12-1-82
Light gray medium grained Crinoidal Limestone, some stylolites, no bedding visible - rock is fresh with slight weathering on cracks - Very poor crack fit (Gasport Member)		8	R-1		10'/10' = 100%	9.2'/10' = 92%			P	n		
									F	M		
									F	n		
		10							F	n		
									F	n		
		12										

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LOG OF BORING MW-1a

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
		14										No fractures Present
		16										
MW-1a abandoned at 18 ft: drillers lost Auger plug + could not retrieve it. hole grouted to 0.3 below grade - topped with asphalt patch. MW-1 offset 2 ft to north		18										

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LOG OF BORING MW-1 SHEET 1 OF 3

PROJECT AND LOCATION NYSEG - LOCKPORT		ELEVATION AND DATUM 594.33'	PROJECT NO. 82C4495-2
COORDINATES N 831.21 E 1553.76			
DRILLING AGENCY Pittsburgh Testing (Earth Dimensions)	FOREMAN S. Misner	DATE STARTED 12/6/82	DATE FINISHED 12/9/82
DRILLING EQUIPMENT Mobile B-40L Truck Mounted Rig		COMPLETION DEPTH 48 ft.	ROCK DEPTH 7.9
SIZE AND TYPE OF BIT 6" Auger	SIZE AND TYPE CORE BARREL NX	NO. SAMPLES DIST. 0	UNDIST. 0 CORE 30 ft
CASING 3" BLACK STEEL		WATER LEVEL FIRST	COMP. 24 HR.
CASING HAMMER WEIGHT	DROP	BORING ANGLE AND DIRECTION VERTICAL	
SAMPLER 2 in OD SPLIT SPOON		INSPECTOR H. Gold	
SAMPLER HAMMER WEIGHT 120 lbs	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
See log of MW-1a for soil descriptions		2 4 6										6" Auger Through overburden Top of Rock
See log of MW-1a for Rock core description		8 10 12										Roller cone to 14'

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LOG OF BORING MW-1 SHEET 2 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
		14										
		16										
Light Gray crinoidal dolomitic m.g. LIMESTONE slightly weathered, Moderate weathering on fractures - fractures coincide with shaly partings (GASPORT MEMBER) some stylolites		18	R-1		47/50 = 94 %	45/47 = 96 %	Possibly defined Horizontal		P			Gasport/DeCew Contact preserved in core
		20							P			
Dark Gray dolomitic LIMESTONE some shale, fine grained lens of sparry calcite petroleum odor on fresh fractures. (DeCew Member) some stylolites		22					Horizontal Laminae		P			Accidental Break
SAA - slightly more weathered and slightly pitted in some places - than above - petroleum odor on fresh fractures some wavy shale partings		24	R-2 3ft / 32 min		46/50 = 96 %	45/46 = 97 %	Horizontal Laminae		G			healed fractures cemented with calcite
		26							P			Crushed zone
? — ? — ? — ? — ? — ? — ? — ?		28							P			Probable DeCew/ Rochester contact in core
Dark gray Limey SHALE very fine grained - finely bedded rare thin zones of coarser grained material Fresh but slightly weathered on fractures (Rochester Shale)		30	R-3		6.1/5 = 122 %	3.4/5 = 68 %			P			Crushed zone

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LOG OF BORING MW 1 SHEET 3 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV. %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	WEATHERING	WATER TEST	REMARKS
		32							P P P P			Perm test with open rock to 33 ft Crushed zone
SAA- but slightly more weathered - some Iron staining, fractures very weathered + mechanically abraded during coring		34	R-4		47/5.0 = 94%	33/47 = 68%	HORIZONTAL LAMINAE		M P P M P P P	Slight, fractures moderately weathered		
SAA- Core covered with iridescent oily slick. Not present on fresh fractures - strong oily smell - distinct from coating Oil - on fresh fractures Oil coating similar to that on core at MW-3		38	R-5	1 ft / 15 min	46/5.0 = 92%	31/46 = 67%			P P P P P M			Crushed zone weathered + pitted weathered + pitted layer
SAA Oily coating on core		44	R-6	1 ft / 15 min	53/5 = 106%				M P P P P P P			Crushed zone
		48										Broken zone
Boring terminated at 48 ft. MONITORING WELL INSTALLED												

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LOG OF BORING MW2 **SHEET** 1 **OF** 4

PROJECT AND LOCATION: NYSEG - LOCKPORT		ELEVATION AND DATUM: 595.00'	PROJECT NO.: 82C4495
COORDINATES: N 568.26 E 1431.07			
DRILLING AGENCY: Dominion Soils (Earth Dimensions)	FOREMAN: S. Leschychian	DATE STARTED: 12/15/82	DATE FINISHED: 12/16/82
DRILLING EQUIPMENT: ATV MOUNTED BOA		COMPLETION DEPTH: 50.7'	ROCK DEPTH: 17'
SIZE AND TYPE OF BIT: 8" O.D. Augers	SIZE AND TYPE CORE BARREL: NX - WIRELINE	NO. SAMPLES: DIST. 7	UNDIST. – CORE 34'
CASING: 4"		WATER LEVEL: FIRST	COMP. 24 HR.
CASING HAMMER: WEIGHT: DROP:		BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2 in OD SPLIT SPOON		INSPECTOR: H. Gold	
SAMPLER HAMMER: WEIGHT 140 LBS DROP 30"			

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	SAMPLES PENETR. RESIST. BL/6IN	SAMPLES RECOV., %	ROCK CORE ROD	ROCK CORE BEDDING	ROCK CORE FRACTURE SKETCH	ROCK CORE FRACTURE COND.	ROCK CORE WEATHERING	WATER TEST	REMARKS
Asphalt (Road bed) Concrete												
Tan C-f SAND		2	S-1	8 8 (24)	25%							
Brown sandy CLAY, some silt (moist)		4	S-2	6 5 6	75%							
Red brown clayey Fine SAND (moist)		6	S-3	5 14 5 15	25%							
Green + Brown mottled Gravelly CLAY, some fine Sand (moist)		8	S-4	5 6 8 5	100%							
SAA (Dry)		10	S-5	3 8 7 12	100%							
SAA (DRY) Green Brown CLAY and C-f GRAVEL		12	S-6	5 7								

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LOG OF BORING MW-2 SHEET 2 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
SAA		14	S-7	9 9								Refusal at 17' 50bl/0"
		16		45 16								4" Roller to 14.4'
Light gray medium grained Crinoidal LIMESTONE (GASPORT)		18										
Gray fine grained shaley DOLOMITE (De Cew Member) Some STYLOLITES - VERTICAL fractures are filled with calcite and coated with a black tarry substance		20	R-1	24 lions in	24.3 = 86 %	1.5/2 = 75 %			P			Cracks coated with calcite
		22	R-2	5'/15 min	5.6/5.6 = 100 %	4.6/5.6 = 82 %	HORIZONTAL		G G P P G			
SAA		26										
		28	R-3		4.4/4.4 = 100 %	3.7/4.4 = 84 %	HORIZONTAL		P P P G			
? — ? — ? — ? — ? — ? —		30										
Dark gray limey SHALE (Rochester)												

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LOG OF BORING MW-2 SHEET 3 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
SAA - Oily coating on core - petroleum smell on fresh fractures		32, 34, 36, 38, 40	R-4		10/10 = 100%	8.1/10 = 81%	HORIZONTAL		G, G, G, G, G, G, P, G, G, G, F			
SAA		42, 44, 46, 48	R-5		10/10 = 100%	9.6/10 = 96%	HORIZONTAL		G, M, M			CRUSHED ZONE

