SUPPLEMENTAL SITE INVESTIGATION
FOR
TRANSIT STREET MGP SITE
LOCKPORT, NEW YORK

Prepared For:

NEW YORK STATE ELECTRIC & GAS CORPORATION
BINGHAMTON, NEW YORK

Prepared By:

ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

ATLANTIC PROJECT NO.: 1284-06-05

JUNE 22, 1993

ATLANTIC

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EXECUTIVE SUMMARY

New York State Electric and Gas Corporation (NYSEG) is investigating several former manufactured gas plant (MGP) sites to evaluate potential risk associated with MGP by-products and residuals to human health and the environment. MGPs were the major source of combustible gas at 1500 to 2500 sites in the U.S. between 1816 and the 1950's. NYSEG acquired the Transit Street former MGP site in Lockport, Niagara County, New York in 1929.

The Transit Street site is currently occupied by an electric substation comprising a transformer house, switch house, and storage building (see Plate 1). The foundation of a former gas holder is present in the northeastern corner of the site. The site is surrounded by a chain link fence, and access is provided through two locked gates. Land use surrounding the site is both residential and commercial. Two gasoline stations are located near the site, one immediately downgradient and the other one block upgradient. Documented gasoline spills have occurred at both stations. The New York State Barge Canal is located one to two blocks northwest of the site and flows to the northeast.

In 1982, tar was observed in bedrock fractures in the wall of the New York State Barge Canal near the Transit Street site. At this time, NYSEG contracted Woodward-Clyde Consultants (WCC) to conduct a multi-task environmental investigation at the site. This study indicated the presence of MGP residuals in shallow bedrock migrating into the New York State Barge Canal as seeps northwest of the site. However, the WCC study did not characterize the overburden soils in the site vicinity. The New York State Department of Health (NYSDOH) expressed concern that seasonal high groundwater conditions might raise these contaminants into overburden soils and shallow groundwater, thereby exposing residents downgradient of the site to potential health risks. In 1991, NYSEG contracted Atlantic Environmental Services, Inc. (Atlantic) to conduct a supplemental site investigation to evaluate the extent of contamination related to MGP wastes in the overburden soils and shallow groundwater in the vicinity of the Transit Street site.

The objective of the supplemental site investigation was to evaluate the risk to area residents from potential MGP residues and other sources in the overburden by evaluating the extent of MGP residues in the overburden, determining the direction and extent of migration of MGP residues in the shallow groundwater, and identifying other potential sources of contamination intercepting or co-mingling with MGP residues (such as contaminants related to the local gasoline spills). Field activities conducted during the study included a soil gas survey, shallow subsurface boring to locate former MGP structures and collect on-site subsurface soil samples for analysis, drilling of test borings and monitoring wells, overburden permeability testing, groundwater and deeper subsurface soil sampling, air quality monitoring of residential homes, and a site survey (see Plate 1 for sampling locations). Two rounds of groundwater sampling were conducted: one in January 1992, when groundwater levels were expected to be relatively low, and one in May 1992, during expected seasonal high groundwater conditions. Concurrent soil gas surveying, permeability testing, air quality monitoring of residential homes, and shallow subsurface soil sampling were conducted during the May groundwater sampling round in order to evaluate contamination levels under seasonal high groundwater conditions.

All groundwater and soil samples were analyzed by gas chromatography/mass spectrometry (GC/MS) methods for volatile organic compounds (VOCs) (EPA Method 8240), semi-volatile organic compounds (SVOCs) (EPA Method 8270), and also for metals (6000-7000 series). Groundwater samples and shallow subsurface soil samples were also analyzed for cyanide (EPA Method 9010), and sulfide (EPA Method 9030). Groundwater samples also were analyzed for methyl tertiary butyl ether (MTBE) (EPA Method 8020), a compound associated with unleaded gasoline. In addition, infrared spectral (IR) analysis was performed on several soil and groundwater samples in order to determine the origin of contaminants. Air quality samples were analyzed in accordance with EPA Method T0-1 for volatile organic compounds. Soil gas samples were analyzed using a Photovac Model 10S50 portable GC equipped with a 10 m CPSIL-19 capillary column and a photoionization detector.

The following observations can be stated based on field and laboratory data acquired during the supplemental site investigation:

- Shallow subsurface soils at the site contain elevated levels of MGP related contaminants. Because the area is secured, however, these on-site residues do not create a risk to the general public based on the current land use. Elevated levels of PAHs were detected at one off-site residential location, immediately downgradient of the site. These residues may not pose a human health risk as they are 5.0 - 7.0 feet below land surface and have a low concentration (8.36 ppm) of probable carcinogenic PAHs.

- Subsurface soils (6 to 8 feet below the surface) from two locations immediately downgradient of the site contained elevated levels of contaminants related to MGP residuals. However, these levels may not represent a human health risk due to the depth of the soil in which they were detected and the lack of an exposure route.

- Shallow groundwater samples from two wells immediately downgradient of the site contained elevated concentrations of contaminants associated with MGP residuals. MTBE, a compound associated with the presence of gasoline, was found in groundwater samples collected adjacent to Garlock's Restaurant upgradient of the site. This restaurant is known to have been affected by fumes from a 1989 gasoline spill. Samples could not be collected from most wells downgradient of the site due to dry well conditions, indicating that MGP residuals were not raised into the overburden via groundwater at the time of the investigation. It is not known whether groundwater elevation is significantly higher at other times during the year. Measuring groundwater levels at the monitoring wells on-site at regular intervals would provide this information.

- Low levels of benzene, toluene and xylene were detected during air quality monitoring inside homes downgradient of the former MGP site. Concentrations detected were within background levels and EPA total exposure assessment methodology (TEAM) study results; however, benzene concentrations in most samples were above proposed AGC standards. The compounds detected could have been due to the presence of tar, various household items, and/or the proximity of a local gasoline station at which documented spills have occurred. Soil gas surveying performed concurrently with air quality monitoring found contaminant concentrations (primarily monocyclic aromatic hydrocarbons) ranging from nondetectable to low, all within background levels. Soil gas results suggest that the source of compounds detected during the air quality monitoring survey were not MGP-related. Neither airborne nor soil gas contaminants as detected in this investigation pose a risk to public health based on current AGC standards, EPA TEAM Study results, and concentrations measured upgradient of the former MGP site. The origin of odors previously detected by residents could not be conclusively determined, but it is likely these odors were related to gasoline spills and tank filling/venting procedures at the adjacent gasoline station.

- The majority of contaminants related to MGP wastes appear to reside in the bedrock and deep groundwater. The major concern regarding these contaminants is their entry into the canal via seepage from the bedrock. Although the canal is rarely used as a source of drinking water and the intake for canal water is upstream of the site, the canal is used for boating and fishing, and sediments are exposed during the winter months. There may be problems related to transfer of the contaminants to canal sediments and to bioaccumulation of PAH compounds in fish. A less likely exposure route could be through human contact with the sediments exposed during the winter months (WCC Task 4 Report, July 1985).

The following recommendations for further action are based on findings from this study and information provided by previous studies:

- The major objective of the field investigations conducted concurrently in May 1992 was to determine whether high groundwater conditions would raise LNAPLs and dissolved constituents of tar normally contained within bedrock and deep groundwater into overburden soils, potentially exposing residents downgradient of the Lockport site to levels of contamination of concern. However, groundwater levels were not significantly higher in May than in the January sampling round. It is recommended that groundwater elevation be monitored at regular intervals throughout the year to determine whether there is a significant seasonal difference in groundwater elevation. If groundwater elevation is found to be significantly higher at any time during the year, it is recommended that the soil gas survey and air quality monitoring study be conducted at that time.

- It is recommended that a site-specific health and safety plan be developed prior to any on-site activities or to any excavation greater than 5 feet in the area immediately downgradient of the site.

- WCC performed an endangerment assessment (WCC Task 4 Report, July 1985) stating analyses of tissue from fish inhabiting the canal would be necessary in order to accurately assess the levels of PAHs in those fish. The WCC Report recommended that if it were found that ingestion of the fish poses a significant health risk, a fishing ban should be imposed on the affected portions of the canal. WCC noted that further study would be necessary to determine the relative contribution of site derived material to bioaccumulation of PAHs in canal fish.

- The WCC endangerment assessment stated that analysis of canal sediments would be necessary in order to determine the degree, if any, to which these sediments represent a health risk via direct contact during winter months.

1.0 INTRODUCTION

The Lockport Transit Street site is the location of the former Manufactured Gas Plant (MGP) in Lockport, Niagara County, New York. The Transit Street MGP operated from 1851 to 1927. The processes used to manufacture gas at the Transit Street plant included coal carbonization and carburetted water gas. A multi-task environmental investigation of the former MGP site was conducted by Woodward Clyde Consultants (WCC) between October 1982 and January 1985. The investigation defined the extent and degree of MGP residual contamination in the bedrock; however, characterization of the overburden material was not conducted. The potential for seasonal high groundwater conditions to carry bedrock contamination into the overburden in the site vicinity was identified as a major human health concern due to the residential land use of the area. As a result, NYSEG contracted Atlantic Environmental Services, Inc. (Atlantic) to conduct a supplemental site investigation in order to evaluate human health and environmental risks associated with exposure to potential MGP residuals in the overburden.

The objective of the supplemental site investigation was to evaluate the risk to area residents from potential MGP residues or other sources in the overburden by:

- evaluating the extent of MGP residues in the overburden
- determining the direction and extent of migration of MGP residues in the shallow groundwater
- identifying other potential sources of contamination intercepting or co-mingling with MGP residues

The Supplemental Investigation is presented in the remaining sections of this report including Section 2.0 Site Background, Section 3.0 Site Activities, Section 4.0 Site Characterization, Section 5.0 Chemical Distribution of Contaminants, Section 6.0 Data Assessment, Section 7.0 Exposure Pathway Identification, and Section 8.0 Summary and Conclusions.

2.0 SITE BACKGROUND

The Transit Street site is located in a commercial and residential area in the City of Lockport, Niagara County, New York. The site location is depicted in Figure 2-1.

2.1 Site Description

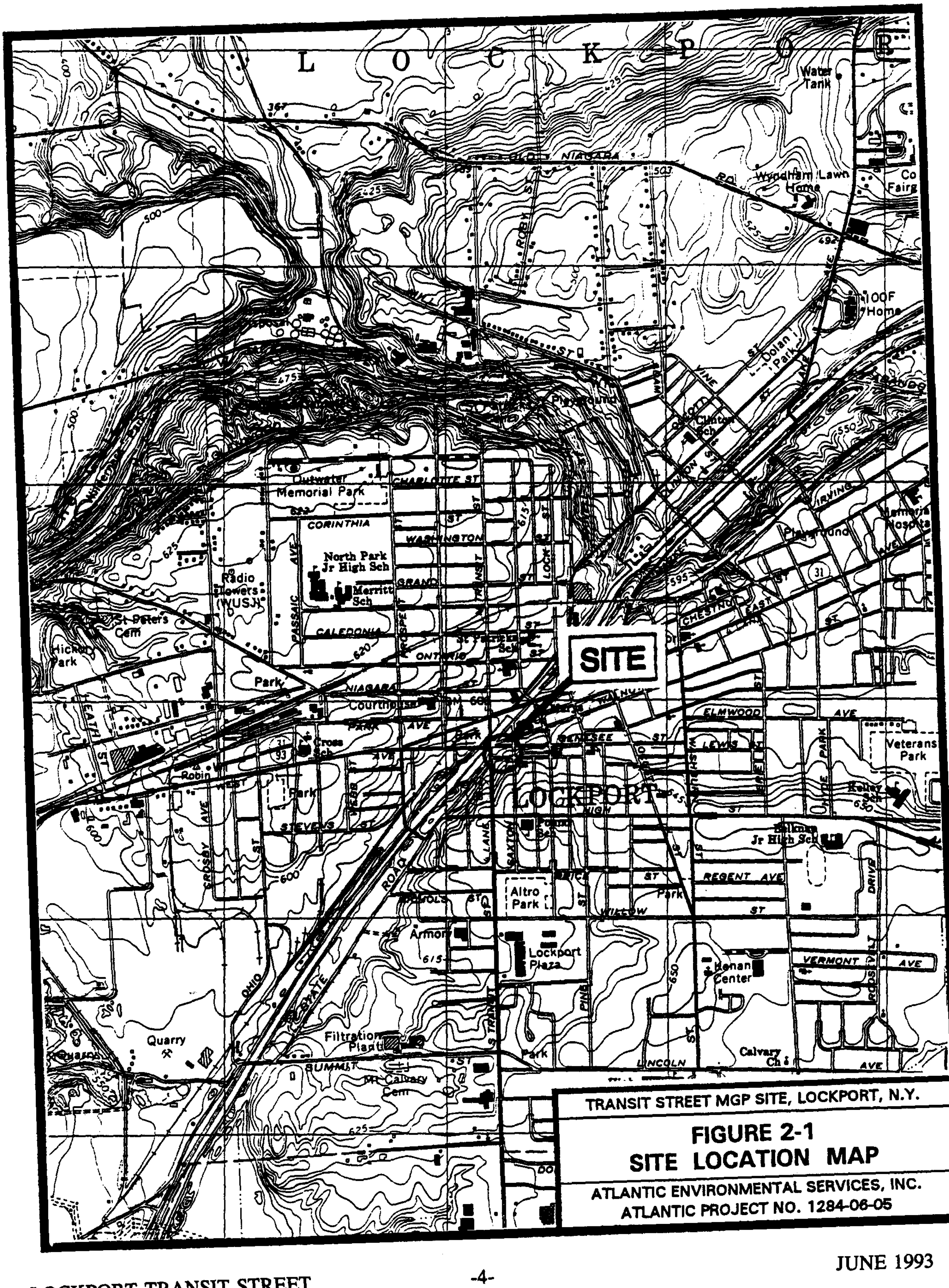
The site is an electrical substation currently owned by NYSEG and contains a transformer area, switch house, and storage building. The foundation of a former gas holder is present in the northeastern corner of the site. The site is entirely surrounded by a chain-link fence, complete with locked gates on LaGrange and Transit Streets. The site is bordered by LaGrange Street to the north, Saxton Street to the east, private residences to the south, and Transit Street to the west. The current site configuration and adjacent land use are illustrated in Figure 2-2.

Land use adjacent to the site consists of Garlock's Restaurant to the west-southwest of the site on the opposite side of Transit Street, Reed's Gas Station north of the site across LaGrange Street, a church and residences east of the site on the opposite side of Saxton Street, and residences to the south. An Atlantic Gas Station is located approximately 650 feet south of the site on the northeast corner of the High Street and Transit Street intersection. The New York State Barge Canal is located one to two blocks northwest of the site and flows to the northeast.

2.2 Site History

The Transit Street MGP operated from 1851 to 1927, according to NYSEG. During the first seven years of operation, the facility used whale oil as a feedstock. Manufactured gas production by coal carbonization began circa 1857-1859. In the coal carbonization process, bituminous coal was heated in a sealed chamber, causing the distillation of gas from coal and the formation of coke. Carburetted water gas was produced at the site beginning around 1914, as evidenced by the addition of a water gas department and oil tanks on the 1914 Sanborn Map and as referenced in the 1914 edition of Brown's Directories. Carburetted water gas, containing hydrogen and carbon monoxide, was produced by passing steam through a bed of incandescent coke (or coal). The resultant "blue gas" was then passed through two chambers containing hot firebrick into which oil was sprayed and the oil cracked into gaseous hydrocarbons and tar. Tars produced during coal carbonization were high in phenols and base neutral organics. Tars produced by carburetted water gas processes contain lower amounts of these compounds. Substantial amounts of cyanide and ammonia were typically produced by coal carbonization, but only trace amounts of cyanide were typically produced during carburetted water gas processes.

The Transit Street MGP was owned by City Gas and Electric Light Works from at least 1886 to 1894, according to Sanborn Maps and NYSEG property records (Sanborn Maps from 1886 through 1948 are provided in Appendix A). Lockport Gas and Electric Light Company acquired the site location in 1894 and owned it until 1907, when Lockport Light, Heat and Power Company took over the properties of Lockport Gas and Electric Light Company and Economy Light, Fuel and Power Company (Brown's Directories, 1908 and NYSEG property



TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 2-1
SITE LOCATION MAP

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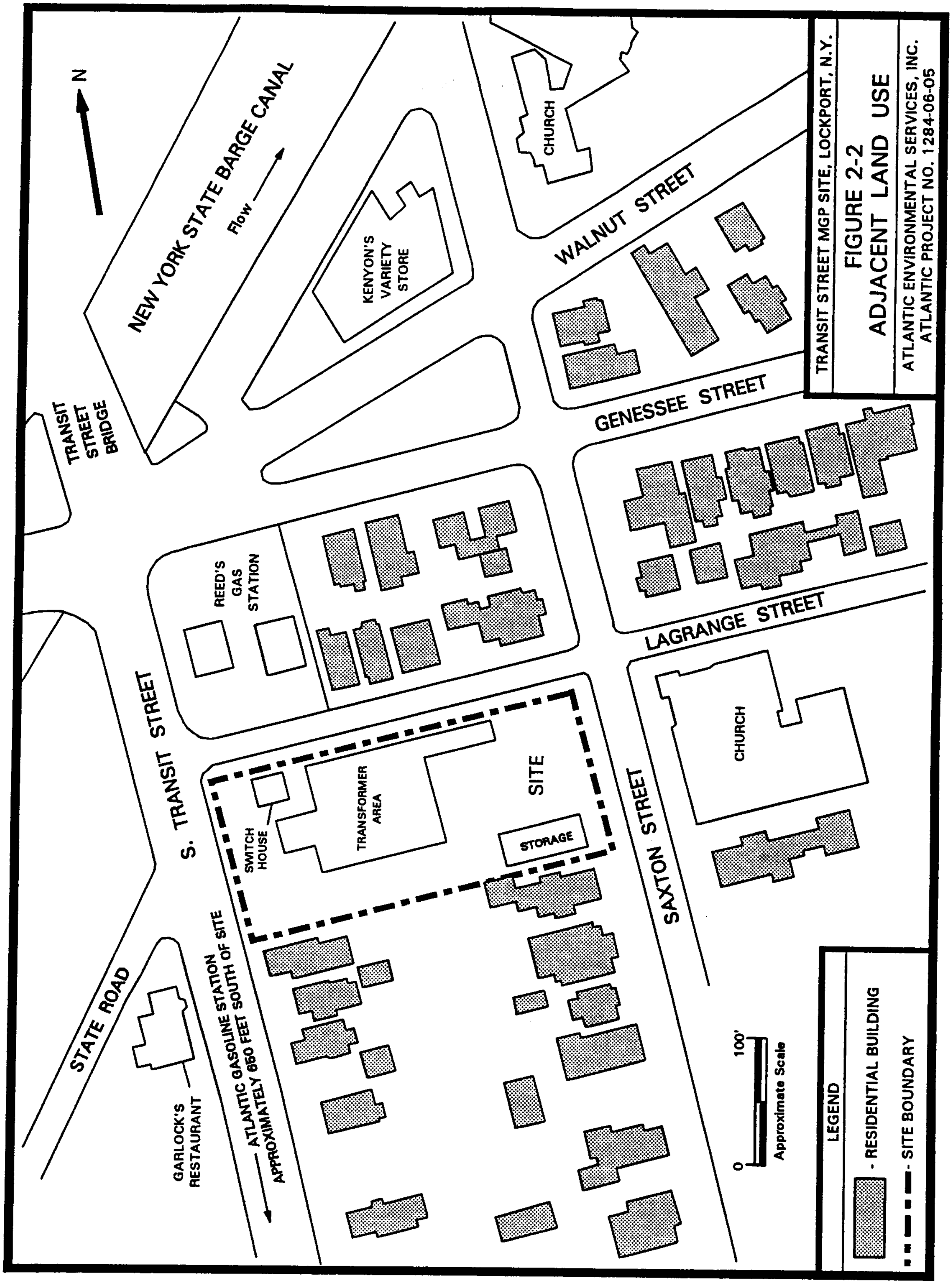

TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 2-2
ADJACENT LAND USE

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records). The Lockport Light, Heat and Power Company went under the control of United Gas and Electric Company of New Jersey in 1914 (Brown's Directories, 1914). NYSEG acquired ownership by a deed dated May 1, 1930 according to NYSEG property records, but did not operate the MGP according to the 1930 Brown's Directory.

The configuration of structures at the Transit Street Site from 1886 to 1948 are illustrated on Figure 2-3. The earliest configuration of the Transit Street MGP, as illustrated in Figure 2-3, is based on the 1886 Sanborn Map of the site. Site structures comprised a plant building made up of retorts, an engine room, and purifiers in the western part of the site. Three gas holders were located in the north-central and northeastern part of the site. Surrounding land use consisted of R.J. Sterrett Cooper Shop and private residences to the north, private residences to the east, south and southwest, and F. Elliott's Washing Machine Works to the west of Transit Street between State Road and the canal. According to the 1892 Sanborn Map, the Transit Street site configuration remained unchanged in 1892, at which time F. Elliott's Washing Machine Works was replaced by White and Clifford's Sash and Blind Factory.

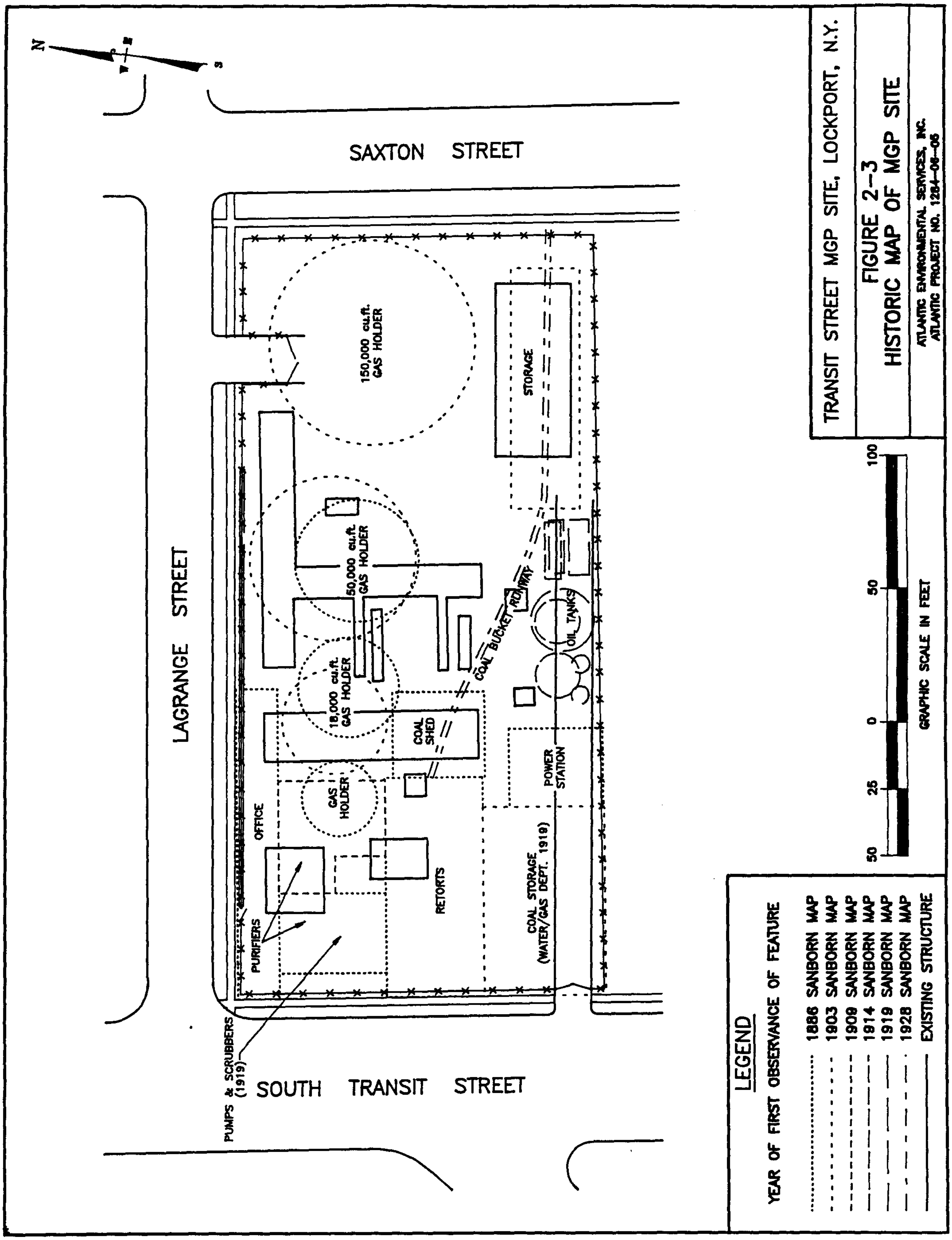
The easternmost gas holder was removed between 1892 and 1898, as evidenced on the 1898 Sanborn Map. The only change in adjacent land use in 1898 was the addition of the German Lutheran Church east of the site on the opposite side of Saxton Street.

Between 1898 and 1903, the adjacent private residence east of the site was removed and the site boundary was extended eastward to Saxton Street, according to the 1903 Sanborn Map. A dwelling with a storage shed was included in the new site boundary in the southeastern corner of the site. Three gas holders were located on the site in 1903. The middle holder appears to be larger and in a different location than it was on the 1898 Sanborn Map. It is unknown if the 1898 holder was replaced or if it is scaled and located differently on the 1903 Sanborn Map. Adjacent land use remained the same in 1903 except that the sash and blind factory was replaced by Niagara Textile Company.

The site configuration was essentially the same in 1909 as in 1903, according to the 1909 Sanborn Map. The capacity of the holders was listed as 18,000 cubic feet (c.f.) for the westernmost holder, 50,000 c.f. for the central holder, and 150,000 c.f. for the easternmost holder. The dwelling and storage building in the southeastern corner of the site was replaced by an electrical department and storage building. Adjacent land use remained the same in 1909.

The 1914 Sanborn Map documents the addition of water gas equipment in the southeastern part of the site and three oil tanks between the plant building and the water gas department along the southern site boundary. No changes in adjacent land use were depicted on the 1914 Sanborn Map.

The 1919 Sanborn Map documents the relocation of the water gas department from the southeast corner of the site to the southwest site corner. The storage shed remained in the southeastern part of the site. A total of five oil tanks were located along the southern site boundary, east of the new water gas department location. The Niagara Textile Company expanded between 1903 and 1919. The farmhouse located southwest of the site had been


TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 2-3
HISTORIC MAP OF MGP SITE
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SAXTON STREET
LAGRANGE STREET
SOUTH TRANSIT STREET
150,000 cu.ft. GAS HOLDER
STORAGE
50,000 cu.ft. GAS HOLDER
18,000 cu.ft. GAS HOLDER
GAS HOLDER
COAL BUCKET RUNWAY
OIL TANKS
COAL SHED
POWER STATION
OFFICE
RETORTS
PURIFIERS
COAL STORAGE (WATER/GAS DEPT. 1919)
PUMPS & SCRUBBERS (1919)
GRAPHIC SCALE IN FEET
50 25 0 50 100
LEGEND
YEAR OF FIRST OBSERVANCE OF FEATURE
1886 SANBORN MAP
1903 SANBORN MAP
1909 SANBORN MAP
1914 SANBORN MAP
1919 SANBORN MAP
1928 SANBORN MAP
EXISTING STRUCTURE

replaced by the Gerner Hotel with a livery and stable.

The 18,000 c.f. capacity gas holder (westernmost holder) and the storage shed in the southeastern site corner were removed between 1919 and 1928, according to the 1928 Sanborn Map. A coal pit with northern and southern retaining walls was located in the southeastern corner of the site. A coal bucket runway extended from the coal pit to the plant building. The R.J. Sterrett Cooper Shop located north of the site was replaced by Extors Distributing by 1928. An automobile sales and service shop was located north of and adjacent to Extors Distributing (currently Reed's Gasoline Station).

All of the MGP structures were removed from the Transit Street site between 1928 and 1948, according to the 1948 Sanborn Map. The last year of gas production at the Transit Street site is believed to be 1927, based on recollection of present and former employees. The dismantling procedures of the Transit Street MGP are unknown. Underground MGP structures that may still exist at the site include portions of gas holders, debris associated with tar settling pits, and miscellaneous underground piping.

The earliest production figures for the Transit Street MGP show that the facility manufactured an average of 46.3 million cubic feet (MCF) of coal gas in 1907 (Brown's Directories, 1907). Coal gas production increased to an average of 66.6 MCF in 1913 (Brown's Directories, 1913). The addition of water gas equipment in 1914 increased the average annual gas production to 70.7 MCF (Brown's Directories, 1914). The annual gas production continued to increase at the Transit Street site to an average of 154 MCF in 1926 (Brown's Directories, 1926).

Disposal practices at the Transit Street MGP site are unknown. The majority of the coke, tar and ammonia by-products generated at the site between 1920 and 1926 were listed as being sold (Brown's Directories, 1920 through 1926). A tar works operation, referred to as the State Road Tar Works, previously existed approximately 1.5 blocks west of the Transit Street MGP between State Road and the New York State Barge Canal. Based on information provided by NYSEG, it is possible that the State Road Tar Works were established as a secondary processing plant for tar generated at the Transit Street MGP. The Tar Works were in existence from between 1898 and 1903 until between 1909 and 1914, according to Sanborn Maps. The State Road Tar Works site contained a saturating works building and several tar and ammonia tanks, suggesting that the Transit Street MGP may have also sent the by-product ammonia to the State Road facility. The presence of purifier waste in a very limited area and a letter from a former area resident who reported sliding down piles of wood chips at the State Road site (both reported by NYSEG personnel) suggest that the Transit Street MGP purifier wastes may also have been taken to the State Road site. NYSEG conducted a preliminary investigation of the State Road Site in 1990. Future additional investigation efforts at the site are planned; however, no imminent threat was identified.

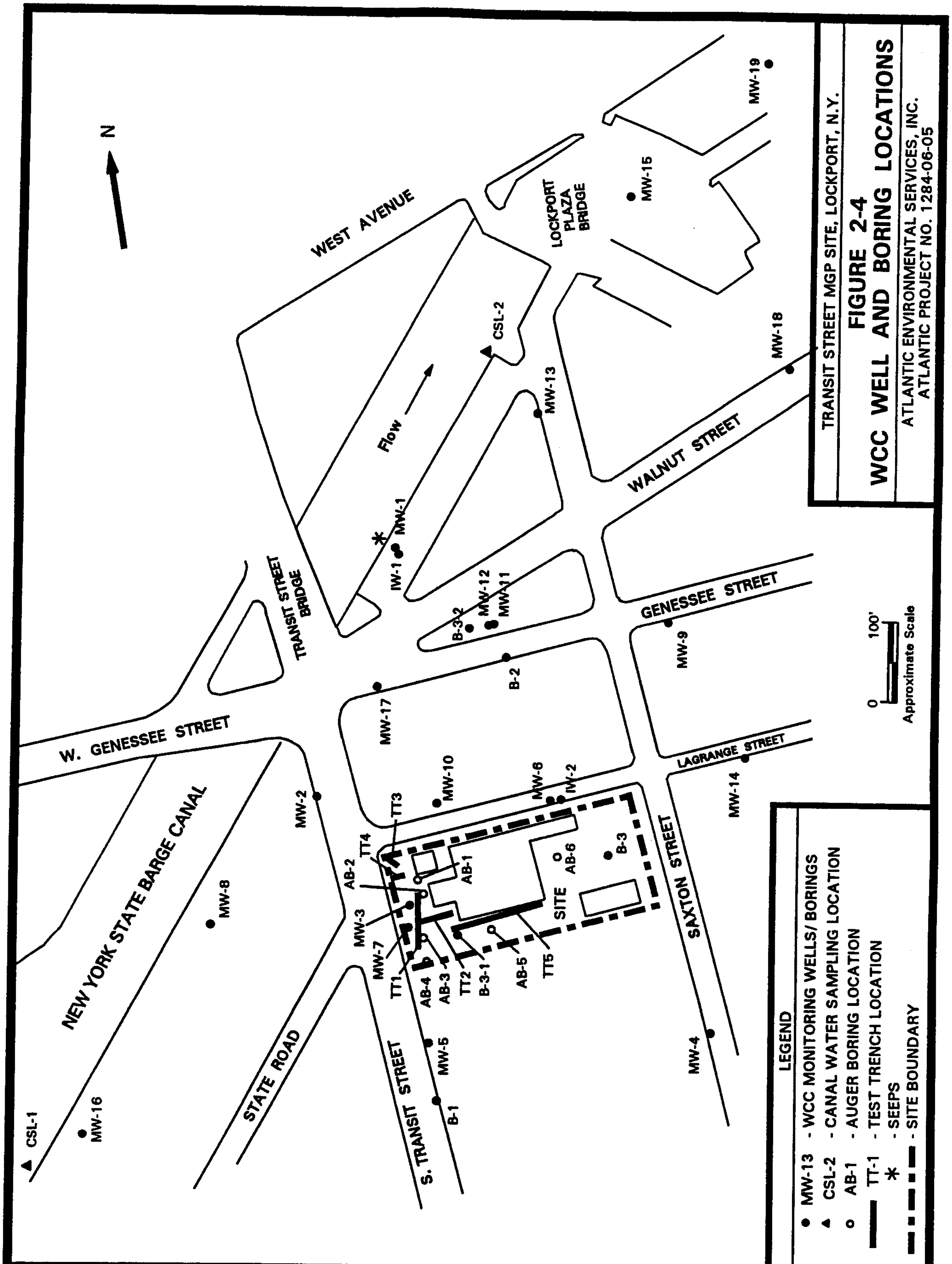
2.3 Previous Investigations

Woodward-Clyde Consultants (WCC) conducted a multi-task environmental investigation at the Transit Street site between October 1982 and January 1985. WCC installed 21 monitoring wells, drilled eleven borings, and excavated five test trenches as part of the investigation. Sample locations are illustrated in Figure 2-4. Details of the investigations have been compiled into a two-volume summary report by WCC (WCC, 1985). An overview of the investigation is provided below.

The presence of MGP residuals was documented in shallow (generally 30-50 feet below land surface) bedrock migrating into the New York State Barge Canal as seeps northwest of the Transit Street site. Two seep samples were collected in February 1983 from the base of the south wall of the Lockport Canal north of the Transit Street bridge. Seep 1 (CSL-1) was located 100 feet northeast of the Transit Street bridge, and Seep 2 (CSL-2) was located 169 feet north of the bridge (Figure 2-4). Both samples represent seepage that was entering the canal from the bedding plane fractures of the DeCew formation. In addition, a soil sample was collected at the substation in February 1983 and groundwater samples were collected from monitoring wells MW-1, MW-2, MW-3, MW-4 and IW-5 (Figure 2-4). The soil sample contained organic oils and tars presumed to be typical of residual coal tar wastes generated at that site. The soil, seep, and groundwater samples were analyzed for specific pollutants and the base neutral compounds of the EPA priority pollutant list. In addition, a C_5 to C_{22} chromatogram scan was performed to characterize the range of organic compounds detected in groundwater, the seeps, and the soil sample. The laboratory reported that all the chromatograms were virtually identical to the chromatogram of the soil sampled collected on-site. Results of the pollutant analysis showed that pollutants characteristic of coal tar were present in the soil samples, the seep samples, and two of the groundwater samples (WCC Report).

Conceptually, migration of organic contaminants from site soils to groundwater within bedrock was reported to occur by downward percolation through the overburden to the bedrock surface. According to the WCC Summary Report, indications of tar on-site were encountered from 0.5 to 15 feet below land surface. The organics and groundwater then flow laterally along the bedrock surface and/or within the upper few feet of fractured bedrock. Near-vertical fractures in the bedrock, the downward vertical hydraulic gradient, and the higher specific gravity of the organics may allow the downward migration of contaminants to lower bedrock horizons. The organics and groundwater then migrate laterally along bedding planes and possibly joints and fractures within the bedrock. Based on the WCC investigations, the organic contamination from tar, gasoline, and/or diesel fuel in the bedrock and deeper groundwater appears to extend west to an unknown distance between monitoring wells MW-8 and MW-16, north to the Barge Canal, east to monitoring well MW-15, and south to an unknown distance between monitoring wells MW-9 and MW-14 (see Figure 2-4 for well locations).

Additional site vicinity environmental information provided by NYSEG indicates that two gasoline stations in the area, one immediately downgradient of the site and the other approximately 650 feet upgradient, have had significant spills over the years. Review of the Lockport fire chiefs' files found documentation of spills from the Reed Gasoline Station (immediately downgradient) in the mid-1960s. Sampling of a shallow bedrock well adjacent to Reed's Gasoline Station (MW-17) in 1984 revealed 30 inches of product in the well. Laboratory analysis of the floating product in the well indicated that it contained 632,000 ppm gasoline and



TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 2-4

WCC WELL AND BORING LOCATIONS

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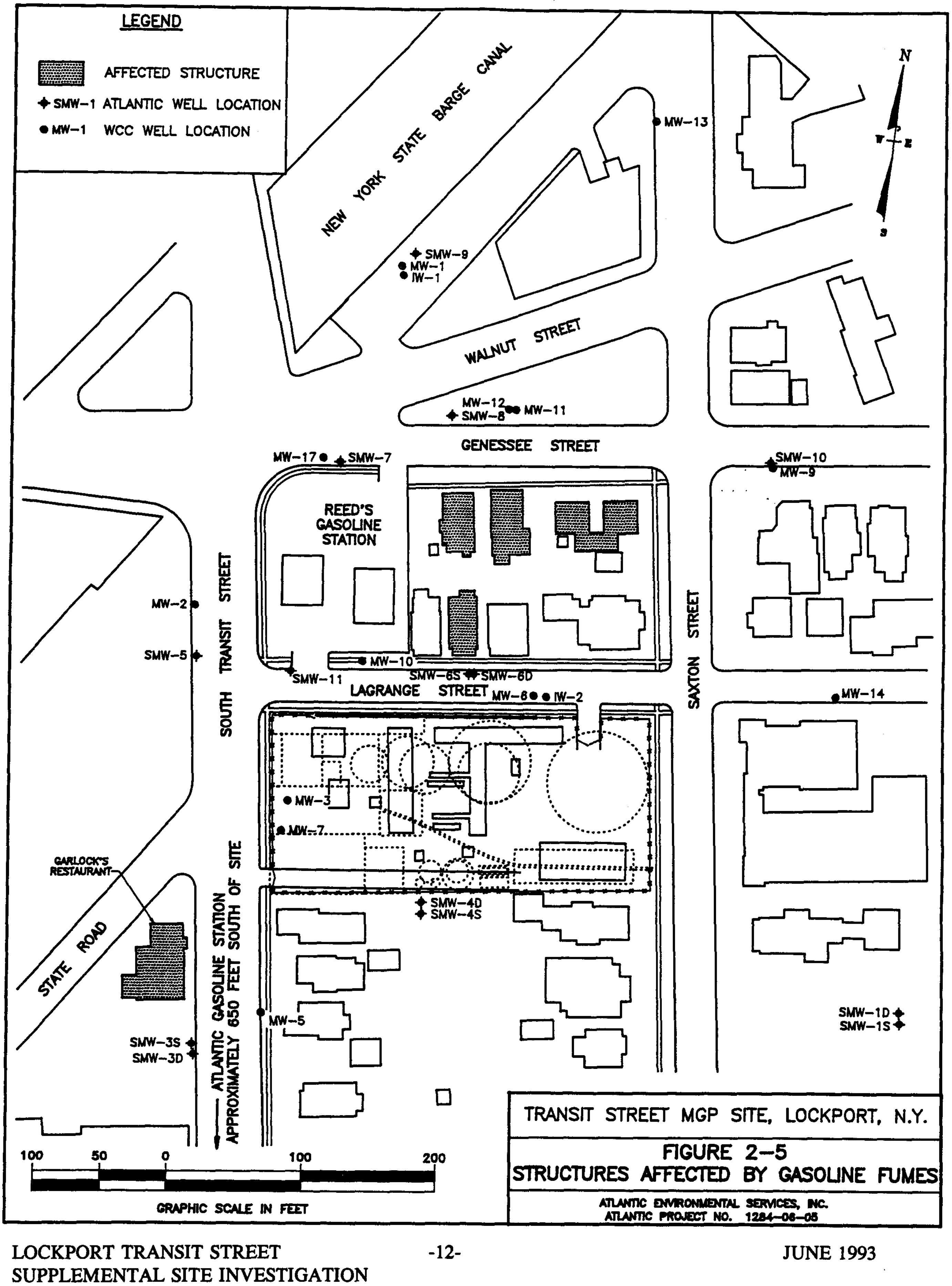
55,000 ppm No. 2 fuel oil/diesel fuel (WCC Report). None of the spills from this gas station have been remediated. The Atlantic (formerly Stamps) Gasoline Station (one block upgradient) began having documented problems in December 1989. At that time, residents immediately downgradient were not impacted by the spill. However, residents north of the MGP site adjacent to Reed's (see Figure 2-5) were driven from their homes by the fumes. Garlock's Restaurant, across the street from the MGP site, was also affected by the gas fumes. The distance and rate of migration of the gasoline was attributed to migration through fractured bedrock. NYSEG placed fans in a subsurface vault at the substation to vent fumes presumed to be traveling down underground utility lines in the area. A remediation system (pump and treat) was installed at the Atlantic Station upgradient of the site and was operating at the time of the supplemental investigation.

The New York State Department of Health (NYSDOH) contacted NYSEG in June 1990 with some concerns regarding air quality within a residence located north of the site and east of Reed's Gasoline Station (Figure 2-5). Most of the concerns were traced to Reed's Gasoline Station and their gasoline tank filling and venting procedures. However, there was also discussion of a spring time condition relating to odors in the basement. The basements in several of the homes are quite close to bedrock and may be impacted by spring high groundwater, which has been observed approximately 6 to 7 feet beneath land surface. NYSEG conducted a survey of the basement of the home in which odors were noted in June 1990. No fumes were noted during the survey, although it was recognized that the high groundwater condition had probably already occurred for the year.


LEGEND
AFFECTED STRUCTURE
SMW-1 ATLANTIC WELL LOCATION
MW-1 WCC WELL LOCATION
NEW YORK STATE BARGE CANAL
SMW-9
MW-1
IW-1
MW-13
WALNUT STREET
MW-12
SMW-8
MW-11
GENESSEE STREET
MW-17
SMW-7
SMW-10
MW-9
REED'S GASOLINE STATION
MW-2
SMW-5
SOUTH TRANSIT STREET
SAXTON STREET
SMW-11
MW-10
SMW-6S
SMW-6D
LAGRANGE STREET
MW-6
IW-2
MW-14
MW-3
MW-7
GARLOCK'S RESTAURANT
STATE ROAD
SMW-4D
SMW-4S
ATLANTIC GASOLINE STATION APPROXIMATELY 650 FEET SOUTH OF SITE
MW-5
SMW-1D
SMW-1S
SMW-3S
SMW-3D
100 50 0 100 200
GRAPHIC SCALE IN FEET
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 2-5
STRUCTURES AFFECTED BY GASOLINE FUMES
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3.0 SITE ACTIVITIES

The field activities conducted during the supplemental site investigation at the Transit Street site included a soil gas survey, shallow subsurface boring to locate former structures and collect on-site subsurface soil samples for analysis, drilling of test borings and installation of monitoring wells, overburden permeability testing, indoor air quality monitoring, and groundwater and subsurface soil sampling and analysis. Two rounds of groundwater sampling were conducted, one in January 1992 and one in May 1992. During the May sampling round, soil gas surveying, permeability testing, indoor air quality monitoring, shallow subsurface soil sampling, and groundwater sampling were conducted concurrently in order to evaluate the site under seasonally high groundwater conditions. The objective of this concurrent sampling was to evaluate the potential for seasonal high groundwater conditions to raise light non-aqueous phase liquids (LNAPLs) and dissolved tar constituents contained in bedrock into overburden soils, thereby adversely affecting shallow groundwater, soil gas and indoor air quality. The major concern regarding seasonal fluctuation in contamination levels is the possibility of increased risk to residents downgradient of the former MGP site during the spring season or high groundwater conditions.

Each component of the field program is described in the following sections. Technical details of field procedures are presented in Appendix B (Atlantic Technical Procedures).

3.1 Test Borings and Subsurface Soil Sampling and Analysis

A total of 15 borings were drilled in the vicinity of the Transit Street site. Fourteen of these borings were completed as monitoring wells, and their locations are presented in Plate 1 and Figure 3-1. One boring (north of the original location for SMW-10 in the Work Plan) was abandoned due to shallow refusal. Drilling could not be conducted at the proposed location of SMW-2 due to the high concentration of underground and overhead utilities and inaccessibility by the drill rig. Eight of the completed wells comprise four nested pairs installed in areas where the saturated thickness of the overburden exceeded 15 feet. These wells are identified with the letter S or D (for shallow or deep) following the well identification number. Table 3-1 presents the rationale for the placement of the 14 shallow monitoring wells. Variations from the locations originally proposed in the Work Plan were due to problems of accessibility or proximity of underground or overhead utilities.

Drilling was performed using hollow stem auger (HSA) methods. Each boring was advanced to the top of bedrock (Gasport member) or to auger refusal. Continuous soil samples, obtained in advance of augers using split-spoon samplers, were screened for organic vapors according to Atlantic procedure No. 1051 (Appendix B) using an HNu photoionization detector. Each boring was logged by an Atlantic geologist. Log notations included the presence of any visual or olfactory evidence of contamination. Complete boring logs are included in Appendix C.