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LOG OF BORING MW-2 SHEET 4 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
		50						C / G				
Boring terminated at 50.7 ft. monitoring well installed												

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LOG OF BORING MW-3 **SHEET** 1 **OF** 4

PROJECT AND LOCATION: NYSEG - LOCKPORT		ELEVATION AND DATUM: 600.95 (ground)	PROJECT NO.: 82C4495
COORDINATES: N 431.76 E 1518.10		DATE STARTED: 11/23/82	DATE FINISHED: 11/30/82
DRILLING AGENCY: Pittsburgh Testing Labs - (Earth Dimensions)	FOREMAN: D. Oscar, S. Misner	COMPLETION DEPTH: 60 ft.	ROCK DEPTH: 12.5'
DRILLING EQUIPMENT: Truck Mounted Mob. / B-40L		NO. SAMPLES: DIST. 7	UNDIST.: — CORE: 7.5 ft
SIZE AND TYPE OF BIT: 6" AUGER	SIZE AND TYPE CORE BARREL: NX	WATER LEVEL: FIRST	COMP.: 24 HR.
CASING: 3" ID Black Steel		BORING ANGLE AND DIRECTION: Vertical	
CASING HAMMER: WEIGHT 140 LBS	DROP 30"	INSPECTOR: S. Helbig / H. Gold	
SAMPLER: 2 in O.D. - Split Spoon			
SAMPLER HAMMER: WEIGHT 140 LBS	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV, %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: FRACTURE: WEATHERING	WATER TEST	REMARKS
Gray GRAVEL (Fill - dry)												
Red brown SILT, trace clay, fine sand (Black discoloration 4" in middle)(sl moist)			S-1	3 6 6 7	15" / 24"							
SAA (moist)		2										
Fragments of DOLOMITE (coarse grained) Brown Black SAND, some silt GRAVEL, moist (wet with coal tar?)			S-2	3 50 36 22	12" / 24"							ATTEMP PERM. TEST @ 4' - N.G. water flowed up outside auger
Brown-Black wet SILT some sand & gravel, 1 piece of wood (Blocked nose of split spoon) coal tar odor		4	S-3	6 7 4 6	6" / 24"							
Brown Black, some Green mixed CLAY & SAND, some gravel, Coal tar odor in 50% of sample (moist)		6	S-4	20 4 7 15	15" / 24"							
Red-Brown SILT some gravel minor organics, tr. Small (1mm) Black inclusions (coal tar) coal tar odor (moist)		8	S-5	11 19 23 19	16" / 24"							Perm. test @ 9.0 ft.
SAA		10	S-6	14 22 40 35	23" / 24"							
Black-Brown GRAVEL, some sand, silt, coal tar & WATER soaked		12	S-7	50/4"	0							Perm. test Auger to 8 ft. open hole to 12 ft. Top of rock 12.5 ft. 3" casing grouted into rock - 11/30/82
no Sample												

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LOG OF BORING MW-3 SHEET 2 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	FRACTURE: SKETCH	FRACTURE: COND.	WEATHERING	WATER TEST	REMARKS
Gray fine grained Dolomite Irregular Bedding - Discontinuous and wavey dark laminations Tr. coral fossils - All fractures are sub parallel to bedding		14	R-1	45 min	3.75/4.0 = 94%	2.25/3.75 = 73%	Horizontal, undulatory		G	M		START 11/24/82 Cleaned hole to 13.0ft Start NX Core 13.0ft Brown Ret. for 1st 6' White milky Return
		16							G			
SAA - some stylolites & black shaley partings - accidental break yielded characteristic petroleum odor		18										11:15 11:30 - 12:15 Lunch 12:15 - 12:45
Gray Dolomite - fine grained matrix containing numerous Crinoid Fossils (Gasport Member)		20	R-2		101%	97%	Horizontal irregular - undulatory			Fresh		
		22										
		24							G			
SAA		26	R-3		100%	9.5/10 = 95%	Poorly defined horiz.		F	Fresh		H. Gold - 11/29/82 Core barrel coated with black oily material
Gray well laminated fine grained shaley Dolomite with some black shaley partings - (De Cew Member)		30										

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LOG OF BORING MW-3 SHEET 3 OF 4

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
		35	R-3						G	Slight weathering on cracks		STARTED CORING 10:15 on 11/26/87 CORE coated with oily water; WASH water is very oily for first 5 min. then clears to milky gray white.
SAA - oily smell on fresh fractures			R-4	60 min	45/50 = 90%	42/50 = 84%	Horizontal laminae		P P G G			
		40										
Blackish-gray very fine grained LIMESTONE with minor shale, horizontal fine bedding, some light gray layers with shell fragments and coarse grained material. Coarse grained lenses are more highly weathered & exhibit small (1mm) pits. Oily smell on fresh fractures. Rock is generally fresh, with slight weathering on fractures		42	R-5	3'/60 minutes 10.3'/10: 103% 9.6'/10': 96%			Horizontal laminae with some coarse layers		M M G P M	S S F		Oily coating on core when removed from core barrel
		44										
		46										
		48										

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LOG OF BORING MW-3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	FRACTURE: SKETCH	FRACTURE: COND.	WEATHERING	WATER TEST	REMARKS
		50										
SAA - Heavy oil coating on core. Crack fit moderate to poor. Some horizontal fractures show signs of abrasion, resulting from coring.		50–52	R-6		10.3/10 = 103%	8.5/10 = 85%	Horizontal Laminae		P, P			
		52–54										
		54–56							P, P, P P			Some pitting; CRUSHED ZONE
		56–58							P M, P			
		58–60							M, P, P, M, M			
		60										
Boring terminated @ 60.6 ft. Monitoring well installed												

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LOG OF BORING MW-11 **SHEET** 1 **OF** 5

PROJECT AND LOCATION: NYSEG - LOCKPORT		ELEVATION AND DATUM: 627.57	PROJECT NO.: 82C4495
COORDINATES: N 241.9 E 1837.6			
DRILLING AGENCY: Dominion Soils (Earth Dimensions)	FOREMAN: S. Leschychian	DATE STARTED: 12/16/82	DATE FINISHED: 12/17/82
DRILLING EQUIPMENT: ATV MOUNTED BOA RIG		COMPLETION DEPTH: 82.2	ROCK DEPTH: 39.4'
SIZE AND TYPE OF BIT: 8" Auger	SIZE AND TYPE CORE BARREL: NX - Wireline	NO. SAMPLES: DIST. 11	UNDIST. — CORE 42.8
CASING: 4"		WATER LEVEL: FIRST	COMP. 24 HR.
CASING HAMMER: WEIGHT: DROP:		BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2 in O.D SPLIT SPOON		INSPECTOR: H. Gold	
SAMPLER HAMMER: WEIGHT: 140 lbs DROP: 30"			

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV. %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
Asphalt + Crushed stone (fill)		2										
Brick red clayey SILT trace c-f sand (Dry)		4	S-1	7, 12, 10, 10	100%							
SAA		6	S-2	39, 9, 12, 12	100%							
SAA		8	S-3	3, 9, 15, 18	100%							
SAA		10	S-4	11, 20, 19, 23	50%							
SAA		12	S-5	18, 24, 50/3"	100%							Refusal at 11.1 ft 50 bl/0" Driller reports boulder 11.1-12.2 ft
SAA			S-6	23								

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LOG OF BORING MW-4/ SHEET 2 OF 5