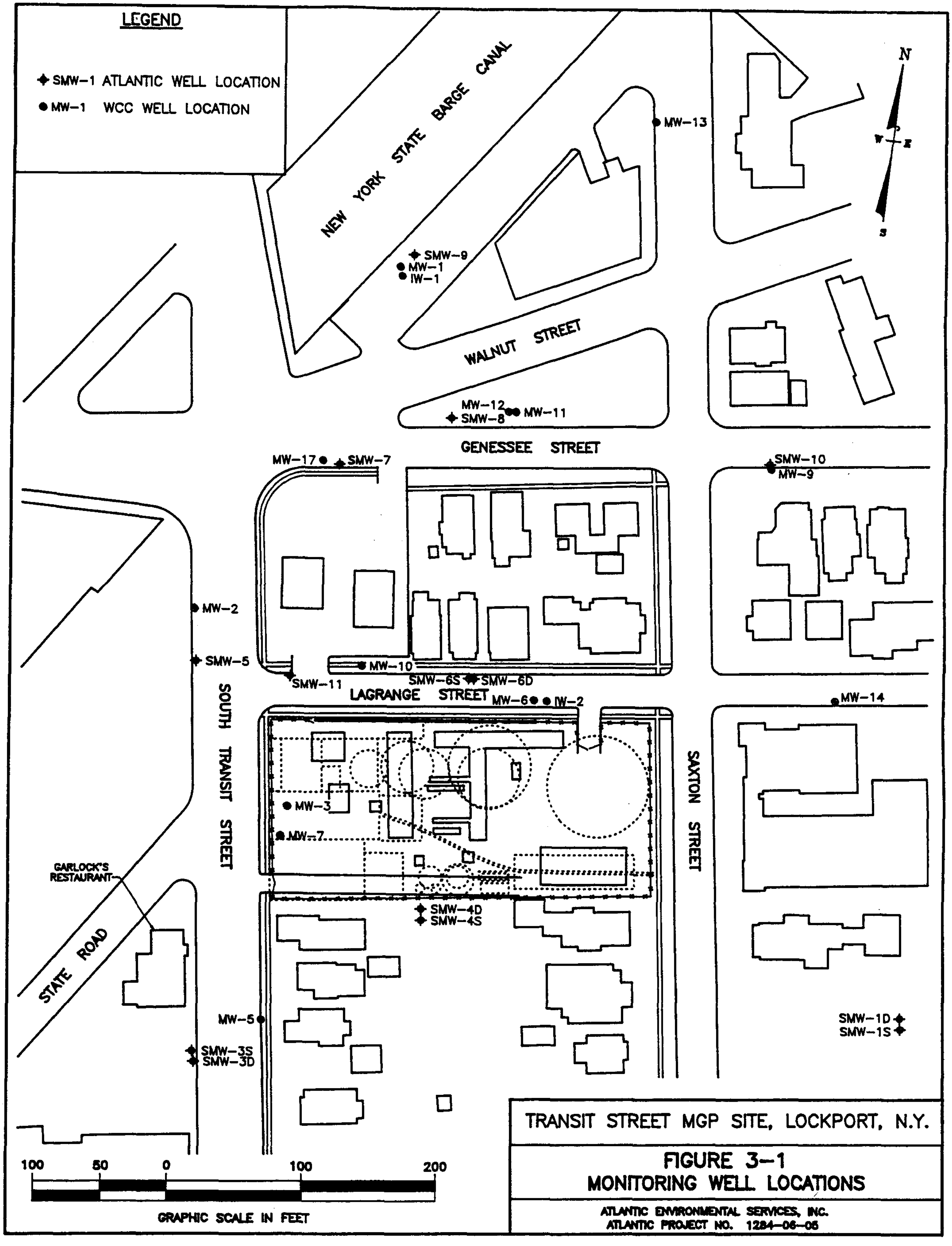

LEGEND
SMW-1 ATLANTIC WELL LOCATION
MW-1 WCC WELL LOCATION
NEW YORK STATE BARGE CANAL
MW-13
SMW-9
MW-1
IW-1
WALNUT STREET
MW-12
SMW-8
MW-11
GENESSEE STREET
MW-17
SMW-7
SMW-10
MW-9
MW-2
SMW-5
MW-10
SMW-11
SMW-6S
SMW-6D
LAGRANGE STREET
MW-6
IW-2
MW-14
SOUTH TRANSIT STREET
SAXTON STREET
MW-3
MW-7
GARLOCK'S RESTAURANT
STATE ROAD
SMW-4D
SMW-4S
MW-5
SMW-3S
SMW-3D
SMW-1D
SMW-1S
100 50 0 100 200
GRAPHIC SCALE IN FEET
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 3-1
MONITORING WELL LOCATIONS
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

TABLE 3-1 MONITORING WELL RATIONALE	
WELL NUMBER	**LOCATION AND RATIONALE**
SMW-1S, 1D	Presumed upgradient of the Transit Street MGP site to evaluate upgradient groundwater and subsurface soil quality.
SMW-3S, 3D	Presumed downgradient of the Atlantic Gas Station and upgradient of the Transit Street MGP site to evaluate presence of MGP wastes and/or other wastes in the overburden associated with gasoline fumes detected in Garlock's Restaurant in 1989.
SMW-4S, 4D	Presumed upgradient of the Transit Street MGP site to evaluate upgradient groundwater and subsurface soil quality.
SMW-5	Presumed downgradient of the Transit Street MGP site to evaluate presence of MGP and/or other wastes migrating towards the Barge Canal in the overburden.
SMW-6S, 6D	Immediately downgradient of the Transit Street MGP site to evaluate presence and potential migration of MGP and/or other wastes in the overburden.
SMW-7	Immediately downgradient of Reed's Gasoline Station, adjacent to previously installed bedrock monitoring well MW-17 to evaluate the presence and potential migration of MGP and/or other wastes in the overburden.
SMW-8	Presumed downgradient of the Transit Street MGP site and Reed's Gasoline Station to evaluate the presence and potential migration of MGP and/or other wastes in the overburden.
SMW-9	Adjacent to previously installed monitoring wells MW-1 and IW-1, presumed downgradient of the Transit Street MGP site and Reed's Gasoline Station to evaluate presence and potential migration of MGP and/or other wastes in the overburden. Replacement well for IW-1.
SMW-10	Presumed downgradient of the Transit Street MGP site to evaluate possible presence of MGP wastes in the overburden.
SMW-11	Immediately downgradient of the Transit Street MGP site and upgradient of Reed's Gasoline Station to evaluate possible presence of MGP wastes in the overburden.

A total of ten subsurface soil samples were collected for analysis. Samples were not collected at all drilling locations due to low recovery in some borings. The sampling strategy was generally to take samples at the water table, at the overburden/bedrock interface, from soils in which visible contamination was evident, and from intervals in which the wells were to be screened. Table 3-2 presents the sampling interval rationale for each sample collected.

Soil samples for laboratory analysis were collected from the central portion of each soil core to minimize cross contamination from sampler walls. An equipment rinsate was collected during each day of the sampling program to evaluate proficiency of decontamination procedures. Samples were placed in an ice chest for preservation and shipped to the laboratory by overnight courier within 24 hours of collection. The samples were analyzed by O'Brien and Gere Laboratories for volatile organic compounds (VOCs) using EPA Method 8240, semivolatile

TABLE 3-2 SAMPLE INTERVAL RATIONALE		
Well I.D.	Depth (ft)	Sampling Rationale
SMW-1S	30-32	To evaluate soil quality at the water table upgradient of the former MGP.
SMW-1D	50-51	To evaluate subsurface soil quality at the overburden/bedrock interface upgradient of the former MGP.
SMW-3D	16-18	To evaluate the potential presence of MGP or gasoline related compounds in the subsurface at the top of the saturated zone. This well is situated southwest of the former MGP, adjacent to Garlock's Restaurant where gasoline fumes were a problem in 1989.
SMW-4S	10-12	To evaluate subsurface soil quality at the top of the saturated zone upgradient of and adjacent to the former MGP but downgradient of Atlantic Gasoline Station.
SMW-4D	16-18	To evaluate subsurface soil quality at the overburden/bedrock interface upgradient of and adjacent to the former MGP.
SMW-5	12-14	To chemically characterize the visual contamination (staining) observed in the subsurface soils downgradient of the former MGP.
SMW-6	6-8	To chemically characterize the visual contamination (sheen and tar) observed in the subsurface soils downgradient of the former MGP.
SMW-10	10-14 14-16	To evaluate subsurface soil quality within the overburden and at the overburden/bedrock interface downgradient of the former MGP.
SMW-11	6-8	To chemically characterize the visual contamination (staining) and tar and gas odor noted in the subsurface soils downgradient of the former MGP and adjacent to Reed's Gasoline Station.

organic compounds (SVOCs) using EPA Method 8270, and metals (6000/7000 series). These analytical results were data validated by META Environmental, Inc. (META). Two samples were fingerprinted by Infrared Spectroscopy (IR) to identify potential source material. IR is a tool to identify hydrocarbons. The method generates an absorption spectrum over the infrared wavelengths of light for the substance under consideration. The spectrum is a fingerprint having unique characteristics that can be used to identify the substance. Samples were also screened to determine grain size.

3.2 Monitoring Well Installation and Development

Fourteen shallow monitoring wells were installed in the vicinity of the Transit Street site during the field investigation. Monitoring well locations are illustrated on Figure 3-1, as well as on Plate 1. The monitoring wells were constructed of 2-inch I.D. stainless steel casing and screen. Monitoring well screened intervals were determined in the field. Screens were placed in appropriate horizons to evaluate water level fluctuations and the presence of dense (DNAPL) and light (LNAPL) non-aqueous phase liquids. None of the screened intervals exceed ten feet in length. Four pairs of nested wells were installed in areas where the saturated thickness of the overburden exceeded 15 feet. The wells were constructed according to the NYSEG

Environmental Matters Group Installation Procedures for monitoring wells and piezometers at former coal gasification sites (NYSEG, 1989). The screened intervals were packed with clean, washed silica sand to a depth of 1 to 2 feet above the screen. A two foot bentonite clay seal was placed above the sand pack. The remaining annular space was filled to grade with cement-bentonite grout. A locking well cap was installed on the well casing, and a protective flush-mounted steel curb box was installed in concrete surrounding the well casing.

Monitoring wells were developed to remove cuttings and silt according to Atlantic Procedure No. 1070 (Appendix B). They were developed until the water attained visual clarity. Development water was collected and stored in the wastewater tank located on the Transit Street site.

3.3 Groundwater Sampling and Analysis

Two groundwater sampling rounds were conducted following monitoring well installation and development. The two groundwater sampling rounds were intended to evaluate the effects of seasonal high and low groundwater conditions. The first groundwater sampling round was conducted in January 1992, when groundwater levels were expected to be relatively low, and the second was conducted in May 1992, during expected high groundwater conditions.

All groundwater sampling was conducted in accordance with Atlantic Procedure No. 1023 (Appendix B). One duplicate sample, matrix spike and matrix spike duplicate sample, and an equipment rinsate were collected during each sampling round for quality assurance/quality control (QA/QC) purposes. Samples were preserved according to Atlantic Procedure No. 1040-NY (Appendix B). Shallow groundwater samples (including duplicate samples) were analyzed for VOCs (Method 8240), SVOCs (Method 8270), MTBE (Method 8020), various metals (6000/7000 Series), cyanide (Method 9010), and sulfide (Method 9030). Analytical results were data validated by META. Two groundwater samples also were "fingerprinted" by IR spectral analysis to differentiate between tar and gasoline sources.

Prior to collection of groundwater samples, the water level and total depth of each well were measured to 0.01 feet, with respect to the inner well casing, using an electric tape. The static well volume was then calculated according to the following formula:

Example: $V = 0.163Tr^2$

Where: V = Static volume of well in gallons
T = Linear feet of static water in well
r = Inside radius of well casing in inches

Prior to sampling, a minimum of three well volumes was purged from each well. Temperature, conductivity, and pH measurements were taken during well purging to determine groundwater stability. Samples were obtained for analysis only after these parameters had stabilized. Evacuated water was containerized and collected in the wastewater tank on-site.

Groundwater samples were obtained from each well using peristaltic pumps and bailers. Samples to be analyzed for metals were filtered to remove fine particulates using an in-line filter. Filter pump tubing was dedicated to each well and disposed of after each sampling event to avoid cross-contamination. Teflon bailers were used to collect samples for VOC analysis.

3.4 Soil Gas Survey

A soil gas survey was conducted on property adjacent to the Transit Street site during the week of May 25, 1992. The survey was focused on the residential block enclosed by Transit, Genesee, Saxton and LaGrange Streets. The objective of the survey was to provide information for correlation with shallow groundwater, subsurface soil, and indoor air quality data in order to determine the potential risk to residents downgradient of the site from any MGP residuals that may have been raised into the overburden by high groundwater conditions.

A total of 30 sampling points were selected along the foundations of seven residences located downgradient of the NYSEG substation (former MGP). Four additional sampling points were selected around a residence upgradient of the substation in order to evaluate background soil gas conditions. Sampling locations are shown in Figure 3-2. The numbers on the buildings in Figure 3-2 represent the street numbers of the resident's address. The numbers surrounding the residences represent the sampling points located around each foundation. Soil gas samples were analyzed in the field using a Photovac 10S50 portable gas chromatograph. The sampling and analysis procedures for the soil gas survey are presented in detail in Atlantic Procedure Nos. 1052 and 1053 (Appendix B). Soil gas samples were compared to standards of 1,1-dichloroethylene (DCE), benzene, toluene, ethylbenzene, tetrachloroethylene (PCE), and total xylenes to help identify soil gas constituents.

3.5 Indoor Air Quality Monitoring

Indoor air quality monitoring was performed by Galson Corporation on May 27 and 28, 1992. Monitoring was conducted in residences formed by the block of Saxton, Genesee, Transit and LaGrange Streets. The residences selected for monitoring were chosen by NYSEG, including the control dwelling located outside the suspected influence of potential contaminants (Figure 3-3). The control house was selected based on the following criteria: it is within a 0.5 mile radius of the site as suggested by NYSDOH; it is relatively the same age as the other homes in the study; it has the same soil type and geology as the other homes; it is representative of the background area in terms of subsurface soil and groundwater quality, and it is upgradient of the site.

Survey forms were administered to residents to detect possible contaminant interferences. Copies of the air survey sheets are provided in Appendix E. Sampling was conducted in basements and, if odors were reported by occupants, in living areas as well. Outdoor samples were collected on the porches of some residences. Porch sampling locations were chosen to obtain outdoor concentrations of contaminants because lots were essentially occupied by the entire dwelling and there were no secure yard areas in which to locate sampling devices.

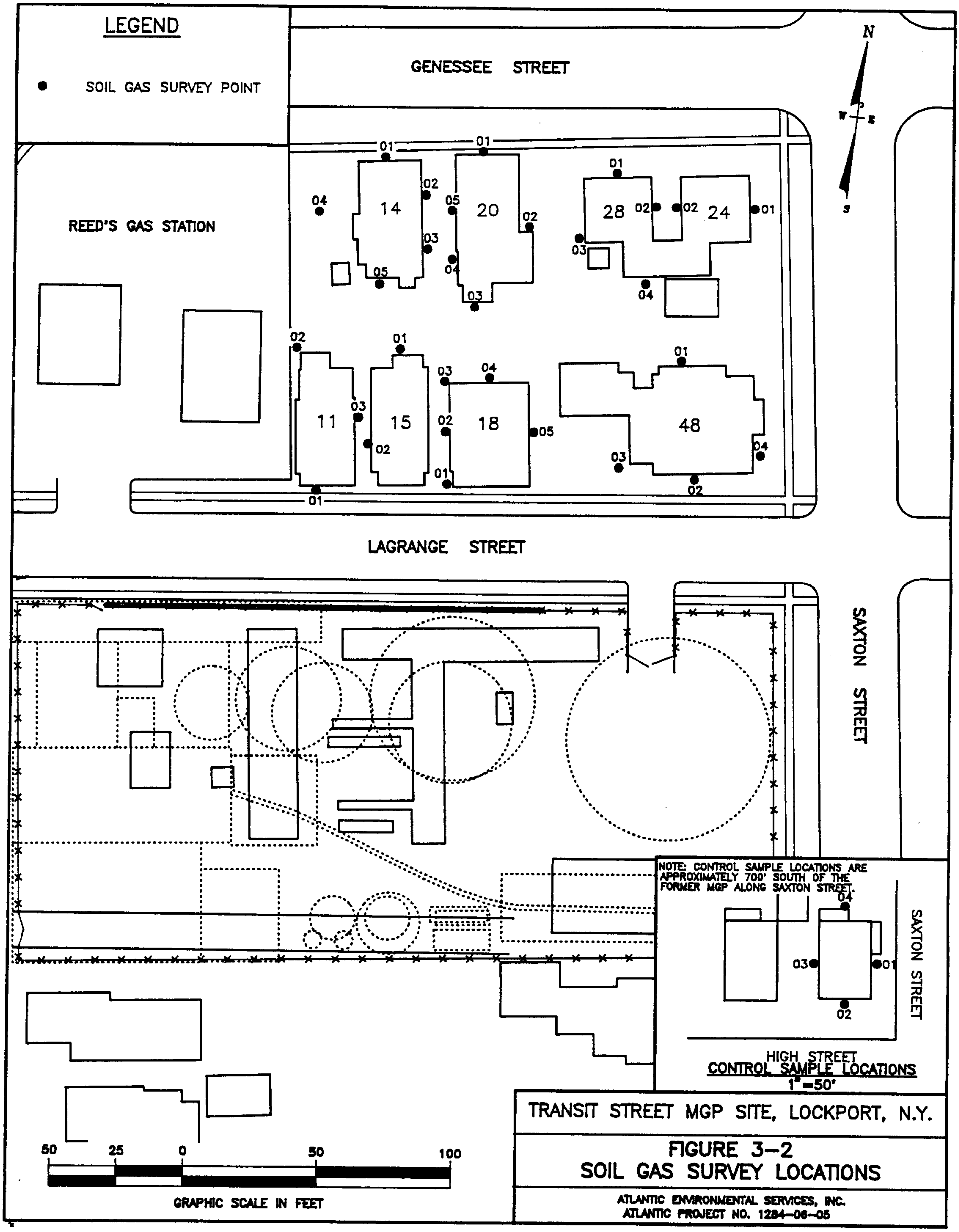
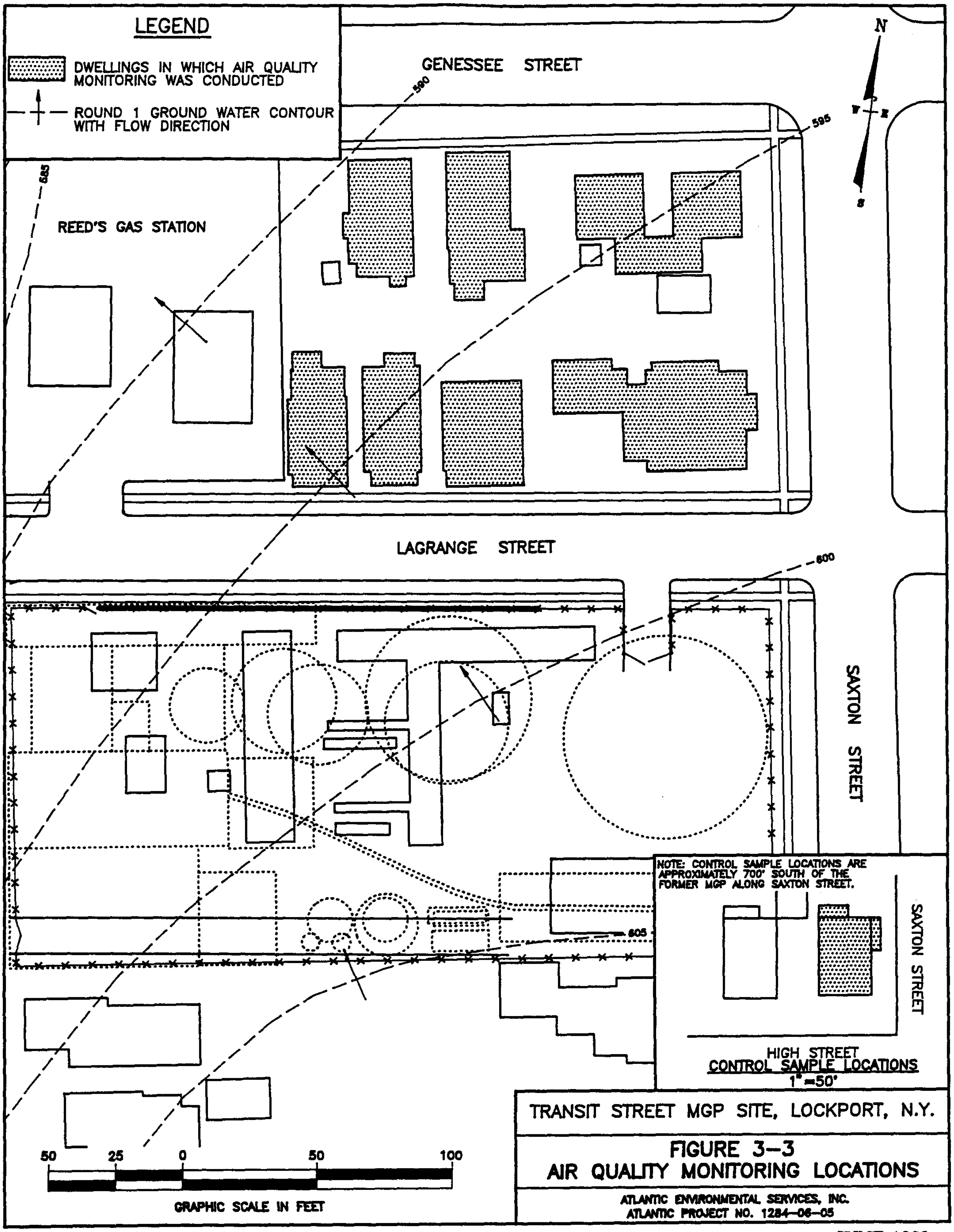


FIGURE 3-2
SOIL GAS SURVEY LOCATIONS


LEGEND
DWELLINGS IN WHICH AIR QUALITY MONITORING WAS CONDUCTED
ROUND 1 GROUND WATER CONTOUR WITH FLOW DIRECTION
GENESSEE STREET
REED'S GAS STATION
LAGRANGE STREET
SAXTON STREET
590
585
595
600
605
N
NOTE: CONTROL SAMPLE LOCATIONS ARE APPROXIMATELY 700' SOUTH OF THE FORMER MGP ALONG SAXTON STREET.
SAXTON STREET
HIGH STREET
CONTROL SAMPLE LOCATIONS
1"=50'
50 25 0 50 100
GRAPHIC SCALE IN FEET
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 3-3
AIR QUALITY MONITORING LOCATIONS
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

Air samples were collected and analyzed by Galson Corporation for volatile organic compounds in accordance with EPA Method T0-1. This method was chosen because it allows fingerprinting of any detected compounds to distinguish between gasoline, diesel fuel, and coal tar. Samples were collected on Tenax traps using portable battery powered pumps with sample volumes ranging from 8.9 to 13.6 liters. Sampling periods ranged from 48 to 74 minutes. Quality control methods included the submittal of daily field blanks and a trip blank and the collection of side by side duplicate samples. Additional field quality control procedures included calibrating each sampling train before and after monitoring using a primary standard. The residential air sampling methodology was reviewed and approved by NYSDOH whose recommendations were incorporated. Recommendations included using an accredited laboratory, investigating possible contaminant interferences, monitoring living spaces (e.g., living rooms), and identifying additional contaminants if present beyond the methods reportable listing.

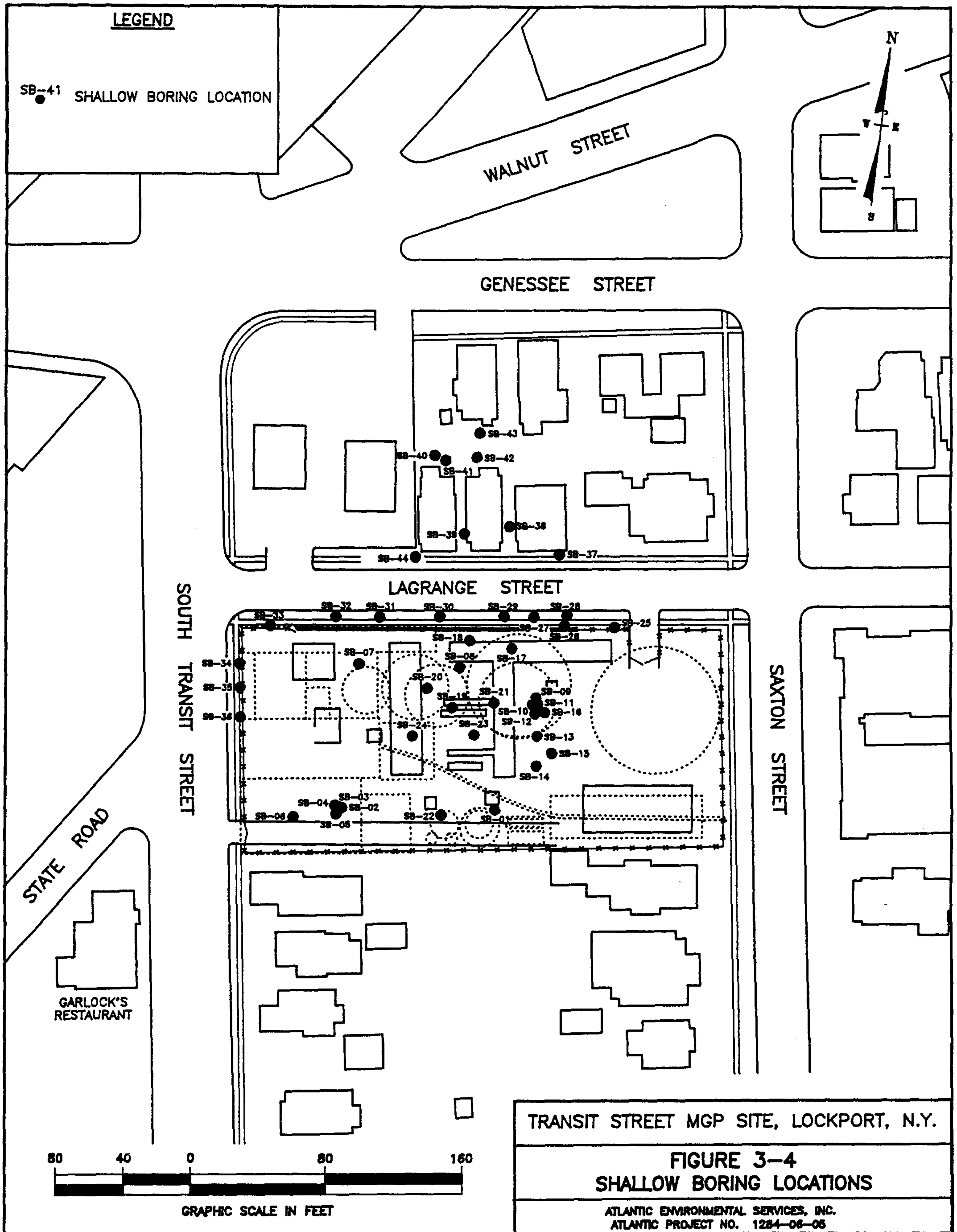
3.6 Shallow Subsurface Soil Sampling

Due to overhead and underground utility lines, buildings and transformers at the Transit Street Substation, it was not feasible to use a drill rig for on-site sampling in areas where many former MGP structures were located. Shallow subsurface soil sampling was therefore performed with a hand-held gasoline powered auger system (Little Beaver auger system). The objectives of shallow subsurface probing were to determine the location of subsurface structures related to MGP operations and to evaluate the extent of MGP residuals in the shallow overburden in areas inaccessible to the drill rig.

Forty-four Little Beaver borings were drilled at the site and are illustrated in Figure 3-4. Soil samples were taken from the auger flights and represented soils at depths of 2 to 8 feet. Seventeen soil samples were collected for chemical analysis. Field notes were made characterizing the soils visually and by odor and are included in Appendix C. Soil samples were analyzed for VOCs (EPA Method 8240), SVOCs (Method 8270), metals (6000/7000 series), cyanide (EPA Method 9010), and sulfide (EPA Method 9030). The analytical results were reviewed by a qualified Atlantic chemist. Two soil samples were "fingerprinted" by IR Spectral Analysis.

3.7 Permeability Testing

In order to assess the hydraulic characteristics of the overburden, permeability testing was conducted in five overburden monitoring wells (SMW-3S, SMW-3D, SMW-4S, SMW-4D, and SMW-6D) during the week of May 26, 1992. Atlantic Procedure No. 1071 was followed to conduct the permeability testing. Slug extraction tests were conducted using a Hermit 1000B data logger and a pressure transducer to measure and record water level changes. In addition to in situ permeability testing, grain size analyses of soil samples collected during drilling activities were used to evaluate the hydraulic conductivity of the overburden.



TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 3-4
SHALLOW BORING LOCATIONS

ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

3.8 Site Survey

A site survey was conducted by Wendel Surveyors in November 1992 to determine the exact curb box locations and inner casing elevations for the 14 newly installed shallow monitoring wells. Locations and elevations were determined based on historic well coordinates and elevations on an existing base map from the WCC study. The WCC base map was generated by Lockwood Services from aerial photogrammetry.

4.0 SITE CHARACTERIZATION

This section describes the physiographic, geologic and hydrologic setting of the Transit Street MGP site. Also included is information regarding water use and city sewers. A portion of the information presented in this section was obtained from the WCC Summary Report of previous investigations performed at the Transit Street site.

4.1 Physiography and Topography

The City of Lockport straddles the Niagara Escarpment, a north-facing feature supported by resistant rocks of the Lockport Group, and is bisected by the New York State Barge Canal. The Barge Canal is an excavated gorge which cuts the Niagara Escarpment. The Barge Canal and other glacial gorges in the area trend to the northeast and are probably joint controlled features.

The Transit Street site is located on a hillside southeast of the Barge Canal in Lockport, New York. The land surface elevation at the site ranges from approximately 620 feet above the National Geodetic Vertical Datum (NGVD) at the southeast corner to 599 feet NGVD at the northwest corner. The site topography has been altered by excavation and fill placement.

4.2 Geology

The Transit Street site area is underlain by glacial till and lacustrine deposits which generally increase in thickness to the southeast. The underlying bedrock is flat-lying dolomite and shale of Silurian age. The following subsections describe the local and site-specific bedrock and overburden geology in the site vicinity.

4.2.1 Local Geology

The site area is underlain by the Silurian-aged Clinton and Lockport Groups. The Lockport Group consists of interlayered dolomite and limestone with argillaceous and shale units. It has been reported that dolomites of the Lockport Group typically exude strong odors of naturally occurring petroleum when freshly fractured and may contain numerous films and partings of black, carbonaceous material (Kinder and Taylor, 1913). The hydrocarbon occurrences in the Silurian-aged rocks in the site area are in the form of natural gas or petroleum odors. No natural oil or tar-like substances have been reported.

The members of the Lockport Group, from youngest to oldest, are the Oak Orchard Member, the Framosa Member, the Goat Island Member, and the Gasport Member. The Gasport Member is the uppermost bedrock unit present beneath the Transit Street MGP site. Table 4-1 summarizes the general site vicinity stratigraphy.

The Gasport Member is a coarse-grained, crystalline dolomite containing abundant fragments of fossilized crinoid stems and corals. The dolomite is massive with only faint discontinuous bedding suggested by grading of some crinoid fragments. The Gasport Member

TABLE 4-1 GENERAL SITE VICINITY STRATIGRAPHY	
UNIT	THICKNESS (feet)
Overburden	8 to 50
Gasport Member	10 (average)
DeCew Member	5 (average)
Rochester Member	> 20
Based on Atlantic boring logs (overburden) and WCC Summary Report	

has an average thickness of ten feet in the site vicinity.

The Gasport Member is underlain by the upper and lower Silurian Clinton Group. The Clinton Group consists of the DeCew Member underlain by the Rochester Shale Member. The DeCew Member is separated from the overlying Gasport Member by a sharp contact. It is a fine-grained, dark gray, crystalline dolomite which is non-fossiliferous and displays clear bedding. Thin shale layers and partings were observed to be numerous in the DeCew Member, with bedding thicknesses varying from less than 1 centimeter (cm) to 10 cm. The DeCew dolomite also releases a strong natural hydrocarbon odor when freshly fractured. The average measured thickness of the DeCew Member in the site vicinity reportedly is five feet.

The DeCew-Rochester Shale contact is gradational, marked by an increasing thickness of shale and a decrease in carbonate layer thickness in the site area. The Rochester Shale Member is described as a medium gray, well-laminated rock containing minor discontinuous bands of dolomite. It is reported to be at least 20 feet thick in the site area. The thickness of the Rochester Shale Member in the site vicinity is unknown because the lower contact has not been observed.

4.2.2 Site Geology

The following sections discuss the overburden and bedrock geology in the immediate vicinity of the Transit Street site. The descriptions are based on Atlantic and WCC field investigations.

Atlantic installed 14 monitoring wells, ten of which extended to the top of bedrock, in November 1991. WCC installed 21 monitoring wells and drilled 11 borings, all of which extended to or into bedrock, between October 1982 and January 1985. Boring logs generated by Atlantic and copies of WCC boring logs are provided in Appendix C.

4.2.2.1 Overburden

Atlantic and WCC monitoring well locations are illustrated in Figure 4-1. Figures 4-2 and 4-3, cross sections illustrating overburden stratigraphy in the site vicinity, were constructed

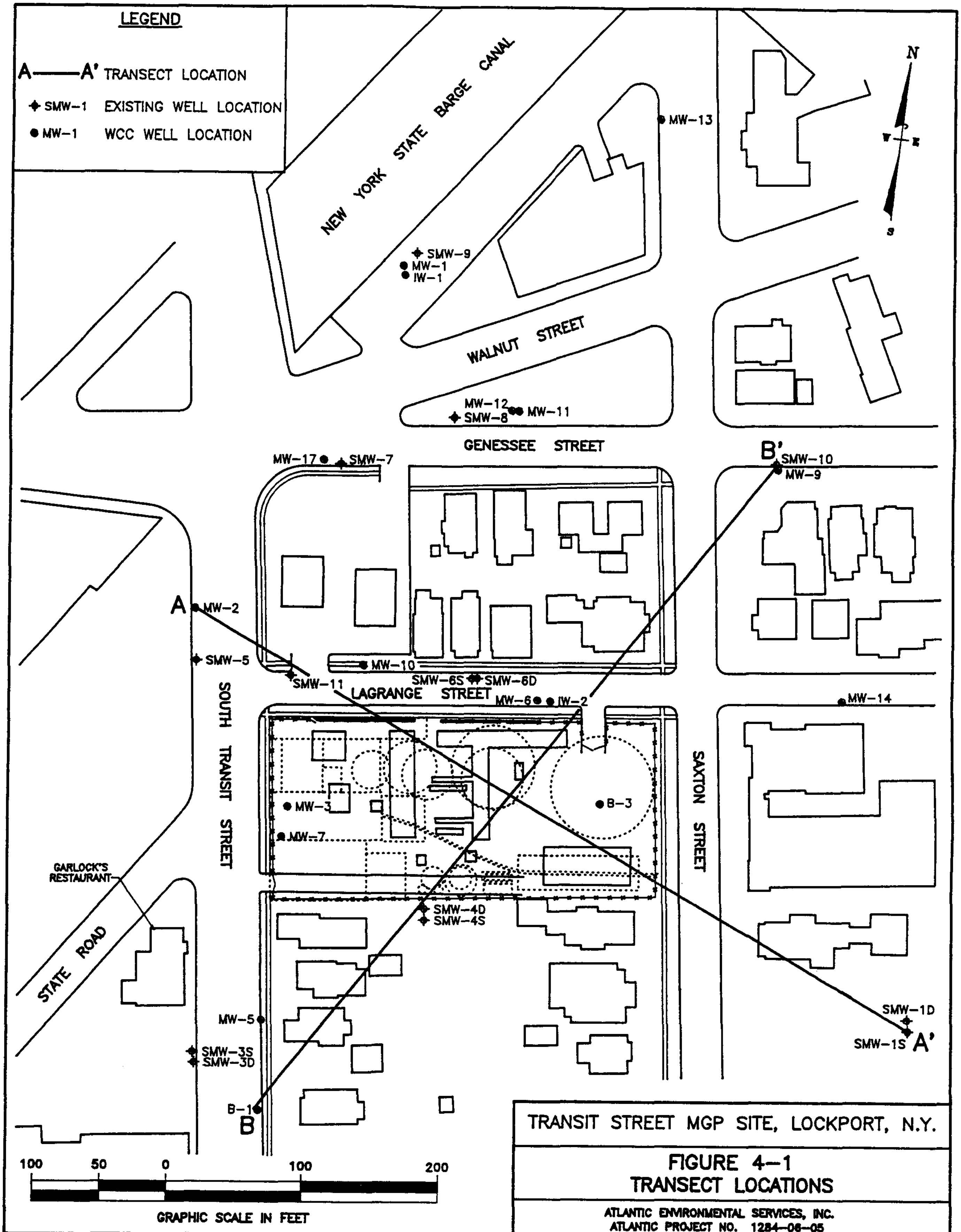
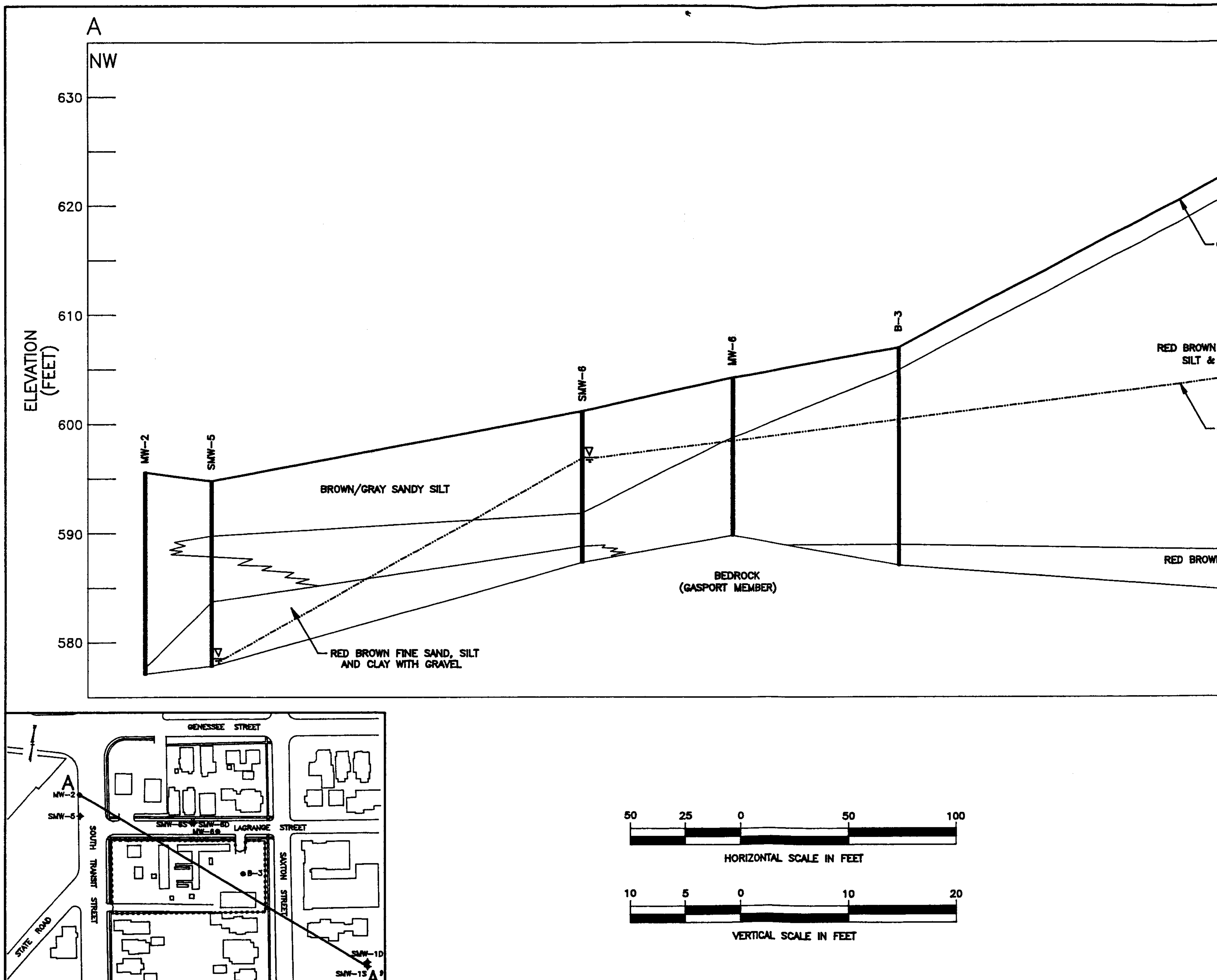


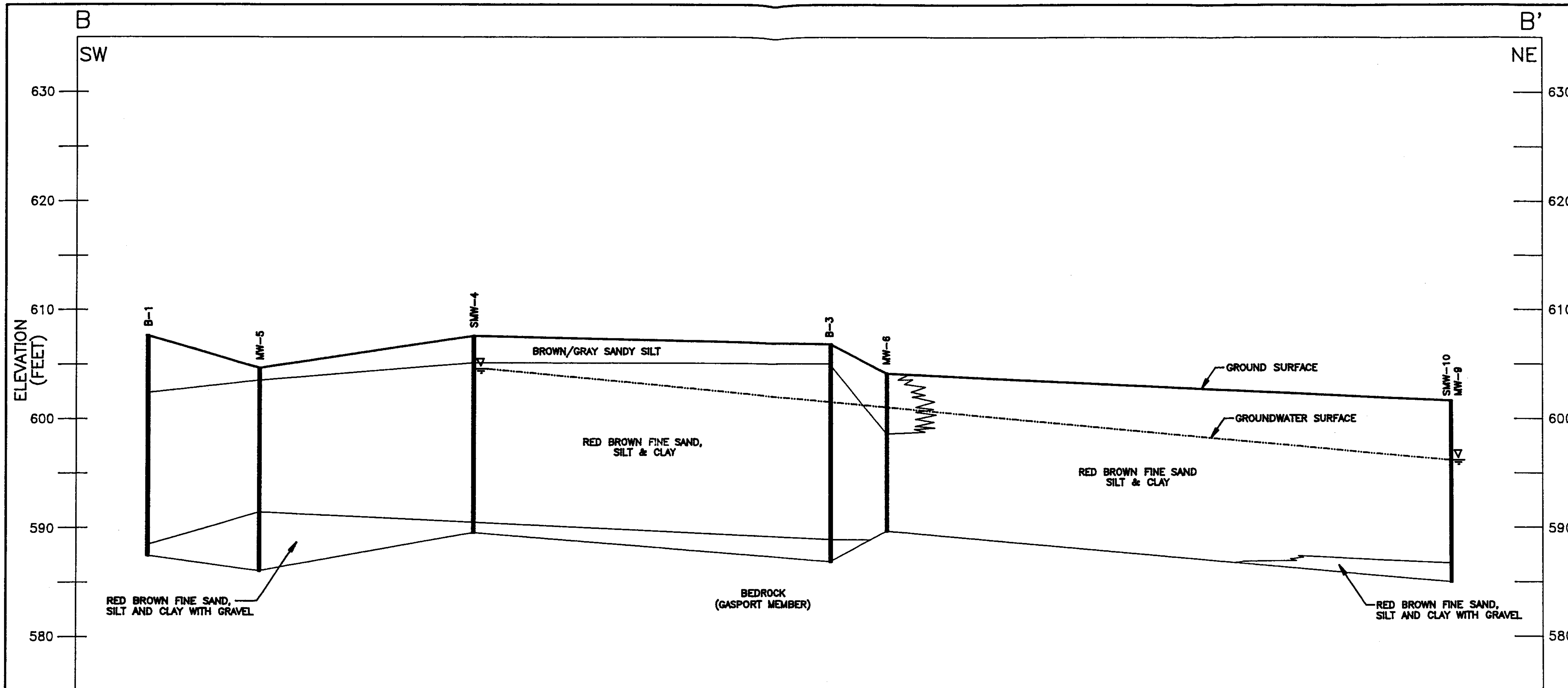
FIGURE 4-1
TRANSECT LOCATIONS

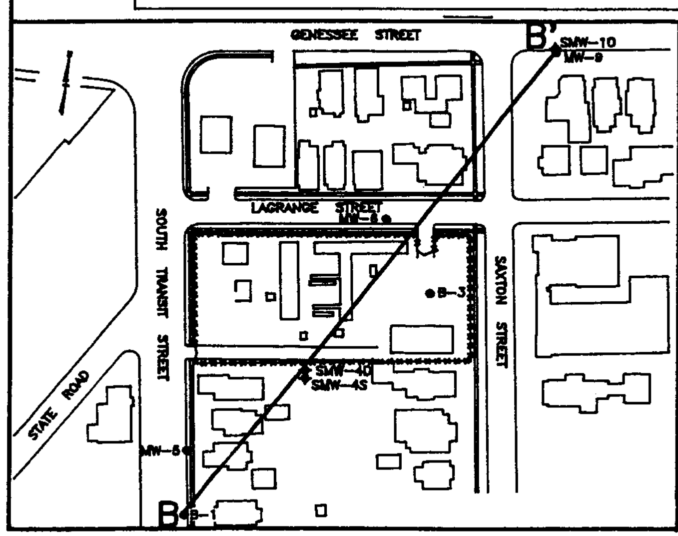


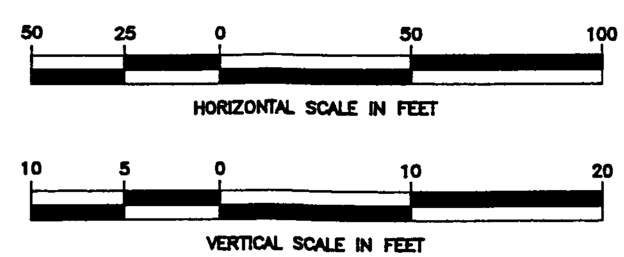
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 4-2
TRANSECT A-A'

ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05







TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 4–3
TRANSECT B–B'

ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

from the shallow monitoring wells drilled for this study and from WCC monitoring wells and borings. Cross section locations are illustrated in Figure 4-1.