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	SAMPLES PENETR. RESIST. BL/6IN.	SAMPLES RECOV., %	ROCK CORE RQD	ROCK CORE BEDDING	ROCK CORE FRACTURE SKETCH	ROCK CORE FRACTURE COND.	ROCK CORE WEATHERING	WATER TEST	REMARKS
SAA		14	S-6	44 50	100%							
Brick red gravelly SILT some clay (dry)			S-7	23 41 47 56	100%							
		16										
		18										
Brick red medium SAND, trace coarse gravel (moist)			S-8	28 25 25 50	100%							
		24										
		22										
		24										
Brick-red silty CLAY (wet)			S-9	15 17 23 30	100%							
Brick red + green mottled CLAY		26										
		28										
		30										
Brick red silty CLAY (moist) trace coarse sand			S-10	29 30								

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LOG OF BORING MW-4 SHEET 3 OF 5

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. L/C.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
SAA		32	S-10	38 32	100%							
		34										
SAA		36	S-11	56 50 65 97		100%						
		38										Refusal at 39.4 ft
Light grey medium grained Crinoidal LIMESTONE some stylolites, poorly defined horizontal bedding slightly weathered (GASPORT member)		40	R-1		1.6/1.4=88%	1.6/1.6=100%			G			
		42	R-2		10/10 = 100% 8.1/10 = 81%		HORIZONTAL		P P C			
		44							P			
		46							C			
		48							C			
									C			

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LOG OF BORING MW-41 SHEET 4 OF 5

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	SAMPLES PENETR. RESIST. BL/6IN.	SAMPLES RECOV., %	ROCK CORE RQD	ROCK CORE BEDDING	ROCK CORE FRACTURE SKETCH	ROCK CORE FRACTURE COND.	ROCK CORE WEATHERING	WATER TEST	REMARKS
SAA		52							G			
		54	R-3		10/10 = 100%	9.8/10 = 98%						
Dark gray fine grained shaley DOLOMITE thin horizontal bedding some stylolites (Delaware member) petroleum odor on fresh fractures		56							G			
		58							G			
									G			
		60							G			
		62	R-4		10/10 = 100%	9.1/10 = 91%						
		64										
Dark Gray fine grained Liney SHALE - thin horizontal laminae (Rochester Shale) Petroleum odor on fresh fractures		66							G			

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LOG OF BORING MW-4 SHEET 5 OF 5

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
SAA		68, 70, 72, 74, 76, 78, 80, 82	R-5		10/10 = 100 % 9.2/10 = 92 %				G, G, G, G, P, F, F, C, 3, F			
Boring terminated at 82.2ft Monitoring well installed												

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LOG OF BORING IW-1 **SHEET** 1 **OF** 1

PROJECT AND LOCATION NYSEG – LOCKPORT		**ELEVATION AND DATUM** 594.37'	**PROJECT NO.** 82C4495
COORDINATES N 844.45 E 1552.10			
DRILLING AGENCY Pittsburgh Testing (Earth Dimensions)	**FOREMAN** S Misner	**DATE STARTED** 12/2/82	**DATE FINISHED** 12/3/82
DRILLING EQUIPMENT Mobil Truck Mounted – B40L		**COMPLETION DEPTH** 11.6 ft	**ROCK DEPTH** 7.9
SIZE AND TYPE OF BIT [illegible]	**SIZE AND TYPE CORE BARREL** NX	**NO. SAMPLES** DIST. 5 UNDIST. –	**CORE** [illegible]
CASING 3" Black Steel		**WATER LEVEL** FIRST	**COMP.** **24 HR.**
CASING HAMMER **WEIGHT** 140 LBS	**DROP** 30"	**BORING ANGLE AND DIRECTION** Vertical	
SAMPLER 2" OD Split Spoon		**INSPECTOR** H. Good	
SAMPLER HAMMER **WEIGHT** 140 LBS	**DROP** 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV, %	ROCK CORE: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHERING	WATER TEST	REMARKS
Asphalt + Concrete Road bed												
[illegible] GRAVEL and SILT (moist) Fill			S-1	6	100							Advanced [illegible]
Asphalt + Brick – OLD road bed; Orange-Red Gravelly SILT (dry fill)												
Brown SILT – (moist)		2	S-2	16, 22	50							
Gray C-F GRAVEL, some sand and clay [illegible]			S-3	21, 17, 9	50							
Brown gravelly SILT (dry fill)		4	S-4	6, 7, 4, 4	25							
Gray C-F GRAVEL, some sand, [illegible] clay (dry) – spoon may be advancing through weathered rock												
Black silty CLAY (organic [illegible]) (wet) some wood fragments, [illegible]		6	S-5	3, 1, 2	[illegible]							Spoon advanced 3" with 1 blow. Perm. test w/augers at 6 ft. + 2 in. Spoon hole 6-8 FT. Refusal at 7.9 ft.
Gray [illegible] CLAY (wet) [illegible]												
Gray crinoidal dolomitic LIMESTONE (GASPORT MEMBER) rock is slightly weathered but moderately weathered on fracture surfaces		8, 10	R-1		97%	[illegible]		[sketch]				Milky gray-white return flow during coring. No return during 6" Roller to enlarge 3" rock hole
Boring terminated at 11.6. Monitoring Well INSTALLED												

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LOG OF BORING IW-2 SHEET 1 OF 2

PROJECT AND LOCATION NYSEG - LOCKPORT		ELEVATION AND DATUM 604.93	PROJECT NO. 82C4495
COORDINATES N 533.77 E 1655.54			
DRILLING AGENCY Dominion Soils (Earth Dimensions)	FOREMAN S. LESCHYCHIAN	DATE STARTED 12/13/82	DATE FINISHED 12/13/82
DRILLING EQUIPMENT ATV MOUNTED BOA		COMPLETION DEPTH 21 ft.	ROCK DEPTH 18 ft.
SIZE AND TYPE OF BIT 8" O.D Auger	SIZE AND TYPE CORE BARREL NX	NO. SAMPLES DIST. 8	UNDIST. CORE
CASING 3" Black Steel		WATER LEVEL FIRST	COMP. 24 HR.
CASING HAMMER WEIGHT	DROP	BORING ANGLE AND DIRECTION Vertical	
SAMPLER 2in O.D. Split Spoon		INSPECTOR H. Gold	
SAMPLER HAMMER WEIGHT 140 LBS	DROP 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	SAMPLES PENETR. RESIST. BL/6IN	SAMPLES RECOV., %	ROCK CORE RQD	ROCK CORE BEDDING	ROCK CORE FRACTURE SKETCH	ROCK CORE FRACTURE COND.	ROCK CORE WEATHER-ING	WATER TEST	REMARKS
Asphalt Brick		0										
Brown black CLAY, trace medium gravel (moist)		2	S-1	5 2 2 -	25%							
SAA, Some Cinders		4	S-2	3 12 5 5	25%							
Brown-green silty CLAY some c-f gravel (moist) Brown-green CLAY		6	S-3	2 4 4 9	50%							
SAA Red brown SILT (wet)		8	S-4	1 4 10 15	50%							
SAA		10	S-5	8 10 12 10	75%							
SAA		12	S-6	25 12	75%							

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LOG OF BORING IW-2 SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	SAMPLES: RECOV., %	ROCK CORE: ROD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE: SKETCH	ROCK CORE: FRACTURE: COND.	ROCK CORE: FRACTURE: WEATHERING	WATER TEST	REMARKS
		14		10								
				14								
SAA			S-7	25	100							
				33								
Brown Silty C-f GRAVEL (Dry)		16		87								
				70								
SAA (wet)			S-8	44	100							
				100								
		18		73								
				70								
												Roller cone to 21 ft.
		20										
Boring terminated at 21 ft. Monitoring well installed												

4

MONITOR WELL INSTALLATION REPORT

Project NYSEG - Lockport
Project No. 82C4495 Installed By Pittsburgh Testing
Monitor Well No. MW 1
Location Buffalo + S. Transit - 5
Date 12/8/82 Time

Method of Installation Advanced Auger through overburden - 3" casing grouted to top of rock - NX core advanced to 48 ft.