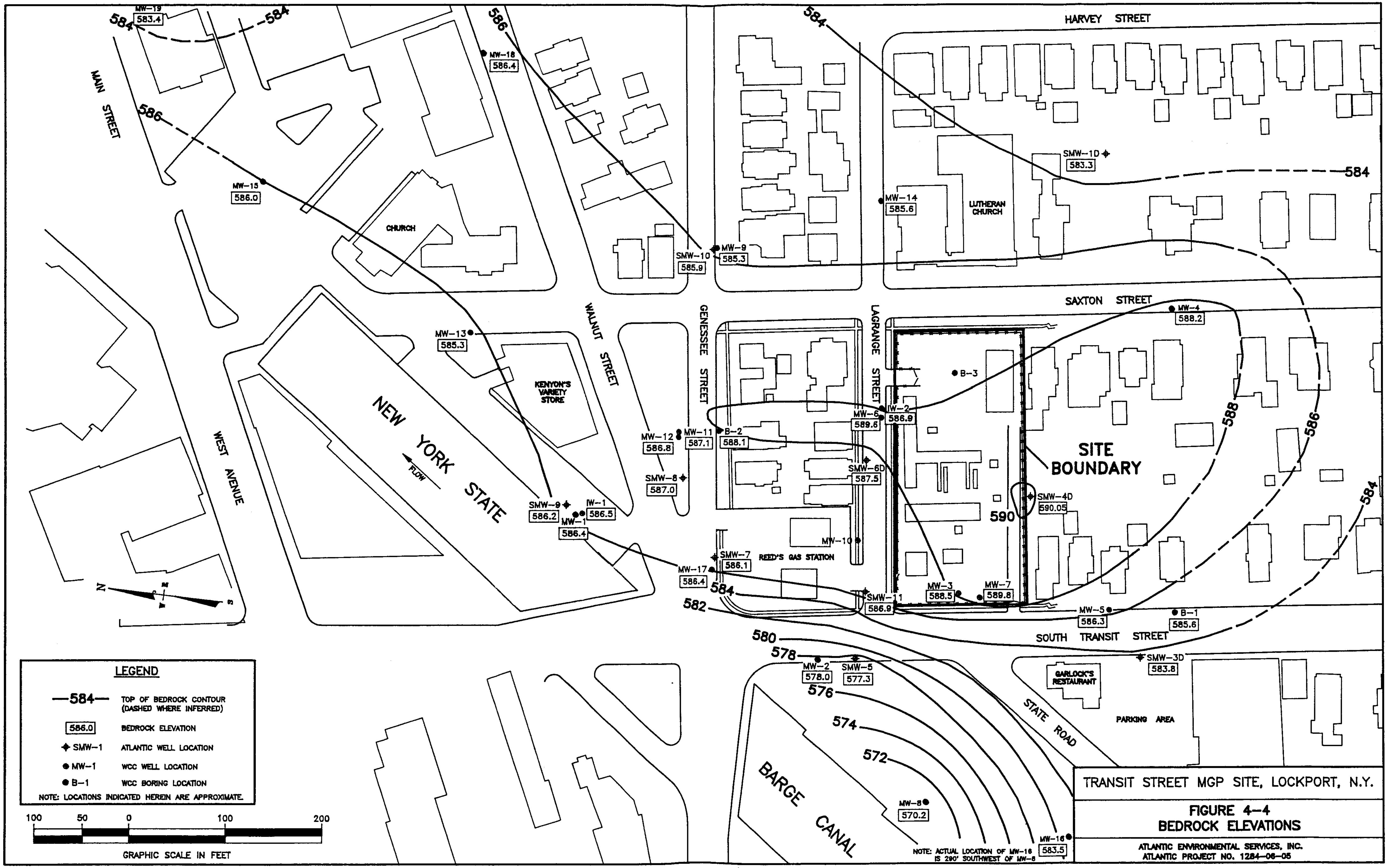
Overburden thickness at the site ranges from approximately 8 to 50 feet. Overburden thickness appears to average about 15 feet, increasing sharply in the southeast to a maximum of 51 feet at SMW-1D. Overburden soil consists chiefly of red-brown clays, silts and sands associated with glacio-lacustrine deposition. These are underlain by a thinner (2 to 5 feet) layer of gravelly material representing glacial till deposits. According to the WCC study, these soils are replaced by darker sandy silts and gray-green clays near the barge canal in the northwest. These gray-green sediments were observed in boring SMW-5 from 11 to 18 feet below land surface, SMW-3D (6-14 feet), and SMW-7 (6-8). Grain size analyses were performed on ten subsurface soil samples collected during the drilling activities. These analyses confirm that the overburden consists mainly of fine-grained sediments which coarsen with depth. The grain size analysis data are provided in Appendix C.

4.2.2.2 Bedrock

A map showing the top of bedrock elevation and monitoring well locations at the site is shown in Figure 4-4. Contours are based on bedrock elevation data from the shallow monitoring wells drilled by Atlantic and from deeper monitoring wells and borings drilled as part of the WCC study. The Transit Street site appears to be located on a bedrock high which slopes away in all directions except possibly to the south, where relatively high elevations may continue. The contour lines along the southern end of Figure 4-4 may not close as depicted, but could continue in a northeast-southwest trend, forming more of a ridge than an anticline. In general, the slope of the bedrock appears to be greatest northwest of the site between State Road and the Barge Canal.

Visible evidence of contamination was seen in all borings drilled into bedrock during the WCC study except MW-4, MW-17, B-1 and B-2. MGP residuals were only observed in wells SMW-6S, SMW-6D and SMW-11 during Atlantic's drilling program. Based on the slope of the bedrock surface, it appears that migration along the overburden/bedrock interface and within the upper weathered/fractured bedrock surface may account for a portion of the widespread distribution of tar in bedrock away from the site. However, based on the relatively greater depths and distances at which tar has been documented in bedrock in the site vicinity (WCC Summary Report), it is likely that tar migration is predominantly controlled by bedrock fractures and bedding planes.

According to the WCC report, fracture sets within all three underlying bedrock units make up the dominant rock structures in the site vicinity, providing a potential route for contaminant migration. Data mapped in the site vicinity indicate that several fracture sets are present; five with nearly vertical dips, one essentially horizontal, and one with an intermediate dip to the southeast. Two near vertical joint sets measured at the site trended N40E and N84E and are regionally significant. Joint spacing, smoothness, persistence, and aperture vary with lithology. In general, the sub-horizontal bedding planes are more open than vertical joints. Bedding planes in the dolomites were observed to be less pronounced and more widely spaced



TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 4-4
BEDROCK ELEVATIONS

ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

than in the shales. Vertical joints were more persistent in the massive dolomites and typically were tight and ranged in spacing from two to ten feet. Bedrock fractures are covered by overburden and cannot be readily mapped; therefore, exact migration within the bedrock cannot be determined.

4.3 Hydrogeology

Atlantic installed a total of 14 overburden monitoring wells (SMW on Figure 4-5) during November 1991. A total of 19 bedrock monitoring wells (MW on Figure 4-5) and two overburden monitoring wells (IW on Figure 4-5) were installed at and in the vicinity of the Transit Street MGP site during WCC's field activities.

Groundwater flow is reported by WCC to involve infiltration of precipitation through the overburden to the bedrock surface where it flows laterally until open, near-vertical fractures are intercepted. These fractures, if present, would allow downward migration to lower bedrock horizons. The following subsections describe the shallow and deeper groundwater flow regimes at the site.

4.3.1 Shallow Groundwater

Overburden groundwater elevations for January and May 1992 are presented in Figure 4-5. Table 4-2 presents groundwater elevations measured during the two rounds of groundwater sampling and well construction information for the 14 overburden monitoring wells installed by Atlantic at the site. Groundwater flow is generally northwest toward the barge canal, following the slope of the topography. Several monitoring wells (SMW-5, SMW-7, SMW-8 and SMW-9) were dry during the two groundwater sampling rounds. As illustrated in Figure 4-2 (Cross Section A-A'), the water table gradient declines rapidly to the northwest. Comparison of groundwater levels in the four nested monitoring well pairs indicates a variable vertical gradient in overburden groundwater; no consistent trend is evident. During the WCC investigation, saturated overburden sediments were found to be separated from bedrock in some areas by dry impermeable layers, suggesting the existence of local perched water table conditions beneath at least part of the site.

The last column in Table 4-2 presents the difference in groundwater elevations measured during January and May 1992. May groundwater levels were somewhat higher than January levels, with a maximum difference in elevation of 2.89 feet at SMW-1S. In general, however, the differences in groundwater elevation between the two sampling rounds were not large; the average difference in elevation was 0.65 feet.

Overburden permeability values were estimated from slug extraction tests conducted on five shallow monitoring wells. Permeability values range from 7.7×10^{-5} to 7.8×10^{-4} cm/sec (Table 4-3). Overburden permeability is fairly consistent at the locations tested. These values correlate well with published permeability values for these types of fine-grained sediments (Freeze and Cherry, 1979). Complete permeability data, including time-drawdown measurements and plots, are provided in Appendix C.

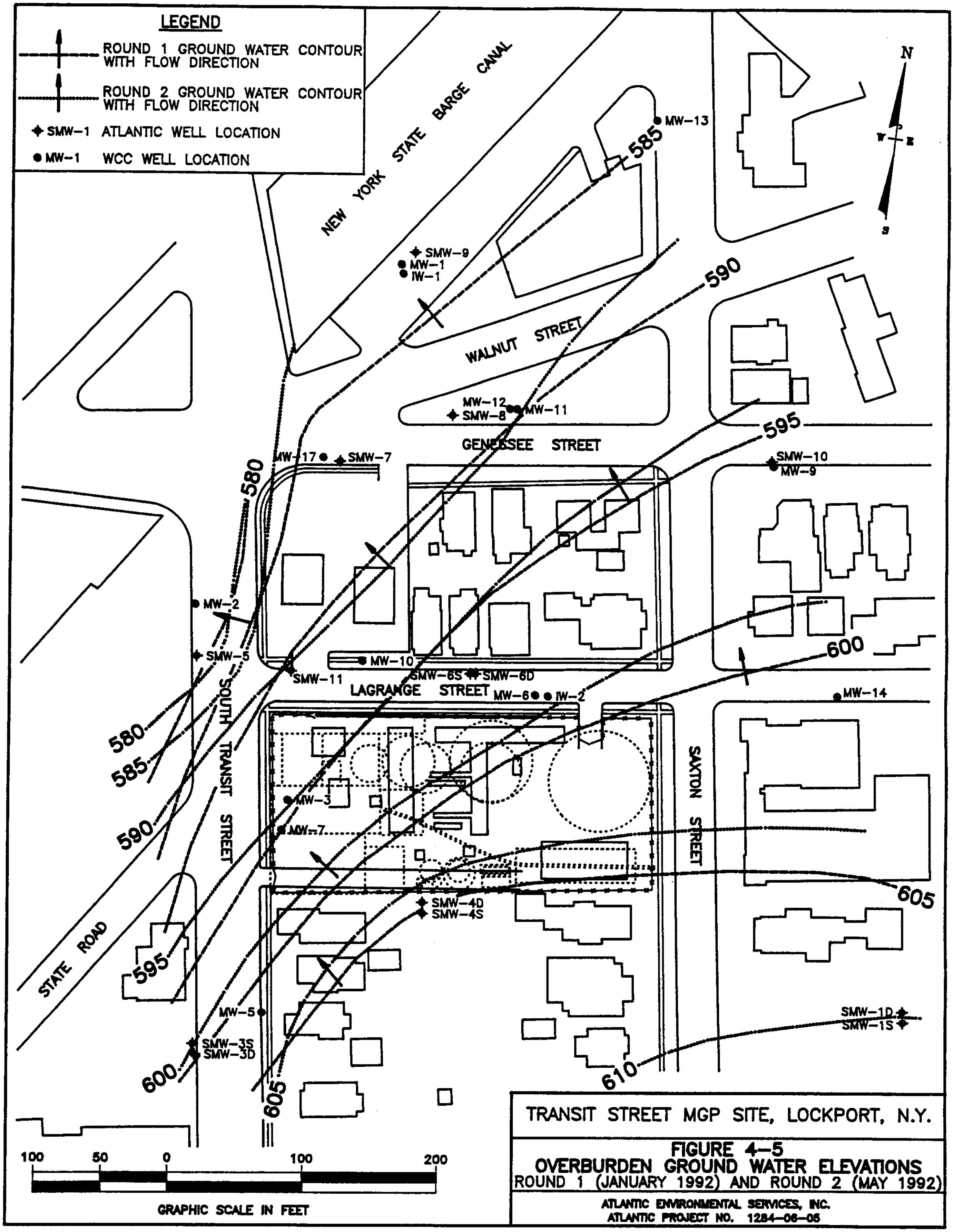

LEGEND
ROUND 1 GROUND WATER CONTOUR WITH FLOW DIRECTION
ROUND 2 GROUND WATER CONTOUR WITH FLOW DIRECTION
SMW-1 ATLANTIC WELL LOCATION
MW-1 WCC WELL LOCATION
NEW YORK STATE BARGE CANAL
WALNUT STREET
GENESSEE STREET
LAGRANGE STREET
SOUTH TRANSIT STREET
SAXTON STREET
STATE ROAD
MW-13
SMW-9
MW-1
IW-1
MW-12
SMW-8
MW-11
MW-17
SMW-7
SMW-10
MW-9
MW-2
SMW-5
SMW-11
MW-10
SMW-6S
SMW-6D
MW-6
IW-2
MW-14
MW-3
MW-7
SMW-4D
SMW-4S
MW-5
SMW-3S
SMW-3D
SMW-1D
SMW-1S
580
585
590
595
600
605
610
100
50
0
100
200
GRAPHIC SCALE IN FEET
N
W
E
S
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 4-5
OVERBURDEN GROUND WATER ELEVATIONS
ROUND 1 (JANUARY 1992) AND ROUND 2 (MAY 1992)
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

TABLE 4-2
WATER LEVEL ELEVATIONS

Well I.D.	Land Surface Elevation	Top of Casing Elevation	Total Well Depth (feet below land surface)	Elevation of Screened Interval	Round 1 (1-8-92) Water Level Elevation	Round 2 (5-26-92) Water Level Elevation	Difference in Ground Water Elevation Round 2 - Round 1 (ft)
SMW-1S	634.57	634.33	33.0	612.07 - 601.59	607.14	610.03	2.89
SMW-1D	634.33	633.76	51.0	589.83 - 583.33	608.05	609.96	1.91
SMW-3S	605.94	605.33	17.0	599.44 - 588.94	599.45	599.63	0.18
SMW-3D	606.38	605.94	22.6	589.38 - 583.78	599.91	600.29	0.38
SMW-4S	607.65	607.36	10.0	603.15 - 597.65	604.74	605.96	1.22
SMW-4D	608.05	607.38	18.0	600.55 - 590.05	605.45	606.08	0.63
SMW-5	595.78	595.41	18.5	587.28 - 577.28	577.89	577.91	0.02
SMW-6S	601.30	600.66	8.5	598.30 - 587.28	596.84	596.96	0.12
SMW-6D	601.50	600.74	14.0	593.00 - 587.50	596.14	596.74	0.60
SMW-7	594.30	593.80	8.2	591.50 - 586.10	586.60	586.90	0.30
SMW-8	595.48	594.92	8.5	592.48 - 586.98	587.92	587.87	-0.05
SMW-9	594.46	593.73	8.3	591.76 - 586.16	Dry	586.53	---
SMW-10	601.93	601.43	16.0	596.43 - 585.93	596.10	596.23	0.13
SMW-11	596.66	596.19	9.8	592.46 - 586.86	590.89	590.96	0.07

TABLE 4-3 PERMEABILITY TESTING IN SHALLOW MONITORING WELLS			
Well Number	Soil Type	Interval Tested (Depth, Feet)	Permeability (cm/sec)
SMW3S	silty clay 6.5' - 14', fine sand & gravel 14' - 17'	6.5 - 17.0	7.8×10^{-4}
SMW3D	fine sand, gravel and silt	17.0 - 22.8	7.7×10^{-5}
SMW4S	fine sand, silt and clay	4.5 - 10.0	3.4×10^{-4}
SMW4D	fine sand, silt and clay, some gravel	7.5 - 18.0	3.8×10^{-4}
SWM6D	fine sand, silt and clay	8.5 - 14.0	1.5×10^{-4}

4.3.2 Deeper Bedrock

The majority of the WCC bedrock monitoring wells have open intervals extending through the Gasport and DeCew Members, into the top of the Rochester Shale Member. Therefore, water level measurements from these wells represent composite water levels of the three members. Monitoring wells MW-6, MW-7, and MW-12 are screened in the Rochester Shale Member. Monitoring well MW-11 has an open interval extending through the Gasport and DeCew members but not into the Rochester Shale member. Monitoring wells MW-18 and MW-19 are listed as being sealed in the Rochester Shale (Table 4 of the WCC Summary Report); however, the well construction diagrams indicate that their open intervals extend through the Gasport, DeCew and Rochester Shale Members. Many of these wells have been paved over by the city, filled in with silt or have otherwise degraded, subsequent to the original investigation.

According to the WCC Report, artesian conditions predominate in the lower part of the Lockport Group. Recharge occurs where fractures intersect an unconfined aquifer, glacial overburden, or the ground surface. The local flow direction in the bedrock aquifer is to the north-northwest as evidenced by groundwater levels and the numerous seeps in rock along the Barge Canal wall. The average gradient is reported to be approximately 5 percent to the northwest. The gradient drops off steeply near the Barge Canal wall, indicating that the Barge Canal acts as a groundwater sink or discharge area.

Water levels in monitoring wells were measured by WCC several times before and after the Barge Canal was lowered for the winter months. Groundwater elevations were observed to drop after canal lowering, especially in the Rochester Shale. Water levels from wells sealed (screened) in the Rochester Shale were reported to be three to 38 feet lower than water levels in adjacent unsealed (open) wells. The WCC Summary Report states that a significant downward groundwater gradient exists in the bedrock underlying the site and surrounding vicinity, indicating that dissolved contaminants also are likely to migrate into and through bedrock.

Permeability values were estimated from slug tests performed in the bedrock wells.

Table 4-4 lists the interval of each well tested and the corresponding permeability. The permeability values range from 1.9 x 10^{-2} cm/sec in well MW-19 to 2.5 x 10^{-6} cm/sec in well MW-7.

TABLE 4-4
PERMEABILITY IN BEDROCK WELLS

Well Number	Interval Tested (Depth, Feet)	Permeability (cm/sec)
MW-1	29.5 - 48.0	8.2 x 10^{-5}
MW-2	20.5 - 50.7	3.9 x 10^{-5}
MW-3	11.7 - 60.0	5.8 x 10^{-5}
MW-4	19.0 - 82.2	1.9 x 10^{-4}
MW-5	21.8 - 50.0	2.3 x 10^{-4}
MW-6*	39.5 - 49.5	9.5 x 10^{-6}
MW-7*	44.5 - 54.5	2.5 x 10^{-6}
MW-8	20.0 - 30.0	1.1 x 10^{-4}
MW-9	19.0 - 50.0	1.7 x 10^{-4}
MW-10	14.0 - 50.0	3.0 x 10^{-4}
MW-11**	10.0 - 30.0	8.7 x 10^{-4}
MW-12*	43.7 - 52.8	1.8 x 10^{-3}
MW-13	27.4 - 50.0	2.5 x 10^{-4}
MW-14	11.75 - 70.0	5.1 x 10^{-4}
MW-16	12.0 - 30.0	1.1 x 10^{-4}
MW-17	21.7 - 35.0	3.7 x 10^{-5}
MW-18	11.0 - 45.0	7.9 x 10^{-4}
MW-19	14.5 - 50.0	1.9 x 10^{-2}

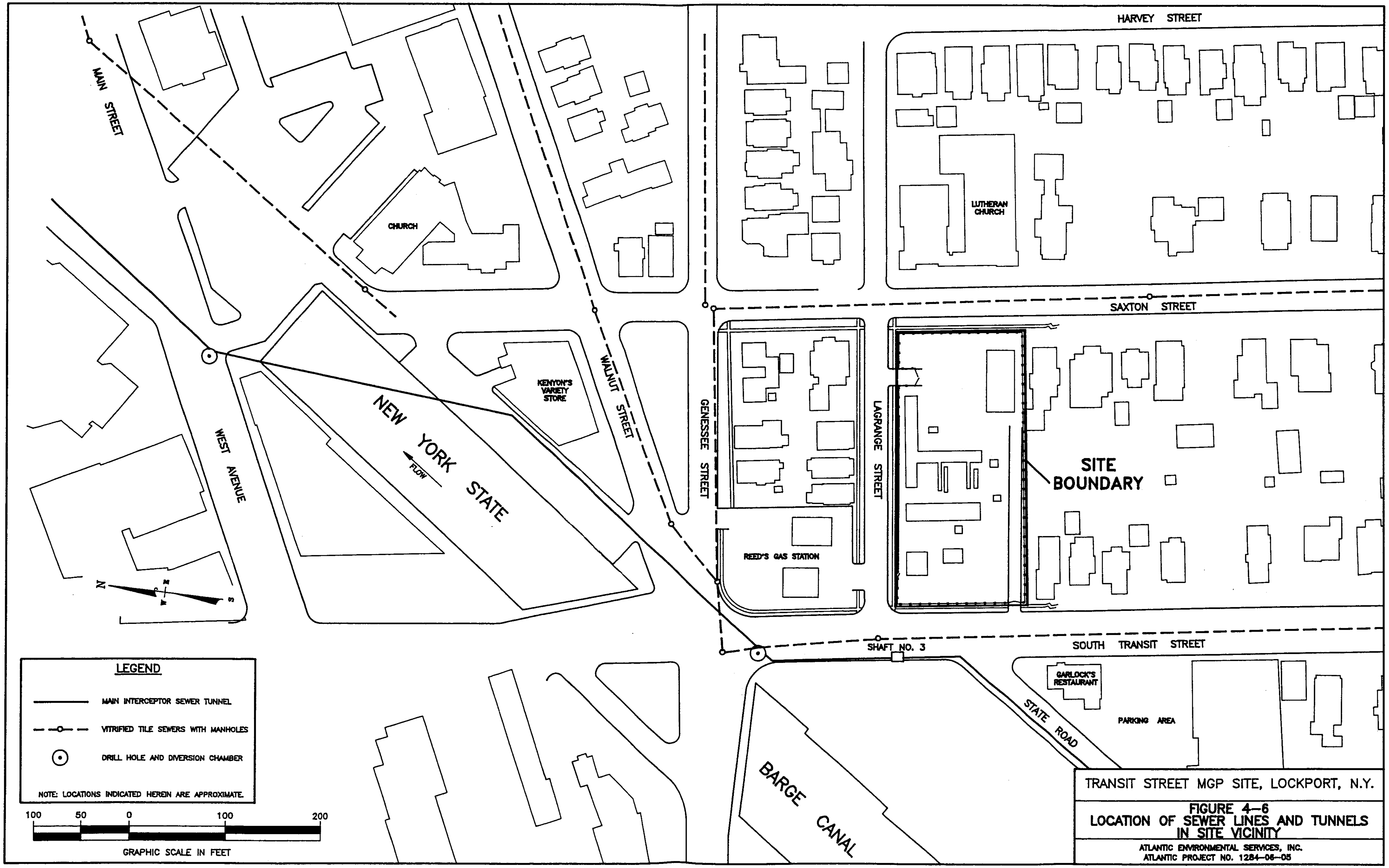
* Wells sealed in Rochester Shale Member.
** Well open to the Gasport and DeCew Members only
All permeability values calculated from slug tests. Data taken from WCC Summary Report

4.3.3 Water Use

The east branch of the Niagara River is the primary source of potable water for the City of Lockport. During drought periods or when supply line maintenance interrupts the primary water supply, water is purchased from Niagara County. Niagara County withdraws water from the west branch of the Niagara River. If Niagara County cannot supply sufficient water to meet the City of Lockport's demands, water from the New York State Barge Canal is blended (after treatment) with county water. The canal water intake is approximately 4,600 feet upstream of the site. Canal water has only been used as supplemental water twice in the past 19 years. It does not appear likely that any discharge of contaminants from the site vicinity would have potential health impacts on canal water because of the upstream location of the city intake. Several wells exist within a three mile radius of the Transit Street Site according to U.S. Geological Survey (USGS) well records. Many of these wells are part of the observation well network for the USGS Niagara Project. The remaining wells are listed as being used for domestic and livestock purposes. The closest well to the Transit Street Site is approximately two miles southeast and is listed as a domestic well. It is unknown if any of these wells currently are in use.

4.3.4 Sewer Lines, Tunnels and Shafts

WCC collected information concerning the location and construction of sewer lines, tunnels and shafts in order to evaluate their potential to act as pathways for contaminant migration (Figure 4-6). Lockport has a sewer system which uses tunnels excavated in rock as interceptor sewers. The main interceptor tunnel extends along State Road to South Transit Street, along South Transit Street one block between LaGrange and Genesee Streets, continues along what was formerly Buffalo Street, crossing under the Barge Canal, and continuing to Williams Street where it joins a pipeline extending to the sewage disposal plant on Jackson Street. Access shaft number 3 is located on South Transit Street approximately 40 feet northwest of the NYSEG substation (former MGP site). The shaft number 3 tunnel invert is approximately 75 feet below street grade. It has been reported by the City Engineer (Mr. Gurner at the time of the WCC investigation) that tar odors were present whenever the manhole cover over shaft number 3 was removed. The system of sewer lines and tunnels does not appear to act as a direct conduit for lateral migration of tar contaminants. However, according to the WCC Summary Report, cased drill holes and shafts may be acting as preferred vertical pathways for migration of contaminants into bedrock. Sewage odors were reported by WCC in several monitoring wells, also suggesting connection between leaky sewer lines and bedrock; however, specific wells were not identified. Sewage odors were noted in soils in a shallow boring (SB-34) adjacent to the western site border during Atlantic's shallow boring program.



TRANSIT STREET MGP SITE, LOCKPORT, N.Y.

FIGURE 4-6
LOCATION OF SEWER LINES AND TUNNELS IN SITE VICINITY

ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

5.0 CHEMICAL DISTRIBUTION OF CONTAMINANTS

The field program at the Transit Street site included sampling of shallow and deep subsurface overburden soils, two rounds of groundwater sampling, soil gas sampling, and indoor air quality monitoring. Analytical results are summarized and discussed in the following sections. Complete analytical results are provided in Appendix D, along with a table relating Atlantic sample identification numbers with NYSEG database sample identification labels.

5.1 Subsurface Soils

5.1.1 Shallow Subsurface Soils

Shallow subsurface soils in the former MGP site vicinity were investigated with a hand-held gasoline-powered auger system, due to inaccessibility of a drill rig in certain areas. Forty-four borings were attempted at the locations illustrated in Figure 5-1. Field notes characterizing the soils visually and by odor are included in Appendix C. Twenty-two of these borings were terminated at shallow depths (6 inches to 2.5 feet) due to refusal on former foundations or large rubble/fill. The borings in which refusal was encountered at shallow depths include SB-02 through SB-06 and SB-22 in the southwest portion of the site, SB-09 through SB-16 in the eastern portion of the site, SB-20 in the center of the site, SB-25 in the northeast site corner, SB-33 in the northwest site corner, and SB-39 through SB-42 in the central-southern portion of the residential block north of the former MGP site.

Seventeen soil samples were collected from depths of 2 to 8 feet for chemical analysis. A field equipment rinsate and trip blank samples were submitted for analysis for QA/QC purposes. The samples were analyzed by Galson Corporation for VOCs (EPA Method 8240), SVOCs (EPA Method 8270), metals (6000/7000 Series), cyanide (EPA Method 9010), and sulfide (EPA Method 9030). The analytical results were validated by a qualified Atlantic chemist. Table 5-1 summarizes the results of these analyses (complete analytical results are available in Appendix D). In addition, two samples were collected for infrared spectral (IR) analysis. Figure 5-1 presents total volatile aromatic (VOA), polycyclic aromatic hydrocarbon (PAH), chlorinated hydrocarbon, cyanide, and sulfide concentrations for all locations sampled.

Two classes of VOCs were detected in the shallow subsurface soils at the site. Volatile aromatics, including benzene, toluene, ethylbenzene, styrene, and xylenes, were detected in 11 of the 17 samples. Chlorinated hydrocarbons, including methylene chloride, 1,1,1-trichloroethane, and 1,1-dichloroethane were found in 10 of the 17 samples. Volatile aromatics are common constituents of MGP and petroleum by-products and residuals. Chlorinated hydrocarbons are generally not associated with MGP operations. Acetone and methylene chloride, common laboratory contaminants, were detected in several of the seventeen samples.

The majority of SVOCs detected in the shallow subsurface soils were PAHs, as summarized in Table 5-1. Other semi-volatiles detected include benzoic acid, dibenzofuran, bis(2-ethylhexyl)phthalate, and di-n-butylphthalate. PAHs, dibenzofuran, and benzoic acid may all be associated with MGP residues. The presence of phthalates at the levels detected may be

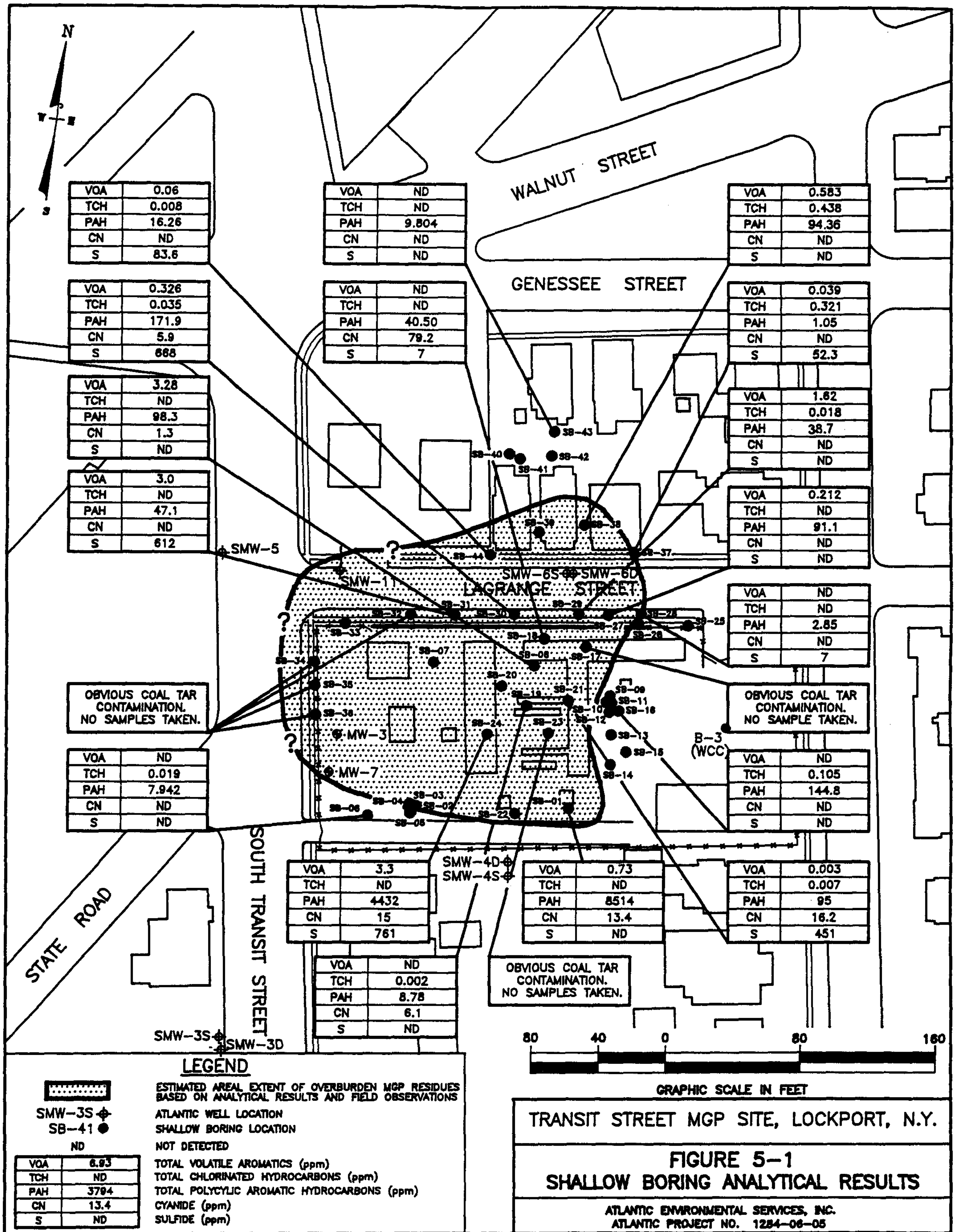


FIGURE 5-1
SHALLOW BORING ANALYTICAL RESULTS

TABLE 5-1
LOCKPORT ANALYTICAL RESULTS
SHALLOW SUBSURFACE SOIL (ppm)

ANALYTE	BORING ID																
	SB-01	SB-06	SB-08	SB-16	SB-18	SB-19	SB-21	SB-24	SB-27	SB-28	SB-29	SB-30	SB-31	SB-37	SB-38	SB-43	SB-44
VOLATILE ORGANIC COMPOUNDS																	
Volatile Aromatics																	
Benzene	<1.5	<0.006	0.54 J	<0.006	<0.006	<0.007	0.003 J	<2.3	0.007 JD	<0.007	0.19 D	0.25	<0.88	<0.039	0.019 JD	<0.007	<0.015
Toluene	<1.5	<0.006	0.4 J	<0.006	<0.006	<0.007	<0.006	<2.3	0.005 JD	<0.007	0.25 D	0.005 J	<0.88	<0.039	0.034 JD	<0.007	<0.015
Ethylbenzene	<1.5	<0.006	2.7	<0.006	<0.006	<0.007	<0.006	<2.3	0.12 D	<0.007	0.68 D	0.01 J	1.1	<0.039	0.38 D	<0.007	0.045 D
Styrene	0.73 JD	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Xylenes (total)	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	3.3 D	0.08 D	<0.007	0.5 D	0.061	1.9	0.039	0.15 D	<0.007	0.015 JD
Chlorinated Hydrocarbons																	
Methylene Chloride	<1.5	0.019	<0.76	0.1	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	0.018 JD	<0.011	<0.88	0.071 D	0.23 D	<0.007	0.008 JD
1,1,1-Trichloroethane	<1.5	<0.006	<0.76	0.005 J	<0.006	0.002 J	0.007	<2.3	<0.016	<0.007	<0.02	0.017	<0.88	0.24 D	0.19 D	<0.007	<0.015
1,1-Dichloroethane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	0.018	<0.88	0.01 JD	0.018 JD	<0.007	<0.015
Other Volatiles																	
Acetone	<3.1	0.011 J	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	0.072 D	<0.014	0.056 D	0.053	<1.8	0.14 D	<0.098	<0.015	<0.03
SEMI-VOLATILE ORGANIC COMPOUNDS																	
Probable Carcinogenic PAHs																	
Benzo(a)anthracene	320 D	0.5	6	58 D	3.6	0.54	8.6 D	100	5	0.2 J	2	17 D	0.98	<0.42	1.8	0.86	1
Benzo(b)fluoranthene	92	0.42	4.8	8.4 D	3.4	0.68	13 D	64	2.8	0.28 J	1.1	14 D	0.82	<0.42	0.94	0.94	1.5
Benzo(k)fluoranthene	92	0.48	2.8	5.4 D	3.2	0.74	5.4	52	3.4	0.32 J	0.9	17 D	0.66	<0.42	0.9	1.4	1.4
Benzo(g,h,i)perylene	62	0.26 J	1.2	7.2 D	1.9	0.72	12 D	28	3	0.28 J	0.72	7.4	0.52	<0.42	0.66	0.5	0.76
Benzo(a)pyrene	120	0.52	4.6	9.6 D	4.4	0.88	13 D	22	5.6	0.38	1.8	22 D	1.1	<0.42	1.6	1.4	2.4
Chrysene	100	0.52	4.6	6 D	3.2	0.62	4.6	70	3.8	0.22 J	1.8	7.4	1.2	<0.42	1.62	0.86	1.1
Dibenzo(a,h)anthracene	30	0.11 J	0.7	3.4	0.84	0.2 J	2.6 D	14	1.5	0.12 J	0.32 J	4.2	0.28 J	<0.42	0.28 J	0.3 J	0.24 J
Indeno(1,2,3-cd)pyrene	58	0.26 J	1.4	5.8 D	2	0.6	5.4	28	2.6	0.24 J	0.66	6.8 D	0.5	<0.42	0.56	0.58	0.72
Subtotal	874	3.07	26.1	103.8	22.54	4.98	64.6	378	27.7	2.04	9.3	95.8	6.06	ND	8.36	6.84	9.12
Non-Carcinogenic PAHs																	
Acenaphthene	820 D	<0.4	7.6 D	0.46	0.3 J	<0.45	0.26 J	32	6	<0.38	3.8	3.8	2.2	<0.42	7.2	0.092 J	0.38
Acenapthylene	120	0.24 J	4.2	6.8 D	2.4	0.66	4.4	38	4.2	<0.38	1.4	6.8	1.1	<0.42	1.2	0.092 J	1.5
Anthracene	540 D	0.24 J	6.4	4.2	1.4	0.26 J	2.4	170 E	5	<0.38	2.8	4.8	3.6	0.11 J	3.6	0.22 J	0.64
Fluoranthene	700 D	1.5	7.4	11 D	4.2	0.84	5.8	200 D	6	0.3 J	3.2	19 D	2.4	0.2 J	3.4	0.98	1.2
Fluorene	1100 D	0.2 J	5.4 D	1.2	0.88	<0.45	0.58	54	4.4	<0.38	2.6	2.6	0.74	<0.42	3.8	<0.43	0.26 J
2-Methylnaphthalene	1000 D	<0.4	7.8 D	0.42	0.28 J	0.22 J	0.62	1100 D	4	<0.38	3	1.3	2.4	<0.42	18 D	<0.43	<0.46
Naphthalene	1000 D	0.092 J	13 D	0.52	0.9	0.46	0.74	1800 D	3.8	0.12 J	2.4	5.2	4.8	0.1 J	30 D	<0.43	0.26 J
Phenanthrene	1600 D	1.4	13 D	6.4	3	0.48	3.6	460 D	18 D	0.15 J	6.4 E	8.6	22 D	0.44	15 D	0.7	1
Pyrene	760 D	1.2	7.4 D	10 D	4.6	0.88	12 D	200 D	12 D	0.24 J	3.8	24 D	1.8	0.2 J	3.8	0.88	1.9
Total PAHs	8514	7.942	98.3	144.80	40.50	8.78	95.00	4432	91.1	2.85	38.7	171.90	47.10	1.05	94.36	9.804	16.26

TABLE 5–1
LOCKPORT ANALYTICAL RESULTS
SHALLOW SUBSURFACE SOIL (ppm)

ANALYTE	BORING ID																
	SB–01	SB–06	SB–08	SB–16	SB–18	SB–19	SB–21	SB–24	SB–27	SB–28	SB–29	SB–30	SB–31	SB–37	SB–38	SB–43	SB–44
Other Semi–volatiles																	
Benzoic Acid	<39	<2	<2	0.15 J	0.16 J	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
Dibenzofuran	44	0.1 J	0.86	0.68	0.15 J	<0.45	0.38 J	88	0.66	<0.38	0.3 J	0.66	<0.47	<0.42	0.44 J	<0.43	<0.46
bis(2–ethylhexyl)phthalate	<7.8	<0.4	<0.41	<0.41	0.28 J	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
di–n–butylphthalate	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	0.78	<6.7	0.84	0.94	0.62	0.96	0.86	0.58	0.86	0.74	0.84
INORGANICS																	
Aluminum	3810	6130	4720	5000	4130	4680	4510	1430	4330	5200	8410	6310	5450	3680	6000	5790	4800
Antimony	<0.24	<0.25	<0.25	<0.22	<0.23	<0.24	<0.23	2.9 B	<0.24	<0.23	<0.24	<0.32	<0.3	<0.26	<0.29	<0.25	<0.23
Cadmium	0.96	<0.37	0.38 B	0.78	0.35 B	0.85	4.4	1.8	<0.36	0.58	0.6	0.49 B	0.45 B	<0.39	<0.44	0.49 B	0.34 B
Chromium	12.1	7.5	7.9	7.6	7.8	14.5	12.4	24.8	7.4	8.7	13.1	9.7	7.6	7.6	10.1	7.4	7.6
Cobalt	5.1 B	4.5 B	3.6 B	5 B	5.9	5 B	5.6 B	8 B	3.5 B	4.4 B	5.6 B	4.4 B	3.7 B	5 B	2.5 B	3.2 B	3.9 B
Copper	28	11.8	11.1	26.3	20.3	134	461	44.7	14.8	13.8	9.1	44.7	25.4	13.9	40.1	47.2	11.9
Iron	11300	9630	9110	10100	12200	14900	12000	24100	7910	9540	15000	10600	10400	9720	8330	8810	8800
Lead	518	14.6	120	552	159	732	282	1690	199	35.8 B	8.6	364	35.6 B	90.4	467	159	3.1
Manganese	265	527	436	528	403	464	427	602	385	412	508	369	527	611	1150	1770	493
Nickel	8.3	8.6	6.9	6.9	9.3	14.3	16.6	12	7.6	9.7	10.5	11.2	8.2	7.7	12.3	9.7	7.4
Zinc	93.3	33.2	13.3	76.7	34.1	460	5310	520	39.8	47.9	32.9	105	48.7	33.6	189	150	26.8
Cyanide	13.4	<1.2	13	<1.2	79.2	6.1	16.2	15	<1.2	<1.2	<1.2	5.9	<1.5	<1.3	<1.4	<1.3	<1.1
Cyanide (Amenable)	<1.1	NR	<1.2	NR	<1.1	<1.2	11.9	<1.9	NR	NR	NR	<1.6	NR	NR	NR	NR	NR
Sulfide	<4.9	<5	<5.1	<4.7	7	<4.9	451	761	<5.1	7	<4.9	668	612	52.3	<5.9	<5.1	83.6

Notes:

<0.017 – Not detected, minimum detection limit.

B – Indicates the result was less than the Contract Required Detection Limit (CRDL), but greater than or equal to the Instrument Detection Limit (IDL)

D – Indicates all compounds identified in an analysis at a secondary dilution.

E – Identifies compounds whose concentrations are outside the calibration range of the analysis.

J – Indicates estimated value.

NR – Not reported.

Shading indicates detected compound.

due to laboratory contaminants or the use of latex gloves to collect the sample. PAHs were detected in all 17 analytical samples, with a maximum concentration of 8514 ppm found in a sample taken from SB-01, near the former location of several oil tanks (Figure 5-1).

Results of analysis for inorganic compounds are also summarized in Table 5-1. Elevated levels of lead were found in 12 of the 17 wells when compared to background metal concentrations in the United States (Shacklette and Boerngen 1989). Samples from two locations at the center of the site (SB-19 and SB-21) showed elevated levels of copper. These two samples and two others (SB-24 and SB-38) contained elevated levels of zinc. Cyanide was detected in seven of the samples, with the highest concentration, 79.2 ppm, detected in a sample taken near the former location of several gas holders (SB-18). Sulfide was detected in eight of the samples as illustrated in Figure 5-1. The highest sulfide concentration detected at the site (761 ppm) was collected from sample SB-24 in the vicinity of a former coal shed. Cyanide and sulfide at former MGP sites generally are associated with purifier materials.

In addition to chemical analyses, IR analysis was performed by Remediation Technologies, Inc. (RETEC) on samples from SB-8 and SB-24, which are located in the central portion of the site. Both samples exhibited IR absorptions characteristic of a mixture of PAHs and aliphatic hydrocarbons, consistent with devolatilized water gas tar. The sample from SB-24 contained detectable levels of indene and naphthalene.

Based on the visual and odiferous observations noted during boring activities and sample analytical results, it is apparent that MGP residuals are present in the overburden beneath the majority of the former MGP site and extend downgradient beneath part of the residential block north of the site. Figure 5-1 illustrates the interpreted areal extent of MGP residues in the overburden soils in the site vicinity. The northwestern extent of residuals is based on observations noted during the installation of SMW-5 and SMW-11, in addition to the shallow borings. The northern boundary of MGP residues is interpreted to extend between SB-38 and SB-43 based on visual and analytical results. The northeastern extent of MGP residues is located between SB-38 and SB-37 based on visual and analytical results. The eastern and southern extent of residues is nebulous due to shallow refusal. The eastern boundary appears to extend between B-3 (drilled by WCC) and SB-23. The southern boundary is located between SMW-4S, 4D and SB-01 and SB-24. The extent of MGP residues to the west is uncertain. Tar saturated sediments were encountered at shallow depths along Transit Street west of the site. Due to the high concentration of overhead and underground utilities and heavy traffic along Transit Street and the steep terrain between Transit Street and the Barge Canal, it was not possible to drill additional borings between MW-8 (drilled by WCC - no MGP residuals noted in overburden) and the western site boundary. However, MGP residuals were not observed in the overburden in SMW-5 to the northwest or in SMW-3S and 3D, MW-5, or B-1 to the southwest.

Two borings within the interpreted areal extent of contamination show little sign of MGP-related chemicals. Shallow boring SB-07 was drilled through a mixture of clinkers, brick and gravel to a depth of 11 feet. No tars or odors were noted in SB-07, however, an analytical sample was not collected to verify the lack of MGP chemicals. Shallow boring SB-19 was drilled through sandy/gravelly fill containing bricks and coal to a depth of 6 feet. No odors or tars were noted and the analytical sample collected from 4 to 6 feet contained relatively low levels of total PAHs (8.78 ppm).

5.1.2 Deeper Subsurface Soils from the Drilling Program

Chemical analyses were performed by O'Brien and Gere Laboratories, Inc. on ten subsurface soil samples collected during the drilling program at depths ranging from 6 to 50 feet. Samples were analyzed for VOCs (EPA Method 8240), SVOCs (EPA Method 8270), metals (6000 - 7000 series), and grain size. The sampling strategy was to collect samples from visibly contaminated intervals, from intervals in which the wells were screened, at the top of the saturated zone, and at the overburden/bedrock interface (see Table 3-2). Table 5-2 summarizes the results of analyses performed on the soil samples (complete analytical results are available in Appendix D). In addition, two samples were collected for IR analysis. Borings logs indicating staining, odors and sheens encountered during drilling are provided in Appendix C.

Most of the VOCs detected in these subsurface soil samples are in the volatile aromatics class. Six of the ten samples contained VOAs, including benzene, toluene, ethylbenzene, styrene, and xylenes. Four of the samples contained very low estimated concentrations of benzene or toluene. In addition, 2-butanone was found in one sample from SMW-10; its presence is likely due to laboratory contamination. The highest total VOA concentrations were found in two wells immediately downgradient of the Transit Street site; SMW-6D had a total VOA concentration of 75.2 ppm, and SMW-11 had a concentration of 32.2 ppm (Figure 5-2).

The majority of SVOCs detected in these soil samples were PAHs; these compounds were detected in six of the samples, five of which also contained VOAs. Relatively low concentrations of PAHs were detected in samples collected from SMW-10 and SMW-4D. The highest concentration of PAHs were found in the same samples that contained the highest VOA levels, those from wells SMW-6D and SMW-11 (Figure 5-2). Two other semi-volatile compounds were present: bis(2ethylhexyl)phthalate, a common field sampling artifact, was detected in two samples, and dibenzofuran was detected in three samples. Dibenzofuran, which may be related to MGP residuals, was found at its maximum concentration (8 ppm) in the sample from SMW-11.

Most of the metals detected in the inorganic analysis of the soil samples were within typical background levels (Shacklette and Boerngen, 1984). One sample from SMW-5 exhibited elevated levels of lead and selenium.

In addition to chemical analysis, IR analysis was performed by RETEC on samples from wells SMW-6D and SMW-11. Carbon disulfide extractions of these samples exhibited IR absorptions characteristic of a mixture of PAHs and minor aliphatic hydrocarbons, consistent with a mixture of devolatilized carburetted water gas tar, and heavy coal tar derivatives. The extract from the SMW-11 sample appeared to be higher in heavy coal tar derivatives than that from SMW-6S. The IR analyses indicate that contaminants in the soil at SMW-6D and SMW-11 are related to MGP residues rather than gasoline.

TABLE 5-2
LOCKPORT ANALYTICAL RESULTS (ppm)
SUBSURFACE SOIL

ANALYTE	BORING ID/SAMPLE DEPTH INTERVAL (feet below land surface)									
	SMW-1S	SMW-1D	SMW-3D	SMW-4S	SMW-4D	SMW-5	SMW-6	SMW-10S	SMW-10D	SMW-11
	30-32	50-51	16-18	10-12	16-18	12-14	6-8	10-14	14-16	6-8
VOLATILE ORGANIC COMPOUNDS										
Volatile Aromatics										
Benzene	<0.006	<0.006	<0.006	<0.005	<0.006	<0.006	14	<0.006	<0.006	<2
Toluene	<0.006	0.002 J	<0.006	<0.005	<0.006[3]	0.003 J	2.2 J	<0.006	<0.006	4.2 J[1]
Ethylbenzene	<0.006	<0.006	<0.006	<0.005	<0.006	<0.006	34	<0.006	<0.006	3.6 J[2]
Styrene	<0.006	<0.006	<0.006	<0.005	<0.006	<0.006	<3.8	<0.006	<0.006	3.4 J[2]
Xylenes (total)	<0.006	<0.006	<0.006	<0.005	<0.006	<0.006	25	<0.006	<0.006	21 J[2]
Chlorinated Hydrocarbons										
Methylene Chloride	<0.006	<0.006[1]	<0.007[2]	<0.005[1]	<0.006[1]	<0.006[1]	<4.1[2]	<0.006[1]	<0.006[1]	<2[1]
Other Volatiles										
Acetone	<0.012[1]	<0.024[2]	<0.012[1]	<0.011[1]	<0.012[1]	<0.013[1]	<7.6	<0.031[2]	0.018[2]	<3.9
Carbon Disulfide	<0.006	<0.006	<0.006	<0.005	<0.006	<0.006[3]	<3.8	<0.006	<0.006	<2
2-Butanone	<0.012	<0.012	<0.012	<0.011	<0.012	<0.013	<7.6 R[1]	<0.012	<0.011	<3.9 R[1]
SEMI-VOLATILE ORGANIC COMPOUNDS										
Probable Carcinogenic PAHs										
Benzo(a)anthracene	<0.4	<0.39	<0.39	<0.38	<0.39	0.76	6.9 J	<0.4	0.062 J	5.9
Benzo(b)fluoranthene	<0.4	<0.39	<0.39	<0.38	<0.39	0.88	2.8 J	<0.4	<0.38	3.1 J
Benzo(k)fluoranthene	<0.4	<0.39	<0.39	<0.38	<0.39	0.62	2.9 J	<0.4	<0.38	3.1 J
Benzo(g,h,i)perylene	<0.4	<0.39	<0.39	<0.38	<0.39	0.44	1.7 J	<0.4	<0.38	1.2 J
Benzo(a)pyrene	<0.4	<0.39	<0.39	<0.38	<0.39	0.75	4.8 J	<0.4	<0.38	3.7 J
Chrysene	<0.4	<0.39	<0.39	<0.38	<0.39	0.78	6 J	<0.4	0.054 J	5.1
Dibenzo(a,h)anthracene	<0.4	<0.39	<0.39	<0.38	<0.39	0.31 J	<12	<0.4	<0.38	1 J
Indeno(1,2,3-cd)pyrene	<0.4	<0.39	<0.39	<0.38	<0.39	0.49	1.6 J	<0.4	<0.38	1.6 J
Subtotal	ND	ND	ND	ND	ND	5.03	26.7	ND	0.116	24.7
Non-Carcinogenic PAHs										
Acenaphthene	<0.4	<0.39	<0.39	<0.38	<0.39	0.051 J	32	<0.4	<0.38	3.1 J
Acenapthalene	<0.4	<0.39	<0.39	<0.38	<0.39	0.056 J	2 J	<0.4	<0.38	13
Anthracene	<0.4	<0.39	<0.39	<0.38	<0.39	0.22 J	15	<0.4	0.08 J	10
Fluoranthene	<0.4	<0.39	<0.39	<0.38	<0.39	1	13	<0.4	0.22 J	12
Fluorene	<0.4	<0.39	<0.39	<0.38	<0.39	0.092 J	19	<0.4	0.14 J	14
2-Methylnaphthalene	<0.4	<0.39	<0.39	<0.38	<0.39	0.12 J	44	<0.4	0.077 J	3.5 J
Naphthalene	<0.4	<0.39	<0.39	<0.38	<0.39	0.12 J	75	0.58 J	0.16 J	29
Phenanthrene	<0.4	<0.39	<0.39	<0.38	0.046 J	0.81	42	<0.4	0.42	23
Pyrene	<0.4	<0.39	<0.39	<0.38	<0.39	1.1	18	<0.4	0.14 J	9.9
Total PAHs	ND	ND	ND	ND	0.046	8.599	286.7	0.58	1.353	142.2
Other Semi-volatiles										
Bis(2-ethylhexyl)phthalate	<0.4[1]	<0.39	<0.39[1]	<0.38[1]	<0.39[1]	<0.42	<12	<0.4[1]	<0.38[1]	<4.2
Dibenzofuran	<0.4	<0.39	<0.39	<0.38	<0.39	0.094 J	<12	<0.4	0.078 J	8

TABLE 5-2
LOCKPORT ANALYTICAL RESULTS (ppm)
SUBSURFACE SOIL

ANALYTE	SMW-1S	SMW-1D	SMW-3D	SMW-4S	SMW-4D	SMW-5	SMW-6	SMW-10S	SMW-10D	SMW-11
	BORING ID/SAMPLE DEPTH INTERVAL (feet below land surface)									
	30-32	50-51	16-18	10-12	16-18	12-14	6-8	10-14	14-16	6-8
INORGANICS										
Aluminum	3420	4940	4680	6490	<4640	9080	11900	6760	2840	9630
Antimony	<6.2 J^3	<6 J^3	<6.1 J^3	<5.9 J^3	<6.1 J^3	<6.5 J^3	<9.5 J^3	<6.2 J^3	<6 J^3	<6.5 J^3
Arsenic	1.4 J^5	2.7 J^5	2.6 J^5	4.5 J^5	6.6	5.4	2.5 B	2.2 B	2.7	4.9
Barium	78.4	66	151	68.5	95.1	96.4	477	89.7	42 B	211
Beryllium	0.7 B	0.66 B	0.68 B	0.63 B	0.66 B	0.77 B	0.99 B	0.67 B	0.67 B	0.67 B
Cadmium	<0.48	<0.47	<0.47	<0.45	<0.47	<0.5	<0.73	<0.48	<0.46	<0.5
Calcium	25800 J^4	50700 J^4	35700 J^4	57200 J^4	35700 J^4	98500 J^4	206000 J^4	36200 J^4	89200 J^4	48300 J^4
Chromium	5.1 R^2	7.2	6.8	9.2	8	12.3 R^2	15.8	10.4	4.7	14.5
Cobalt	3 B	4 B	4.7 B	5.4 B	4.6 B	5.1 B	5.9 B	6.7 B	3.5 B	7.2
Copper	6.8 R^2	16.4	16	21.6	19.8	40.7	39.8	7 R^2	17.3 R^2	11.7 R^2
Iron	7210	10100	9390	12300	10300	12900	12700	12900	7110	16200
Lead	1.6 J^3	2.5 J^3	2 J^3	5.7 J^3	1.9 J^3	128 J^3	42.9 J^3	2.1 J^3	2.7 J^3	6.4 J^3
Magnesium	5350	7200	6200	10800	6360	16400	21100	7860	13100	9720
Manganese	302	517	462	728	477	365	1760	546	686	925
Mercury	<0.12	<0.12	<0.12	<0.11	<0.12	0.26	<0.18	<0.12	<0.11	<0.12
Nickel	4.9 B	5.7 B	8 B	9.1	4.3 B	9.9 B	11.4 B	11.6	3.7 B	11.9
Potassium	452 B	400 B	937 B	551 B	507 B	1200 B	2380	1060 B	566 B	1290
Selenium	<0.95 J^3	<0.93 J^3	<0.94 J^3	<0.91 J^3	<0.94 J^3	2.6 J^3	<1.5 J^5	<0.95 J^5	<0.92 J^3	<1 J^3
Silver	<0.71	<0.7	<0.71	0.74 B	<0.71	<0.75	<1.1	<0.71	0.7 B	<0.75
Sodium	336 R^2	314 R^2	370 R^2	370 R^2	436 R^2	3180 J^6	1070 R^2	367 R^2	341.43	488 R^2
Thallium	<2.4	<2.3 J^5	<2.4	<1.1 J^5	<2.4	<2.5 J^5	<3.6 J^5	<2.4	<0.23 J^5	<2.5 J^5
Vanadium	10.8 B	15.2	12.7	16.7	16	20.5	29.1	16.1	11.3 B	22
Zinc	15.5	21.8	23.8	29.8	20.4	92.1	108	28.9	13.3 R^2	37

Notes:

<0.017 – Not detected, minimum detection limit.

1 – Compound was present in the associated blank; compound is present in the sample at a concentration less than the CRQL, report CRQL.

2 – Compound was present in the associated blank; compound was present in the sample at a concentration higher than the CRQL, but lower than the "action level" (the Limit of Detection has been raised for that compound, and the result is considered to be a non-detect.

3 – This compound was inappropriately reported at levels below the detection limit, report CRQL.

B – Indicates a value greater than or equal to the instrument detection limit, but less than the contract required detection limit.

J – Indicates the result is less than the sample quantitation limit, but greater than zero; estimated value.

J^1 – The Matrix Spike and/or Matrix Spike Duplicate Percent Recovery were not within the Contract Required Recovery range for this compound, estimated value.

J^2 – This compound was detected above the CRQL in the native sample, but was not detected in the MS and MSD, estimated value.

J^3 – The recovery of the matrix spike for an element is outside of criteria, estimated value.

J^4 – The Relative Percent Difference for duplicate laboratory sample analysis is >20% (>35% for soil), estimated value.

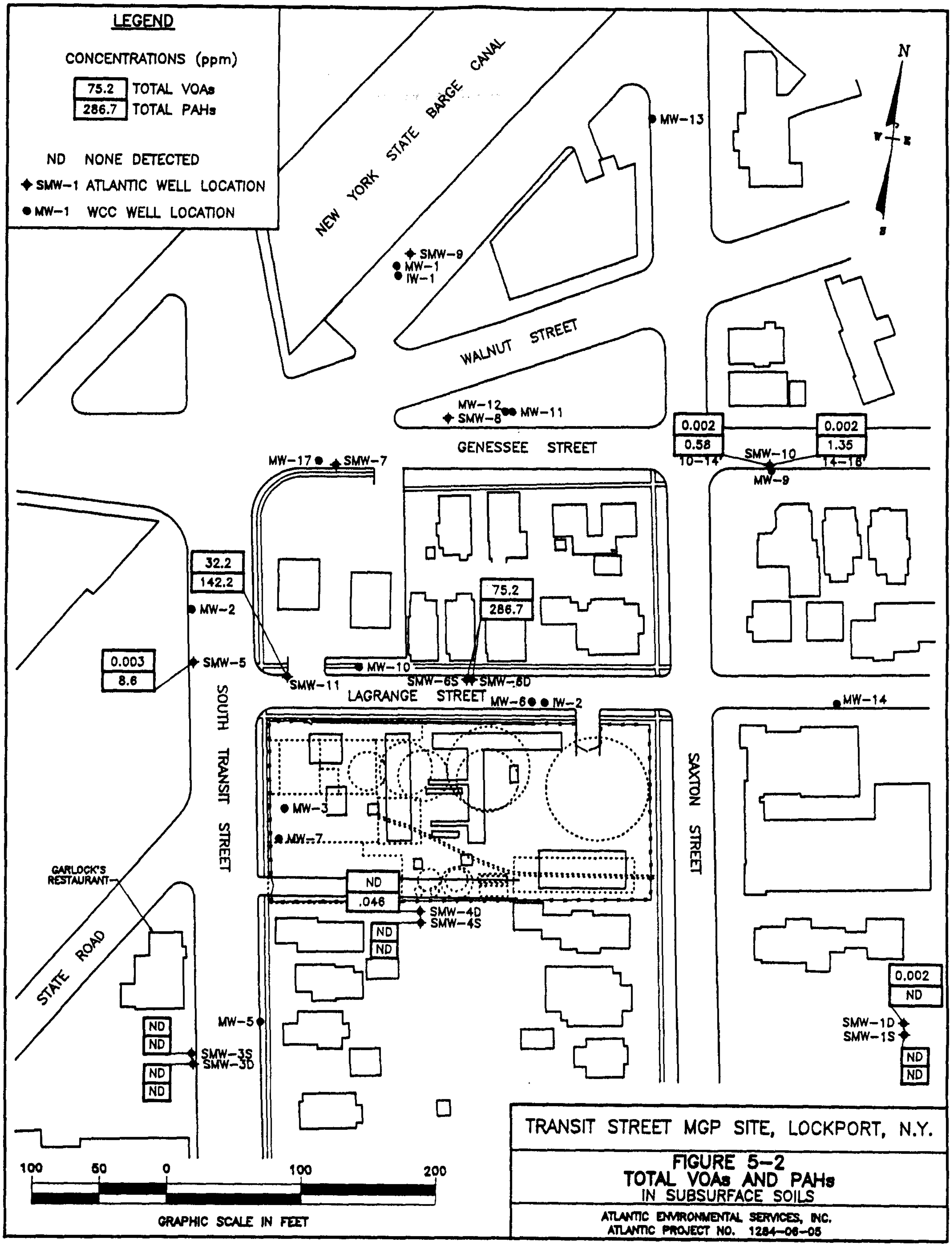
J^5 – The recovery of analytical spikes for GFAA analysis is outside of control limits, estimated value.

J^6 – The results of the ICP Serial Dilution experiment was outside of criteria, estimated value.

R^1 – The initial or continuing calibration RFs were low, estimated value.

R^2 – The compound was present in the associated blank; the sample result was less than the action level of 5x the maximum concentration found in any blank, and has been rejected.

Shading indicates detected compound.



LEGEND
CONCENTRATIONS (ppm)
75.2 TOTAL VOAs
286.7 TOTAL PAHs
ND NONE DETECTED
SMW-1 ATLANTIC WELL LOCATION
MW-1 WCC WELL LOCATION
NEW YORK STATE BARGE CANAL
WALNUT STREET
GENESSEE STREET
LAGRANGE STREET
SOUTH TRANSIT STREET
SAXTON STREET
STATE ROAD
GARLOCK'S RESTAURANT
N
W
E
S
MW-13
SMW-9
MW-1
IW-1
MW-12
SMW-8
MW-11
0.002
0.58
10-14'
0.002
1.35
14-18'
SMW-10
MW-9
MW-17
SMW-7
32.2
142.2
MW-2
75.2
286.7
0.003
8.6
SMW-5
MW-10
SMW-11
SMW-6S
SMW-6D
MW-6
IW-2
MW-14
MW-3
MW-7
ND
.046
SMW-4D
SMW-4S
ND
ND
0.002
ND
SMW-1D
SMW-1S
ND
ND
MW-5
ND
ND
SMW-3S
SMW-3D
ND
ND
100 50 0 100 200
GRAPHIC SCALE IN FEET
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 5-2
TOTAL VOAs AND PAHs
IN SUBSURFACE SOILS
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

In general, soils from deeper subsurface borings contain much lower levels of contamination than those from shallow borings. The highest levels of VOAs, PAHs, and dibenzofuran were found in soils immediately downgradient of the site (SMW-6D and SMW-11). IR analysis indicates that contaminants in these borings most likely are related to MGP wastes.

5.2 Groundwater

Two rounds of groundwater sampling were conducted at the Transit Street site, one in January 1992 and one in May 1992. The nine samples collected in Round 1 were analyzed by Wadsworth/Alert Laboratories, and ten samples from Round 2 were analyzed by Galson Corporation. Samples could not be collected from several downgradient monitoring wells because many were dry or contained insufficient water to obtain a representative sample.

Groundwater samples were analyzed for the following:

- volatile organic compounds - EPA Method 8240
- semivolatile organic compounds - EPA Method 8270
- MTBE - EPA Method 8020
- metals, including iron, zinc, aluminum, cadmium, antimony, cobalt, copper, manganese, and nickel - EPA Method 200.7
- chromium - EPA Method 7191
- cyanide - EPA Method 9010
- sulfide - EPA Method 9030 (Round 2 only)

In addition, IR analysis was performed on six samples. Analytical results are summarized in Table 5-3; complete analytical data are available in Appendix D.

Two classes of VOCs were detected in groundwater samples from the site: volatile aromatics, including benzene, toluene, ethylbenzene, styrene, and xylenes; and chlorinated hydrocarbons, including methylene chloride, chloroethane, 1,1-dichloroethane, and 1,1,1-trichloroethane. In addition, acetone was detected in Round 1 and 2 samples from SMW 4D, and MTBE was detected in Round 2 samples from SMW-3S and SMW-3D. Figures 5-3 and 5-4 show the concentrations of VOCs at each sampling location for Rounds 1 and 2, respectively. The highest levels of volatile aromatics were found in the sample collected from SMW-6D (19.68 ppm in Round 1) and SMW-11 (9.76 ppm) in Round 2, immediately downgradient of the site. Monitoring wells SMW-5, SMW-7, SMW-8 and SMW-9, situated hydraulically downgradient of the site, could not be sampled as they were essentially dry. Maximum levels of chlorinated hydrocarbons were detected during Round 2 in the sample collected from SMW-6S (0.0202 ppm) and SMW-6D (.061 ppm). MTBE, a compound associated with unleaded gasoline, was found only in the two wells adjacent to Garlock's Restaurant (SMW-3S and SMW-3D). SMW-7, located next to the WCC well (MW-17) in which 30 inches of product were found after a gasoline spill at the Reed's station, could not be sampled due to dry well conditions.

TABLE 5-3
LOCKPORT ANALYTICAL RESULTS (ppm)
GROUND WATER

ANALYTE	WELL ID																		
	SMW-1S		SMW-1D		SMW-3S		SMW-3D		SMW-4S		SMW-4D		SMW-6S		SMW-6D		SMW-10		SMW-11
	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD2
VOLATILE ORGANIC COMPOUNDS																			
Volatile Aromatics																			
Benzene	<0.005 J[1]	<0.001	<0.005	0.0014	<0.005 R[3]	<0.005 R[3]	<0.005 J[1]	0.0025 J	<0.005 R[3]	0.0088	<0.005 R[3]	0.003	1.6	0.0003 J	6.2 J[1]	1.1	<0.005 J[1]	<0.001	0.68
Toluene	<0.005 J[1]	<0.001	<0.005	<0.001	<0.005 R[3]	<0.005 R[3]	<0.005 J[1]	<0.005	<0.005 R[3]	0.0016	<0.005 R[3]	<0.001	0.46	<0.001 J[1]	5.5 J[1]	1.13	<0.005 J[1]	<0.001	4.3 E
Ethylbenzene	<0.005 J[1]	<0.001	<0.005	<0.001	<0.005	<0.005	<0.005 J[1]	<0.005	<0.005	0.0004 J	<0.005	<0.001	0.31	<0.001 J[1]	4.1 J[1]	0.041	<0.005 J[1]	<0.001	0.41
Styrene	<0.005 J[1]	<0.001	<0.005	<0.001	<0.005	<0.005	<0.005 J[1]	<0.005	<0.005	<0.001	<0.005	<0.001	<0.1	<0.001 J[1]	0.28 J[1]	<0.025	<0.005 J[1]	<0.001	0.77
Xylenes (Total)	<0.005 J[1]	<0.001	<0.005	<0.001	<0.005	<0.005	<0.005 J[1]	<0.005	<0.005	0.0018	<0.005	<0.001	0.86	<0.001 J[1]	3.6 J[1]	3.51	<0.005 J[1]	<0.001	3.6
Chlorinated Hydrocarbons																			
Methylene Chloride	<0.01 J[1]	<0.001	<0.01	<0.001	<0.01 [1]	<0.005 [1]	<0.01 J[1]	<0.005 [1]	<0.01 [1]	<0.001	<0.01 [1]	<0.001	<0.2	<0.001 J[1]	<0.4 J[1]	<0.025	<0.01 J[1]	<0.001	<0.025
Chloroethane	<0.01 J[1]	<0.002	<0.01	<0.002	<0.01	<0.01	<0.01 J[1]	<0.01	<0.01	<0.002	<0.01	<0.002	<0.2	0.0022	<0.4 J[1]	<0.05	<0.01 J[1]	<0.002	<0.05
1,1-Dichloroethane	<0.005 J[1]	<0.001	<0.005	<0.001	<0.005	<0.005	<0.005 J[1]	<0.005	<0.005	<0.001	<0.005	<0.001	<0.1	0.0075	<0.2 J[1]	0.04 [2]	<0.005 J[1]	<0.001	<0.025
1,1,1-Trichloroethane	<0.005 J[1]	<0.001	<0.005	<0.001	<0.005	<0.005	<0.005 J[1]	<0.005	<0.005	<0.001	<0.005	<0.001 [1]	<0.1	0.0027	<0.2 J[1]	<0.025 [1]	<0.005 J[1]	<0.001	<0.025
Other Volatiles																			
Acetone	<0.05 J[1]	<0.002	<0.05	<0.002	0.008 J [2]	<0.01	<0.05 J[1]	<0.01	0.007 J [2]	<0.002	0.005 J[2]	0.027 [2]	<0.1	<0.002	<2 J[1]	<0.05	<0.05 J[1]	<0.002	<0.05
Methyl tertiary butyl ether	<0.001 J[1]	<0.001	<0.001	<0.001	0.41	0.23	0.037	0.05	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Carbon Disulfide	<0.005 J[1]	<0.002	<0.005	<0.001	<0.005	<0.005	<0.005 J[1]	<0.005	<0.005	<0.001	<0.005	0.001 J	<0.1	<0.001	<0.2 J[1]	<0.025	<0.005 J[1]	<0.001	<0.025
SEMI-VOLATILE ORGANIC COMPOUNDS																			
Non-Carcinogenic PAHs																			
Acenaphthene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	0.014	0.037 J[1]	0.096	<0.01 J[1]	<0.01	0.015 J
Acenaphthalene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	0.001 J	<0.01 J[1]	<0.01	<0.01 J[1]	0.002 J	0.006 J[1]	<0.01	0.2 J[1]	0.47	<0.01 J[1]	<0.01	0.21
Anthracene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	0.012 J[1]	0.015 J	<0.01 J[1]	<0.01	<0.097
Fluoranthene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	0.0007 J	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<2 J[1]	<0.097	<0.01 J[1]	<0.01	<0.097
Fluorene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	0.0007 J	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<2 J[1]	0.096 J	<0.01 J[1]	<0.01	0.023 J
Naphthalene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	0.013 J[1]	<0.01	5.6 J[1]	3.1	<0.01 J[1]	<0.01	3
2-Methylnaphthalene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<2 J[1]	1	<0.01 J[1]	<0.01	0.45
Phenanthrene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	0.066 J[1]	0.081 J	<0.01 J[1]	<0.01	0.011 J
Pyrene	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	0.0007 J	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	0.022 J[1]	<0.097	<0.01 J[1]	<0.01	<0.097
Total PAHs	ND	ND	ND	ND	ND	ND	ND	0.0031	ND	ND	ND	0.002	0.019	0.014	5.937	4.858	ND	ND	3.709
Phenols																			
Phenol	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	0.071 J[1]	0.085	0.048 J[1]	0.059 J	<0.01 J[1]	<0.01	<0.097
2-Methylphenol	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<2 J[1]	0.041 J	<0.01 J[1]	<0.01	<0.097 [3]
4-Methylphenol	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<2 J[1]	0.062 J	<0.01 J[1]	<0.01	0.032 J
2,4-Dimethylphenol	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<2 J[1]	0.047 J	<0.01 J[1]	<0.01	0.026 J
Other Semi-volatiles																			
bis(2-ethylhexyl)phthalate	<0.01 J[1]	0.006 J	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	0.0007 J	<0.01 J[1]	<0.01	<2 J[1]	<0.097	<0.01 J[1]	0.002 J	<0.097
Dibenzofuran	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.011 J[1]	<0.014	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<0.01 J[1]	<0.01	<2 J[1]	0.012 J	<0.01 J[1]	<0.01	0.022 J

TABLE 5-3
LOCKPORT ANALYTICAL RESULTS (ppm)
GROUND WATER

ANALYTE	WELL ID																		
	SMW-1S		SMW-1D		SMW-3S		SMW-3D		SMW-4S		SMW-4D		SMW-6S		SMW-6D		SMW-10		SMW-11
	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD2
INORGANICS																			
Aluminum	1	<0.04	<0.2	<0.04 R[2]	<0.2	<0.04	<0.2	<0.04 R[2]	<0.2	<0.04	<0.2 R[2]	<0.04 R[2]	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	<0.04 R[2]
Aluminum (dis)	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	NS	<0.04 R[2]	<0.2	<0.04 R[2]	<0.2	<0.04 R[2]	<0.04 R[2]
Antimony	<0.06	<0.002	<0.06	<0.002	<0.06	<0.002	<0.06	<0.002	<0.06	<0.002	0.47 R[2]	<0.002	<0.06	<0.002 R[2]	<0.06	<0.002	<0.06	<0.002	<0.002
Antimony (dis)	<0.06	<0.002	<0.06	<0.002 R[2]	<0.06	<0.002	<0.06	<0.002	<0.06	<0.002	<0.06	<0.002	NS	<0.002	<0.06	<0.002 R[2]	<0.06	<0.002	<0.002
Cadmium	0.007	<0.003	<0.005	<0.003	<0.005	<0.003	<0.005	<0.003	<0.005	<0.003	0.048 R[2]	<0.003	<0.005	<0.003 R[2]	<0.005	<0.003	0.007	<0.003	<0.003
Cadmium (dis)	<0.005 J[3]	<0.003	<0.005 J[3]	<0.003	<0.005 J[3]	<0.003	<0.005 J[3]	<0.003	<0.005 J[3]	<0.003	<0.005 J[3]	<0.003	NS	<0.003	<0.005 J[3]	<0.003 R[2]	<0.005 J[3]	<0.003	<0.003
Chromium	<0.004	<0.003	<0.004	<0.003	0.018	<0.003	<0.004	<0.003	0.0086	<0.003	0.19 R[2]	<0.003	0.0048	<0.003 R[2]	<0.004	<0.003	0.0059	<0.003	<0.003
Chromium (dis)	<0.004	<0.003	<0.004	<0.003	<0.004	<0.003	<0.004	<0.003	<0.004	<0.003	<0.004	<0.003	NS	<0.003	<0.004	<0.003	<0.004	<0.003	<0.003
Cobalt	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	0.46 R[2]	<0.007	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	<0.007
Cobalt (dis)	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	<0.05	<0.007	NS	<0.007	<0.05	<0.007	<0.05	<0.007	<0.007
Copper	<0.025	<0.005	0.081	<0.005	<0.025	<0.005	<0.025	<0.005	<0.025	<0.005	0.24 R[2]	<0.005	0.026	<0.005 R[2]	<0.025	<0.005	<0.025	<0.005 R[2]	<0.005
Copper (dis)	<0.025	<0.005 R[2]	<0.025	<0.005	<0.025	<0.005 R[2]	<0.025	<0.005 R[2]	<0.025	<0.005 R[2]	<0.025	<0.005 R[2]	NS	<0.005 R[2]	<0.025	<0.005 R[2]	<0.025	<0.005 R[2]	<0.005 R[2]
Iron	<0.1	<0.008 R[2]	3	0.797	0.72	<0.008 R[2]	0.64	0.894	0.14 J[5]	<0.008 R[2]	1 R[2]	<0.008 R[2]	1.9	<0.008 R[2]	0.7	1.15 J[3]	0.19	<0.008 R[2]	3.91
Iron (dis)	<0.1	<0.008	2	0.654	0.11	<0.008 R[2]	0.78	0.608	0.1 J[5]	<0.008 R[2]	<0.1	<0.008	NS	<0.008 R[2]	0.5	<0.008 R[2]	<0.1	<0.008	2.27
Lead	<0.003 J[3]	<0.001 R[2]	<0.003 J[3]	<0.001	<0.003 J[3]	<0.001	<0.003 J[3]	<0.001 R[2]	<0.003 J[3]	<0.001	<0.003	<0.001	0.315 J[3]	<0.001 R[2]	<0.003 J[4]	<0.001	<0.003 J[3]	<0.001 R[2]	<0.001 R[2]
Lead (dis)	<0.003 J[3]	<0.001 R[2]	<0.003 J[3]	<0.001 R[2]	<0.003 J[3]	<0.001 R[2]	<0.003 J[3]	<0.001 R[2]	<0.003 J[3]	0.0115 J[3]	<0.003 J[3]	<0.001 R[2]	NS	<0.001 R[2]	<0.003 J[3]	<0.001 R[2]	<0.003	0.01	<0.001 R[2]
Manganese	0.11 J[5]	0.045	0.13	0.063	0.13	0.057	0.37 J[5]	0.298	0.075 J[5]	0.049 J[3]	0.52 R[2]	0.081	0.37	0.457	0.14	<0.001 R[2]	0.07 J[5]	0.056	0.71
Manganese (dis)	0.15 J[5]	0.039	0.094	0.061	0.14	0.068	0.46 J[5]	0.251	0.098 J[5]	0.048 J[3]	0.5	0.08	NS	<0.001 R[2]	0.16	0.323 J[3]	0.094 J[5]	0.044	0.595
Nickel	<0.04	<0.005	<0.04	<0.005	0.047	<0.005 R[2]	<0.04	<0.005	0.049 J[5]	<0.005 R[2]	0.5 R[2]	<0.005	<0.04	<0.005 R[2]	<0.04	<0.005	<0.04	<0.005	<0.005 R[2]
Nickel (dis)	<0.04	<0.005 R[2]	<0.04	<0.005	0.049	<0.005 R[2]	<0.04	<0.005	0.078 J[5]	<0.005 R[2]	<0.04	<0.005	NS	<0.005 R[2]	<0.04	<0.005 R[2]	<0.04	<0.005	<0.005 R[2]
Zinc	0.072 R[1]	<0.003 R[2]	<0.054 R[1]	<0.003 R[2]	0.03 R[1]	<0.003 R[2]	0.028 R[1]	0.108	0.023 R[1]	<0.003 R[2]	0.49 R[2]	<0.003 R[2]	0.05 R[1]	<0.003 R[2]	0.05 R[1]	<0.003 R[2]	0.09 R[1]	<0.003 R[2]	<0.003 R[2]
Zinc (dis)	<0.02	<0.003 R[2]	<0.02	<0.003 R[2]	<0.02	<0.003 R[2]	<0.02	<0.003 R[2]	<0.02	<0.003 R[2]	<0.02	<0.003 R[2]	NS	<0.003 R[2]	<0.02	<0.003 R[2]	<0.02	<0.003 R[2]	<0.003 R[2]
Cyanide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.017	<0.01	<0.01	<0.01	<0.01	<0.01	0.043	0.02	0.017	<0.01	<0.01	0.12
Cyanide (amenable)	NA	NA	NA	NA	NA	NA	NA	0.017	NA	NA	NA	NA	NA	<0.01	NA	<0.01	NA	NA	0.033
Sulfide	NA	<1	NA	<1	NA	<1	NA	<1	NA	<1	NA	3.6	NA	<1	NA	<1	NA	<1	<1

TABLE 5-3
LOCKPORT ANALYTICAL RESULTS (ppm)
GROUND WATER

ANALYTE	WELL ID																		
	SMW-1S		SMW-1D		SMW-3S		SMW-3D		SMW-4S		SMW-4D		SMW-6S		SMW-6D		SMW-10		SMW-11
	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD1	RD2	RD2

ROUND 1 NOTES

Notes:

<0.017 – Not detected, minimum detection limit.

1 – Compound was present in the associated blank; compound is present in the sample at a concentraiton less than the CRQL.

J^1 – The sample was analyzed outside the 12 hour clock from the last acceptable time.

J^2 – The initial or continuing calibration %RSD or %D was high; estimate.

J^3 – The initial or continuing calibration recovery was outside of criteria or the correlation coefficient of initial calibration (AA, Hg, or CN) is <0.995.

J^4 – The recovery of analytical spikes for GFAA analysis is outside of control limits.

J^5 – The dissolved metal result is greathr than the total metal result by >20%.

R^1 – The compound was present in the associated blank; the sample results was less than the action level of 5x the maximum concentration found in any blank, and was rejected.

R^2 – There was an error in the laboratory preparation of this sample.

R^3 – The internal standard area performance could not be evaluated because the necessary information was not provided: estimate all positive results and reject all non-detected results.

NA – Not analyzed.

ND – Not detected.

NS – Not sampled due to slow recharge rate (deletion of dissolved metals samples approved by client on 1/9/92 at 5730 p.m.).

Shading indicates detected compound.

ROUND 2 NOTES

Notes:

<0.017 – Not detected, minimum detection level.

1 – Compound was present in the associated blank; compound is presen in the sample at a concentration less than the CRQL.

2 – Compound was present in the associated blank; compound was present in the sample at a concentration higher than the CRQL but lower than the "action "level".

3 – Indicates the result should have been a false positive, based on retention time characteristics.

E – Identifies compounds whose concentrations exceed the calibration range of the instruments for specific analysis.

J – Indicates the result is less than the sample quantitation limit, but greater than zero; estimated value.

J^1 – One or more Internal Standard areas were not within the Contract Required Recovery range.

J^3 – The dissolved metal result is greater than the total metal result by >20%.

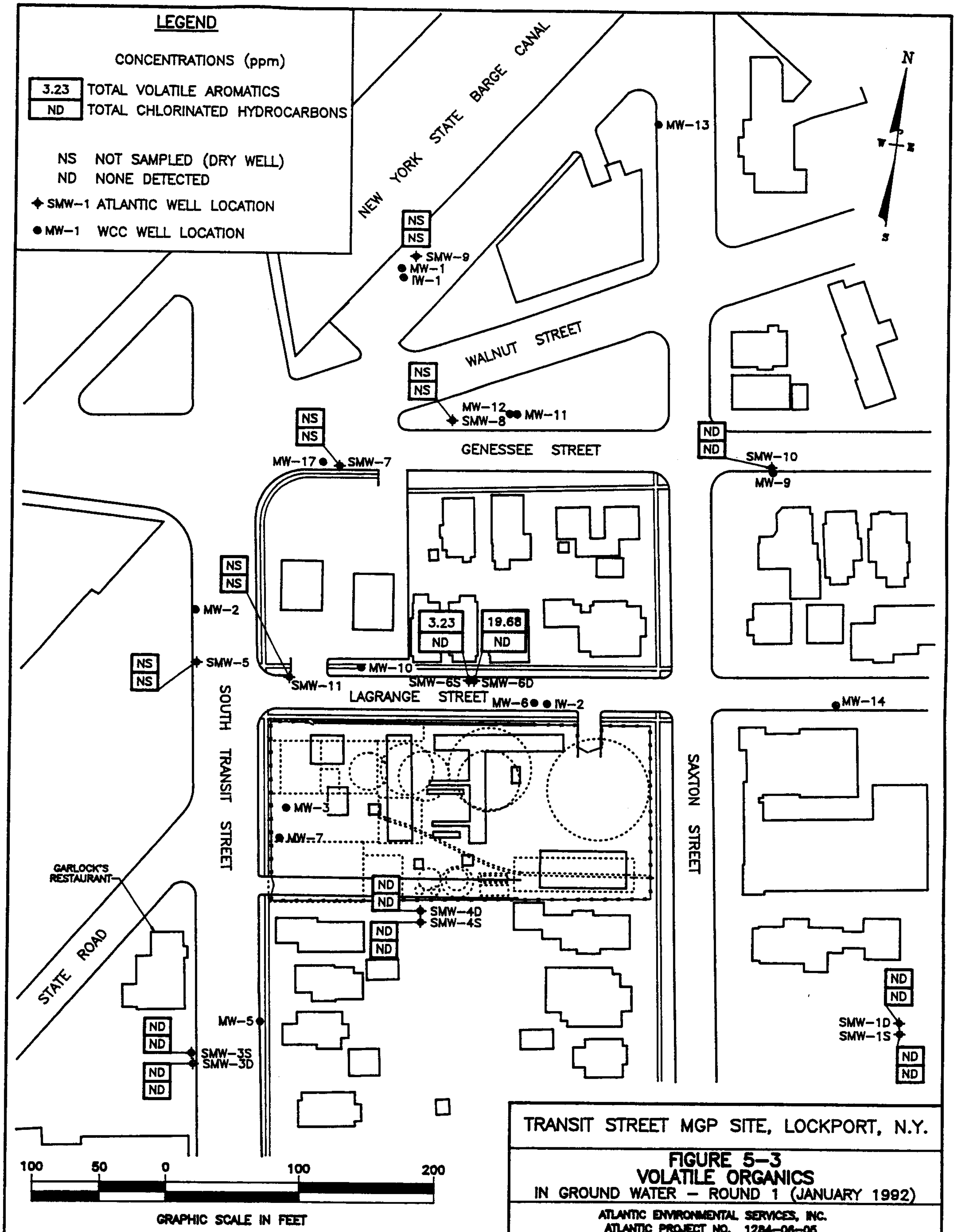
R^2 – The compound was present in the associated blank; the sample result was less than the action level of 5x the maximum concentration found in any blank, and has been rejected.

R^3 – The internal strandard area performance could not be evaluated because the necessary information was not provided: estimate all positive results and reject all non-detected results.

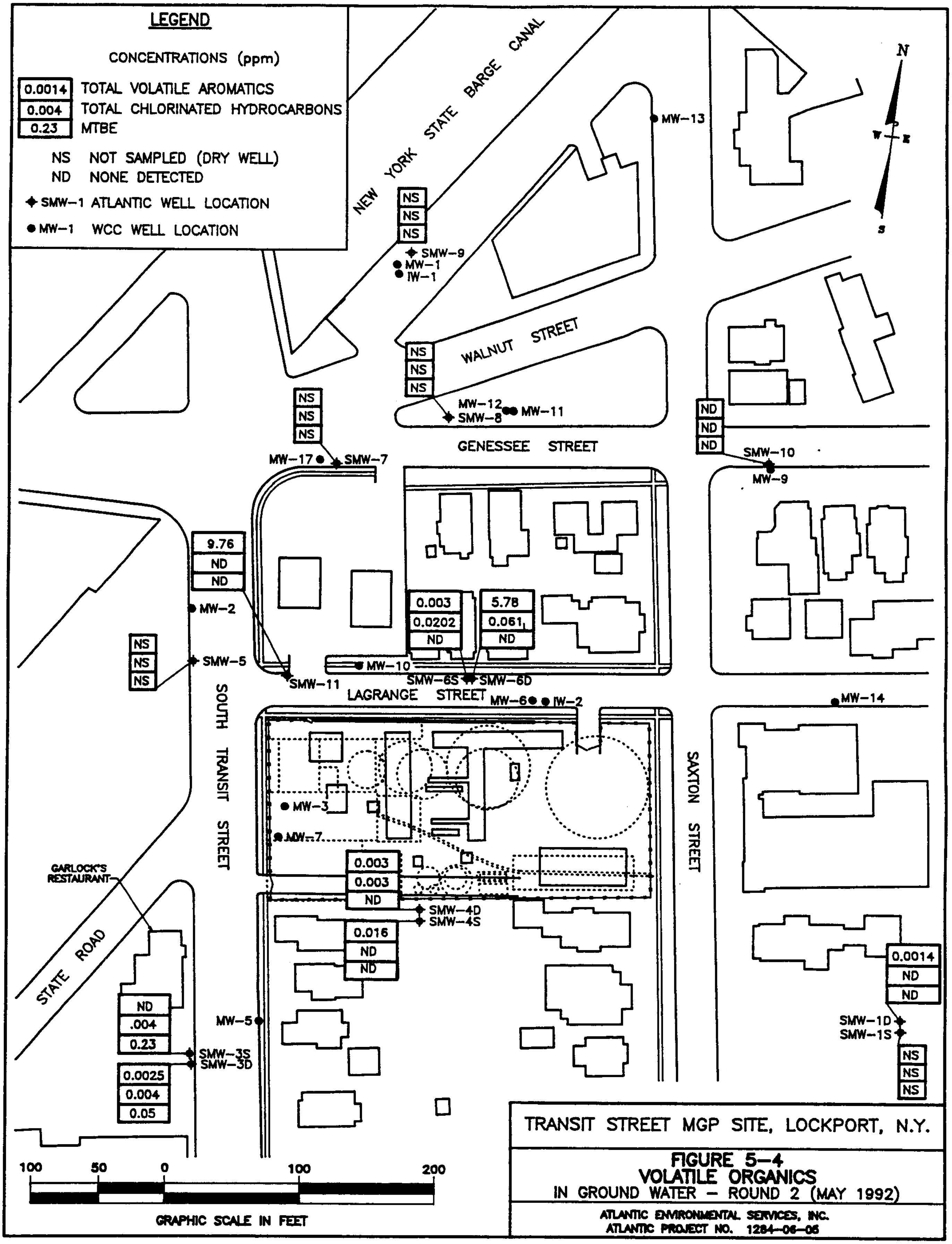
NA – Not analyzed.

ND – Not detected.

Shading indicates detected compound.



LEGEND
CONCENTRATIONS (ppm)
3.23 TOTAL VOLATILE AROMATICS
ND TOTAL CHLORINATED HYDROCARBONS
NS NOT SAMPLED (DRY WELL)
ND NONE DETECTED
SMW-1 ATLANTIC WELL LOCATION
MW-1 WCC WELL LOCATION
NEW YORK STATE BARGE CANAL
WALNUT STREET
GENESSEE STREET
LAGRANGE STREET
SOUTH TRANSIT STREET
SAXTON STREET
STATE ROAD
GARLOCK'S RESTAURANT
MW-13
SMW-9
MW-1
IW-1
MW-12
SMW-8
MW-11
MW-17
SMW-7
SMW-10
MW-9
MW-2
SMW-5
SMW-11
MW-10
SMW-6S
SMW-6D
MW-6
IW-2
MW-14
MW-3
MW-7
SMW-4D
SMW-4S
MW-5
SMW-3S
SMW-3D
SMW-1D
SMW-1S
3.23
19.68
NS
ND
N
100 50 0 100 200
GRAPHIC SCALE IN FEET
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 5-3
VOLATILE ORGANICS
IN GROUND WATER - ROUND 1 (JANUARY 1992)
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-06


LEGEND
CONCENTRATIONS (ppm)
0.0014 TOTAL VOLATILE AROMATICS
0.004 TOTAL CHLORINATED HYDROCARBONS
0.23 MTBE
NS NOT SAMPLED (DRY WELL)
ND NONE DETECTED
SMW-1 ATLANTIC WELL LOCATION
MW-1 WCC WELL LOCATION
NEW YORK STATE BARGE CANAL
WALNUT STREET
GENESSEE STREET
LAGRANGE STREET
SOUTH TRANSIT STREET
SAXTON STREET
STATE ROAD
GARLOCK'S RESTAURANT
MW-13
SMW-9
MW-1
IW-1
MW-12
SMW-8
MW-11
MW-17
SMW-7
SMW-10
MW-9
MW-2
SMW-5
SMW-11
MW-10
SMW-6S
SMW-6D
MW-6
IW-2
MW-14
MW-3
MW-7
SMW-4D
SMW-4S
MW-5
SMW-3S
SMW-3D
SMW-1D
SMW-1S
9.76
0.003
0.0202
5.78
0.061
0.016
0.0014
.004
0.23
0.0025
0.004
0.05
N
W
E
S
100 50 0 100 200
GRAPHIC SCALE IN FEET
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 5-4
VOLATILE ORGANICS
IN GROUND WATER - ROUND 2 (MAY 1992)
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-06

Several SVOCs, including PAHs and phenols, were detected in three of the samples. The latter group includes phenol, 2-methylphenol, 4 methylphenol, and 2,4-dimethylphenol. Both PAHs and phenols are associated with MGP residuals. In addition, bis(2-ethylhexyl)phthalate was found in three samples, and dibenzofuran was found in two samples. Figure 5-5 shows the total PAH and phenol concentrations for both sampling rounds. The highest concentrations of PAHs were found in groundwater from wells SMW-6D and SMW-11. Phenols were found exclusively in samples from SMW-6S, SMW-6D, and SMW-11, and dibenzofuran was found only in Round 2 samples from SMW-6D and SMW-11.