LOG OF MONITOR WELL

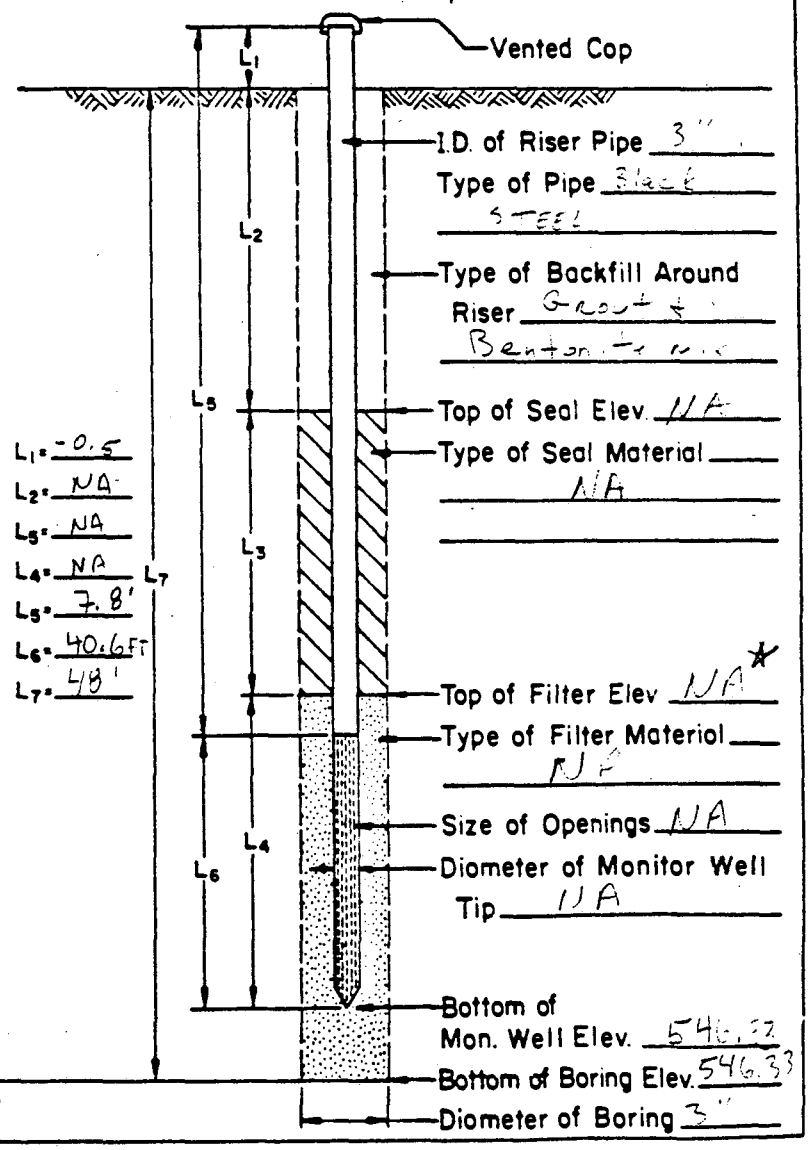
BORING

Depth in ft.	Description	Symbol
0	ASPHALT Black fine SAND (CINDERS) Brown Silty CLAY Gray C-M GRAVEL Black Organic SILT Brown CLAY	
10	Light gray crinoidal LIMESTONE	
20	Dark gray dolomitic LIMESTONE	
30	DARK gray LIMEY SHALE	
40		
	Boring terminated @ 48ft	

MONITOR WELL

Type of Monitor Well DEEP ROCK WELL

Ground Elev. 594.33 Top of Riser Elev. 593.83



L1 = -0.5
L2 = NA
L3 = NA
L4 = NA
L5 = 7.8'
L6 = 40.6FT
L7 = 48'

Vented Cop
I.D. of Riser Pipe 3"
Type of Pipe Black STEEL
Type of Backfill Around Riser Grout + Bentonite mix
Top of Seal Elev. NA
Type of Seal Material NA
Top of Filter Elev NA*
Type of Filter Material NA
Size of Openings NA
Diameter of Monitor Well Tip NA
Bottom of Mon. Well Elev. 546.33
Bottom of Boring Elev. 546.33
Diameter of Boring 3"

Remarks Top of riser 0.5 ft below grade, set in cast iron utility box

* NA INDICATES NOT APPLICABLE ; ROCK WELL

Inspected By H Gold

MONITOR WELL INSTALLATION REPORT

Monitor Well No. MW-2

Project NYSEG - LOCKPORT Locotion S. Transit - opposite Gas Station

Project No. 82C4495 Installed By Dominion Soils Date 12/16/82 Time

Method of Installotion Auger through overburden - CASING set 1 ft into Rock - NX CORE of Rock

LOG OF MONITOR WELL

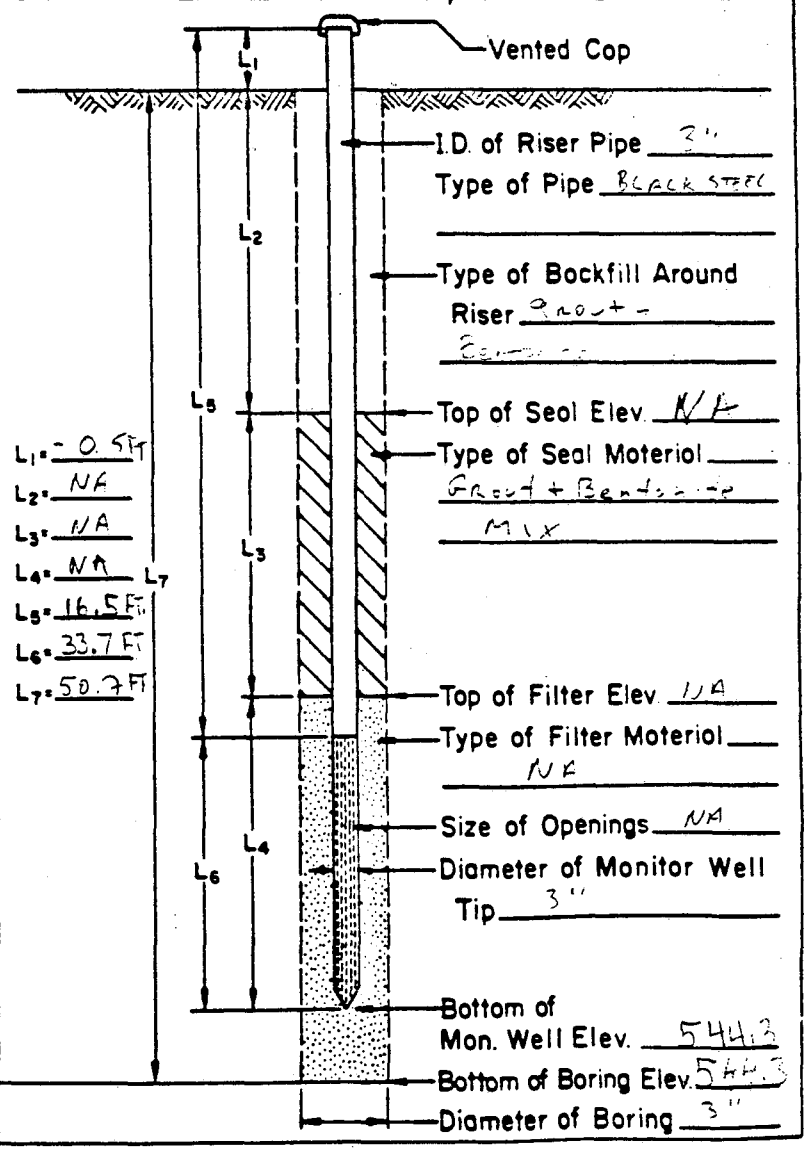
BORING

Depth in ft.	Description	Symbol
0	Asphalt concrete Tan c-f SAND Brown sandy CLAY	
10	Green brown mottled CLAY	
20	Light gray medium grained Crinoidal LIMESTONE Dark gray shaley DOLOMITE	
30	Dark gray limey SHALE	
40		
50		