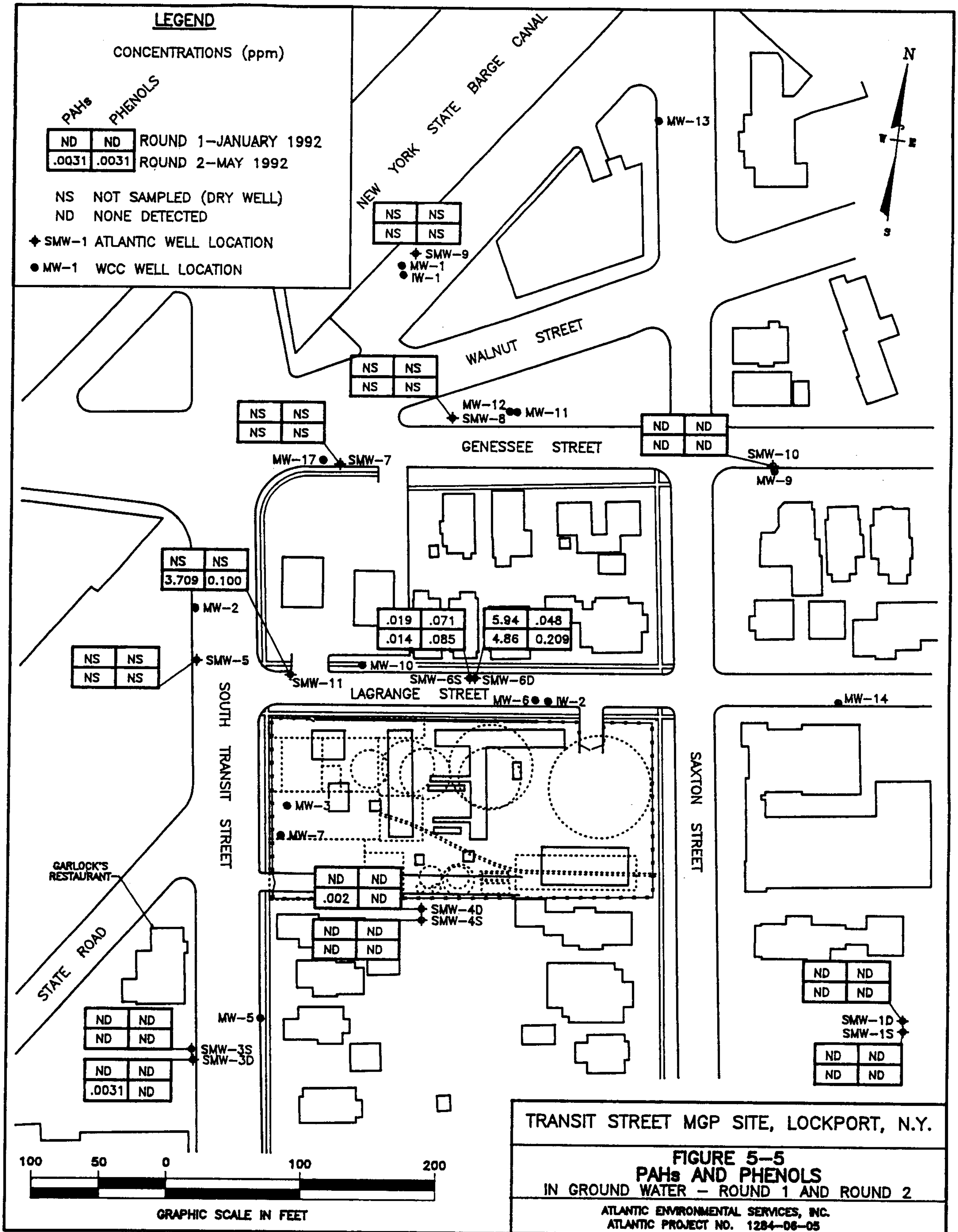
Groundwater samples were field filtered for metals, and metal analyses were conducted in both field filtered and non-field filtered samples. Analytical results are comparable for dissolved and non-filtered samples. Analysis of groundwater for inorganic constituents showed slightly elevated levels of aluminum, cadmium, iron, lead, manganese and/or sulfide in some samples (Table 5-3).

IR analysis was performed by RETEC on groundwater samples from wells SMW-3S, SMW-3D, SMW-6S, SMW-6D (two samples) and SMW-11. One sample from SMW-6D and the sample from SMW-11 contained minor trace amounts of naphthalene, indene and other PAHs. Residues after evaporation contained a complex mixture of highly oxidized aliphatic and aromatic hydrocarbons consistent with MGP tars. The remaining four samples were extracted using freon, and compounds detected in these extracts were thought to be due to interference from the freon. It was not conclusively determined, therefore, whether compounds found in wells SMW-3S and SMW-3D were due to gasoline. The second sample from SMW-6D contained PAHs from the samples, but concentrations were too low to determine their origin.

Based on analytical results, the only significant contamination in shallow groundwater in the site vicinity was found in three wells immediately downgradient of the site, SMW-6S, SMW-6D, and SMW-11. These wells show elevated levels of VOCs, PAHs, phenols, and dibenzofuran, all of which could be associated with MGP operations. MTBE, a compound associated with unleaded gasoline, was found in two wells adjacent to Garlock's Restaurant, known to have been affected by spills from a local gasoline station. The wells downgradient of SMW-6S and SMW-6D and SMW-11 (SMW-5, SMW-7, SMW-8 and SMW-9) could not be sampled due to dry well conditions, suggesting that dissolved MGP residuals and LNAPLs within the underlying bedrock were not raised into the overburden via groundwater at the time of the investigation.

5.3 Soil Gas

Thirty-four soil gas samples were collected from around the foundations of the homes situated in the block north and downgradient of the former MGP site and in a control dwelling located upgradient of the site. The samples were analyzed using a Photovac Model 10S50 portable GC equipped with a 10 m CPSIL - 19 capillary column (Photovac) and a photoionization detector (PID). Samples were analyzed isothermally with the oven temperature set to 40°C. Standard peaks eluted between 1 and 7 minutes after injection. Sample runs were 25 minutes long, but were halted earlier if there was no evidence of the presence of


LEGEND
CONCENTRATIONS (ppm)
PAHs
PHENOLS
ND ND ROUND 1-JANUARY 1992
.0031 .0031 ROUND 2-MAY 1992
NS NOT SAMPLED (DRY WELL)
ND NONE DETECTED
SMW-1 ATLANTIC WELL LOCATION
MW-1 WCC WELL LOCATION
NEW YORK STATE BARGE CANAL
WALNUT STREET
GENESSEE STREET
LAGRANGE STREET
SOUTH TRANSIT STREET
SAXTON STREET
STATE ROAD
GARLOCK'S RESTAURANT
MW-13
SMW-9
MW-1
IW-1
MW-12
SMW-8
MW-11
SMW-10
MW-9
MW-17
SMW-7
MW-2
SMW-5
SMW-11
MW-10
SMW-6S
SMW-6D
MW-6
IW-2
MW-14
MW-3
MW-7
SMW-4D
SMW-4S
MW-5
SMW-3S
SMW-3D
SMW-1D
SMW-1S
3.709 0.100
.019 .071
.014 .085
5.94 .048
4.86 0.209
.002
.0031
100 50 0 100 200
GRAPHIC SCALE IN FEET
N
S
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 5-5
PAHs AND PHENOLS
IN GROUND WATER – ROUND 1 AND ROUND 2
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

contaminants. Purified (ultra-zero grade) compressed air was used as the carrier gas, at a flow rate of 10 ml/minute.

After sample collection, the syringe containing the extracted soil gas was injected directly into the Photovac. Sample peaks were identified by comparing the observed retention times to standard retention times. Semi-quantitative analysis of the compounds present in the soil gas was made using the external standard method, based on the integration of the peak areas by the Photovac.

The total peak and total BTEX peak areas were calculated and relatively quantified by the classification system in Table 5-4. This semi-qualitative analysis of soil gas compounds was based on the integration by the Photovac of areas beneath the peaks of various compounds on the chromatograms. A chromatogram is recorded along a volt versus second grid and total peak areas for each sampling point are calculated and reported as voltseconds. The amount of voltage collected on the Photovac's amplifier is directly related to the chart speed of the recorder. Therefore, the area under a given peak is expressed as volts (V) times seconds (s) or voltseconds (Vs) and provides a relative concentration of the compound detected. A summary of the soil gas data is presented in tabular form in Table 5-5 and graphically in Figure 5-6.

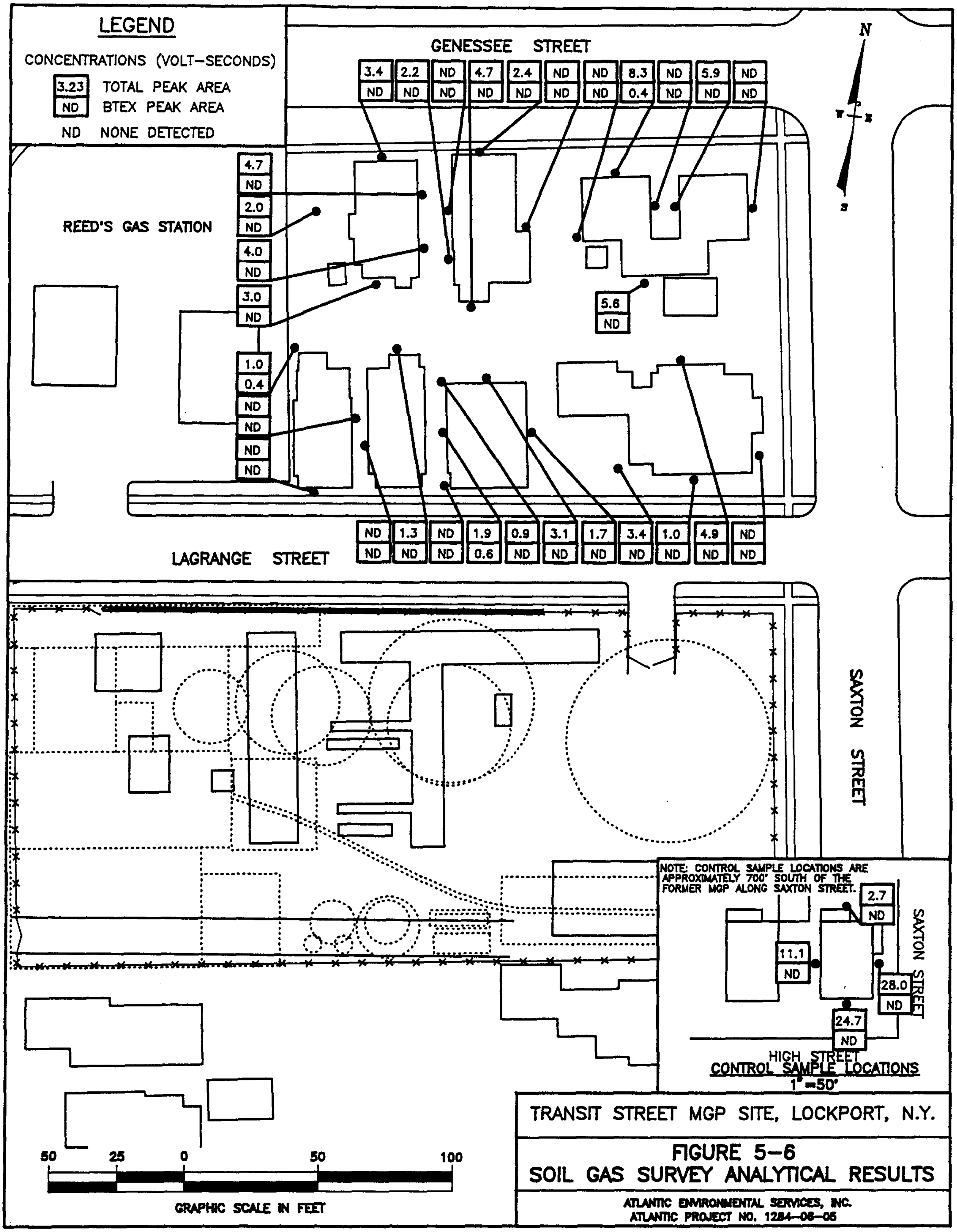
TABLE 5-4
CONTAMINANT RANGE CLASSIFICATION

CLASSIFICATION	TOTAL PEAK AREA RANGE
None detected	0-300 millivolt seconds
Trace	0.301-4.0 volt-seconds
Low	4.1-50.0 volt-seconds
Moderate	50.1-300.0 volt-seconds
High	>300 volt-seconds

Typically, tar chromatograms show positive detects for all the BTEX compounds, and in relatively even proportions. This is true whether the detection is at high or low concentrations, and there are very few other unknown peaks present in the chromatogram. Petroleum products typically show relatively low level concentrations for some or all of the BTEX compounds, but show high levels of early-eluting pre-benzene compounds and sometimes large, unknown late-eluting peaks. Petroleum products also frequently cause a notable baseline rise or an uneven baseline in the chromatogram.

Of the 34 samples collected, 24 had detectable peak levels, and of those 24, only 3 contained BTEX compounds. The contamination levels for the sampling points varied from non-detectable to low. Soil gas points 28-01, 11-02, and 18-02 each contained trace amounts of toluene. Due to their low concentrations, it is impractical to speculate on the nature of their source (i.e., MGP wastes or petroleum products). The highest total peak areas were detected in samples collected in the vicinity of the control house, which is located in close proximity to the Atlantic gasoline station (Plate 1). It is possible that soil gas results at these control points were affected by contaminants associated with the gasoline station. The remainder of the soil gas points contained early eluting pre-benzene compounds which are considered indigenous to

TABLE 5-5 SOIL GAS SURVEY RESULTS NYSEG LOCKPORT, NEW YORK, SUBSTATION			
SAMPLE ID (Street # - Sample Point)	TOTAL PEAK AREA (Vs)	BTEX PEAK AREA (Vs)	LEVEL
11-01	ND	ND	ND
11-02	1.0	0.4	trace
11-03	ND	ND	ND
14-01	3.4	ND	trace
14-02	4.7	ND	low
14-03	4.0	ND	trace
14-04	2.0	ND	trace
14-05	3.0	ND	trace
15-01	1.3	ND	trace
15-02	ND	ND	ND
20-01	2.4	ND	trace
20-02	ND	ND	ND
20-03	4.7	ND	low
20-04	2.2	ND	trace
20-05	ND	ND	ND
24-01	ND	ND	ND
24-02	5.9	ND	low
28-01	8.3	0.4	low
28-02	ND	ND	ND
28-03	ND	ND	ND
28-04	5.6	ND	low
48-01	4.9	ND	low
48-02	1.0	ND	trace
48-03	3.4	ND	trace
48-04	ND	ND	ND
18-01	ND	ND	ND
18-02	1.9	0.6	trace
18-03	0.9	ND	trace
18-04	3.1	ND	trace
18-05	1.7	ND	trace
Control 1	28.0	ND	low
Control 2	24.7	ND	low
Control 3	11.1	ND	low
Control 4	2.7	ND	trace


LEGEND
CONCENTRATIONS (VOLT-SECONDS)
3.23 TOTAL PEAK AREA
ND BTEX PEAK AREA
ND NONE DETECTED
GENESSEE STREET
REED'S GAS STATION
LAGRANGE STREET
SAXTON STREET
N
NOTE: CONTROL SAMPLE LOCATIONS ARE APPROXIMATELY 700' SOUTH OF THE FORMER MGP ALONG SAXTON STREET.
HIGH STREET
CONTROL SAMPLE LOCATIONS
1"=50'
GRAPHIC SCALE IN FEET
TRANSIT STREET MGP SITE, LOCKPORT, N.Y.
FIGURE 5-6
SOIL GAS SURVEY ANALYTICAL RESULTS
ATLANTIC ENVIRONMENTAL SERVICES, INC.
ATLANTIC PROJECT NO. 1284-06-05

the site. Based on these results, it appears that MGP residues did not adversely affect soil gasquality around the homes downgradient of the site at the time of the investigation.

5.4 Air Quality Monitoring

Residential air quality monitoring was conducted concurrently with the soil gas survey in the block of homes north (downgradient) of the former MGP site and within the control dwellings. The goal of the concurrent air monitoring and soil gas survey was to determine the impact, if any, of MGP residues on the residences' indoor air quality. Survey forms were administered to residents to detect possible contaminant interferences. Copies of the completed survey forms are provided in Appendix E. Air samples were collected by Galson Corporation and analyzed by Performance Analytical, Inc. in accordance with EPA Method T0-1 for volatile organic compounds. Quality control measures included the submittal of daily field blanks and a trip blank, and the collection of side-by-side duplicate samples. Additional field quality control procedures included calibrating each sampling train before and after monitoring by using a primary standard. The results of the investigation were presented to NYSEG in a report authored by Galson entitled *Environmental Assessment of Former Manufactured Gas Plant Site Residential Air Monitoring Results*, (1992). These results are summarized in the following section.

A summary of compounds detected during the residential air quality monitoring is presented in Table 5-6. Also presented in this table are the Ambient Guideline Concentrations (AGCs) from New York State Air Guide-I and the mean indoor/outdoor residential contaminant concentrations measured as part of the EPA Total Exposure Assessment Methodology (TEAM) study. The TEAM measurements were collected as part of a total assessment monitoring program to characterize individual total exposure to volatile organic compounds from the environment (air, food, water).

All of the contaminants detected by Method T0-1 were below current NYSDEC AGCs. The proposed AGC for benzene was exceeded in all the samples (indoors/outdoors and control). It should be noted that the proposed AGC value for benzene is lower (0.12 micrograms per cubic meter of air (ug/m^3)) than the T0-1 method's detection limit of 0.5 ug/m^3. Additionally, the benzene results were comparable in magnitude to the EPA TEAM study results.

Toluene and xylene are also associated with tar and petroleum products, including household products such as thinners and paints. Toluene concentrations measured in homes were lower than proposed or existing AGC guidelines. Thinners and paints stored in basements as documented by questionnaires may have also contributed to these contaminant concentrations. The EPA TEAM study did not include analysis for toluene; however, xylene was measured in the EPA study and reported in greater concentrations than those measured in the Lockport dwellings.

Trichloroethane was detected in one dwelling, at a concentration exceeding the proposed AGC for this compound. Trichloroethane is commonly found in solvents, adhesives and refrigerants. The concentration detected was comparable to indoor EPA concentrations monitored in residences, as part of the TEAM study.

Table 5-6: Air Quality Monitoring Results

Observed in a number of basements were paints, thinners, and/or lubricants. One dwelling contained a fuel tank (1/2 full), and gasoline was stored in the basement of another dwelling. All of these materials may have contributed to the contaminants detected. In addition, the gasoline station was operational on the days of the survey, and gasoline odors were quite noticeable in the proximity of this area. There were other potential sources of gasoline vapors, such as cars in driveways and urban traffic. The highest benzene concentrations were detected in the dwellings adjacent to the gasoline station, not in the homes closest to the former MGP site where tar residues were observed.

Tentatively identified compounds observed on the laboratory chromatographs of the air samples were also quantified. These findings are presented in Table 5-7. The compounds identified are associated with petroleum products, not MGP residuals.

The type and magnitude of contaminants observed in and around the homes downgradient of the former MGP were similar to those detected in the control dwelling. However, the proximity of the control house to the Atlantic gasoline station may have affected soil gas and air quality results at the control/background location. The detected concentrations were also comparable to the indoor/outdoor residential contaminant concentrations measured as part of the EPA TEAM study results. Therefore, a link between MGP residues and detected indoor air contaminants is not indicated by the analytical results. Soil gas results also indicate that MGP residuals are not a source of airborne contaminants in the area.

TABLE 5-7
AIR QUALITY MONITORING
TENTATIVELY IDENTIFIED COMPOUNDS

dwelling-1-bas	ug/m^3	dwelling-2-bas	ug/m^3	dwelling-3-out	ug/m^3
2-methylpropane	50	butane	20	butane	8
2-butene	20	isopropanol	60	unknown	6
isopropanol	30	pentane	80	pentane	9
pentane	80	2-methylpentane	5	2-methylpentane	8
2-methyl pentane	20	C9-C12 branched aliphatic	10		
3-methyl pentane	10	C10-C13 branched aliphatic	22		
hexane	20	C10-C14 branched aliphatic	11		

dwelling-4-bas	ug/m^3	dwelling-5-bas	ug/m^3	dwelling-6-bas	ug/m^3
butane	9	butane	10	2-methyl propane	70
isopropanol	20	pentane	10	butane	10
1-propanol	20	C10-C13 branched aliphatic	22	isopropanol	70
pentadiene isomer	20	C11-C15 branched aliphatic	10	pentane	30
C9-C12 branched aliphatic	58	C10-C15 aldehyde	7	2-methyl pentane	10
C10-C13 branched aliphatic	80	C11-C15 aldehyde	6	3-methyl pentane	7
C10-C14 branched aliphatic	30			C10-C13 branched aliphatic	8
C10-C14 branched aliphatic	30				

dwelling-7-bas	ug/m^3	dwelling-7-liv	ug/m^3	dwelling-7-out	ug/m^3
2-methyl propane	30	2-methyl propane	50	2-methyl propane	30
butane	20	butene	30	butane	9
isopropanol	10	unknown	10	pentane	30
pentane	30	pentadiene isomer	100	2-methyl pentane	8
2-methyl pentane	9	2-methyl pentane	20	C10-C15 aldehyde	4
		3-methyl pentane	7	C11-C15 aldehyde	4
		acetic acid	6		
		C10-C13 branched aliphatic	23		
		C10-C14 branched aliphatic	7		
		C10-C15 aldehyde	9		
		C10-C15 branched aliphatic	5		
		C11-C15 branched aliphatic	7		
		C11-C15 aldehyde	6		

dwelling-8-bas	ug/m^3	dwelling-8-liv	ug/m^3	dwelling-9-bas	ug/m^3
C10-C15 aldehyde	10	2-methyl propane	70	2-methyl propane	40
C11-C15 aldehyde	10	unknown	40	butane	20
		pentane	30	isopropanol	5
		C10-C15 aldehyde	8	pentane	50
		C11-C16 aldehyde	9	2-methyl pentane	20
				3-methyl pentane	9
				methyl cyclohexane	7

TABLE 5-7 (continued)
AIR QUALITY MONITORING
TENTATIVELY IDENTIFIED COMPOUNDS

dwelling-3-bas	ug/m^3	dwelling-3-basD	ug/m^3
butane	20	unknown	74
isopropanol	30	C4-C5 alkane	20
pentane	30	C10-C15 aliphatic	9
2-methyl pentane	9	C10-C15 aldehyde	30
3-methyl pentane	6	C11-C16 aldehyde	40
C10-C15 aldehyde	9	C11-C16 branched aliphatic	5
C11-C16 aldehyde	9	C12-C16 branched aliphatic	9

6.0 DATA ASSESSMENT

The majority of the analytical work performed on samples collected by Atlantic from the Lockport Transit Street site was conducted according to New York State Department of Environmental Conservation Analytical Services Protocol (NYSDEC ASP). Round 1 groundwater samples were analyzed by U.S. EPA SW-846 methods; NYSDEC ASP data backup was not requested at the time of analyses, however, sufficient documentation was provided for data validation purposes. Analytical results for (1) subsurface soil samples collected during drilling activities (analyzed by O'Brien & Gere), (2) Round 1 groundwater samples (analyzed by Wadsworth/Alert), and (3) Round 2 groundwater samples (analyzed by Galson and H2M) were data validated by META Environmental, Inc. (META).

META reviewed the analytical data in terms of the parameters listed in Table 6-1. The data were evaluated according to guidelines based on the U.S. EPA Region I Functional Guidelines for Evaluating Organic Analyses (November, 1988), U.S. EPA Region I Functional Guidelines for Evaluating Inorganic Analyses (February, 1989), and the NYSDEC ASP (September, 1989). Corrections and qualifications to the data based on the data validation are referenced as footnotes and qualifiers in the analytical data tables in the text and in Appendix D. Data validation reports were submitted to NYSEG as they were received.

TABLE 6-1
DATA VALIDATION PARAMETERS

Data Completeness	Field Duplicate Precision	ICP Serial Dilution Results
Holding Times	Internal Standard Performance	Detection Limits
GC/MS Tuning	QC Check Standard Performance	Calculation Checks
Calibration	Compound Identification	Laboratory Duplicates
Blanks	Compound Quantitation	Furnace AA Results
Surrogate Recoveries	Interference Check Standard Results	Total and Dissolved Metals
Matrix Spike/MSD/MS Blank	Laboratory Control Sample Results	

The shallow subsurface soil sample analytical results were not validated by META. A qualified Atlantic chemist reviewed the analytical data packages to ensure that:

- the data packages were complete;
- holding times were met;
- blanks were reviewed;
- results were qualified, if necessary; and
- generally that the data is reliable and of high quality.

Qualifications to the shallow subsurface soil analytical data also are presented in the data tables in the text and Appendix D.

The analytical results for Round 1 and Round 2 groundwater sampling and the shallow subsurface soil sampling, have been organized in the NYSEG specified format. These data are available on diskette.

7.0 EXPOSURE PATHWAY IDENTIFICATION

7.1 Overburden and Shallow Groundwater

7.1.1 Shallow Subsurface Soil

Shallow subsurface soils at the Lockport site contain elevated levels of both volatile and semi-volatile organic compounds. Included in the latter category are several PAH compounds classified as probable carcinogens. Lead, sulfide, and cyanide were also detected at elevated levels in these soils. The affected soils are present beneath the majority of the former MGP site and extend north beneath a portion of the residential block downgradient of the site and west of the site to an undetermined extent.

The site is secured by a chain-link fence, with access provided only by two locked gates. In addition, much of the site is covered by asphalt and gravel. Direct contact with shallow subsurface waste materials on-site is not, therefore, a significant potential route of exposure to the general public. Prior to any excavation on-site or immediately downgradient of the site, it is recommended that a site-specific Health and Safety Plan be developed for excavation workers. A total PAH level of 105 ppm was detected in overburden soils at one residential location downgradient of the site. Due to the depth at which the residues were encountered (5.0 - 7.0 feet) and the relatively low concentration (8.36 ppm) of probable carcinogenic PAHs detected in the sample, the potential exposure to this material and the associated health risks likely is low.

7.1.2 Deeper Subsurface Soils

Elevated concentrations of contaminants in deeper subsurface soils were found only in two locations, both immediately downgradient of the site (monitoring well cluster SMW-6S and SMW-6D and monitoring well SMW-11). Samples from both of these locations contained elevated levels of volatile aromatics and PAHs, some classified as probable carcinogens, at depths of 6 to 8 feet. Samples from two other locations (SMW-5 and SMW-10) contained lower concentrations of PAHs at depths between 12 and 16 feet. All four of these sample areas currently are paved. Given the depth of these contaminants, they pose no significant risk to the general public. However, any plans involving subsurface excavation on or adjacent to the site should consider identified areas of contamination. It is recommended that no excavation be conducted in the immediate vicinity of SMW-6 or SMW-11 without prior development of a site-specific Health and Safety Plan.

7.1.3 Shallow Groundwater

Chemical analysis revealed the presence of both volatile and semi-volatile organic compounds and slightly elevated levels of some metals in shallow groundwater samples from the site. Again, the highest contaminant concentrations were found in samples from wells SMW-6S, SMW-6D, and SMW-11. No other downgradient wells could be sampled due to dry well conditions, indicating that MGP residuals were not raised into the overburden via groundwater in these areas at the time of the investigation.

A well survey conducted by WCC indicated that no wells used for drinking water are located within a 1.5 mile radius of the site. The canal water intake for the City of Lockport is located 4,600 feet upstream of the site, so that any contaminants discharged into the canal are unlikely to be ingested as drinking water. The canal is not used for swimming or other water contact recreational activities. Based on the WCC investigations, some of the contaminants from the site appear to migrate into and through the bedrock. MGP residuals in shallow groundwater, therefore, do not appear to pose a significant risk to the public.

7.2 Airborne Contaminants

Indoor air quality monitoring conducted in the site vicinity indicates low levels of some contaminants, but all concentrations are within background limits and also within the limits of EPA TEAM study results. Most of the samples exceeded proposed AGC standards for benzene. At the levels detected, some of the contaminants present could be due to the presence of tar, various household items and/or the proximity of a local gasoline station. If proposed AGC standards are determined to be effective guidelines, the levels of benzene detected in air may present a human health risk. Otherwise, airborne contaminants, as detected during this site investigation, do not create a significant health risk in the site vicinity.

7.3 Bedrock and Deep Groundwater

Boring logs from wells drilled through bedrock during the WCC study indicate that extensive contamination exists within the bedrock, and chemical analysis of deep groundwater also revealed elevated contaminant levels. MGP-type residuals have been observed seeping into the canal, and surface water samples taken from the canal downstream of the site contained detectable levels of PAHs and benzene.

As noted in the discussion of shallow groundwater, the water intake for the canal is located upstream of the site, and the canal is not used for any water contact recreational activities. However, the canal is used for fishing and boating, and canal sediments are exposed during the winter months when the canal is drained. Therefore, potential risks associated with contamination of the canal are those posed by transfer of these contaminants to canal sediments and bioaccumulation of PAHs in fish (WCC Summary Report 1985).

Canal sediments create a risk chiefly during the time the canal is drained. However, the canal is bordered by guard rails and the terrain is difficult, making it unlikely that children would play in the canal and possibly ingest the sediments.

Based on the levels of PAHs found in canal surface water samples, the WCC study estimated that ingestion of fish inhabiting the contaminated portion of the canal could create an exposure level 300 times greater than the calculated allowable dose. The calculated allowable dose was based on New York State Ambient Water Quality Criteria for Class AA and A waters and an assumed average intake. To fully characterize the risk associated with ingestion of fish from the canal, WCC indicated that analysis of PAH levels in fish tissue would be required. If results of this analysis indicate the existence of a significant risk to the public, a fishing ban would be recommended. Available data indicate potential PAH contamination upstream of the seeps suggesting the presence of additional sources of these contaminants in the Lockport area. Identified additional potential sources of PAHs included a service station, a fuel storage facility, and motorized boats within the canal. Additional analysis of canal water and sediments would be required to accurately assess the site contribution to PAH levels in canal water, sediments and fish.

where does the WCC report state this?

8.0 CONCLUSIONS AND RECOMMENDATIONS

The Lockport Transit Street site is the location of the former MGP in Lockport, Niagara County, New York. After tar contained in shallow bedrock was observed migrating into the nearby New York State Barge Canal as seeps northwest of the site, NYSEG contracted Woodward-Clyde Consultants to conduct an investigation of the site. This investigation defined the extent and degree of MGP residual contamination in bedrock, but did not characterize overburden material. The potential for seasonal high groundwater conditions to carry bedrock contamination into the overburden in the site vicinity was identified as a human health concern due to residential land use adjacent to and downgradient from the site. Therefore, Atlantic was contracted to conduct a supplemental site investigation to evaluate the extent of MGP residues in the overburden, determine the direction and extent of migration of MGP residues in the shallow groundwater, identify other potential sources of contamination, and assess the risk to area residents from potential MGP residues in the overburden. Analysis and interpretation of field and laboratory data obtained during the supplementary investigation of the Lockport site suggest the following conclusions:

- Shallow subsurface soils at the site contain elevated levels of MGP related contaminants. Because the area is secured, however, these on-site residues do not create a risk to the general public based on the current land use. Elevated levels of PAHs were detected at one off-site residential location, immediately downgradient of the site. These residues may not pose a human health risk as they are 5.0 - 7.0 feet below land surface and have a low concentration (8.36 ppm) of probable carcinogenic PAHs.

- Subsurface soils (6 to 8 feet below the surface) from two locations immediately downgradient of the site contained elevated levels of contaminants related to MGP residuals. However, these levels may not represent a human health risk due to the depth of the soil in which they were detected and the lack of an exposure route.

- Shallow groundwater samples from two wells immediately downgradient of the site contained elevated concentrations of contaminants associated with MGP residuals. MTBE, a compound associated with the presence of gasoline, was found in groundwater samples collected adjacent to Garlock's Restaurant upgradient of the site. This restaurant is known to have been affected by fumes from a 1989 gasoline spill. Samples could not be collected from most wells downgradient of the site due to dry well conditions, indicating that MGP residuals were not raised into the overburden via groundwater at the time of the investigation. It is not known whether groundwater elevation is significantly higher at other times during the year. Measuring groundwater levels at the monitoring wells on-site at regular intervals would provide this information.

- Low levels of benzene, toluene and xylene were detected during air quality monitoring inside homes downgradient of the former MGP site. Concentrations detected were within background levels and EPA TEAM study results; however, benzene concentrations in most samples were above proposed AGC standards. The compounds detected could have been due to the presence of tar, various household items, and/or the proximity of a local gasoline station at which documented spills have occurred. Soil gas surveying performed concurrently with air quality monitoring found contaminant concentrations (primarily monocyclic aromatic hydrocarbons) ranging from nondetectable to low, all within background levels. Soil gas results suggest that the source of compounds detected during the air quality monitoring survey were not MGP-related. Neither airborne nor soil gas contaminants as detected in this investigation pose a risk to public health based on current AGC standards, EPA TEAM Study results, and concentrations measured upgradient of the former MGP site. The origin of odors previously detected by residents could not be conclusively determined, but it is likely these odors were related to gasoline spills and tank filling/venting procedures at the adjacent gasoline station.

- The majority of contaminants related to MGP wastes appear to reside in the bedrock and deep groundwater. The major concern regarding these contaminants is their entry into the canal via seepage from the bedrock. Although the canal is rarely used as a source of drinking water and the intake for canal water is upstream of the site, the canal is used for boating and fishing, and sediments are exposed during the winter months. There may be problems related to transfer of the contaminants to canal sediments and to bioaccumulation of PAH compounds in fish. A less likely exposure route could be through human contact with the sediments exposed during the winter months (WCC Task 4 Report, July 1985).

The following recommendations for further action are based on findings from this study and information provided by previous studies:

- The major objective of the field investigations conducted concurrently in May 1992 was to determine whether high groundwater conditions would raise LNAPLs and dissolved constituents of tar normally contained within bedrock and deep groundwater into overburden soils, potentially exposing residents downgradient of the Lockport site to levels of contamination of concern. However, groundwater levels were not significantly higher in May than in the January sampling round. It is recommended that groundwater elevation be monitored at regular intervals throughout the year to determine whether there is a significant seasonal difference in groundwater elevation. If groundwater elevation is found to be significantly higher at any time during the year, it is recommended that the soil gas survey and air quality monitoring study be conducted at that time.

- It is recommended that a site-specific health and safety plan be developed prior to any on-site activities or to any excavation greater than 5 feet in the area immediately downgradient of the site.

- WCC performed an endangerment assessment (WCC Task 4 Report, July 1985) stating analyses of tissue from fish inhabiting the canal would be necessary in order to accurately assess the levels of PAHs in those fish. The WCC Report recommended that if it were found that ingestion of the fish poses a significant health risk, a fishing ban should be imposed on the affected portions of the canal. WCC noted that further study would be necessary to determine the relative contribution of site derived material to bioaccumulation of PAHs in canal fish.

- The WCC endangerment assessment stated that analysis of canal sediments would be necessary in order to determine the degree, if any, to which these sediments represent a health risk via direct contact during winter months.

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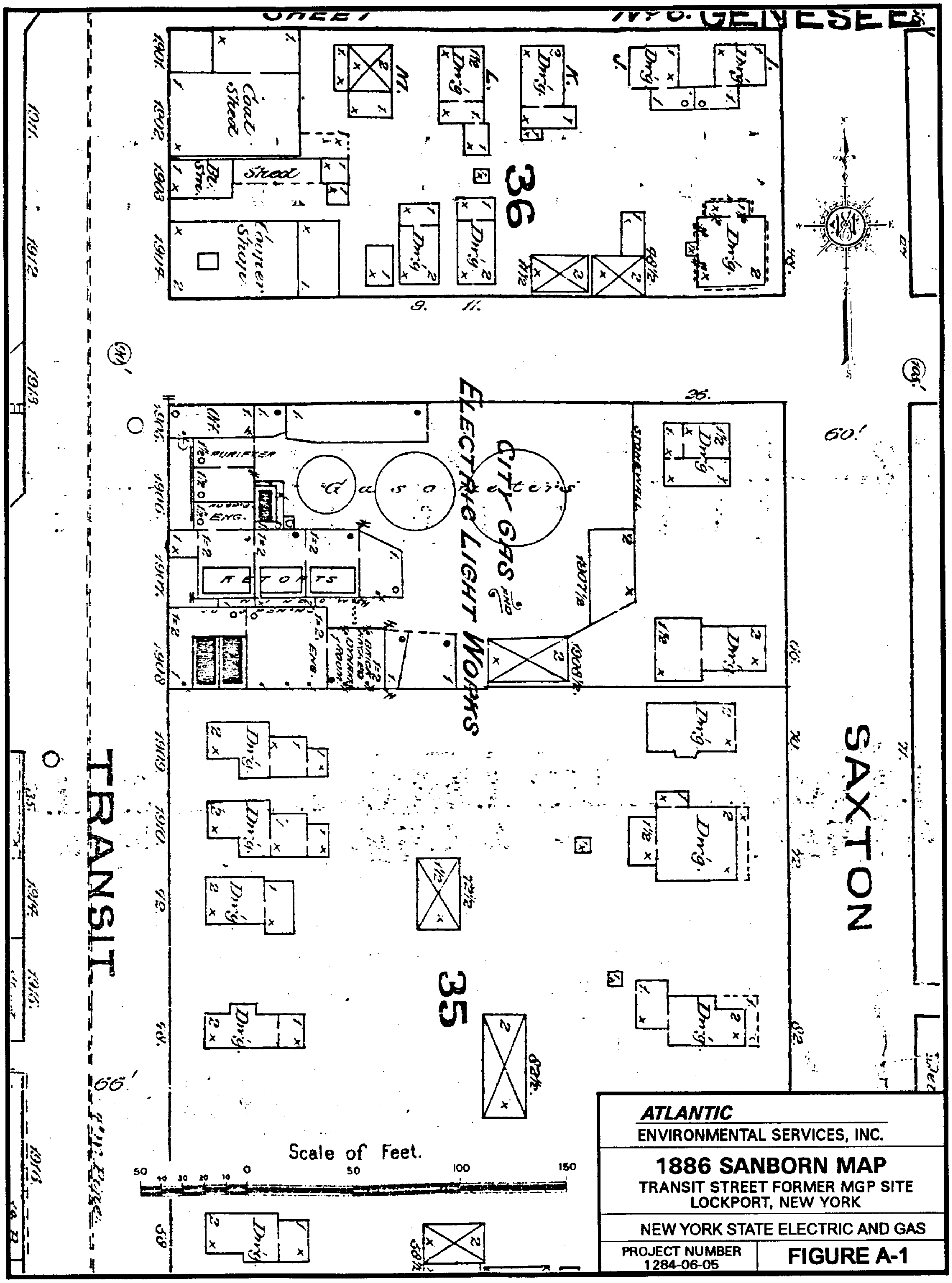
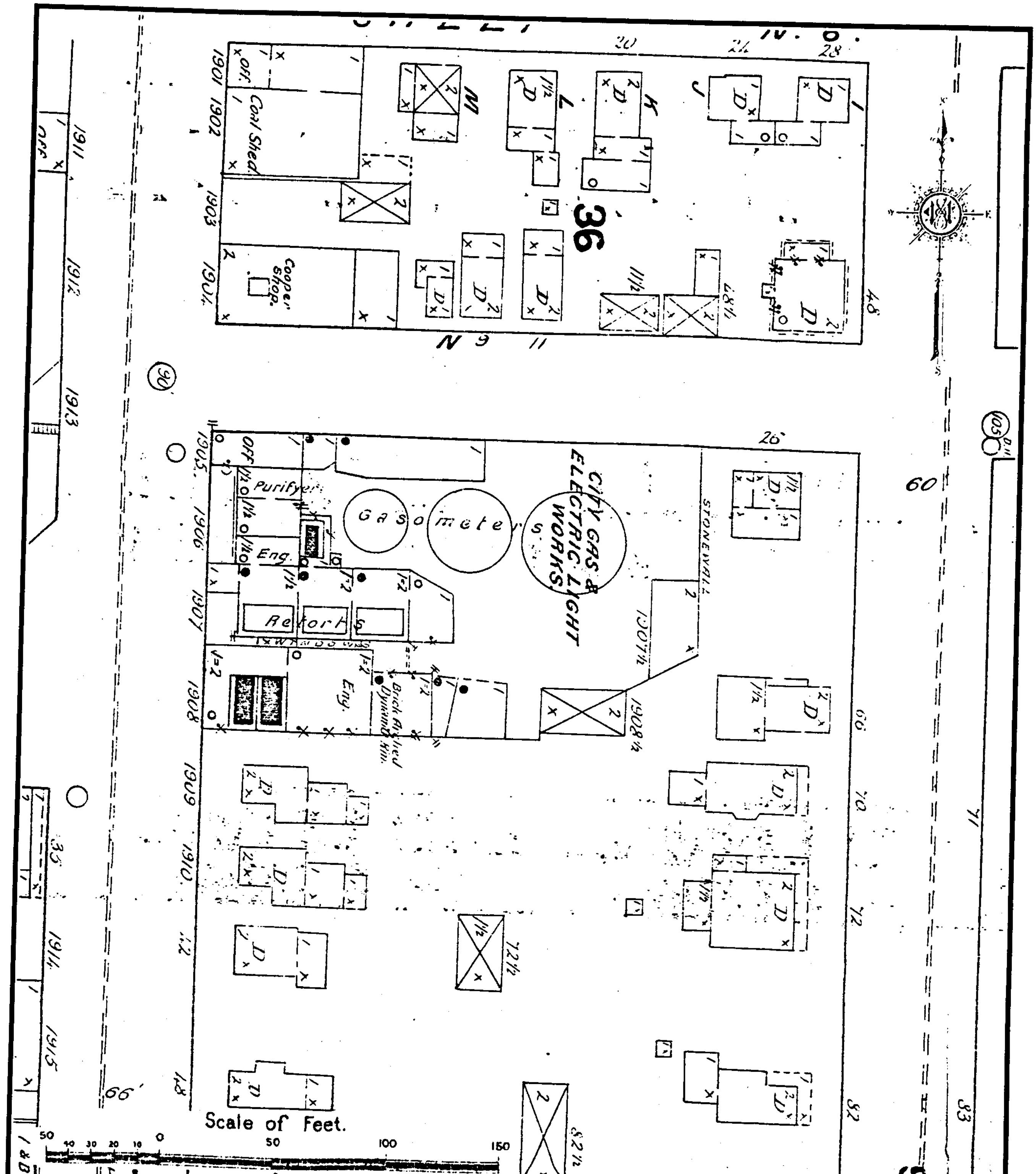


ATLANTIC
ENVIRONMENTAL SERVICES, INC.