MONITOR WELL

Type of Monitor Well Deep rock well

Ground Elev. 595.00 Top of Riser Elev. 594.00



L1 = 0.5 Ft.
L2 = NA
L3 = NA
L4 = NA
L5 = 16.5 Ft.
L6 = 33.7 Ft.
L7 = 50.7 Ft.

Remarks Top of riser 1ft. below grade, set in CAST IRON utility box

Inspected By H. GOLD

MONITOR WELL INSTALLATION REPORT

Monitor Well No. MW-3

Project NYSEG - Lockport Location [illegible] Substation

Project No. 82C 4495 Installed By Pittsburg Testing Date [illegible] Time

Method of Installation Advanced auger through overburden - casing set [illegible] on rock. Sealed with grout - [illegible] - Advanced NX core - 60 ft.

LOG OF MONITOR WELL

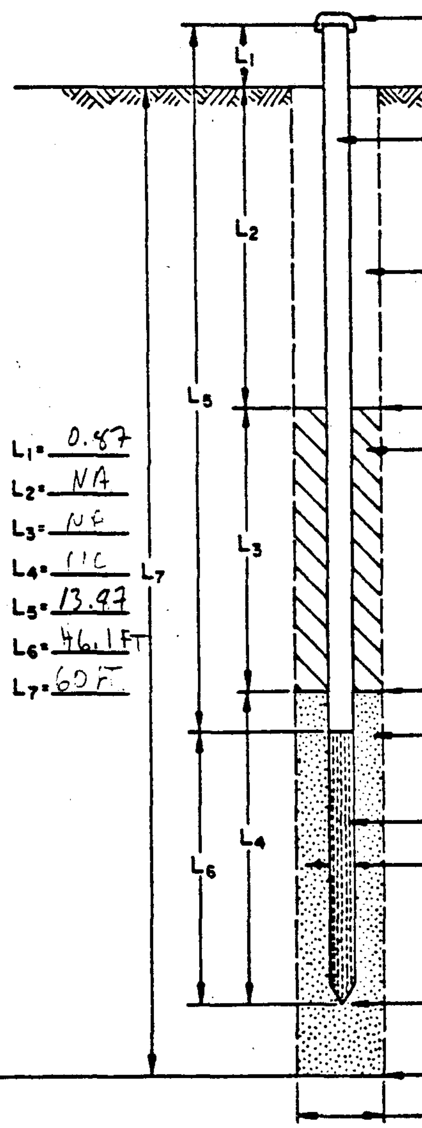
BORING

Depth in ft.	Description	Symbol
0	Gray Gravel; Red brown SILT	
5	Brown black SAND, some wood fragments; mottled Clay + SAND	
10	Red brown SILT	
15	Light gray Dolomite	
20	Light gray Crinoidal LIMESTONE	
25		
30	Dark gray Shaley DOLOMITE	
35		
40	Blackish gray Limey SHALE	
45		
50		
55		
60	Boring terminated @ 60 ft	

MONITOR WELL

Type of Monitor Well DEEP ROCK WELL

Ground Elev. 600.95 Top of Riser Elev. 601.42



L1= 0.47
L2= NA
L3= NA
L4= NA
L5= 13.47
L6= 46.1 FT
L7= 60 FT

Vented Cap

I.D. of Riser Pipe 3"

Type of Pipe Black Steel

Type of Backfill Around Riser Grout + Bentonite Mix

Top of Seal Elev. NA

Type of Seal Material NA

Top of Filter Elev. NA

Type of Filter Material None

Size of Openings — NA

Diameter of Monitor Well Tip NA

Bottom of Mon. Well Elev. 551.8[illegible]

Bottom of Boring Elev. 551.8[illegible]

Diameter of Boring 3"

Remarks 3" Steel Riser Pipe Set + Grouted To Top of Rock. Open Rock Well 13' Depth To 60 ft Depth.

Inspected By H. Gold

WOODWARD-CLYDE CONSULTANTS

MONITOR WELL INSTALLATION REPORT

Monitor Well No. MW-4

Project NYSEG - LOCKPORT Location SAXTON AVE

Project No. 82C4495 Installed By Dominion Soils Date 12/12/82 Time

Method of Installation Advanced Auger through overburden, set 4" CASING, NX core through rock

LOG OF MONITOR WELL

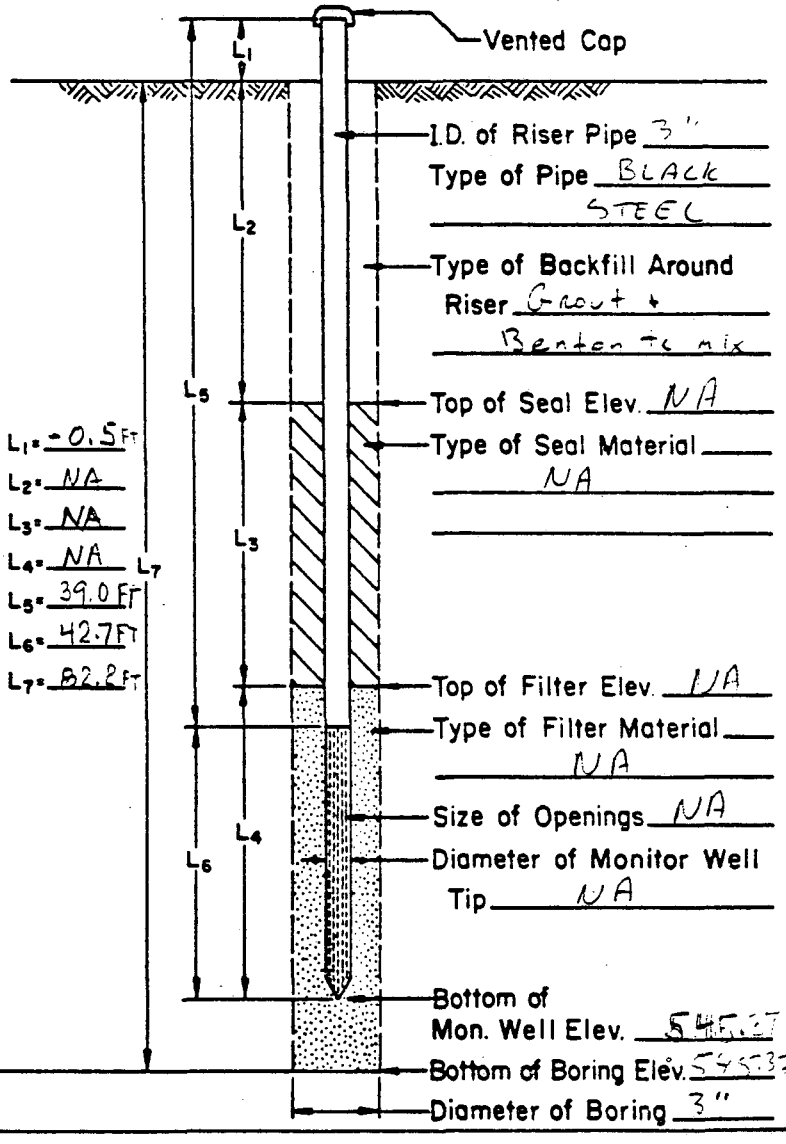
BORING

Depth in ft.	Description	Symbol
0	ASPHALT + CRUSHED STONE	
	Brick red clayey SILT and silty fine SAND	
20		
40	Light gray crinoidal LIMESTONE	
	Dark gray shaley DOLOMITE	
60	DARK gray Limey SHALE	
80	Boring terminated at 82.2'	

MONITOR WELL

Type of Monitor Well Deep rock well

Ground Elev. 627.57 Top of Riser Elev. 627.07



L1 = 0.5 Ft
L2 = NA
L3 = NA
L4 = NA
L5 = 39.0 Ft
L6 = 42.7 Ft
L7 = 82.2 Ft

Vented Cap

I.D. of Riser Pipe 3"

Type of Pipe BLACK STEEL

Type of Backfill Around Riser Grout + Bentonite mix

Top of Seal Elev. NA

Type of Seal Material NA

Top of Filter Elev. NA

Type of Filter Material NA

Size of Openings NA

Diameter of Monitor Well Tip NA

Bottom of Mon. Well Elev. 545.37

Bottom of Boring Elev. 545.37

Diameter of Boring 3"

Remarks Top of riser set 0.5 ft below grade in CAST IRON utility box

Inspected By H. GOLD

MONITOR WELL INSTALLATION REPORT

Monitor Well No. IW-1

Project NYSEG - Lockport — Location Buffalo + S. Transit

Project No. 32C4495 — Installed By Pittsburgh testing — Date 12.3.92 — Time

Method of Installation Advanced auger through over burden. NX core through rock. ENLARGED NX core hole with 6" Roller cone

LOG OF MONITOR WELL

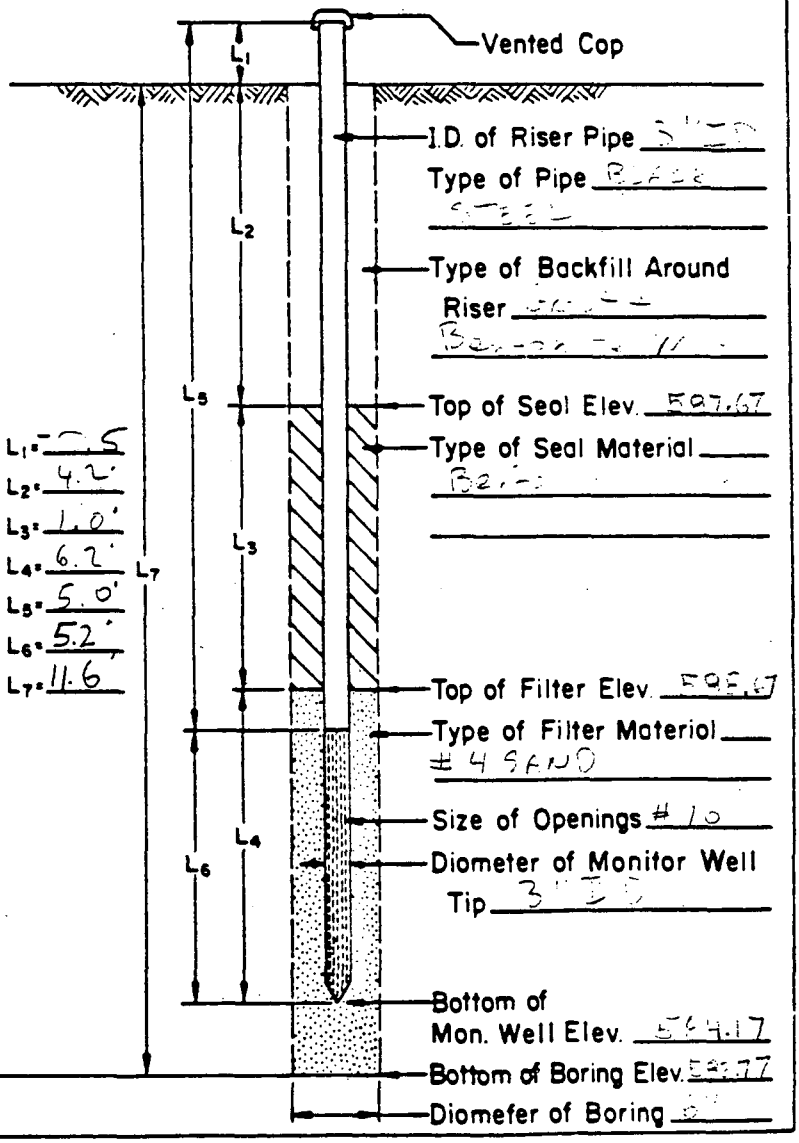
BORING

Depth in ft.	Description	Symbol
0	Road bed	
1	Brown f. GRAVEL + SILT (MOIST)	
	Orange-Red Gravelly SILT	
2	Brown SILT (MOIST)	
	Gray C-f GRAVEL, some	
3	Sand (dry) fill	
4	Brown gravelly SILT (dry) fill	
5	Gray C-f GRAVEL, some sand, silt + clay (dry)	
6	Black silty CLAY - (organic - peat, some wood fragments) sulferous	
7	smell (moist)	
	Gray silty CLAY (wet) trace fine sand	
8	Gray crinoidal dolomitic	
9	Limestone	
10		
11		
	Boring terminated @ 11.6 ft	

MONITOR WELL

Type of Monitor Well Overburden - top of rock

Ground Elev. 594.37 — Top of Riser Elev. 594.37



L1 = 0.5
L2 = 4.2'
L3 = 1.0'
L4 = 6.2'
L5 = 5.0'
L6 = 5.2'
L7 = 11.6

Remarks Cap is 0.5 ft. below grade

Inspected By Hans Gous

MONITOR WELL INSTALLATION REPORT

Project NYSEG - LOCKPORT
Project No. 82C4495 Installed By Dominion Soils
Monitor Well No. IW-2
Location La GRANGE St
Date 12/13/82 Time

Method of Installation Advanced 8" O.D. Auger to top of rock. Roller coned 3 ft. into rock. Set screen in # 4 SAND filter. Set bentonite seal, back fill to grade with grout + bentonite mix.