1886 SANBORN MAP
TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05	FIGURE A-1



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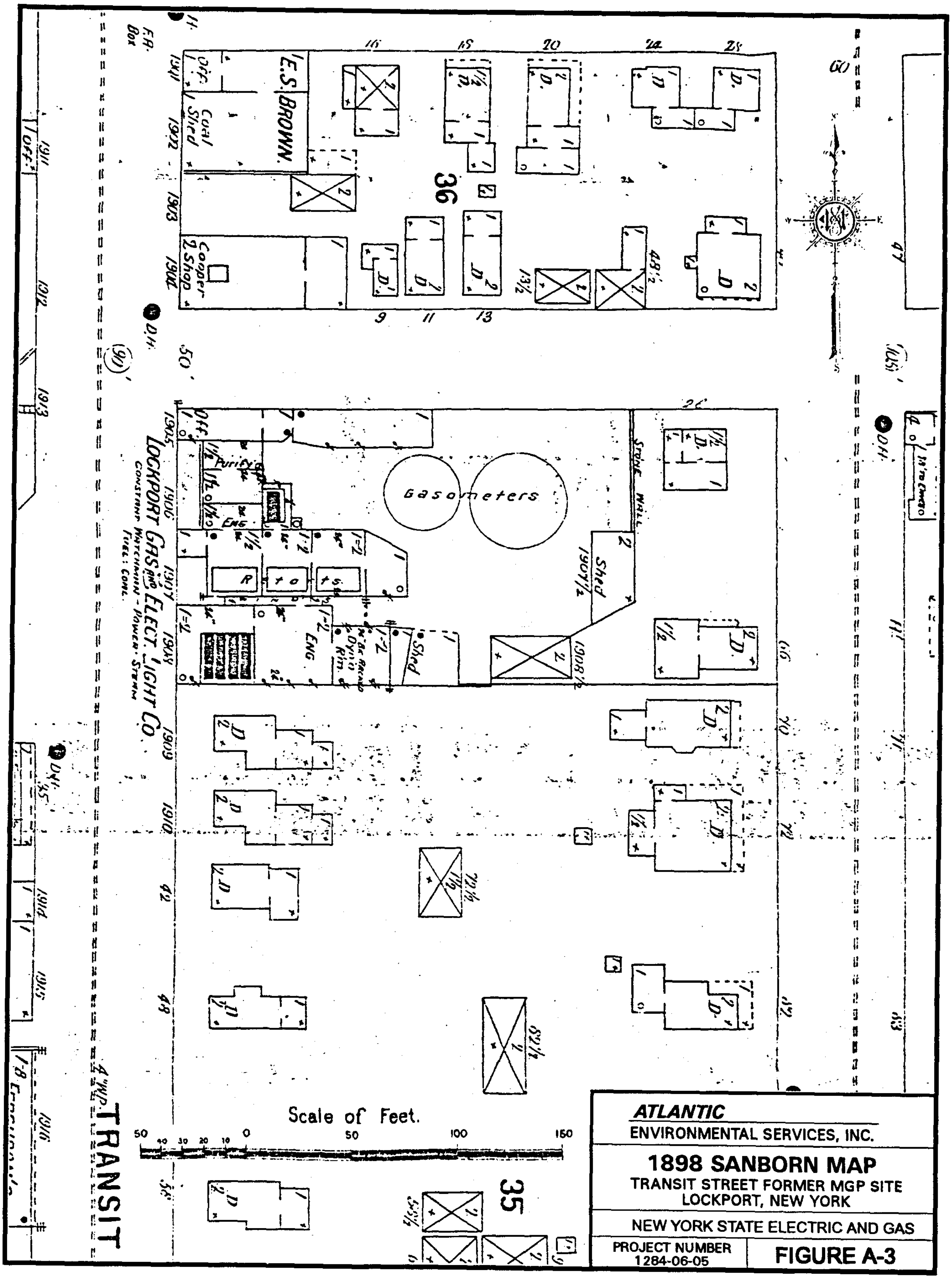
1892 SANBORN MAP
TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05	FIGURE A-2



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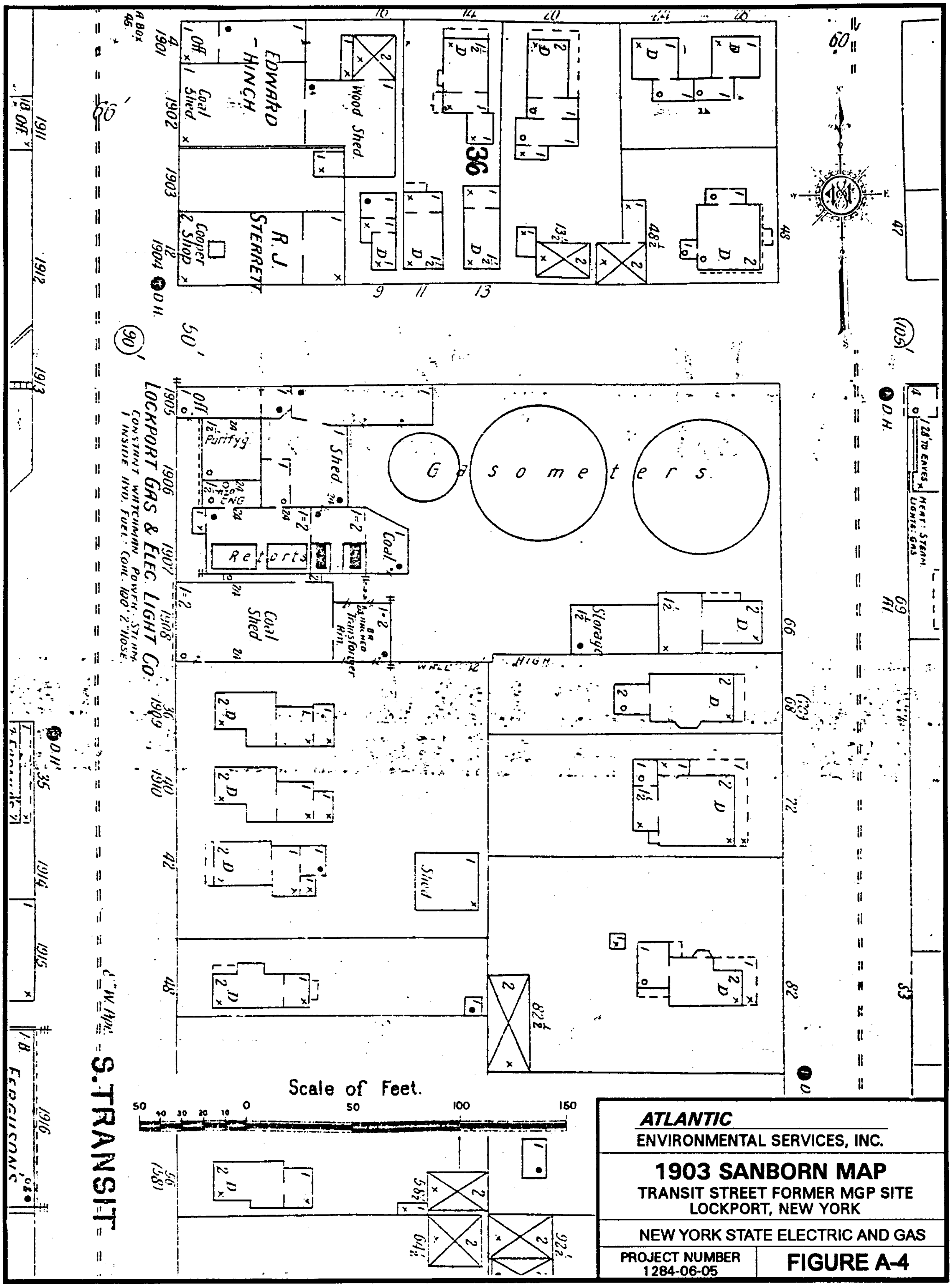
1898 SANBORN MAP
TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05	**FIGURE A-3**



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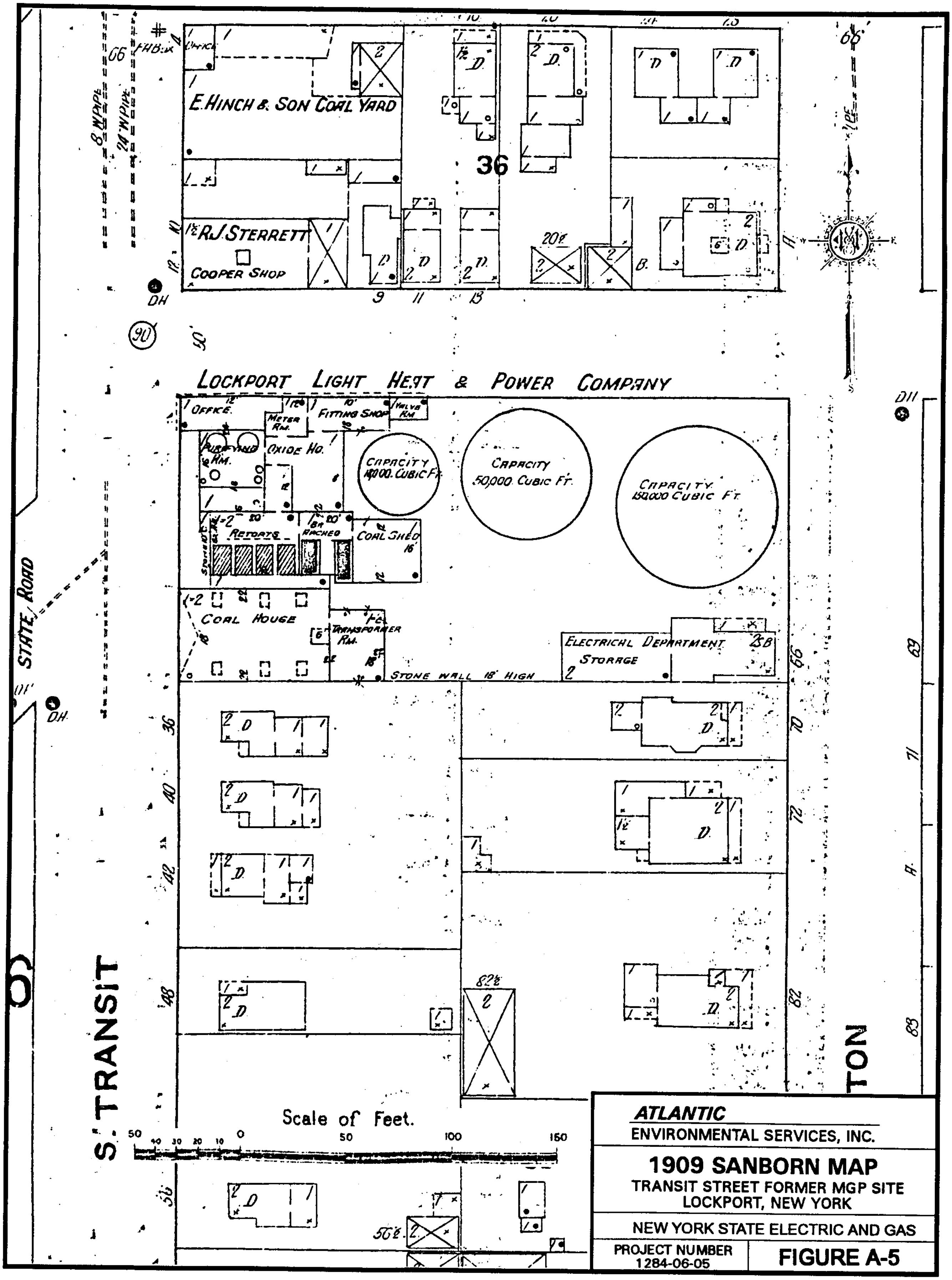
1903 SANBORN MAP
TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05	**FIGURE A-4**

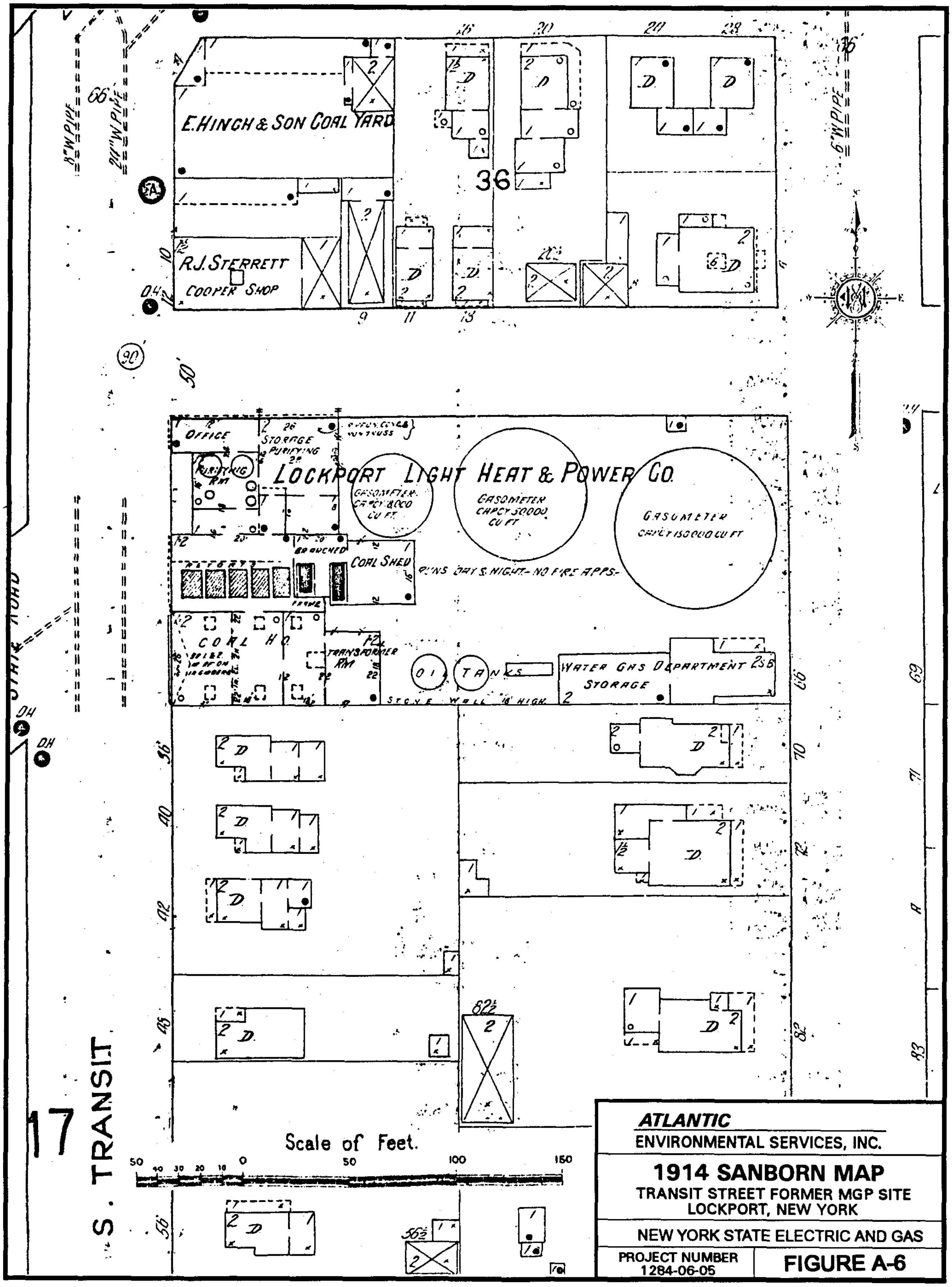


ATLANTIC
ENVIRONMENTAL SERVICES, INC.

1909 SANBORN MAP
TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05	**FIGURE A-5**



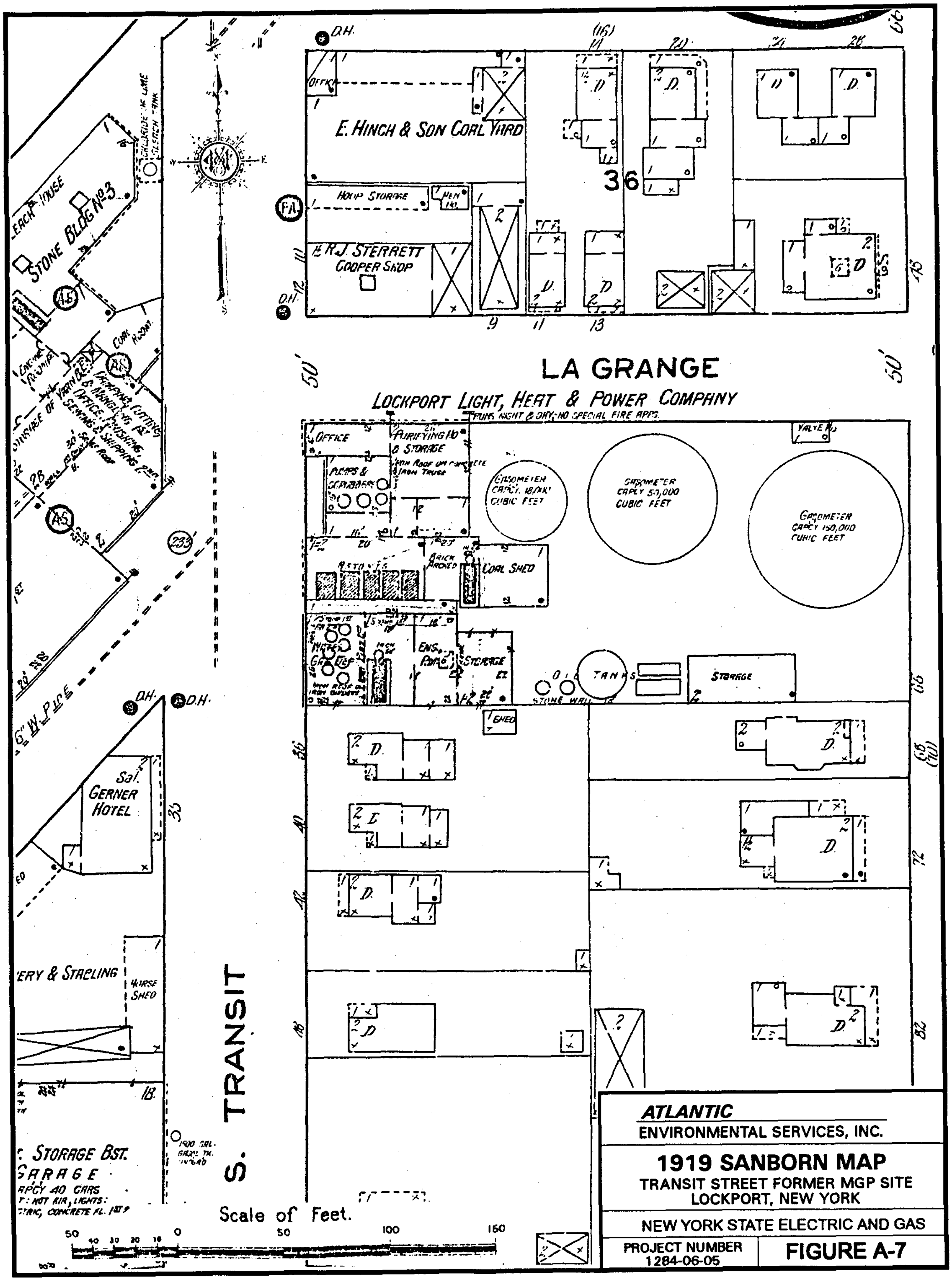
ATLANTIC
ENVIRONMENTAL SERVICES, INC.

1914 SANBORN MAP

TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05	FIGURE A-6



ATLANTIC
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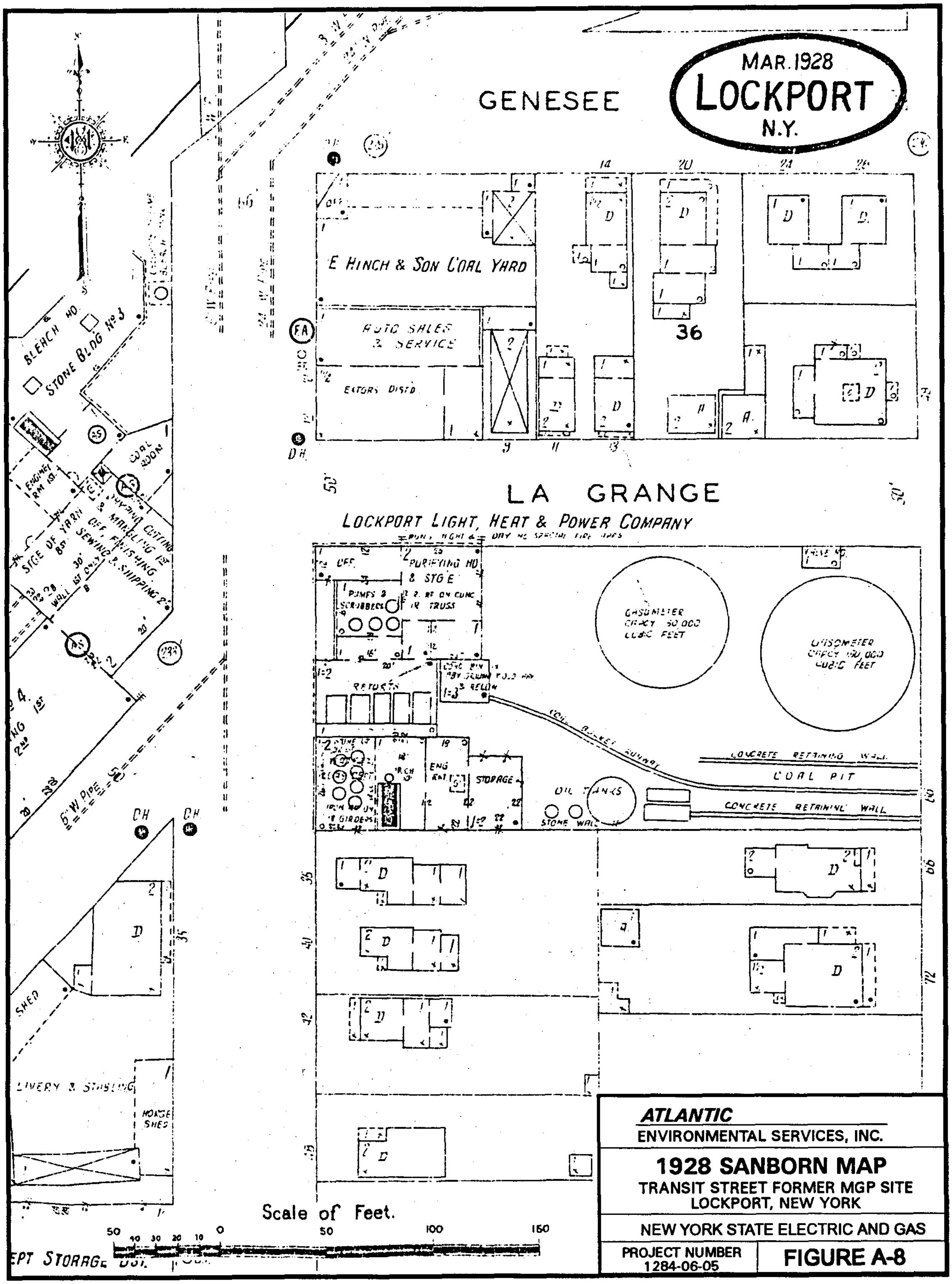
1919 SANBORN MAP

TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05	FIGURE A-7



ATLANTIC
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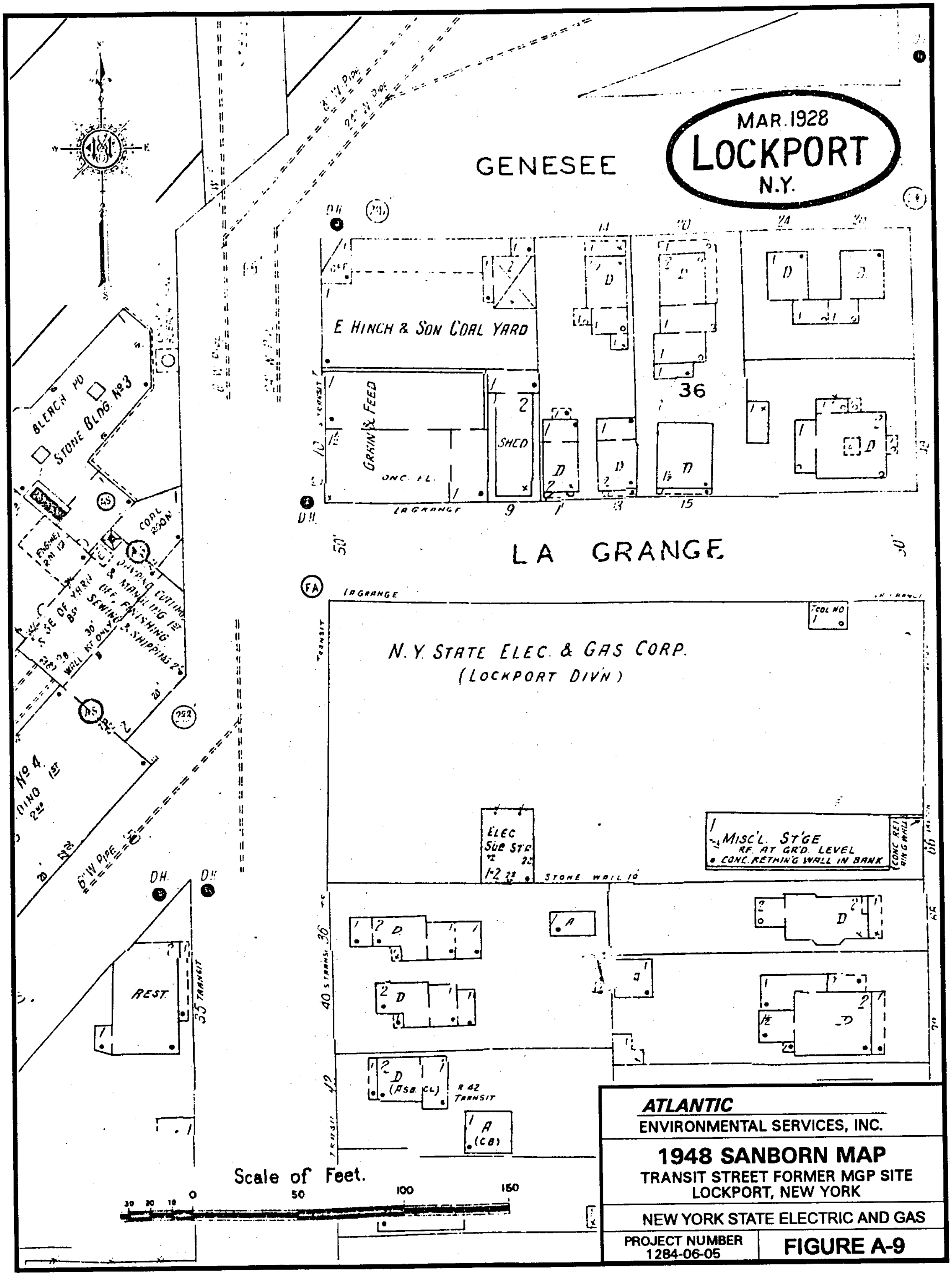
1928 SANBORN MAP
TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05

FIGURE A-8



ATLANTIC
ENVIRONMENTAL SERVICES, INC.

1948 SANBORN MAP
TRANSIT STREET FORMER MGP SITE
LOCKPORT, NEW YORK

NEW YORK STATE ELECTRIC AND GAS

PROJECT NUMBER 1284-06-05

FIGURE A-9

ATLANTIC PROCEDURE NO. 1023

FIELD PROCEDURES FOR COLLECTION OF GROUND WATER SAMPLES FOR HAZARDOUS WASTE DETERMINATION

Prepared By: John A. Ripp — Principal
JOHN A. RIPP — TITLE

Reviewed By: Edmund J. Burke — Q.A. Manager
EDMUND J. BURKE, P.E. — TITLE

Approved By: Paul Burgess — Chief Engineer
PAUL BURGESS, P.E. — TITLE

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NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
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ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

TABLE OF CONTENTS

SECTION 1.0: PURPOSE

To insure a standard procedure for collection of ground water samples for the identification of chemical constituents.

SECTION 2.0: SCOPE

The following procedure describes the logistics, chain of events, collection techniques and documentation requirements for collecting ground water samples designated for chemical analysis.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Supervisor - Second

Field Sampling Technicians - Third

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1041 Sample Chain-of-Custody Procedure.

SECTION 5.0: REQUIRED FORMS

Field Notebook No. 351 published by J.L. Darling Corp., Tacoma, Washington

SECTION 6.0: PROCEDURE

6.1 Selection of Sampling Locations

Ground water sampling locations in and around a project site are typically obtained from existing domestic, production and monitoring wells, and newly installed ground water monitoring wells which were part of the site hydro-geological investigation. The location of new ground water monitoring wells will be based upon the review of existing site hydrogeological data, the results of preliminary site surveys, and the initial estimates of the extent of the waste. The ground water sampling locations will be chosen by the project manager. At a minimum one upgradient and three downgradient water samples from the uppermost aquifer will be taken.

6.2 Equipment List

The following is to be considered a guide for groundwater sampling preparation.

1. Latex gloves, and any other personal safety equipment specified in the site health and safety plan.

2. Sample containers (depending on sample requirements of the analytical laboratory) may include for each location:

   - 4 each 1 liter glass jars with Teflon lined caps
   - 8 each 40 ml. glass vials with Teflon lined septas
   - 1 each 500 ml. plastic containers for metals analysis
   - 1 each 500 ml. plastic containers for mercury analysis

3. Device to measure water levels in wells to within .01 feet. Typically a cloth tape with a "plopper" or an electronic water level indicator is used.

4. Field Notebook No. 351

5. Sample bottle labels

6. Chain-of-custody forms

7. A large volume bailer or pump to evacuate the wells.

8. Dedicated Teflon bailer with stainless steel cable, or a peristaltic pump with dedicated Teflon tubing.

6.3 Sample Collection

Prior to the extraction of any ground water, the depth to water shall be measured to the nearest .01 feet. A cloth tape with a "plopper", or an electronic water sensing device (i.e. Slope Indicator Water Mark) shall be used for this purpose. The device used must be clean to avoid contamination of the well. The depth to water is typically measured from a reference point established on the top of the well casing. This value is recorded in the field notebook along with the length of casing stick-up above the ground surface. If both an inner and outer casing are present, the one used as the measurement reference point shall be identified (normally the inner), and any distance between the two, measured and recorded. If the depth of the well is unknown the bottom shall be sounded and the depth recorded.

Ground water samples are to be collected in a manner to be representative of the formation from which the samples were taken. To insure against sampling stagnant water in a well, a minimum of four well volumes must be evacuated from the well prior to sampling. In the case of monitoring wells that will not yield water at a rate adequate to be effectively flushed, one of the two following procedures must be followed. The first procedure includes purging water to the top of the screened interval at a sufficiently slow rate to prevent the exposure of the gravel pack or formation to atmospheric conditions. The sample is then taken at a rate that would not cause rapid drawdown. The second procedure would be to pump the well dry and allowed it to recover. The samples should be collected as soon as a volume of water sufficient for the intended analytical scheme reenters the well. Exposure of water entering the well for periods longer than 2 to 3 hours may render samples unsuitable and unrepresentative of water contained within the aquifer system. In these cases, it may be desirable to collect small volumes of water over a period of time, each time pumping the well dry and allowing it to recover. Whenever full recovery exceeds 3 hours, samples should be collected in order of their volatility as soon as sufficient volume is available for a sample for each analytical parameter or compatible set of parameters. Parameters that are not pH-sensitive or subject to loss through volatilization should be collected last.

Evacuation is accomplished by bailing with a large volume (1.5 liter) bailer, or by pumping. Whichever method is used, it must be assured that any materials (hose, bailer, tubing, pumps, rope, etc.) entering the well must be clean. If the same device is being used to evacuate a number of wells, the device must be cleaned with the appropriate cleaners between each well to prevent cross-contamination.

For pre-preserved sample containers the following procedure will be followed:

1. Prior to collecting any water samples, place a waterproof sample label on each container which specifies the following:

   Sample Number
   Date
   Time
   Preservative
   Project Number
   Initials of the Collector

   Fill in the information with a waterproof ink pen. This will prevent difficulty in filling out labels on a wet jar after it is filled.

2. Extract the ground water sample using either a dedicated Teflon bailer or a peristaltic pump with dedicated Teflon tubing. Latex gloves shall be worn during this procedure.

3. When using the peristaltic pump or bailer first fill the 40 ml. vials making sure no air is trapped in the vials. This sample is normally taken for volatile analysis and therefore should be sampled prior to further disturbance of water in the well.
4. Fill all the remaining jars directly from the pump discharge or bailer. With the containers containing preservative, avoid overflow since this will dilute the preservative.
5. If dissolved metals analysis are required an extra bottle (no preservative) will be filled and the metals container (pre-preserved with nitric acid) will remain empty. Only after the water sample is field filtered will it be poured into the pre-preserved metals container. This will constitute a sample for dissolved metals.
6. Place all sample containers into a sample shipping container, cool with ice packs and fill out the chain-of-custody form.
7. Detail in the field notebook the following:

   - sample identification number
   - location of the sample
   - time and date of sampling
   - personnel performing task
   - depth to water table, reference mark, casing(s) stick-up, and horizontal distance between inner and outer casing
   - Amount evacuated from well and device used for evacuation
   - Visual or sensory description of the sample (color, odor, turbidity, etc.)
   - Weather conditions both present and previous to sampling
   - Other pertinent observations

8. Make sure the well is secured after sampling.

Note:

1. It is understood that all sample containers and collection devices will be cleaned prior to field use following the appropriate cleaning procedures.

2. If sampling devices are to be dedicated to a particular sample location, they will be placed in a plastic bag after its use and marked or tagged

"DEDICATED TO PROJECT NO. ____________

SAMPLE LOCATION NO. ________________

ATLANTIC PROCEDURE NO. 1040-NY

SAMPLE PRESERVATION FOR SOLID AND LIQUID MATRICES FOR PROGRAMS CONDUCTED IN NEW YORK STATE

Prepared By: *John A. Ripp* — JOHN A. RIPP — *Principal* — TITLE

Reviewed By: *James E. Gould* — JAMES E. GOULD — *Engineer* — TITLE

Approved By: *Paul Burgess* — PAUL BURGESS, P.E. — *Principal* — TITLE

REVISIONS

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2.				
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4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

TABLE OF CONTENTS

SECTION 1.0: PURPOSE

To insure a standard procedure for preservation of solid and liquid samples collected at a site for hazardous waste determination.

SECTION 2.0: SCOPE

The following procedure is established to provide a set of standards which follow recommended NYSDEC preservation techniques and holding times for various analytical groups as per the NYSDEC Analytical Services Protocol (ASP) published in 1989.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Staff - Third

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1020 Field Procedures for Collection of Surface Soil Samples

Atlantic Procedure No. 1021 Field Procedures for Collection of Subsurface Soils

Atlantic Procedure No. 1022 Field Procedures for Collection of Surface Water and Sediment Samples for Hazardous Waste Determination

Atlantic Procedure No. 1023 Field Procedures for Collection of Groundwater Samples for Hazardous Waste Determination

Atlantic Procedure No. 1042 Shipping Procedure for Environmental Field Samples

SECTION 5.0: REQUIRED FORMS

1. Field Notebook No. 351. Published by the J.L. Darling Corp., Tacoma, Washington
2. Master Sample Log

SECTION 6.0: PROCEDURE

6.1 General Procedure

All sample preservations will be performed in the field as soon after sample collection as possible. In many instances sample containers supplied by the analytical laboratory will be pre-preserved so that no additional preservations will be required. In the event preservations are required, Atlantic personnel will use the following format:

1. For those water samples requiring target compound list (TCL), the procedures in Table 6-1 will be followed.

2. All glass or plastic containers must be cleaned prior to sampling according to appropriate cleaning procedures. In no case will sample containers be rinsed with a sample before the actual sample is containerized.

3. In no case shall methylene chloride or acetone be used as a cleaning agent in any glassware or field equipment used on a site investigation. Methylene chloride and acetone are listed wastes and if used, cleaning may cause errors in evaluating field data.

4. All soils samples collected for TCL analysis be placed in a one liter glass jar with teflon lined cap. This jar also must be cleaned prior to sampling according to appropriate cleaning procedure. To avoid losing volatile organics to the head space within a jar, all soil jars will be filled completely. Care must be taken to avoid getting soil on the threads of a sample jar. This can cause a faulty seal.

5. All samples will be held in insulated shipping containers and kept cool to a temperature of $4^{o}C$ until they are delivered to the analytical laboratory.

6. When samples are preserved in the field, the type of preservation will be listed on the label along with all other appropriate label information. Also the details of each sample will be logged in the Master Sample Log, maintained at the field office.

7. If Atlantic personnel plan to perform field preservations the analytical laboratory must be consulted to verify those particular procedures to be followed. In some instances different laboratories may require more sample volume than those listed or wish no preservative be used.

8. Table 6-1 is taken directly from the NYSDEC ASP. Soils rarely require preservation and the laboratory should always be consulted before collecting soil samples. Occasionally the NYSDEC may update the holding times and this can be found by calling the NYSDEC headquarters in Albany, New York.

9. All field preservations should be performed using proper safety precautions especially when handling acids and caustics. A reference for proper chemical handling techniques is found in Basic Laboratory Skills for Water and Wastewater Analysis by

Douglas W. Clark, New Mexico Water Resources Research Institute, Report No. 125, 1980. Also latex or chemical resistant gloves should be worn during all field preservations. Proper ventilation is necessary when performing preservations in enclosed areas.

6.2 Sample Preservation and Holding Time Requirements

Table 6-1 provides a schedule for sampling, preservation, and holding times for samples being analyzed for convention parameters and target compound list (TCL) parameters.

The laboratory shall adhere to the preservation procedures and holding times listed in Table 6-1 below unless specifically directed otherwise by the Bureau of Technical Services and Research. All holding times are from Verified Time of Sample Receipt (VTSR) at the laboratory.

The laboratory shall provide all necessary preservatives to properly stabilize the samples. The laboratory must adhere to all analytical holding times. Failure to do so will result in the imposition of any contract specified penalties.

TABLE 6-1

REQUIRED CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES			
Bacteriological Tests:			
Total Coliform	Sterilized P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$ (5)	6 hours
Fecal Coliform	Sterilized P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$ (5)	6 hours
Fecal Streptococci	Sterilized P,G	Cool, 4°C, 0.008% $Na_2S_2O_3$ (5)	6 hours
Inorganic and Conventionals Tests:			
Acidity	P,G	Cool, 4°C	12 days
Alkalinity	P,G	Cool, 4°C	12 days
Ammonia	P,G	Cool, 4°C H_2SO_4 to pH<2	26 days
BOD_5	P,G	Cool, 4°C	24 hours
BOD_{20}	P,G	Cool, 4°C	24 hours
Bromide	P,G	Cool, 4°C	26 days
$CBOD_5$	P,G	Cool, 4°C	24 hours
COD	P,G	Cool, 4°C H_2SO_4 to pH<2	26 days
Chloride	P,G	Cool, 4°C	26 days
Color	P,G	Cool, 4°C	24 hours
Cyanide, Total	P,G	Cool, 4°C NaOH to pH>12	12 days

TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Cyanide, Amenable to Chlorination	P,G	Cool, 4°C NaOH to pH>12, 0.6 g ascorbic acid(5)	12 days(6)
Fluoride	P only	Cool, 4°C	26 days
Hardness	P,G	HNO_3 to pH<2	6 months
Kjeldahl Nitrogen	P,G	Cool, 4°C H_2SO_4 to pH<2	26 days
Organic Nitrogen	P,G	Cool, 4°C H_2SO_4 to pH<2	26 days
Metals(7), except Chromium+6 and Mercury	P,G	HNO_3 to pH<2	6 months
Chromium+6	P,G	Cool, 4°C	24 hours
Mercury	P,G	HNO_3 to pH<2	26 days
Nitrate + Nitrite	P,G	Cool, 4°C H_2SO_4 to pH<2	26 days
Nitrate	P,G	Cool, 4°C	24 hours
Nitrite	P,G	Cool, 4°C	24 hours
Oil and Grease	G only	Cool, 4°C H_2SO_4 to pH<2	26 days
Total Organic Carbon	P,G	Cool, 4°C H_2SO_4 to pH<2	26 days
Orthophosphate	P,G	Cool, 4°C	24 hours
Total Phenols	G only	Cool, 4°C H_2SO_4 to pH<2	26 days

TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Phosphorous, Total	P,G	Cool, 4°C H_2SO_4 to pH<2	26 days
Residue, Total	P,G	Cool, 4°C	5 days
Residue, Filterable	P,G	Cool, 4°C	24 hours
Residue, Non-Filterable	P,G	Cool, 4°C	5 days
Residue, Settleable	P,G	Cool, 4°C	24 hours
Residue, Volatile	P,G	Cool, 4°C	5 days
Silca	P only	Cool, 4°C	26 days
Specific Conductance	P,G	Cool, 4°C	26 days
Sulfate	P,G	Cool, 4°C	26 days
Sulfide	P,G	Cool, 4°C, add zinc acetate plus NaOH to pH>9	5 days
Surfactants (MBAS)	P,G	Cool, 4°C	24 hours
Turbidity	P,G	Cool, 4°C	24 hours
Organic Tests(8):			
Purgeable Halocarbons	G, teflon lined septa	Cool, 4°C	7 days
Purgeable Aromatics	G, teflon lined septa	Cool, 4°C	7 days
Acrolein and Acrylonitrile	G, teflon lined septa	Cool, 4°C, 0.008% $Na_2S_2O_3$(5) adjust to pH 4-5(9)	7 days

TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Phenolics(10)	G, teflon lined septa	Cool, 4°C, 0.008% $Na_2S_2O_3$ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Benzidines(10,11)	G, teflon lined septa	Cool, 4°C 0.008% $Na_2S_2O_3$ (5)	5 days after VTSR until extraction(12)
Phthalate esters(10)	G, teflon lined septa	Cool, 4°C	5 days after VTSR until extraction; 40 days for analysis(12)
Nitrosamines(10,14)	G, teflon lined septa	Cool, 4°C 0.008% $Na_2S_2O_3$ (5) Store in dark	5 days after VTSR until extraction; 40 days for analysis(12)
PCBs(10)	G, teflon lined septa	Cool, 4°C	5 days after VTSR until extraction; 40 days for analysis(12)
Nitroaromatics and Isophorone(10)	G, teflon lined septa	Cool, 4°C 0.008% $Na_2S_2O_3$ (5) Store in dark	5 days after VTSR until extraction; 40 days for analysis(12)

TABLE 6-1 (CONTINUED)

REQUIRED CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

PARAMETER NAME	CONTAINER(1)	PRESERVATIVE(2),(3)	MAXIMUM HOLDING TIME(4)
AQUEOUS SAMPLES (continued)			
Polynuclear Aromatic Hydrocarbons(10)	G, teflon lined septa	Cool, 4°C 0.008% $Na_2S_2O_3$ (5) Store in dark	5 days after VTSR until extraction; 40 days for analysis(12)
Haloethers(10)	G, teflon lined septa	Cool, 4°C 0.008% $Na_2S_2O_3$ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Chlorinated Hydrocarbons(10)	G, teflon lined septa	Cool, 4°C 0.008% $Na_2S_2O_3$ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Chlorinated Dioxins and Furans(10)	G, teflon lined septa	Cool, 4°C 0.008% $Na_2S_2O_3$ (5)	5 days after VTSR until extraction; 40 days for analysis(12)
Pesticides(10)	G, teflon lined septa	Cool, 4°C Adjust pH to 5-9(14)	5 days after VTSR until extraction; 40 days for analysis(12)
Radiological Tests:			
Alpha, beta and Radium	P,G	HNO_3 to pH<2	6 months
SOIL/SEDIMENT/SOLID SAMPLES			

The same containers and holding times as listed for aqueous samples are to be used for soil/sediment/solid samples. Preservation for all analyses is limited to cooling to 4 C.

Footnotes for Table 6-1

1. Polyethylene (P) or Glass (G).

2. Sample preservation should be performed immediately upon collection. For composite chemical samples each aliquot should be preserved at the time of collection. When use of an automated sampler makes it impossible to preserve each aliquot, then chemical samples may be preserved by maintaining at 4°C until compositing and sample splitting is completed.

3. When any samples is to be shipped by common carrier or sent through the United States Mails, it must comply with the Department of Transportation Hazardous Materials Regulations (49 CFR Part 172). The person offering such material for transportation is responsible for ensuring such compliance. For preservation requirements of Table 6-1, the Office of Hazardous Materials, Materials Transportation Bureau, Department of Transportation has determined that the Hazardous Materials Regulations do not apply to the following materials: Hydrochloric Acid (HCL) in water solutions at concentrations of 0.04% by weight or less (pH about 1.96 or greater); Nitric Acid (HNO_3) in water solutions at concentrations

of 0.15% by weight or less (pH about 1.62 or greater); Sulfuric Acid (H_2SO_4) in water solutions at concentrations of 0.35% by weight or less (pH about 1.15 or greater); and Sodium Hydroxide (NaOH) in water solutions at concentrations of 0.080% by weight or less (pH about 12.30 or less).

4. Samples should be analyzed as soon as possible after collection. The times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the monitoring laboratory has data on file to show that specific types of samples under study are stable for the longer time, and has received written permission prior to analysis form the Regional Administrator under 40 CFR Part 136.3(e) AND from the Bureau of Technical Services and Research. Some samples may not be stable for the maximum time period given in the table. A monitoring laboratory is obligated to hold the sample for a shorter time if knowledge exists to show that this is necessary to maintain sample stability.

5. Should only be used in the presence of residual chlorine.

6. Maximum holding time is 24 hours when sulfide is present. Optionally all samples may be tested with lead acetate paper before pH adjustments in order to determine if sulfide is present. If sulfide is present, it can be removed by addition of cadmium nitrate powder until a negative spot test is obtained. The sample is filtered and then NaOH is added to pH 12.

7. Samples should be filtered immediately onsite before adding preservative for dissolved metals.

8. Guidance applies to samples to be analyzed by GC, LC or GC/MS for specific compounds.

9. The pH adjustment is not required if acrolein will not be measured. Samples for acrolein receiving no pH adjustment must be analyzed within 3 days of sampling.

10. When the extractable analytes of concern fall within a single chemical category, the specified preservative and maximum holding times should be observed for optimum safeguard of sample integrity. When the analytes of concern fall within two or more chemical categories, the sample may be preserved by cooling to

4°C, reducing residual chlorine with 0.008% sodium thiosulfate, storing in the dark, and adjusting the pH to 6-9; samples preserved in this manner may be held for five days before extraction and for 40 days after extraction. Exceptions to this optional preservation and holding time procedure are noted in footnote 5 (re the requirement for thiosulfate reduction of residual chlorine), and footnotes 12, 13 (re the analysis of benzidine).

11. If 1,2-diphenylhydrazine is likely to be present, adjust the pH of the sample to 4.0±0.2 to prevent rearrangement of benzidine.

12. This does not supercede the contract requirement of a 30 day reporting time.

13. Extracts may be stored up to 7 days before analysis if storage is conducted under an inert (oxidant-free) atmosphere.

14. For the analysis of diphenylnitrosamine, add 0.008% sodium thiosulfate and adjust the pH to 7-10 with NaOH within 24 hours of sampling.

15. The pH adjustment may be preformed upon receipt in the laboratory and may be omitted if the samples are extracted with 72 hours of collection. For the analysis of aldrin, add 0.008% sodium thiosulfate.

ATLANTIC PROCEDURE NO. 1051

OPERATION AND CALIBRATION OF THE HNu SYSTEMS PHOTOIONIZER MODEL PI-101

Prepared By: John A. Ripp — JOHN A. RIPP   Principal — TITLE

Reviewed By: Edmund J. Burke — EDMUND J. BURKE, P.E.   Q.A. Manager — TITLE

Approved By: Paul Burgess — PAUL BURGESS, P.E.   Chief Engineer — TITLE

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COLCHESTER, CONNECTICUT

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SECTION 1.0: PURPOSE

To insure a standard procedure for the calibration and operation of the HNu Systems Photoionizer Model PI-101.

SECTION 2.0: SCOPE

The following procedure details those steps necessary for the collection and operation in the survey mode of the HNu Photoionizer. A listing of calibration data needed for proper documentation is supplied at the end of this procedure.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Staff - Third

SECTION 4.0: SUPPORTING PROCEDURES

None

SECTION 5.0: REQUIRED FORMS

Field Notebook No. 351, published by J.L. Darling Corp., Tacoma, Washington (or equivalent), or a conventional paper, bound laboratory notebook (Nalge 6301 or equivalent).

SECTION 6.0: PROCEDURE

6.1 General Description

The HNu Photoionizer is a survey tool for determining general levels of organic vapors in air. The instrument is comprised of a readout module which contains all controls and the battery power supply and a photoionizer probe which contains the photo-cell. The readout module also contains terminals for connection to a recorder. This module is carried by a strap held across the shoulder while the probe is held by hand.

6.2 Instrument Startup

First connect the probe unit to the readout module by attaching and turning the connector terminal. Note this fitting is "keyed" and must be attached in only one orientation.

Second turn the main switch to battery. The needle should deflect to the upper end of the green scale. If it doesn't deflect into the green area or is at the low end of the scale, the instrument needs to be charged. A battery charger is located in the instrument cover and it plugs into the side of the readout module. For a full day's operation the battery should be charged overnight.

Third turn on the main switch to any range (ie. 0-2,000 ppm, 0-200 ppm or 0-20 ppm). Look into the probe through the sample tube and observe the violet light of the photo cell. If the light is not on, check the following:

1. Make sure the probe is attached properly to the readout module.
2. An etch mark should be scribed on the probe where it can be unscrewed to replace the photo cell. This mark shows the exact position that the top of the probe takes so that the air inlet ports are lined up. If not lined up, unscrew the probe and assemble it properly.
3. Check the photo cell lamp and replace it if necessary.

Once the battery and photo cell are operating, perform a calibration.

6.3 Calibration

The PI 101 Analyzer is designed for trace gas analysis in ambient air and is calibrated at HNu with certified standards of benzene, vinyl chloride and isobutylene.

Some general points to consider when calibrating the PI 101 are that the analyzer is designed for operation at ambient conditions and therefore the gas standards used for calibration should be delivered to the analyzer at ambient temperatures and pressure and at the proper flow rates. The PI 101 is a non-destructive analyzer; calibrations using toxic or hazardous gases must be done in a well ventilated area.

The frequency of calibration should be twice daily as a minimum. The instrument should be calibrated at the beginning of the day (or when the instrument is first turned on) and at the end of the day (or when use of the instrument is completed). If the instrument is turned off during the day for any significant length of time, it should be calibrated when turned on. An accurate and reliable method of calibration check is to use analyzed gas cylinders of "hydrocarbon-free" air and isobutylene (prepared by HNu).

Step 1. Zero set - Turn the function switch to STANDBY. In this position the lamp is OFF and no signal is generated. Set the zero point with the ZERO set control. The zero can also be set with the function switch on the X1 position and using a "Hydrocarbon-free" air. In this case "negative" readings are possible if the analyzer measures a cleaner sample when in service.

Step 2. 0-20 or 0-200 range - For calibrating on the 0-20 or 0-200 range only one gas standard is required. Turn the function switch to the range position and note the meter reading. Adjust the SPAN control setting as required to read the ppm concentration of the standard. Recheck the zero setting (Step 1). If readjustment is needed, repeat Step 2. This gives a two-point calibration; zero and the gas standard point.

6.4 Documentation

In the field notebook, or in the bound laboratory notebook, at the start of the project (or if there is a change in instruments), record the following:

1. Site name
2. Instrument model and serial number S/N
3. Types of calibration gases
4. Note the size of the photo cell lamp used in the particular probe. This is useful to know which organic compounds the HNu is sensitive toward.

In the field notebook, or in the bound laboratory notebook, at the start of each calibration, record the following:

1. Date
2. Time
3. Name of person performing the calibration
4. Span setting before beginning calibration
5. That the instrument was zeroed, and whether the instrument was on standby or if "hydrocarbon-free" air was used.
6. The new span setting, if necessary, to calibrate instrument reading
7. Repeat Step 5 if span was adjusted during Step 6
8. Note that the second calibration reading was correct

ATLANTIC PROCEDURE NO. 1052

OPERATION OF THE PHOTOVAC 10S50 PORTABLE GAS CHROMATOGRAPH

Prepared By: ______________________ FRANCIS DUMONT   Chemist TITLE

Reviewed By: ______________________ DENNIS F. UNITES, P.G.   ______ TITLE

Approved By: ______________________ JOHN A. RIPP   ______ TITLE

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ATLANTIC ENVIRONMENTAL SERVICES, INC.
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SECTION 1.0: PURPOSE

To establish a standard procedure for the operation of the Photovac 10S50 Portable Gas Chromatograph.

SECTION 2.0: SCOPE

This procedure details the steps necessary for the operation of the Photovac 10S50 in regard to performing soil gas surveys.

SECTION 3.0: RESPONSIBILITY

First - Project Manager

Second - Field Team Leader

Third - Photovac Operator

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1053 *Soil Gas Screening for Volatile Organics*

SECTION 5.0: PROCEDURE

5.1 Introduction

The Photovac 10S50 is a portable gas chromatograph (GC) which can be used in the performance of soil gas surveys. This procedure describes the necessary equipment needed for GC operation, the method for setting up the GC, and the method for introducing samples into the GC system.

5.2 Equipment Required

Equipment needed for GC operation includes:

- Photovac 10S50 portable gas chromatograph with CPSIL5 capillary column and isothermal oven;
- cylinder of zero or ultra-zero grade air with regulator;
- glass gas-tight syringes;
- sample standards;
- gas standard of 1 or 10 ppm benzene in air;
- AC power supply;
- AC/DC converter;
- flowmeter (two channel); and
- Photovac owner's manual.

5.3 Instrument Set-Up

The GC requires that certain "running" parameters be inputted into its computer memory prior to operation. Parameters which should be entered include:

- electronic gain - 50;
- slope sensitivity - 18, 14, 6 mV/second;
- chart speed - 0.5 cm/minute;
- window +/- 10 percent;
- minimum area - 100 mV seconds
- timer delay - 10.0 seconds;
- cycle time - 0 minutes;

- analysis time - dependent on compounds of interest but should be at least three times greater than Event 3 (backflush);
- Event 1 (sample pump) on at 8.0 seconds, off at 10.0 seconds;
- Event 3 (backflush) on at 0.0 seconds, off at 160.0 seconds;

Once set, the GC computer memory should retain these running parameters.

The "use" function is utilized to set the date and time. The "info" function is utilized to input information the operator wishes to have printed out with each chromatogram (i.e., site name, location, etc.).

Once the parameters are set up, the carrier gas reservoir is filled with air (zero or ultra-zero grade). The flow meter is attached to the detector "out" and auxiliary "out" fittings. The detector outflow should be adjusted to approximately 10 ml/minute using the column flow adjustment knob. The auxiliary outflow should be adjusted to approximately 12 ml/minute using the auxiliary out valve knob. The oven is then turned on to 40° C. The instrument is then allowed to warm up and stabilize for 30 to 45 minutes.

After allowing for warm up, the "Start/Stop" and "Enter" keys should be pressed. This causes the GC to perform a run without the injection of a sample. This is done to ensure that a stable electronic baseline is being drawn. An unsteady baseline can be due to insufficient warm up or a leak in the GC system. A baseline with peaks can be due to a contaminated GC column. If a stable baseline is not obtained after sufficient warm up, refer to the Operation's Manual for probable causes and repair procedures.

While the baseline sample is running, the "chart" mode is set to "on with set-up". This setting activates the chart recorder to print set-up information at the end of the run, including the offset.

The offset is a measure of how much the instrument must adjust the baseline to compensate for background noise and is checked after each run. The offset should not exceed 50 mV. A high offset is usually the result of a contaminated column or the use of an unsuitable carrier gas. Refer to the Operation's Manual if the offset is greater than 50 mV.

5.4 Sampling Introduction

Analysis of standards and samples can be performed once the machine is properly set up. Standards (refer to Procedure 1053) and samples can be introduced into the GC by the following steps:

- push "Start/Stop" followed by "Enter" keys
- allow pump to buzz on for two seconds and shut off
- immediately inject the standard or sample utilizing a gas tight syringe

SECTION 6.0: STORAGE

While the GC is not in use, a low flow rate (approximately 1 ml/minute) should be maintained through the column. This is done by allowing the carrier gas reservoir to run out or by hooking up the external carrier gas fitting to an outside tank regulated to 40 psi. This is done in order to prevent the buildup of contamination in the column during downtime.

Long-term storage of the GC can cause low battery power. Low battery power can result in the loss of the GC's memory and would necessitate re-inputting running parameters. Sufficient battery charge to ensure memory retention can be maintained by occasionally plugging the GC in and turning it on overnight.

SECTION 7.0: REFERENCES

Photovac 10S Operations Manual

ATLANTIC PROCEDURE NO. 1053

SOIL GAS SCREENING FOR VOLATILE ORGANICS

Prepared By: FRANCIS DUMONT — TITLE: Chemist

Reviewed By: DENNIS F. UNITES, P.G. — TITLE:

Approved By: JOHN A. RIPP — TITLE:

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SECTION 1.0: PURPOSE

To establish standard procedures for screening study sites for volatile organic compound (VOC) contaminants using soil gas sampling, and subsequent analysis using Photovac 10S50 gas chromatograph (GC).

SECTION 2.0: SCOPE

This procedure details steps necessary for the collection and interpretation of soil gas data.

SECTION 3.0: RESPONSIBILITY

First - Project Manager

Second - Field Team Leader

Third - Photovac Operator

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1052 *Operation of the Photovac 10S50 Portable Gas Chromatograph*

SECTION 5.0: PROCEDURE

5.1 Introduction

The objective of this field procedure is to provide a method for screening sites for VOC contamination prior to any subsurface investigation. This procedure can be used to estimate the lateral extent and relative concentration of VOCs in soil or ground water (shallow, unconfined, first water bearing zone only) across a site. This is accomplished by collecting and analyzing soil vapors for selected constituents that are produced by the volatilization of VOCs from in-situ product, waste, contaminated soils, or ground water.

The primary objective of soil gas surveying is to provide cursory information on locations and relative concentrations of site contamination. These data permit more effective planning of the quantitative sampling and analytical phases of the investigation. Soil gas procedures are not intended for evaluating contamination located beneath the water table. These procedures cannot be used to quantify contamination. Subsurface soil/water sampling and analysis by standard laboratory procedures are required to verify soil gas survey results.

5.2 Equipment Required

The following is a list of equipment and supplies that would be required to implement the soil gas procedure:

- Photovac 10S50 portable gas chromatograph with CPS1L5 capillary column and isothermal oven;
- 1/4" ID stainless steel tubing (5 feet long);
- plastic line which fits snugly in tubing (5-1/2 feet long);
- various Swagelok fittings;
- flow meter (two channel);
- cylinder of Zero or Ultra Zero gas with regulator;
- glass gas-tight syringes (10, 100, 500 and 1000 ul);
- sample standards (i.e., benzene in air, BTX headspace, chlorinated solvents headspace, etc.);

- AC power supply (i.e., generator, access to power outlet, etc.);
- modeling clay sufficient to cover soil gas sample hole once stainless steel tube is inserted; and
- gas transfer line (Photovac internal tank).

5.3 Instrument Start-Up and Calibration

The following is a list of suggested initial instrument settings:

- carrier gas flow - 10 ml/min;
- electronic gain - 50;
- oven temperature - 40°C;
- backflush - 160 seconds;
- run time - 1000 seconds;
- data management parameters - see Atlantic Procedure No. 1052;
- sample event times - see Atlantic Procedure No. 1052.

The Photovac GC requires a 30-45 minute warm-up period for the oven temperature and gain settings to stabilize. The electronic baseline should be checked by initiating the GC run without injecting sample.

Next, the Photovac is calibrated by injecting qualitative and quantitative standard mixtures. Stock standards ranging from 25 to 500 ml/l of the target analytes are prepared by diluting the neat (pure) compound in pesticide-grade methanol. Headspace standards are prepared daily by adding a measured (3 - 100 ul) volume of stock standard to 30 ml of distilled water in a 40 ml volatile organic analysis (VOA) vial. The vial is shaken by hand for two minutes and then allowed to equilibrate for an additional three minutes. Between 10 and 100 ul of the headspace vapor is injected into the GC for analysis. The headspace standard provides the relative retention times (time required to elute through the column) of the target analytes.

A standard of 1 part per million (ppm) benzene in air is used to evaluate chromatogram peak variation resulting from fluctuation in instrument sensitivity and as a quality control check on the headspace standards.

Finally, a sample of ambient air (system blank) is collected through the sampling apparatus (see Section 5.5 and 5.7) to ensure that the system is free from contamination.

5.4 Sampling Grid Layout

Soil gas sampling should be performed on a grid at sites where little or no history and/or geologic information is available. The grid spacing may range from 25 to 100 foot centers, depending on the size of the area to be screened and the time and cost constraints of the investigation.

If sources of soil contamination are better known and documented, then the choice of sampling locations can be tailored to that information. The approach for those better documented sites would be to sample in and around areas of known/suspected contamination first to ensure that the subsurface contaminants can be detected at those locations. Areas where no contamination is expected are sampled next. If nothing is detected at these background locations, then subsequent sampling points can be located approximately one-half the distance to the known source. This procedure is followed until soil contamination is defined to the degree that is consistent with project objectives.

5.5 Soil Gas Collection

Soil gas samples are obtained by the following procedure.

- A plunger bar is used to drive a 1/2 inch diameter hole in the ground to a desired depth*. If the sample location is covered by hard pavement or cement, then a hammer drill is used to break through this material.

- A pre-purged, 4 foot long, 1/4 inch O.D. stainless steel tube is used to collect the sample. To prevent soil from plugging the tube as it is lowered into the cavity, a section of plastic line is inserted into the tube and held in place. After the tube is placed in the ground, the line is pulled out. Clay is placed around the tube at the soil surface creating a seal that prevents surface air from mixing with the gas from the soil.

- A 3-way Swagelok fitting is placed on the open end of the steel tube at the ground surface. One end of the fitting is connected to a teflon tube leading to a small personal sampler air pump. A small teflon-coated septum is secured over the remaining opening of the fitting. The pump is switched on and allowed to run for 3 minutes at a flow rate of 100 to 150 milliliters per minute (ml/min). The soil gas sample is collected by inserting a pre-rinsed 500 ul syringe through the septum and withdrawing 300 ul of air.

- The sampling apparatus is removed from the hole and flushed with high flows of ambient air to remove any soil gas contaminants.

Flow rates and purge volumes may have to be adjusted depending on subsurface conditions. Tightly packed soils may necessitate the use of smaller purge volumes and slower flow rates. Sample volumes injected into the GC may need refinement based on the chromatographic responses obtained.

5.6 Analysis and Data Collection

The gas sample obtained is injected directly into the Photovac instrument. The chromatogram that is generated contains peaks that represent constituents in the sample. The retention times of

* Depth is generally four feet but may be changed based on site conditions such as depth of contamination or depth to ground water.

these peaks are compared to the headspace standard to qualitatively identify the compound. Relative concentrations can be calculated by comparing the integrated peak areas that are generated. Any major unknown peaks that cannot be immediately identified should be noted in the event further evaluation is necessary.

5.7 QA/QC Protocol

Standards are run at the beginning, middle and end of each sampling day, and to document, when necessary, any retention time shifts.

System blanks are run at the beginning and end of each day, and when possible cross-contamination between samples is suspected. A system blank is obtained by allowing the sample collecting system to draw in ambient air for 3 to 5 minutes, drawing 300 ul of sample, and injecting it into the GC. If the GC demonstrates contamination in the system, the soil gas sampling tube should be decontaminated in the following way:

- flush stainless steel tube with methanol;
- purge stainless steel tube with high pressure zero air until dry; and
- purge syringe and septa fitting with high pressure zero air.

If contamination persists after this treatment, a different sampling tube and syringe should be used.

A syringe blank is run when it is suspected that the syringe has become contaminated. This is done by drawing 300 ul of ambient air into the syringe and injecting it into the GC. The syringe should be purged with zero air if it is found to be contaminated. If contamination persists after this treatment, a different syringe should be used. Contaminated syringes can be cleaned in the laboratory by flushing with methanol and drying under a UV lamp.

5.8 Interpretation

Integrated area counts can be obtained for individual peaks produced on the chromatograms. This information can be used to outline generalized areas of contamination and locate specific "hot spots" of high soil gas concentrations. It is possible to relatively quantitate soil gas concentrations at a particular site by establishing varied ranges of peak area.

In addition to identifying single peaks, the chromatographic patterns or "signatures" can be evaluated. For example, coal tar exhibits a different chromatographic signature from that of gasoline. The interpretation of these signatures is to a large extent dependent upon the experience and knowledge of the GC operator.

One method that may be useful for interpreting soil gas results involves collecting a known sample of onsite contamination from a sludge pit or boring, and producing a chromatographic "signature" of the headspace vapor to compare to soil gas chromatograms from samples taken elsewhere on the site.

Other methods of distinguishing between contamination sources using chromatographic signatures are presented in a recent topical report available through the Gas Research Institute (see references). Examples of coal tar related data are compared and contrasted with data derived from petroleum related products.

A number of factors can significantly influence the correlation between the soil gas results and the actual conditions present at a particular site. These include soil porosity and composition, soil heterogeneities, and local climatic conditions such as temperature and humidity. Thus, a soil gas sample result should only be compared to results of other soil gas samples from the same site (assuming similar geology) taken under similar climatic conditions.

SECTION 6.0: DOCUMENTATION

The following information is recorded in a laboratory notebook during the implementation of this procedure:

- project title and date of investigation;
- personnel involved;
- instrument parameters used;
- sketch of all soil gas locations (along with measurements necessary to accurately position later on a scale drawing);
- description of collection parameters (e.g., depth, purge rate and volume, etc.);
- meteorological parameters and site geological information; and
- any variation or adjustment of the above procedure that is used.

In addition to the laboratory notebook documentation, each soil gas chromatogram is pasted on an Atlantic soil gas point description sheet which includes the following information:

- project number;
- sample number;
- date of sample collection;
- weather conditions;

- depth to sample;
- comments associated with sample;
- contaminant identification;
- retention time; and
- peak area.

Original chromatograms are saved in the project file and a set of copies are saved in a separate Photovac/Soil Gas file.

SECTION 7.0: REFERENCES

Gas Research Institute (GRI) Topical Report #GRI-89/0166. *Soil Gas Investigations at MGP Sites: An Evaluation of Alternative Compounds*. Chicago, Illinois. 1989.

ATLANTIC PROCEDURE NO. 1070

WELL DEVELOPMENT PROCEDURES FOR SMALL DIAMETER MONITORING WELLS

Prepared By:	Curtis A. Kraemer CURTIS A. KRAEMER	Senior Hydrogeologist TITLE
Reviewed By:	John A. Ripp JOHN A. RIPP	Principal TITLE
Approved By:	Paul Burgess PAUL BURGESS, P.E.	Principal TITLE

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SECTION 1.0: PURPOSE

To insure the natural hydraulic conductivity of the subsurface materials have been restored and all foreign sediment removed to ensure turbid-free ground water samples.

SECTION 2.0: SCOPE

The following procedure describes the methods for monitoring well development and the conditions for which the methods are best suited. The procedure also includes a method for determining whether the development is sufficient for monitoring wells used for RCRA ground water monitoring programs.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Staff - Third

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1030 Field Procedures for Logging Subsurface Conditions During Test Boring and Well Logging

Atlantic Procedure No. 1060 Cleaning Procedure for Sampling Devices used in Environmental Site Investigations

Atlantic Procedure No. 1071 Field Procedures for Determination of In-Situ Hydraulic Conductivity with Single Well Hydraulic Tests

SECTION 5.0: REQUIRED FORMS

Field Notebook No. 351, published by J.L. Darling Corp., Tacoma, Washington (or equivalent)

SECTION 6.0: PROCEDURE

Well development is a means to restore the natural hydraulic conductivity of the subsurface materials surrounding a monitoring well and ensure a turbid-free ground water sample. There are a variety of well development techniques, all of which require reversals or surges in flow to avoid bridging by particles, which is common when flow is continuous in one direction. The in-situ ground water should be used for surging the well. If the well yields an insufficient quantity of water to use, an outside source of water (preferably tap water) may be used. If the source of the outside water is unknown (not tap water), a sample should be chemically analyzed to determine whether the water may have an impact on the in-situ water quality.

The following applies to all methods described below:

* All materials including submersible pumps, suction lines, surge blocks, and lines used to pump water or compressed air into a well should be decontaminated in accordance with Atlantic Procedure No. 1060.

* Field notes should be kept to record the following information;

initial static water level

method of well development

average discharge rate and corresponding drawdown

any measureable recovery or information regarding yield of monitoring well

any noticeable changes in ground water quality resulting from well development

* The well development should continue until the discharge runs sediment free after 20 strokes of the surge block. A clear glass jar of distilled water should be used as a reference. Discharge from the pump should be checked periodically by collecting some of the discharge in a clear glass jar and comparing to the distilled water reference.

6.1 Surge Block Method

This method is best suited for monitoring wells that will yield at least 1/2 gallons per minute (gpm) while being pump with a vacuum lift pump (centrifugal pump). It can be used on wells with yields of less than 1/2 gpm, but may require the introduction of water from an outside source.

A surge block is a piston-like device with an outside diameter that is just smaller than the inside diameter of the well and used with by stroking the block up and down in the well. On the downstroke water is forced outward into the subsurface materials, and on the upstroke water, silt and fine sand are pulled in through the screen. This results in sediment filling in the well screen, which must be periodically removed.

The surge block for 2-inch wells consists of two rubber stoppers with a 1/2-inch pipe passing through the rubber stoppers. The stoppers are held in place with washers and nuts; the nuts can be tightened or loosened to expand the stoppers to get a good fit inside the well. The surge block is attached to either 3/4-inch or 1-inch rigid polypropylene tubing. This tubing is rigid enough that it can be used to stroke the surge block. This tubing is then attached to a centrifugal pump with a valve on the discharge side to control the pumping rate from the well.

The surge block should be kept above the screen if sufficient water is above the well screen. If necessary, the block may be stroked in the well screen, however, care should be exercised so not to damage the well screen and the slot sizing. Periodically the surge block should be lowered to the bottom of the well to remove the sediment that has accumulated at the bottom.

The same methodology applies to wells with yields less than 1/2 gpm except that water may have to be introduced occasionally because the well may dewater. The discharged water from the well should be used if at all possible, if not, tap water is the next choice of an outside source of water. When developing the low yielding wells, keep the discharge rate to a minimum, and if necessary, stop pumping for a short period of time while stroking the surge block.

6.2 <u>Overpumping/Backwashing Development Method</u>

This method can be used for wells that yield either less than or more than 1/2 gpm. Any number of pieces of equipment can be used to develop wells with this method. In general, the method involves overpumping a well so that it dewaters the well and then introducing a slug of water back into the well. As mentioned at the beginning of the procedure, it is preferred to use the discharge water when backfilling into the well. If that is not available, tap water is the next preferred source of water.

Any means of pumping water quickly out of a well may be used to overpump the well, however, there should be some means of removing the sediment that has flowed into the well. To this end a centrifugal pump will both pump quickly (will lift water up to about 25 feet of head) and remove the sediment from the bottom of a well. Most forms of submersible pumps are not designed to pump solids and will quickly become inoperative.

Backwashing the well is performed either by pumping the water back into the well quickly or pouring the water back into the well.

6.3 Air Development Method

The air development method consists of lowering a line (usually solid pvc pipe) down into a well and, using compressed air, blowing air into the well that literally lifts the water up and out of the well. This method is not well suited for low yielding wells since one has to wait for the well to recover before purging more water. The one major disadvantage to this method is that most air compressors have trace amounts of petroleum mixed in the air to keep the equipment lubricated. These trace amounts of petroleum can easily compromise the quality of the water in the well. There are some compressors which filter the air so there is no petroleum mixed in, however, these are not commonly available.

There should be a "U" shaped fitting at the bottom of the line placed in the well. This will direct the air in an upward direction, rather than blowing the air down and, subsequently, out into the subsurface materials. Without this U-shaped fitting, fine-grained materials may be pushed into the well screen producing the opposite of the desired affect. It is important that the air compressor be adequately sized so that it will produce sufficient pressure to lift the column of water out of the well (the longer the column, the more pressure that is required).

6.4 Jetting Development Method

This method can be used for both high and low yielding wells. It involves the pumping of water into the well through "jetting" nozzles (pointed directly at the well screen) and simultaneously pumping the well. The pumping pulls water into the well, and the jetting pushes water out through a small length of screen at a high velocity. This provides both a reversal and surge of water through the well screen. This may require the use of an outside source of water, particularly in low yielding wells. If an outside source is required, it preferably should be tap water.

ATLANTIC PROCEDURE NO. 1071

FIELD PROCEDURE FOR DETERMINATION OF IN-SITU HYDRAULIC CONDUCTIVITY WITH SINGLE WELL HYDRAULIC TESTS

Prepared By:	Curtis A. Kraemer CURTIS A. KRAEMER, P.G.	Senior Hydrogeologist TITLE
Reviewed By:	James E. Gould for DENNIS F. UNITES, P.G.	PRINCIPAL TITLE
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SECTION 1.0 PURPOSE

To insure the use of standard procedures for determining in-situ hydraulic conductivity values of subsurface materials for hazardous materials site investigations. These are single well hydraulic methods which yield order-of-magnitude hydraulic conductivity values. These should not be considered the same as multiple well aquifer tests which are commonly used for water resources investigations and which yield greater information about more of the aquifer.

SECTION 2.0 SCOPE

The following procedure describes first, how to select a field method for determining in-situ hydraulic conductivity based on site conditions and assumed hydraulic conductivity ranges; second, the logistics, chain-of-events, and documentation requirements; and third, the appropriate method to evaluate the field data.

SECTION 3.0 RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Staff - Third

SECTION 4.0 SUPPORTING PROCEDURES

Atlantic Procedure No. 1030 Field Procedures for Logging Subsurface Conditions During Test Boring and Well Logging

Atlantic Procedure No. 1060 Cleaning Procedure for Sampling Devices used in Environmental Site Investigations

Atlantic Procedure No. 1071 Well Development Procedures for Small Diameter Monitoring Wells

SECTION 5.0 REQUIRED FORMS

Field Notebook No. 351, published by J.L. Darling Corp., Tacoma, Washington (or equivalent)

SECTION 6.0 PROCEDURE

6.1 Test Method Selection

The in-situ (within a monitoring well) hydraulic conductivity of subsurface materials can be determined by:

* single well pump tests
* slug tests (injection or extraction tests)
* constant head test

Figure 1 is a decision flow chart developed by Kraemer, Hankins, and Mohrbacher [1] for selecting the most appropriate in-situ hydraulic conductivity test method. There are several factors which influence the selection of the test method. The expected hydraulic conductivity value can be based on observed subsurface conditions and from text books like Groundwater by Freeze and Cherry [2] which give ranges for a variety of soil and bedrock descriptions. The placement of the well screen is critical for some test methods. If the top of the screen is above the water table, water can not be added into the well because some of it will flow into the vadose zone, and the test methods assume the flow is only in the saturated zone. If the ground water is known, or expected, to be contaminated, all water discharged from the well should be containerized (drummed in 55-gallon containers or into larger vessels if appropriate). If the water quality in the monitoring well is of a long term concern or will require subsequent sampling, no water should be introduced into the well.

Water levels can be measured with an electronic water level indicator, however this slows down the measurement and recording procedure. It is also the primary source of error in the test procedure. A pressure transducer hooked to a direct readout can also be used. This requires the field personnel to record the data as it happens. A pressure transducer hooked to a data logger can be used. This allows the field personnel to monitor other ongoing operations while the test is proceeding. The only problem with data loggers is that sometimes the data can not be retrieved, and a well, or group of wells, may require a second test. If a pressure transducer is used, a calibration check will be required. The calibration check is made by lowering the transducer about two feet into the water and allowing the transducer to equilibrate (the water level readings stabilize). Then lower the transducer exactly 1.00 feet using a steel or fiberglass surveying tape or wooden folding rule. Allow the water level readings to stabilize, the readings should show exactly 1.00 foot additional water. Repeat this procedure at least three times, at different depths, in one well at least once a day.

Single wells should not be hydraulically tested until the well has been developed as specified in Atlantic Procedure No. 1070. Notes will be taken as part of the development procedure that will provide some insight regarding the yield of individual wells. These notes will provide an approximate pumping rate, amount of drawdown and duration of pumping.

6.2 Slug Test Procedure

The slug test consists of two methods:

* slug extraction method
* slug injection method

Both methods are used in materials which have relatively low hydraulic conductivities. The major drawback to the slug test is that has a very small zone of influence and often reflects the hydraulic conductivity of the sand backfill around the well screen rather than the in-situ materials.

The slug extraction method involves the "instantaneous" withdrawal of a known volume of water from a well and recording the recovery of the water level back to its original static level. The slug injection method involves the "instantaneous" injection of a known volume of water into a well and recording the lowering of the water level back to its original static level. The slug injection method can not be used where the top of the well screen is above the water table.

6.2.1 Slug Extraction Test Procedure

Required Measurements

* length of well screen
* inside diameter of well screen
* inside diameter of well riser

Required Equipment

* steel or fiberglass surveying tape
* electronic water level indicator/pressure transducer (+ readout/data logger)
* bailer/displacement device
* watch with seconds hand (or digital)
* semi-log paper

1. Establish the static water level in the well by measuring and recording the depth to water to the nearest 0.01 foot from a stationary point (usually a point marked on the top of the well riser or protective casing). Preferably the static water level is measured every 10 minutes for at least 30 minutes prior to initiating the test.

2. Lower a bailer or device that will displace a known volume of water (a PVC pipe filled with sand) and allow the water level to reach the initial static water level. If a displacement device is used, it is best to wait until the following day (about 12 hours if the device is placed in the well toward the end of the day) before starting the test.

3. Measure and record the static water level just prior to initiating the test.

4. As quickly as possible, remove the bailer or displacement device. If a bailer is used, the volume of water in the bailer should be recorded (the water can be placed into a container initially and measured and recorded toward the end of the test)

5. Measure and record water levels as follows:

* 10, 20 and 30 seconds elapsed time
* 45, 60, 75 and 90 seconds elapsed time
* every 30 seconds elapsed time, up to 10 minutes
* every minute up to 30 minutes
* every two minutes up to 1 hour
* every five minutes up to 3 hours
* every ten minutes up to 6 hours
* every 30 minutes up to 12 hours

Measurements may cease once the water level has returned to at least 85 percent recovery.

6. Calculate the volume of water that was displaced by the displacement device, or measure the volume of water that was removed by the bailer and calculate the volume of the bailer materials to determine the total volume removed from the well.

7. Calculate the time zero drawdown in the well based on the volume of water displaced/removed and the radius of the inside well diameter. This should be noted as H_0.

8. Calculate a drawdown ratio for each measurement with the following equation:

$$\frac{\text{maximum drawdown } (H_0 \text{ in feet}) - \text{recovery (in feet)}}{\text{maximum drawdown } (H_0 \text{ in feet})}$$

This equation should equal 1.00 at time zero (maximum drawdown, but no recovery) and should equal 0.15 when 85 percent recovery has been reached.

9. Plot time versus the drawdown ratio on semi-log paper. The time should be plotted linearly on the X axis and the drawdown ratio should be plotted logrithmically on the Y axis.

10. The resulting plot should theoretically be straight; in reality it is not. The straightest portion of this line should be used for the hydraulic conductivity calculations. Generally, the beginning and end points are not on the line and should not be used.

11. Use the time and head values (t_1, H_1 and t_2, H_2) representing the two ends of the line in the equations that are presented in Figure 2. Figure 2, taken from Hvorslev's work [3], shows six different field situations in terms of subsurface strata and borehole/well placement. The most commonly used situations presented in Figure 2 are F and G. The slug extraction method would be calculated under the variable head equations.

6.2.2 Slug Injection Test Procedure

Required Measurements

* length of well screen
* inside diameter of well screen
* inside diameter of well riser

Required Equipment

* steel or fiberglass surveying tape
* electronic water level indicator/pressure transducer (+ readout/data logger)
* bucket/water container (graduated)
* watch with seconds hand (or digital)
* semi-log paper

1. Establish the static water level in the well by measuring and recording the depth to water to the nearest 0.01 foot from a stationary point (usually a point marked on the top of the well riser or protective casing). Preferably the static water level is measured every 10 minutes for at least 30 minutes prior to initiating the test.

2. Measure and record the static water level just prior to initiating the test.

3. As quickly as possible, pour a known volume of water into the well (be certain that the volume of water will not overflow the top of the well). The volume of water poured into the well should be recorded.

4. Measure and record water levels as follows:

* 10, 20 and 30 seconds elapsed time
* 45, 60, 75 and 90 seconds elapsed time
* every 30 seconds elapsed time, up to 10 minutes
* every minute up to 30 minutes
* every two minutes up to 1 hour
* every five minutes up to 3 hours
* every ten minutes up to 6 hours
* every 30 minutes up to 12 hours

Measurements may cease once the water level has returned to at least 85 percent recovery.

5. Calculate the time zero head in the well based on the volume of water added to the well and the radius of the inside well diameter. This should be noted as H_0.

6. Calculate a head ratio for each measurement with the following equation:

$$\frac{\text{maximum head } (H_0 \text{ in feet}) - \text{recovery (in feet)}}{\text{maximum head } (H_0 \text{ in feet})}$$

This equation should equal 1.00 at time zero (maximum head, but no recovery) and should equal 0.15 when 85 percent recovery has been reached.

7. Plot time versus the head ratio on semi-log paper. The time should be plotted linearly on the X axis and the head ratio should be plotted logrithmically on the Y axis.

10. The resulting plot should theoretically be straight; in reality it is not. The straightest portion of this line should be used for the hydraulic conductivity calculations. Generally, the beginning and end points are not on the line and should not be used.

11. Use the time and head values (t_1,H_1 and t_2,H_2) representing the two ends of the line in the equations that are presented in Figure 2. The most commonly used situations presented in Figure 2 are F and G. The slug injection method would be calculated under the variable head equations.

6.3 Constant Head Method

Required Measurements

* length of well screen
* inside diameter of well screen
* inside diameter of well riser
* discharge rate of water into well

Required Equipment

* steel or fiberglass surveying tape
* electronic water level indicator/pressure transducer (+ readout/data logger)
* bucket/water container (graduated)
* watch with seconds hand (or digital)
* semi-log paper

The constant head method involves the discharge of water into a well at a constant rate and allowing the increase in head to equilibrate. The constant head method can not be used where the top of the well screen is above the water table.

1. Establish the static water level in the well by measuring and recording the depth to water to the nearest 0.01 foot from a stationary point (usually a point marked on the top of the well riser or protective casing). Preferably the static water level is measured every 10 minutes for at least 30 minutes prior to initiating the test.

2. Measure and record the static water level just prior to initiating the test.

3. Discharge water into the well at a constant rate. The discharge rate must be known, but not necessarily prior to initiating the test. If necessary, the discharge rate can be measured at the end of the test. The field measurement of the discharge rate is usually made by discharging the water into a container of known volume and timed. The field measurement should be measured and recorded three times and the average recorded as the constant discharge rate.

4. Measure and record water levels as follows:

   * 10, 20 and 30 seconds elapsed time
   * 45, 60, 75 and 90 seconds elapsed time
   * every 30 seconds elapsed time, up to 10 minutes
   * every minute up to 30 minutes
   * every two minutes up to 1 hour
   * every five minutes up to 3 hours
   * every ten minutes up to 6 hours
   * every 30 minutes up to 12 hours

Measurements may cease once the rising water level increases no more than two percent of the total increase between water level readings. The increase in total head at the end of the test should be noted as H_c.

5. Use the constant discharge rate and H_c values in the equations that are presented in Figure 2. The most commonly used situations presented in Figure 2 are F and G. The constant head method would be calculated under the constant head equations.

6.4 Single Well Pump Test

Required Measurements

* length of well screen
* inside diameter of well screen
* inside diameter of well riser
* discharge rate of water into well

Required Equipment

* steel or fiberglass surveying tape
* electronic water level indicator/pressure transducer (+ readout/data logger)
* bucket/water container (graduated)
* watch with seconds hand (or digital)
* pump capable of maintaining constant discharge
* semi-log paper

A single well pump test consists of pumping water from a well at a constant discharge rate and measuring the change in water levels over a period of time. The largest advantage of single well pump tests is that it can involve a large volume of water which influences a greater effective area. Therefore, the test can effect a larger area which provides data more representative of the subsurface materials. The largest drawback is that this larger volume of water may require temporary storage and/or treatment before discharging to the ground or some other approved receptacle.

1. Establish the static water level in the well by measuring and recording the depth to water to the nearest 0.01 foot from a stationary point (usually a point marked on the top of the well riser or protective casing). Preferably the static water level is measured every 10 minutes for at least 30 minutes prior to initiating the test.

2. Lower a submersible pump or suction line for a peristaltic/centrifugal pump into the well and allow the water level to reach the initial static water level.

3. Measure and record the static water level just prior to initiating the test.

4. Begin pumping the well at a constant discharge rate. If using a peristaltic/centrifugal pump, there should be some means to control the discharge rate. On a centrifugal pump this can easily be accomplished by placing a valve (preferably a ball valve) on the discharge end of the pump (before the discharge line though). The discharge rate should be checked periodically and adjusted if necessary. The discharge rate should not vary more than ten percent.

5. Measure and record water levels as follows:

   * 10, 20 and 30 seconds elapsed time
   * 45, 60, 75 and 90 seconds elapsed time
   * every 30 seconds elapsed time, up to 10 minutes
   * every minute up to 30 minutes
   * every two minutes up to 1 hour
   * every five minutes up to 3 hours
   * every ten minutes up to 6 hours
   * every 30 minutes up to 12 hours

The test should be run as long as practical, however, typical budget restraints would indicate the test should be run for about one hour typically. If the discharge rate can not be maintained, the pumping should be terminated immediately.

6. Once the pumping has been terminated, measure and record the recovering water level as follows:

* 10, 20 and 30 seconds elapsed time
* 45, 60, 75 and 90 seconds elapsed time
* every 30 seconds elapsed time, up to 10 minutes
* every minute up to 30 minutes
* every two minutes up to 1 hour
* every five minutes up to 3 hours
* every ten minutes up to 6 hours
* every 30 minutes up to 12 hours

Measurements should be made and recorded until the water level has recovered at least 85 percent. If there is insufficient time, record the recovery as long as possible.

7. Plot time versus drawdown on semi-log paper. The time should be plotted logrithmically on the X-axis and drawdown should be plotted linearly on the Y-axis. If the drawdown is greater than ten percent of the saturated thickness of the subsurface materials (or, if the total saturated thickness is unknown, ten

percent of the water standing in the well), a corrected drawdown needs to also be plotted. The corrected drawdown for each measurement is calculated with the following equation:

$$s_c = s - s^2 / 2m$$

where s = measured drawdown

s_c = corrected drawdown

m = saturated thickness of subsurface materials (if unknown, length of standing water in the well)

8. A "best fit" straight line should be drawn through the plotted points.

9. Calculate the coefficient of transmissivity. This is done with the following equation:

$$T = \frac{264 \times Q}{\text{delta } s}$$

where T = coefficient of transmissivity (gallons per day per foot, gpd/ft)

Q = constant discharge rate (gallons per minute, gpm)

delta s = change in drawdown over one log cycle

If the drawdown was corrected, the change in corrected drawdown over one log cycle should be used.

10. Calculate the hydraulic conductivity with the following equation:

$$k = \frac{T\ (gpd/ft)}{m\ (ft)} / 7.48\ (\text{gallons per } ft^3)$$

where k = hydraulic conductivity (feet per day, ft/day)

T = coefficient of transmissivity

m = saturated thickness of subsurface materials (if unknown, length of standing water in well)

11. Plot time versus recovery on semi-log paper. The time should be plotted logrithmically on the X-axis and recovery should be plotted linearly on the Y-axis. If the recovery is greater than ten percent of the saturated thickness of the subsurface materials (or, if the total saturated thickness is unknown, ten percent of the water standing in the well), a corrected recovery needs to also be plotted. The corrected recovery for each measurement is calculated with the following equation:

$$s'_c = s' - s'^2/2m$$

where s' = measured recovery

s'_c = corrected recovery

m = saturated thickness of subsurface materials (if unknown, length of standing water in the well)

12. A "best fit" straight line should be drawn through the plotted points.

13. Calculate the coefficient of transmissivity. This is done with the following equation:

$$T = \frac{264 \times Q}{\text{delta } s'}$$

where T = coefficient of transmissivity (gallons per day per foot, gpd/ft)

Q = constant discharge rate (gallons per minute, gpm)

delta s' = change in recovery over one log cycle

If the recovery was corrected, the change in corrected recovery over one log cycle should be used.

14. Calculate the hydraulic conductivity with the following equation:

$$k = \frac{T\ (\text{gpd/ft})}{m\ (\text{ft})} \; / \; 7.48\ (\text{gallons per ft}^3)$$

where k = hydraulic conductivity (feet per day, ft/day)

T = coefficient of transmissivity

m = saturated thickness of subsurface materials (if unknown, length of standing water in well)

SECTION 7.0 REFERENCES

[1] Kraemer, Curtis A., Hankins, John B., and Carl J. Mohrbacher, "Selection of Single-Well Hydraulic Test Methods for Monitoring Wells," Ground Water and Vadose Zone Monitoring, ASTM STP 1053, D.M. Nielsen and A.I. Johnson, Eds., American Society for Testing and Materials, Philadelphia. 1989.

[2] Freeze, R.A., and J.A. Cherry, Groundwater, Prentice-Hall, Englewood Cliffs, NJ, 1979.

[3] Hvorslev, M.J., Waterways Experiment Station Bulletin 36, U.S. Army Corps of Engineers, Vicksburg, MS, 1951.

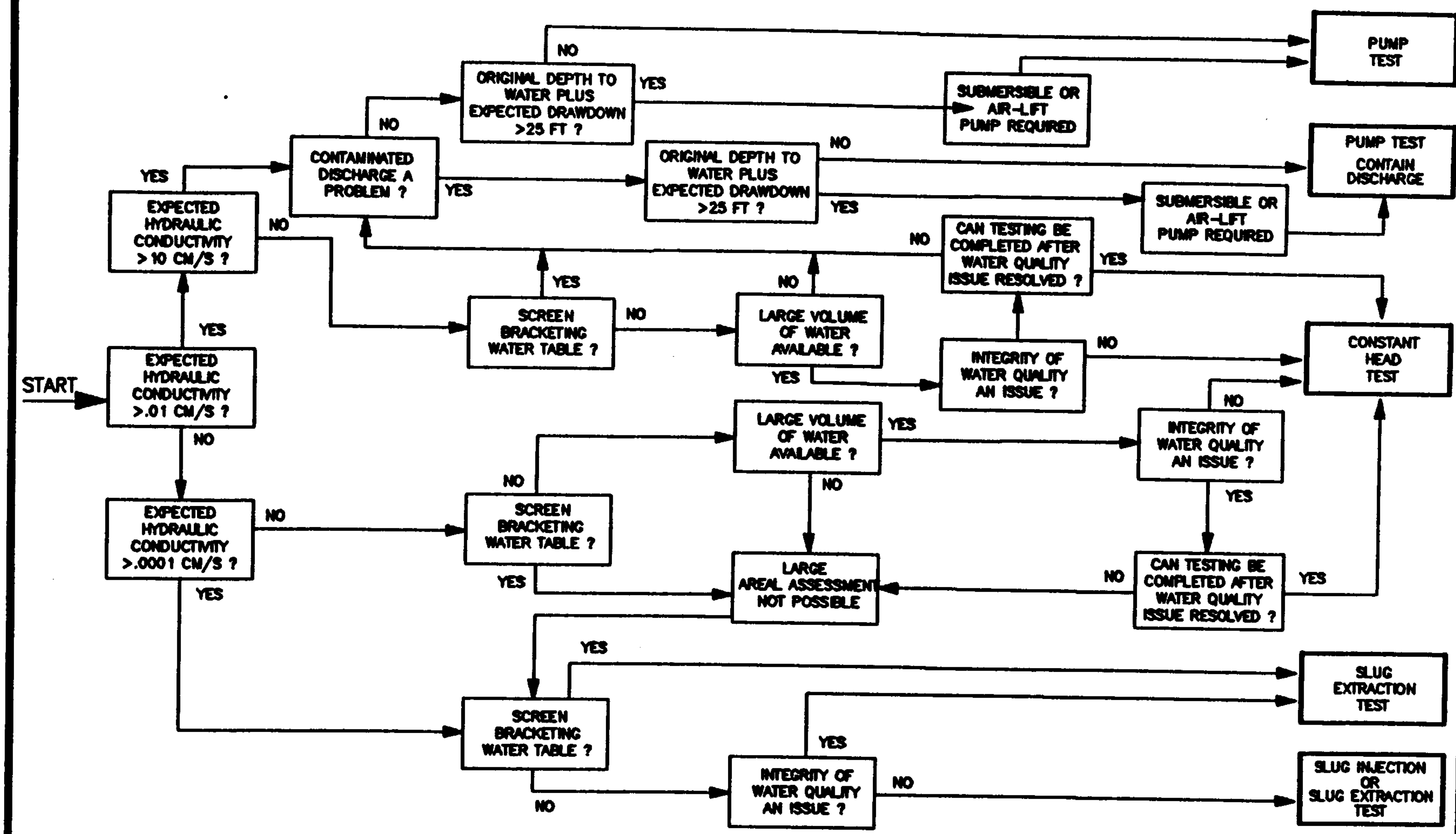
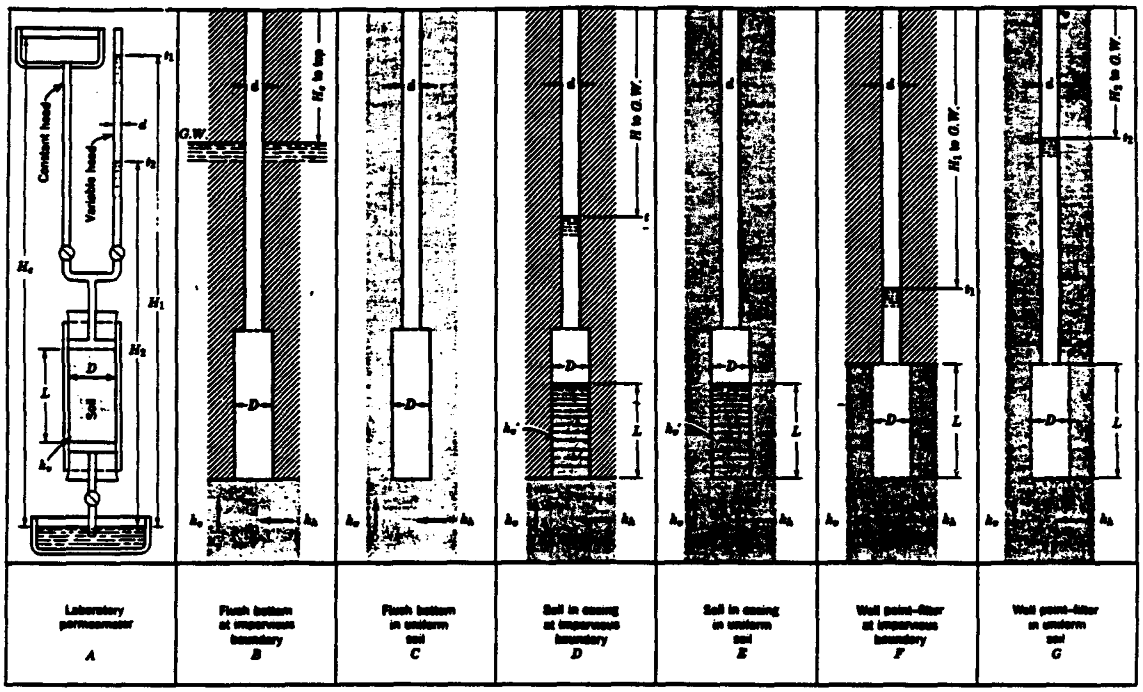


FIGURE 1
DECISION MAKING FLOWCHART FOR HYDRAULIC TESTS
ATLANTIC PROCEDURE NO. 1071
(FROM KRAEMER, HANKINS & MOHRBACHER, 1989)