LOG OF MONITOR WELL

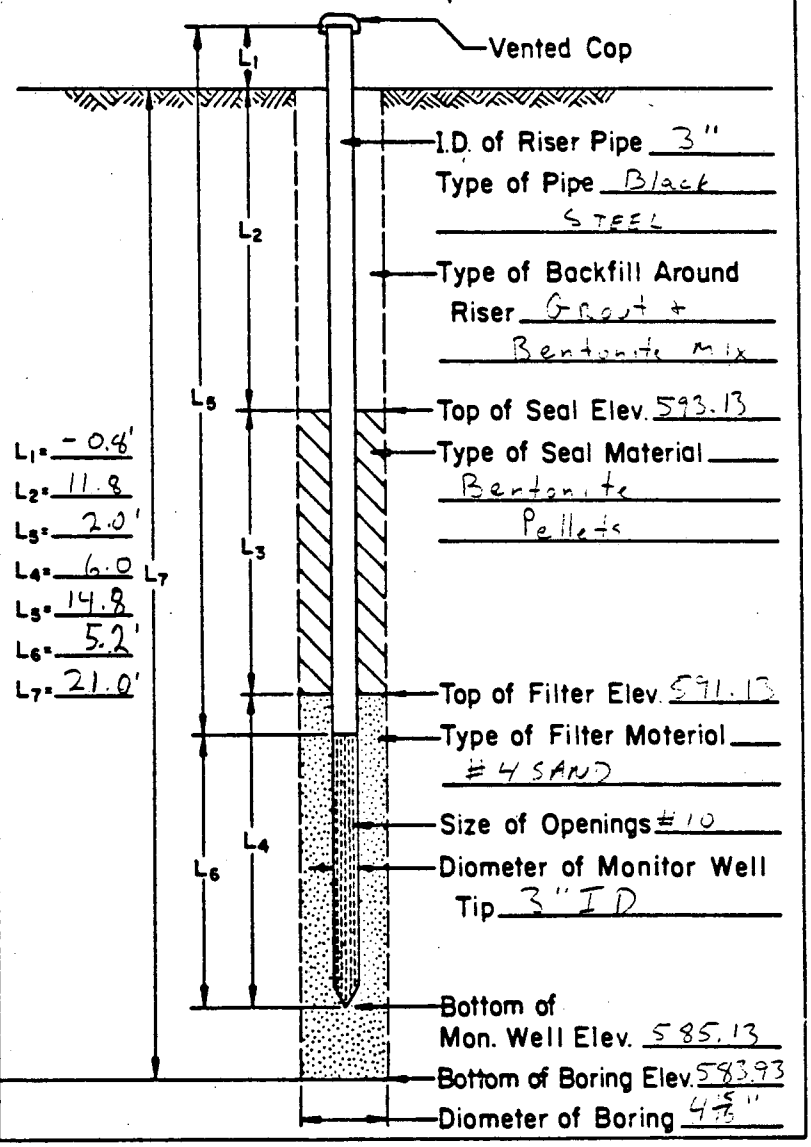
BORING

Depth in ft.	Description	Symbol
5	Brown black CLAY, some cinders, trace medium gravel	
	Brown green silty CLAY	
10	Red brown SILT	
15	Brown silty c-f GRAVEL	
	Top of rock at 18ft	
20		
	Boring terminated at 21ft.	

MONITOR WELL

Type of Monitor Well Overburden - top of rock

Ground Elev. 604.93 Top of Riser Elev. 604.13



L1 = -0.4'
L2 = 11.8
L3 = 2.0'
L4 = 6.0
L5 = 14.8
L6 = 5.2'
L7 = 21.0'

- Vented Cap
- I.D. of Riser Pipe 3"
- Type of Pipe Black STEEL
- Type of Backfill Around Riser Grout + Bentonite mix
- Top of Seal Elev. 593.13
- Type of Seal Material Bentonite Pellets
- Top of Filter Elev. 591.13
- Type of Filter Moteriol # 4 SAND
- Size of Openings #10
- Diometer of Monitor Well Tip 3" ID
- Bottom of Mon. Well Elev. 585.13
- Bottom of Boring Elev. 583.93
- Diometer of Boring 4 5/8"

Remarks Top of riser set below grade in CAST IRON utility box.

Inspected By H. GOLD

general testing corporation

Water and Wastewater Testing Specialists

710 Exchange Street
Rochester. NY 14608
(716) 454-3760

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07602
(201) 488-5242

LABORATORY REPORT

Job No. 8816 Date Jan. 14, 1983

Client
Woodward Clyde
201 Willowbrook Blvd.
Wayne, NJ
Att: Don Ganser

Sample(s) Reference
Volatile Halogenated Organics
624 Series GC/MS METHOD

Lockport, NY

Date samples (x) received ( ) collected by General Testing 12/6/82

P.O. # _____

ANALYTICAL RESULTS

~~mg/kg unless stated otherwise~~ XX
All results ug/kg

Sample Description	
Date(s) Time(s)	12/6/82
Chloromethane	<10
Bromomethane	<10
Dichlorodifluoromethane, Vinyl Chloride*	<10
Chloroethane	<10
Methylenechloride	20
Fluorotrichloromethane	<10
1,1-Dichloroethene	<10
1,1-Dichloroethane	<10
1,2-Dichloroethene (Trans)	<10
Chloroform	<10
1,1,2-Trichloro-1,2,2-Triflouroethane	<10
1,2-Dichloroethane	<10
1,1,1-Trichloroethane	<10
Carbon Tetrachloride	<10
Bromodichloromethane	<10
1,2-Dichloropropane	<10
1,3-Dichloropropene (Trans)	<10
Trichloroethene	<10
1,3-Dichloropropene (Cis), Chlorodibromomethane, 1,1,2-Trichloroethene*	<10
2-Chloroethylvinylether	<10
Bromoform	<10
1,1,2,2-Tetrachloroethane, Tetrachloroethlene*	<10
Monochlorobenzene	<10
1,3-Dichlorobenzene (m)	<10
1,2-Dichlorobenzene (o)	<10
1,4-Dichlorobenzene (p)	<10

Analytical procedures in accordance with the Federal Register Method 624, 12/79.

*Elute together

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.

(<) indicates lowest detectable concentration with procedure used

Laboratory Director

water and wastewater testing specialists

general testing corporation

710 Exchange Street
Rochester, NY 14608
(716) 454-3760

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07601
(201) 488-5242

LABORATORY REPORT

Job No. 8816 Date Jan. 14, 1983

Client

Woodward Clyde
201 Willowbrook Blvd.
Wayne, NJ
Att: Don Ganser

Sample(s) Reference

ACID EXTRACTABLE GC/MS METHOD
Test Well Soil
Lockport, NY

Date samples (x) received ( ) collected by General Testing 12/6/82

P.O. # _____

ANALYTICAL RESULTS

(mg/l unless stated otherwise)
~~xxxxxxxxxxxxxxx~~
All results ug/kg

Sample Description	
Date(s) Time(s)	12/6/82
Cresol	<500
Cresylic acid	<500
Dichlorophenoxy-acetic acid	<500
2,4-Dimethylphenol	<5000
4,6-Dinitro-o-cresol	<5000
4-Nitrophenol	<500
Pentachlorophenol	<500
Phenol	<500
Tetrachlorophenol	<500
Trichlorophenol	<500
2,4,5-TP (Silvex)	<500

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.
(<) indicates lowest detectable concentration with procedure used

Richard Schutz
Laboratory Director

general testing corporation

Water and Wastewater Testing Specialists

326 John Street
Rochester, NY 14623
(716) 424-1970

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07602
(201) 488-5242

LABORATORY REPORT

Job No. 8816 **Date** Jan. 14, 1983

Client
Woodward Clyde
201 Willowbrook Blvd
Wayne, NJ
Att: Don Ganser

Sample(s) Reference
Pesticides and PCB's (625 Series)
Test Well Soil
Lockport, NY

Date samples (X) received ( ) collected by General Testing 12/6/82

P.O. # _____

ANALYTICAL RESULTS

(mg/kg unless stated otherwise)
all results ug/kg

Sample Description	
Date(s)	12/6/82
Time(s)	
a (α)-BHC	<200
b (β)-BHC	<200
g (γ)-BHC	<200
Heptachlor	<200
d (δ)-BHC	<200
Aldrin	<200
Heptachlorepoxide	<200
a (α)-Endosulfan I	<200
p, p' DDE	<200
Dieldrin	<200
o, p' TDE (DDD)	<200
Endrin	<200
p, p' TDE (DDD)	<200
b (β)-Endosulfan II	<200
p, p' DDT	<200
Endrin Aldehyde	<200
Endosulfan Sulfate	<200
Mirex	<200
Methoxychlor	<200
Chlordane	<200
Toxaphene	<200
PCB 1016	<200
PCB 1221	<200
PCB 1232	<200
PCB 1242	<200
PCB 1248	<200
PCB 1254	<200
PCB 1260	<200

Analytical procedures in accordance with the Federal Register Method 625, 12/79.
*Elute Together

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.
(<) indicates lowest detectable concentration with procedure used

Laboratory Director

general testing corporation

Water and Wastewater Testing Specialists

326 John Street
Rochester, NY 14623
(716) 424-1970

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07602
(201) 488-5242

LABORATORY REPORT

Job No. _____ Date _____

Client

Woodward-Clyde
201 Willobrook Blvd
Wayne, NJ 07470

Sample(s) Reference

Test Well Soil
Lockport, New York
Phenols 604 Series GC METHOD

Date samples ( ) received ( ) collected by General Testing

P.O. # _____

ANALYTICAL RESULTS

(mg/l unless stated otherwise)

Sample Description	Test Well Soil (ug/g)
Date(s) Time(s)	
2-Chlorophenol	<25 ug/g
2-Nitrophenol	<25
Phenol	<25
2,4-Dimethylphenol	<25
2,4-Dichlorophenol	<25
2,4,6-Trichlorophenol	<25
4 Chloro-3-methylphenol	<25
2,4-Dinitrophenol	<250
2 Methyl-4,6-dinitrophenol	<250
Pentachlorophenol	<25
4-Nitrophenol	<25

Analytical procedures in accordance with the Federal Register Method 604, 12/79.

*Elute Together

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.
(<) indicates lowest detectable concentration with procedure used

David Turner
Laboratory Director

water and wastewater testing specialists

general testing corporation

710 Exchange Street
Rochester, NY 14608
(716) 454-3760

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07601
(201) 488-5242

LABORATORY REPORT

Job No. 8816 Date Jan. 14, 1983

Client
Woodward Clyde
201 Willowbrook Blvd.
Wayne, NJ
Att: Don Ganser

Sample(s) Reference
BASE NEUTRAL GC/MS METHOD
Test Well Soil
Lockport, NY

Date samples (x) received ( ) collected by General Testing 12/6/82

P.O. # _____

ANALYTICAL RESULTS

(mg/l unless stated otherwise)
All results ug/kg

Sample Description	
Date(s) Time(s)	12/6/82
N-Nitrosodimethylamine	<4000
1,3 Dichlorobenzene	<4000
1,4 Dichlorobenzene	<4000
Bis (2-Chlorethyl) Ether	<4000
1,2 Dichlorobenzene	<4000
Hexachlorethane	<4000
Bis (2-Chloroisoprophyl) Ether	<4000
N-Nitrosodi-N-Propylamine	<4000
Nitrobenzene	<4000
Isophorone	<4000
Hexachlorobutadiene	<4000
1,2,4 Trichlorobenzene	<4000
Napthalene	63,000
Bis(2-Chloroethoxy) Methane	<4000
Hexachlorocyclopentadiene	<4000
2-Chloronaphthalene	<4000
Acenaphtylene	12,000
Acenaphthene	4400
Dimethyl Phthalate	<4000
2,6 Dinitrotoluene	<4000
4 Chlorophenyl Phenyl Ether	<4000
Fluorene	14,000
2,4 Dinitrotoluene	<4000
1,2 Dinitrotoluene	<4000
Diethyl Phthalate	<4000
N-Nitrosodiphenylamine	<4000
Hexachlorobenzene	<4000
4 Bromophenyl Phenyl Ehter	<4000
Phenanthrene	38,000
Anthracene	11,000

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.
(<) indicates lowest detectable concentration with procedure used

Richard Schuster
Laboratory Director

water and wastewater testing specialists

general testing corporation

710 Exchange Street
Rochester, NY 14608
(716) 454-3760

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07601
(201) 488-5242

LABORATORY REPORT

Job No. 8816 Date Dec. 14, 1983

Client Woodward Clyde
201 Willowbrook Blvd.
Wayne, NJ
Att: Don Ganser

Sample(s) Reference

BASE NEUTRAL GC/MS METHOD
Test Well Soil
Lockport, NY

Date samples (x) received ( ) collected by General Testing 12/6/82

P.O. # _____

ANALYTICAL RESULTS

~~Unless stated otherwise~~
All results ug/kg

Sample Description	
Date(s) Time(s)	12/6/82
Di-N-Butyl Phthalate	<4000
Fluoranthene	17,000
Pyrene	13,000
Benzidine	<4000
Butyl Benzyl Phthalate	<4000
Bis (2-Ethylhexyl) Phthalate	<4000
Chrysene	7200
Benzo (a) Anthracene	8400
3,3 Dichlorobenzidine	<4000
Di-N-Octyl Phthalate	<4000
Benzo (b) Fluoranthene, Benzo (k) Fluoranthene *	11,000
Benzo (a) Pyrene	6800
Dibenzo (a,h) Anthracene	<10,000
Indeno (1,2,3-cd) Pyrene	<10,000
Benzo (ghi) Perylene	<10,000

* Compounds elute together

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.
(<) indicates lowest detectable concentration with procedure used

Laboratory Director

water and wastewater testing specialists

general testing corporation

710 Exchange Street
Rochester, NY 14608
(716) 454-3760

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07601
(201) 488-5242

LABORATORY REPORT

Job No. 8816 Date Jan. 14, 1983

Client

Woodward Clyde
201 Willowbrook Blvd.
Wayne, NJ 07470
Att: Don Ganser

Sample(s) Reference

Test Well Soil

Date samples (x) received ( ) collected by General Testing 12/6/82

P.O. # _____

ANALYTICAL RESULTS

All results ug/g ppm

Sample Description	
Date(s) Time(s)	12/6/82
Cyanides, Total	.35
Total Phenols	8.4
Arsenic	12
Cadmium	0.2
Chromium, Total	9.5
Copper	16.5
Lead	4.4
Mercury	1.0
Nickel	8.6
Selenium	<51
Silver	1.2
Zinc	30
Beryllium	0.4
Thallium	15
Antimony	26

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.
(<) indicates lowest detectable concentration with procedure used

Laboratory Director

general testing corporation

Water and Wastewater Testing Specialists

710 Exchange Street
Rochester, NY 14608
(716) 454-3760

625 Delaware Ave.
Buffalo, NY 14202
(716) 883-4990

85 Trinity Place
Hackensack, NJ 07602
(201) 488-5242

LABORATORY REPORT

Job No. 8816 **Date** Jan. 14, 1983

Client
WoodWard Clyde
201 Willowbrook Blvd.
Wayne, NJ
Att: Don Ganser

Sample(s) Reference
Volatile Aromatics
625 Series GC/MS METHOD

Lockport, NY

Date samples (x) received ( ) collected **by General Testing** 12/6/82

P.O. # _____

ANALYTICAL RESULTS

~~(mg/L unless stated otherwise)~~ x
All results ug/kg

Sample Description	
Date(s) Time(s)	12/6/82
Benzene	<10
Toluene	71
Ethyl Benzene	72
p-Xylene	<10
m-Xylene	<10
o-Xylene	<10
Styrene	<10
n-Propylbenzene	<10

Analytical procedures in accordance with the Federal Register Method 625, 12/79.

* Elute Together

Analytical procedures in accordance with Standard Methods for the Examination of Water and Wastewater, 14th Edition and Methods for Chemical Analysis of Water and Wastes, EPA.
(<) indicates lowest detectable concentration with procedure used

Laboratory Director