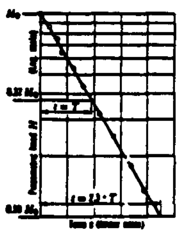
Case	Constant Head	Variable Head	Basic Time Lag	Notation
A	$k_v = \frac{4 \cdot q \cdot L}{\pi \cdot D^2 \cdot H_c}$	$k_v = \frac{d^2 \cdot L}{D^2 \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ $k_v = \frac{L}{t_2 - t_1} \ln \frac{H_1}{H_2}$ for $d = D$	$k_v = \frac{d^2 \cdot L}{D^2 \cdot T}$ $k_v = \frac{L}{T}$ for $d = D$	D = Diam., intake, sample (cm) d = Diameter, standpipe (cm) L = Length, intake, sample (cm) H_c = Constant piez. head (cm) H_1 = Piez. head for $t = t_1$ (cm) H_2 = Piez. head for $t = t_2$ (cm) q = Flow of water (cm³/sec) t = Time (sec) T = Basic time lag (sec) k_v' = Vert. perm. casing (cm/sec)
B	$k_m = \frac{q}{2 \cdot D \cdot H_c}$	$k_m = \frac{\pi \cdot d^2}{8 \cdot D \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ $k_m = \frac{\pi \cdot D}{8 \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ for $d = D$	$k_m = \frac{\pi d^2}{8 \cdot D \cdot T}$ $k_m = \frac{\pi \cdot D}{8 \cdot T}$ for $d = D$	
C	$k_m = \frac{q}{2.75 \cdot D \cdot H_c}$	$k_m = \frac{\pi \cdot d^2}{11 \cdot D \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ $k_m = \frac{\pi \cdot D}{11 \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ for $d = D$	$k_m = \frac{\pi \cdot d^2}{11 \cdot D \cdot T}$ $k_m = \frac{\pi \cdot D}{11 \cdot T}$ for $d = D$	
D	$k_v' = \frac{4 \cdot q \left(\frac{\pi}{8} \cdot \frac{k_v'}{k_h} \cdot \frac{D}{m} + L\right)}{\pi \cdot D^2 \cdot H_c}$	$k_v' = \frac{d^2 \cdot \left(\frac{\pi}{8} \cdot \frac{k_v'}{k_h} \cdot \frac{D}{m} + L\right)}{D^2 \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ $k_v = \frac{\frac{\pi}{8} \cdot \frac{D}{m} + L}{t_2 - t_1} \ln \frac{H_1}{H_2}$ for $k_v' = k_v$, $d = D$	$k_v' = \frac{d^2 \cdot \left(\frac{\pi}{8} \cdot \frac{k_v'}{k_h} \cdot \frac{D}{m}\right) + L}{D^2 \cdot T}$ $k_v = \frac{\frac{\pi}{8} \cdot \frac{D}{m} + L}{T}$ for $k_v' = k_v$, $d = D$	k_v = Vert. perm. ground (cm/sec) k_h = Horz. perm. ground (cm/sec) k_m = Mean coeff. perm. (cm/sec) m = Transformation ratio $k_m = \sqrt{k_h \cdot k_v}$ $m = \sqrt{k_h/k_v}$ $\ln = \log_e = 2.3 \log_{10}$
E	$k_v' = \frac{4 \cdot q \cdot \left(\frac{\pi}{11} \cdot \frac{k_v'}{k_h} \cdot \frac{D}{m} + L\right)}{\pi \cdot D^2 \cdot H_c}$	$k_v' = \frac{d^2 \cdot \left(\frac{\pi}{11} \cdot \frac{k_v'}{k_h} \cdot \frac{D}{m} + L\right)}{D^2 \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ $k_v = \frac{\frac{\pi}{11} \cdot \frac{D}{m} + L}{t_2 - t_1} \ln \frac{H_1}{H_2}$ for $k_v' = k_v$, $d = D$	$k_v' = \frac{d^2 \cdot \left(\frac{\pi}{11} \cdot \frac{k_v'}{k_h} \cdot \frac{D}{m} + L\right)}{D^2 \cdot T}$ $k_v = \frac{\frac{\pi}{11} \cdot \frac{D}{m} + L}{T}$ for $k_v' = k_v$, $d = D$	
F	$k_h = \frac{q \cdot \ln\left[\frac{2mL}{D} + \sqrt{1 + \left(\frac{2mL}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot H_c}$	$k_h = \frac{d^2 \cdot \ln\left[\frac{2mL}{D} + \sqrt{1 + \left(\frac{2mL}{D}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ $k_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ for $\frac{2mL}{D} > 4$	$k_h = \frac{d^2 \cdot \ln\left[\frac{2mL}{D} + \sqrt{1 + \left(\frac{2mL}{D}\right)^2}\right]}{8 \cdot L \cdot T}$ $k_h = \frac{d^2 \cdot \ln\left(\frac{4mL}{D}\right)}{8 \cdot L \cdot T}$ for $\frac{2mL}{D} > 4$	
G	$k_h = \frac{q \cdot \ln\left[\frac{mL}{D} + \sqrt{1 + \left(\frac{mL}{D}\right)^2}\right]}{2 \cdot \pi \cdot L \cdot H_c}$	$k_h = \frac{d^2 \cdot \ln\left[\frac{mL}{D} + \sqrt{1 + \left(\frac{mL}{D}\right)^2}\right]}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ $k_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot (t_2 - t_1)} \ln \frac{H_1}{H_2}$ for $\frac{mL}{D} > 4$	$k_h = \frac{d^2 \cdot \ln\left[\frac{mL}{D} + \sqrt{1 + \left(\frac{mL}{D}\right)^2}\right]}{8 \cdot L \cdot T}$ $k_h = \frac{d^2 \cdot \ln\left(\frac{2mL}{D}\right)}{8 \cdot L \cdot T}$ for $\frac{mL}{D} > 4$	Determination basic time lag T

FIGURE 2
FORMULAS FOR DETERMINATION OF HYDRAULIC CONDUCTIVITY

ATLANTIC PROCEDURE NO. 1071
(FROM HVORSLEV, 1951)

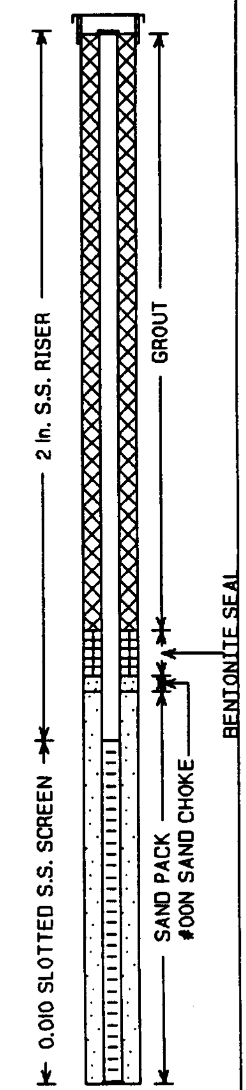
ATLANTIC BORING LOGS

BORING LOG SMW-1S

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: South of Lutheran Church
DATE STARTED: 11/25/91
DATA COMPLETED: 11/25/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Harry & Rick
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: NO SAMPLING

GROUND ELEVATION: 834.57
PROTECTIVE CASING ELEVATION: 834.57
WELL ELEVATION: 834.33 FROM TOC
WATER LEVEL: 807.14 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, occasional rain, 40° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				Refer to boring log SMW-1D for lithologic description	0								
					5								
					10								
					15								
					20								
					25								
					30								
				End of boring at 33.0 feet									



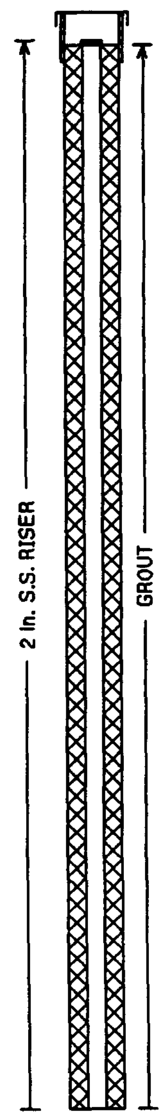
BORING LOG SMW-1D

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: South of Lutheran Church
DATE STARTED: 11/21/91
DATA COMPLETED: 11/25/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Drilled by Joe & Jeff; Set by Harry & Rick
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 634.33
PROTECTIVE CASING ELEVATION: 634.33
WELL ELEVATION: 633.76 FROM TOC
WATER LEVEL: 608.05 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, occasional rain, 40-50° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	VISUAL CONTAM. (NONE / STAIN / SHEEN / HEAVY)	SAMPLE ANALYSIS	LITHOLOGY DEPTH (FT.)
0-2	3, 4 2, 26	40		Black to brown medium sand and clinker, trace silt and coal, moist, FILL	NONE		0.0
2-4	2, 3 6, 8	63		Reddish brown fine sandy SILT with small gravel moist. Reddish brown fine sandy SILT, large isolated pieces of gravel throughout. Fine sand lenses (0.15-0.25 ft. thick) at 4.8, 6.75 and 10.7 ft.	NONE		2.0
4-6	9, 8 9, 9	65			NONE		
6-8	11, 12 11, 11	100			NONE		
8-10	2, 11 16, 29	100			NONE		
10-12	23, 35 37, 42	90			NONE		
12-14	35, 50/0.4'	52			NONE		
14-16	22, 35 37, 37	100			NONE		
16-18	42, 50/0.3'	40		Reddish brown more compact SILT with 0.05 ft. thick tan layers every 0.25 feet, damp	NONE		
18-20	16, 22 22, 32	90		Reddish brown medium to coarse SAND and GRAVEL. Some medium generally well sorted sand, still dry.	NONE		18.45 20.0

WELL CONSTRUCTION



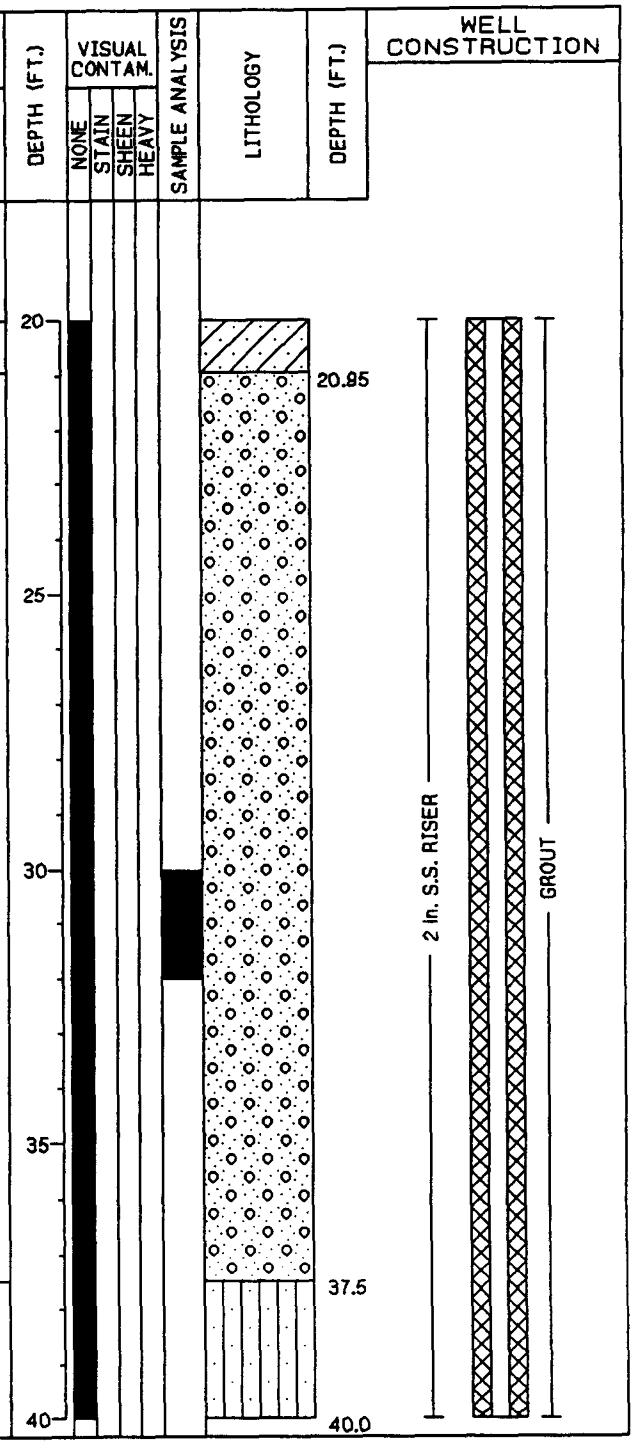
ATLANTIC

BORING LOG SMW-1D

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: South of Lutheran Church
DATE STARTED: 11/21/91
DATA COMPLETED: 11/25/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Drilled by Joe & Jeff; Set by Harry & Rick
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 834.33
PROTECTIVE CASING ELEVATION: 834.33
WELL ELEVATION: 833.78 FROM TOC
WATER LEVEL: 808.05 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, occasional rain, 40-50° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)
20-22	18, 22 28, 32	80		Grayish red medium to coarse well sorted SAND, damp
				Reddish brown fine to medium well sorted sand, damp. Very moist to saturated at 30.0 feet. Collected sample.ID# LPEUSH 811 SG (30-32 ft.)
22-24	37, 35 37, 37	75		
24-26	-, 20 24, 27	75		
26-28	24, 32 27, 26	100		
28-30	10, 15 19, 22	80		
30-32	8, 12 15, 15	100		
32-34	14, 18 20, 32	100		
34-36	8, 10 10, 15	100		
36-38	18, 18 25, 37	100		SILTY FINE SAND and small gravel interspersed throughout - more compact. (from 37.5 ft)
38-40	-, 10 10, 13	100		



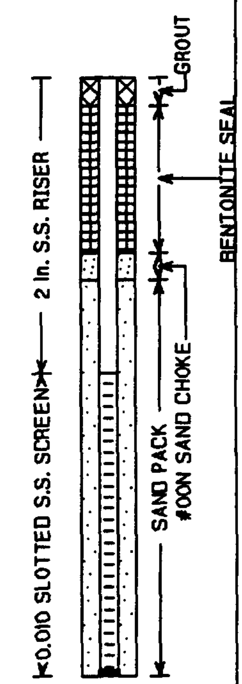
BORING LOG SMW-1D

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: South of Lutheran Church
DATE STARTED: 11/21/91
DATA COMPLETED: 11/25/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Drilled by Joe & Jeff; Set by Harry & Rick
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 834.33
PROTECTIVE CASING ELEVATION: 834.33
WELL ELEVATION: 833.78 FROM TOC
WATER LEVEL: 808.05 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, occasional rain, 40-50° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
40-42	10, 13 17, 22	60		Reddish brown fine SAND and SILT with few gravel pieces at base.	40	NONE			
42-44	40 50/0.4'	100		Soupy fine SAND and SILT, wash Red brown fine SAND and SILT, few pieces of gravel 1" black shaley rock fragment at 43'.		NONE			
44-46	18, 20 30, 40	45		Same as above but more silt, almost clayey. Broken pieces of gray shale.	45	NONE			46.0
46-48	35, 50/0,3'	45		Reddish brown medium to coarse SAND and GRAVEL with large dark grey rock pieces. Rust staining above shaley rock fragment at 46.8'.		NONE / STAIN			
48-50	42, 100 Augered	100		Light gray broken shale pieces. Reddish brown medium to coarse SAND and GRAVEL and gray shale pieces.		NONE			
50-51	25, 87 50/0	50		Wash from above. Reddish brown medium to coarse SAND and GRAVEL. Appears drier. Collected sample ID# LPEUD 911 DG Auger refusal. End of boring at 51.0 feet.	50	NONE	X		51.0

WELL CONSTRUCTION



ATLANTIC

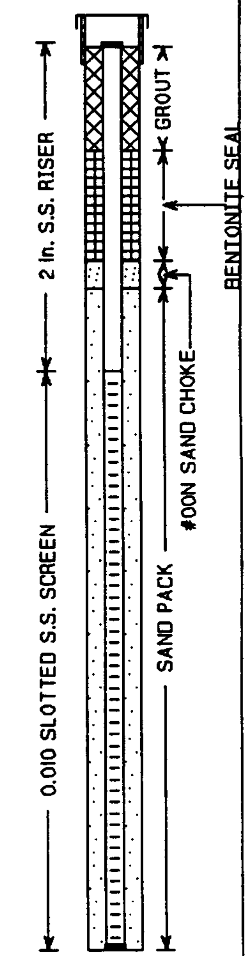
BORING LOG SMW-3S

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: West side of S.Transit St., S.of Garlock's
DATE STARTED: 11/20/91
DATA COMPLETED: 11/20/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: NO SAMPLING

GROUND ELEVATION: 605.94
PROTECTIVE CASING ELEVATION: 605.94
WELL ELEVATION: 605.33 FROM TOC
WATER LEVEL: 599.45 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, Rain 60° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM.: NONE	STAIN	SHEEN	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
				Refer to boring log SMW-3D for lithologic description	0	■ (0–17)						0.0
					5							
					10							
					15							
				End of boring at 17.0 feet.								
					20							

WELL CONSTRUCTION

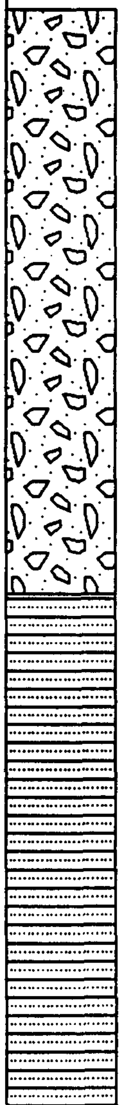


BORING LOG SMW-3D

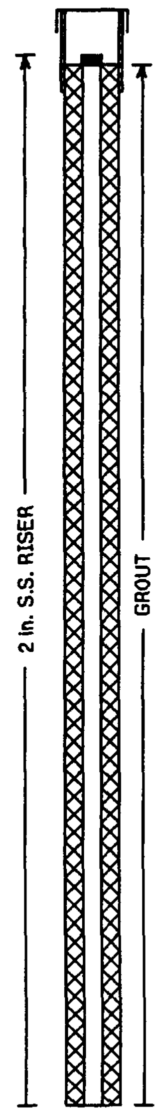
PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: West side of S.Transit St., S.of Garlock's
DATE STARTED: 11/20/91
DATA COMPLETED: 11/20/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 606.38
PROTECTIVE CASING ELEVATION: 606.38
WELL ELEVATION: 605.94 FROM TOC
WATER LEVEL: 599.91 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, Rain 60° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM. (NONE / STAIN / SHEEN / HEAVY)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	2, 4 4, 6	57	0	Dark brown to light brown silty sandy top soil and FILL with a few pieces of coal	0	NONE			0.0
2-4	5, 6 6, 4	5	0	Red-brown, sandy SILT, trace small gravel, moist		NONE			2.0
4-6	5, 7 6, 6	30	0	Reddish brown clayey silt with trace fine sand, less gravel. Very faint organic odor, small pieces of coal from 6.0 to 6.4 feet.	5	NONE			
6-8	19, 16 3, 2	27	0	Dark brown clayey SILT, moist.		NONE			
8-10	5, 5 7, 10	75	-	Light green-grey, silty CLAY with some rust mottling Reddish brown damp, somewhat clayey silt, trace of small gravel. Few thin organic layers and gravel lenses from 10.7 to 11.0 feet		NONE			
10-12	5, 6 6, 10	50	-		10	NONE			



WELL CONSTRUCTION

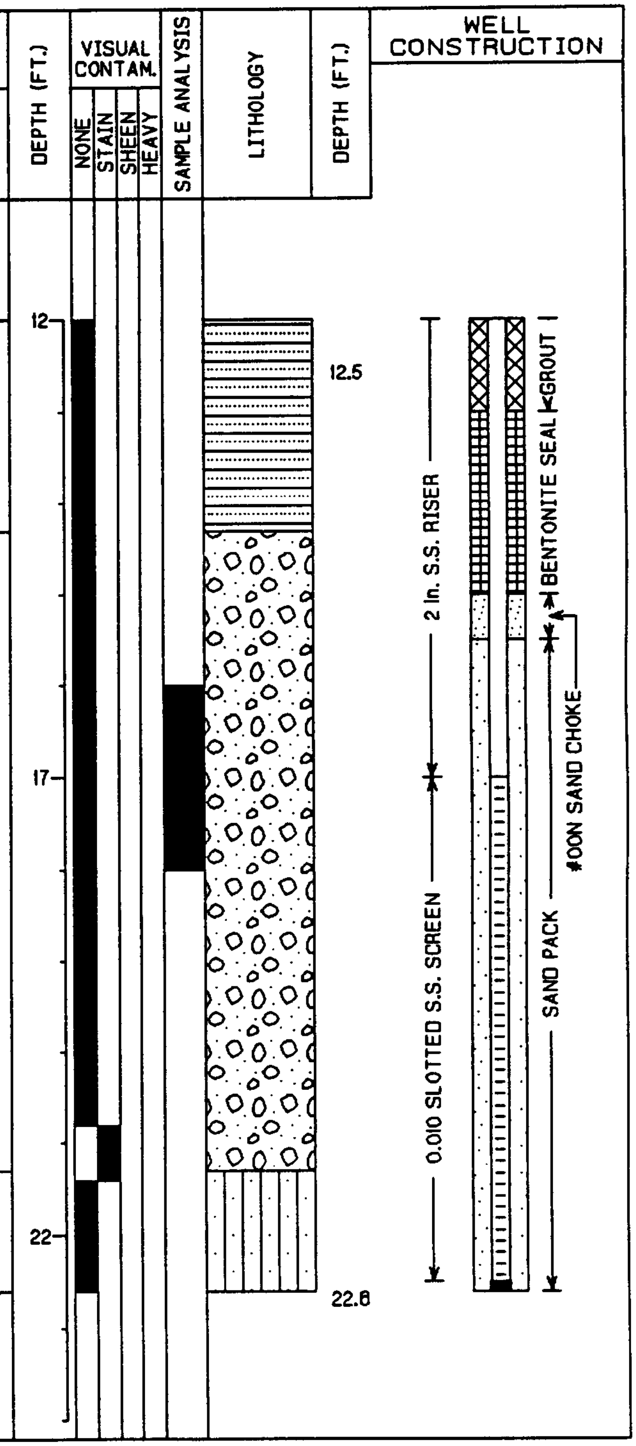


BORING LOG SMW-3D

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: West side of S.Transit St., S.of Garlock's
DATE STARTED: 11/20/91
DATA COMPLETED: 11/20/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 606.38
PROTECTIVE CASING ELEVATION: 606.38
WELL ELEVATION: 605.94 FROM TOC
WATER LEVEL: 599.91 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, Rain 60° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)
12-14	10, 16 27, 17	75	-	Mottled grayish-green and tan silty CLAY. Reddish brown somewhat clayey SILT, trace fine sand and abundant gravel. Becoming wetter large dark gray rock in base of spoon. Red-grey clayey SILT, wet.
14-16	5, 5 6, 7	70	-	Reddish fine SAND and GRAVEL. Very soupy fine SAND / SILT and GRAVEL (up to 4 in. pieces).
16-18	8, 9 8, 8	95	-	Wet, fine to coarse SAND and GRAVEL, little rust mottling. Silty fine to medium SAND, occasional small gravel.
18-20	3, 4 4, 10	100	-	Wet, red-brown medium to coarse SAND and white to black GRAVEL. Reddish brown, silty fine SAND grading to medium to coarse SAND and GRAVEL
20-22	7, 10 16, 28	100	-	Rust stained coarse SAND and GRAVEL. Reddish brown fine sandy SILT with some gravel. Shaley black rock in base of spoon.
22-22.6	30, 50/0.	60	-	Large piece of dark grey rock and silty fine SAND. Grading to more shaley grey rock pieces in base of spoon. Auger refusal. End of boring at 22.6 feet.



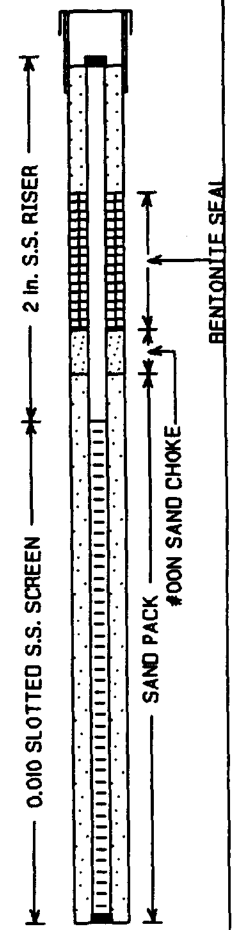
ATLANTIC

BORING LOG SMW-4S

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: South of Substation behind yellow house
DATE STARTED: 11/25/91
DATA COMPLETED: 11/25/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Joe & Jeff
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: NO SAMPLING

GROUND ELEVATION: 607.65
PROTECTIVE CASING ELEVATION: 607.65
WELL ELEVATION: 607.36 FROM TOC
WATER LEVEL: 604.74 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, occasional rain, 40° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				Refer to boring log SMW-4D for lithologic description	0								
					5								
				End of boring at 10.0 ft.	10								



ATLANTIC

BORING LOG SMW-4D

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: South of Substation behind yellow house
DATE STARTED: 11/25/91
DATA COMPLETED: 11/25/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Joe & Jeff
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 808.05
PROTECTIVE CASING ELEVATION: 808.05
WELL ELEVATION: 807.38 FROM TOC
WATER LEVEL: 805.45 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, occasional rain, 40° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

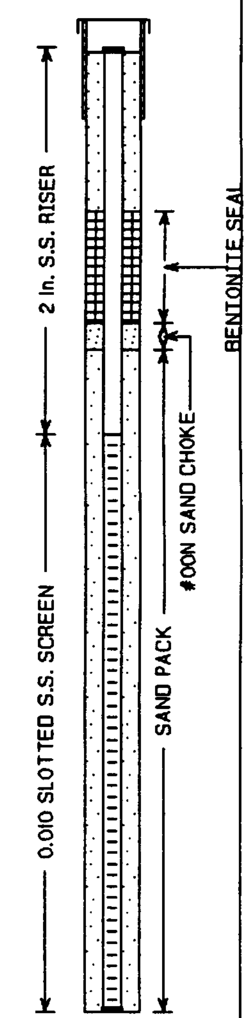
SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	LITHOLOGY DEPTH (FT.)
0-2	5, 3 3, 5	50	0	Brown silty fine SAND, with ash and small pieces of coal, few rock pieces, FILL	0.0
2-4	5, 3 3, 4	50	0	Reddish brown compact clayey SILT trace fine sand and small gravel interspersed throughout. Rust staining observed around gravel from 8.0 to 8.7 feet.	2.5
4-6	8, 9 9, 13	65	0		
6-8	8, 9 12, 12	90	0		
8-10	8, 8 10, 8	35	*	Wet at 8.4 feet.	
10-12	2, 2 2, 2	70	*	Reddish brown SAND and GRAVEL. Collected sample ID# LPEUSH 91 4SG.	10.0
12-14	6, 10 19, 30	90	*	Greenish tan and reddish brown silty fine SAND lenses with small gravel.	13.1
14-16	12, 17 42, 50	100	*	Reddish brown very fine SAND and SILT with gravel interspersed.	13.4
16-18	23, 33 35, 37	100	*	Gravel pieces are larger near base and rust staining was observed in base of spoon. Collected sample ID# LPEUD914DG.	18.0
				Auger refusal. End of MW at 18.0 ft. * HNU not functioning properly due to rain / cold.	

Depth (FT.): 0, 5, 10, 15, 20

VISUAL CONTAM.: NONE, STAIN, SHEEN, HEAVY — NONE from 0 to 18.0 ft.

SAMPLE ANALYSIS: 10-12 ft, 16-18 ft

WELL CONSTRUCTION



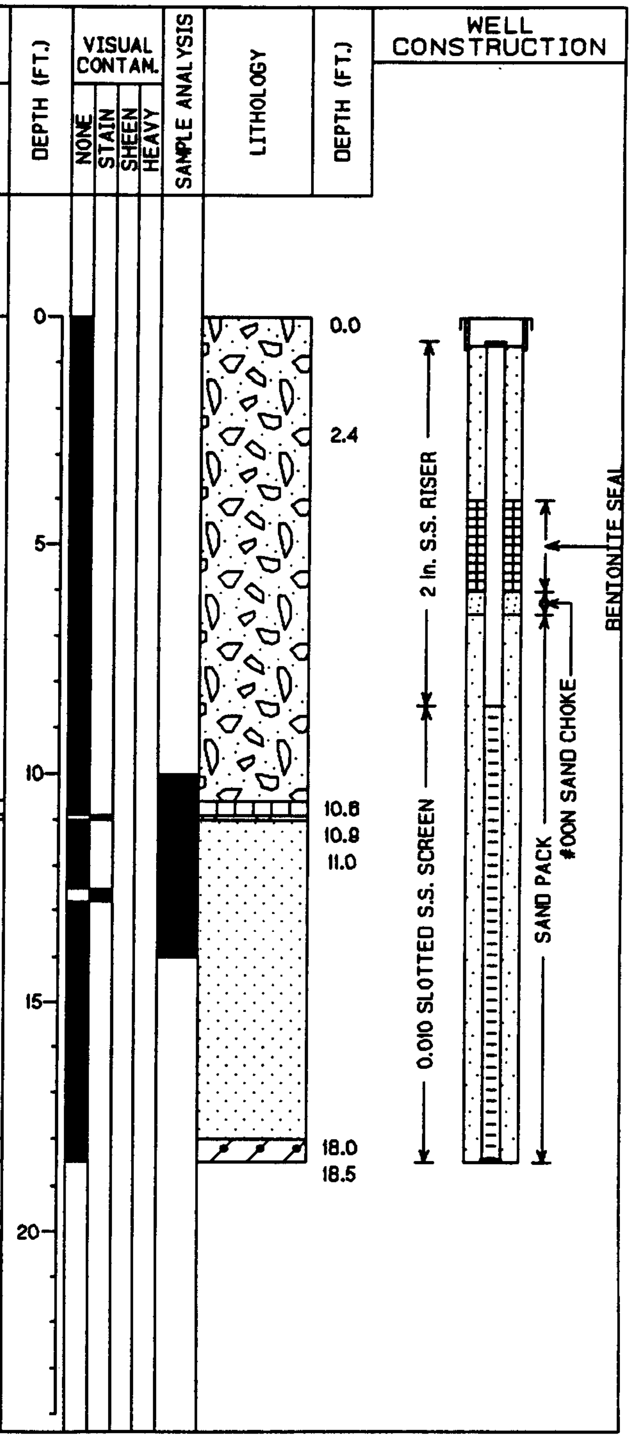
ATLANTIC

BORING LOG SMW-5

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: West Side of S.Transit Across from Reed's
DATE STARTED: 11/21/91
DATA COMPLETED: 11/21/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Joe & Jeff
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 595.78
PROTECTIVE CASING ELEVATION: 595.78
WELL ELEVATION: 595.41 FROM TOC
WATER LEVEL: 577.89 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, rain, 50° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN
0-2	Auger.			Augered through road bed.
2-4	10, 7 5, 4	42		Broken rock pieces and road bed Brown damp fine SANDY SILT and dark brown SAND. Black ash, rock, concrete and small pieces of coal, FILL.
4-6	2, 2 2, 4	17		
6-8	6, 4 6, 3	45		
8-10	4, 2 3, 2	40		Moist, brown sandy silt and silty fine sand with small gravel, small brick pieces, trace gravel and few pieces of coal FILL.
10-12	NR	65		Reddish-orange brown SILT with black organic specks. Rust stained SAND and GRAVEL, trace silt
12-14	4, 4 4, 4	40		Dark grey and green grading to dark brown and grey silty clayey, fine SAND, very moist. Large pieces of rock, rust staining above rock in base of spoon at 14.0 feet, wet.
14-16	1, 1 1, 1	35		
16-18	6, 4 6, 7	32		Wet at 16.5 feet
18-20	18, 50/0			Brown sandy SILT and GRAVEL, underlain by Chunks of broken light gray rock, underlain by medium coarse SAND and GRAVEL. Auger refusal. End of boring at 18.5 feet. NR= NOT RECORDED

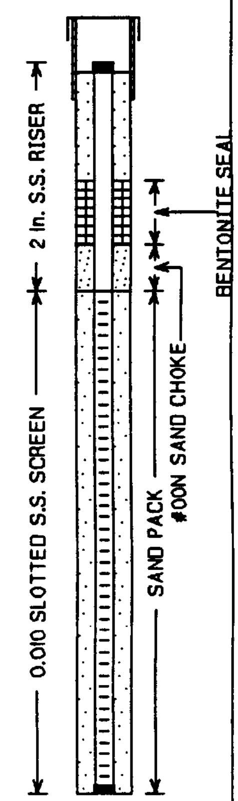


BORING LOG SMW-6S

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: Just South of Red House on LaGrange St.
DATE STARTED: 11/19/91
DATA COMPLETED: 11/19/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: NO SAMPLING

GROUND ELEVATION: 601.30
PROTECTIVE CASING ELEVATION: 601.30
WELL ELEVATION: 600.86 FROM TOC
WATER LEVEL: 598.84 ON 1/8/92
DATUM: NGVD
WEATHER: Rain 55-60° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. NONE	STAIN	SHEEN	HEAVY	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				Refer to boring log SMW-6D for lithologic description.	0							0.0	
					5								
				End of boring at 8.5 feet.								8.5	
					10								

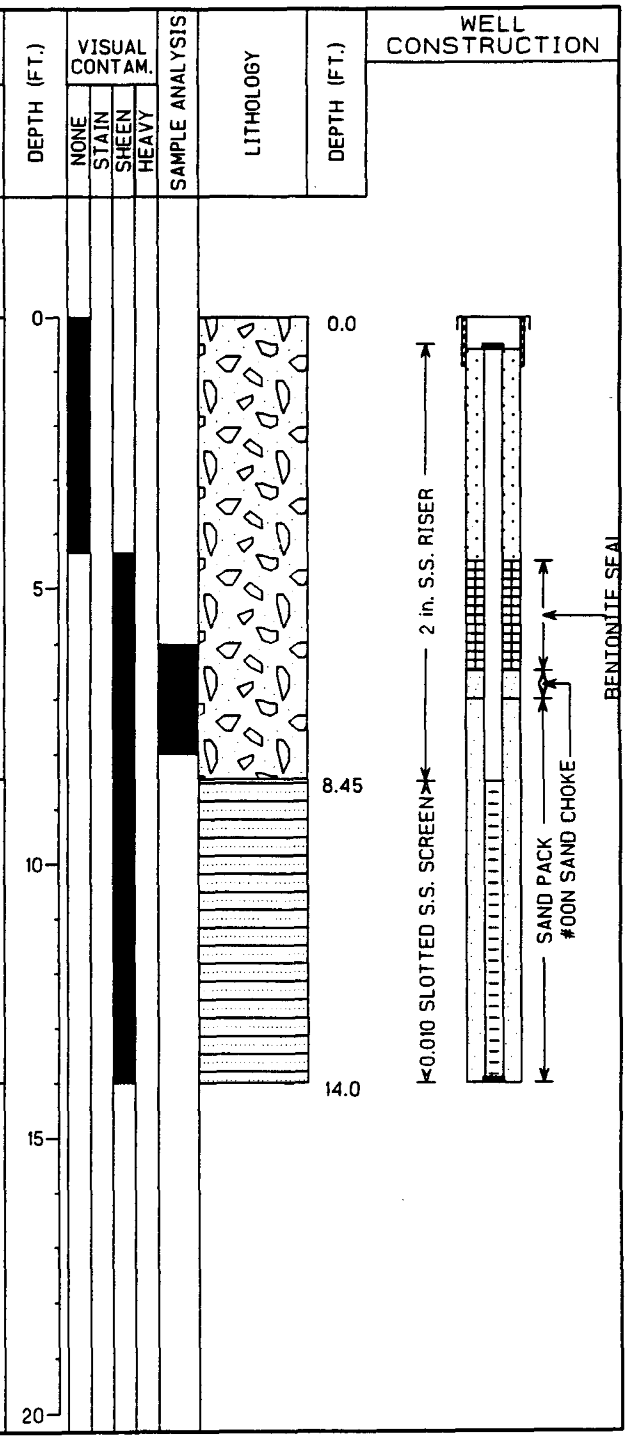


BORING LOG SMW-6D

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: Just South of Red House on LaGrange St.
DATE STARTED: 11/19/91
DATA COMPLETED: 11/19/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 601.50
PROTECTIVE CASING ELEVATION: 601.50
WELL ELEVATION: 600.74 FROM TOC
WATER LEVEL: 596.13 ON 1/8/92
DATUM: NGVD
WEATHER: Rain 55-60° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)
0-2	Augered 15, 8	40	0	Augered through black top and road bed. Brick road below black top. Dark brown to reddish-brown fine to medium SAND and SILT moist. Some dark gray rock pieces. FILL.
2-4	10, 7 5, 6	55	3	Light gray and tan fine sandy SILT with rock pieces. FILL. Brown, wet fine sandy SILT, trace clay. Faint COAL TAR ODOR. FILL.
4-6	28, 15 4, 5	40	14	Thin, light gray shaley rock lense. Brown to dark gray clayey SILT, very little fine sand and gravel. SHEEN AND COAL TAR ODOR. Thin pockets of brown tar around gravel,
6-8	14, 21 28, 16	30	20	wood chips at 6.6 feet, FILL. HNU reading is relative due to rain.
8-10	8, 14 14, 16	65	-	Reddish clayey SILT with few rock pieces. COAL TAR ODOR AND SMALL POCKETS OF SHEEN THROUGHOUT. Wash from above
10-12	NR	20	-	
12-14	100/0.4	45	-	Rock pieces and reddish brown SILTY-SAND with gravel prevalent.
				Refusal. End of boring at 14.0 feet.



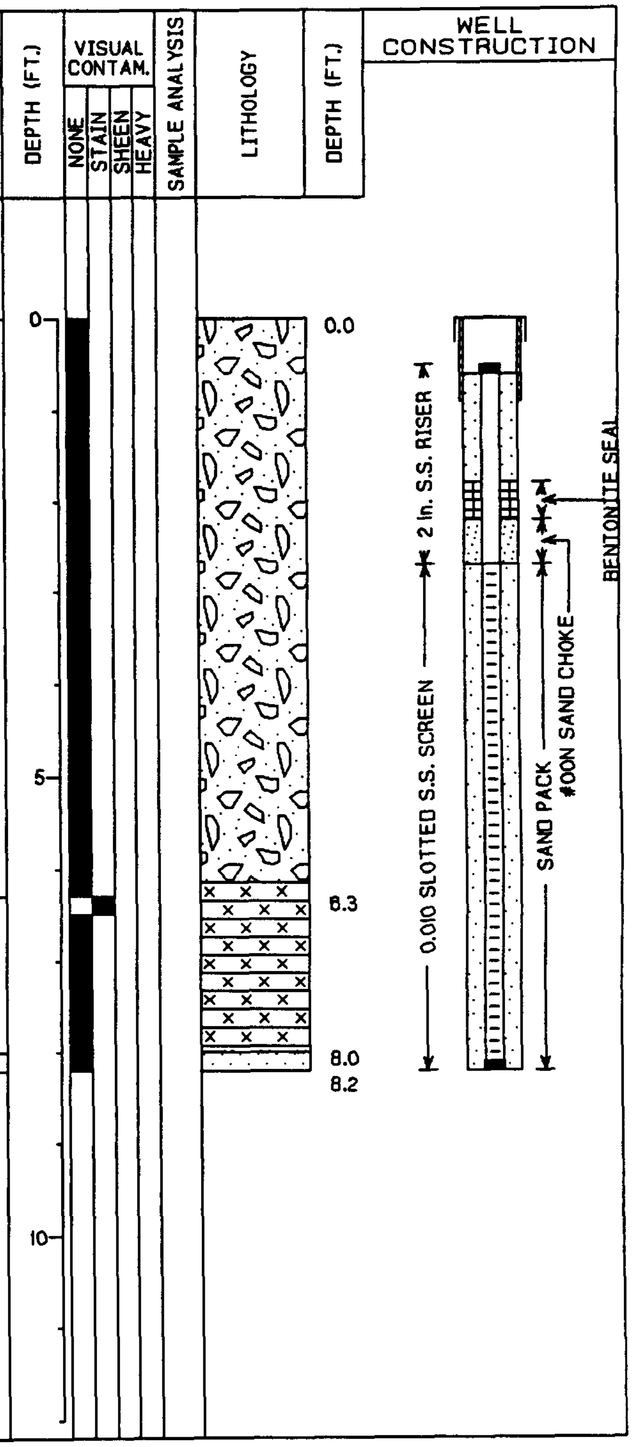
ATLANTIC

BORING LOG SMW-7

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: Downgradient of NE corner of Reed's Gas Station
DATE STARTED: 11/19/91
DATA COMPLETED: 11/19/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 594.30
PROTECTIVE CASING ELEVATION: 594.30
WELL ELEVATION: 593.80 FROM TOC
WATER LEVEL: 586.80 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, Breezy, Rain 55-60° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN
0-2	Augered	-	-	Augered through 0.3' of black top, concrete and cobbles. No sample.
2-4	27, 23 35, 18	35	0	Reddish brown to dark brown clayey fine to medium sandy FILL. Slightly moist, pieces of coal and concrete.
4-6	4, 7 14,42	30	0	
6-8	11, 5 5, 21	40	0	Rock fragments, FILL Dark brown grading to tannish green at base moist SILTY CLAY, trace fine to coarse, friable and rust stained sand. Rock pieces.
8-10	50/0.3'			Reddish brown silty fine SAND, moist Refusal. End of boring at 8.2 feet.



ATLANTIC

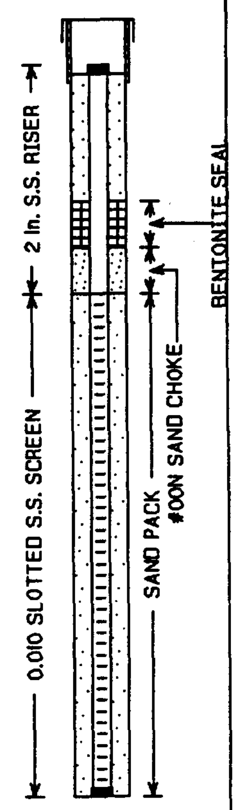
BORING LOG SMW-8

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: West corner of grass triangle North of Genessee St
DATE STARTED: 11/21/91
DATA COMPLETED: 11/21/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: Joe & Jeff
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 595.48
PROTECTIVE CASING ELEVATION: 595.48
WELL ELEVATION: 594.92 FROM TOC
WATER LEVEL: 587.92 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, rain, 50° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)	VISUAL CONTAM.	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)
0-2	3, 4 10, 12	65		Dark brown top soil. Brown concrete and rock. Reddish brown fine sand and silt. FILL.	0	NONE			0.0
2-4	17, 17 21, 14	60		Light red dry, powdery, silt with rock and concrete pieces.		NONE			
4-6	17, 20 28, 32	50			5	NONE			
6-8	6, 7 8, 8	15				NONE			
8-10	8 50/0.2	20		Moist red silt, few gravel pieces. Auger refusal. End of MW at 8.5 ft. NOTE: This hole was backfilled (11/21/91) due to lack of water. Redrilled 10 feet away and set well with construction shown on 11/25/91	10				8.5

WELL CONSTRUCTION



ATLANTIC

BORING LOG SMW-9

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: Along Canal - Kenyon's Parking Lot
DATE STARTED: 11/19/91
DATA COMPLETED: 11/19/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

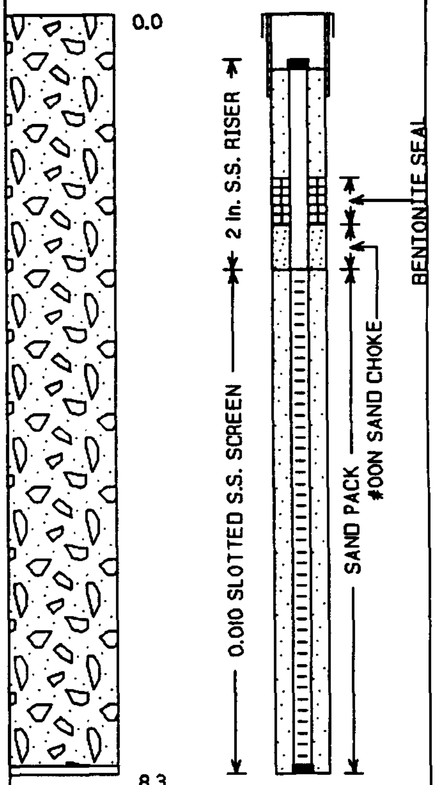
GROUND ELEVATION: 594.48
PROTECTIVE CASING ELEVATION: 594.48
WELL ELEVATION: 593.73 FROM TOC
WATER LEVEL: 588.53 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, 55-60° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)
0-2	Augered	-	-	Augered through cobble, black top and concrete in parking lot. No sample
2-4	Augered 11, 7	25	0	Brown moist silty fine to medium SAND, FILL Concrete and cobbles. Pieces of clinker, concrete, and cobbles in reddish brown moist fine sandy silt FILL. moist.
4-6	6, 5 3, 4	20	0	
6-8	6, 11 6, 4	20	0	
8-10	50/0.3'	15	0	Reddish brown dry clayey SILT. Refusal. End of boring at 8.3 feet.

DEPTH (FT.): 0, 5, 10

VISUAL CONTAM.: NONE, STAIN, SHEEN, HEAVY

SAMPLE ANALYSIS

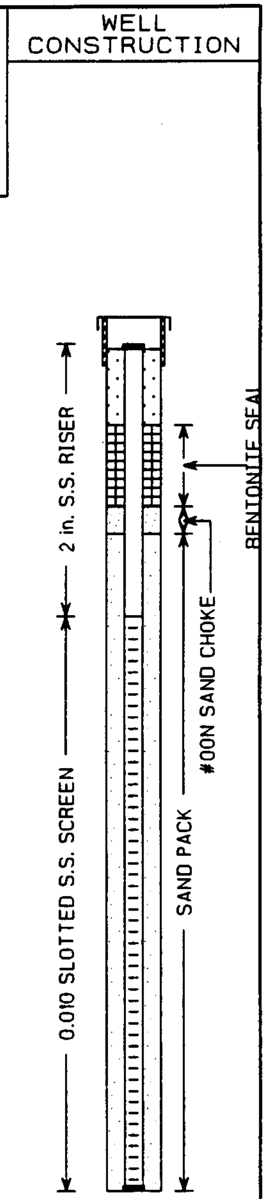


BORING LOG SMW-10

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: S. of Genessee St. approx. 30 ft. E. of Saxton St.
DATE STARTED: 11/26/91
DATA COMPLETED: 11/26/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 601.93
PROTECTIVE CASING ELEVATION: 601.93
WELL ELEVATION: 601.43 FROM TOC
WATER LEVEL: 596.10 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy, Rain/Sleet 30-40° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)	DEPTH (FT.)
0-2	Augered 19, 11	35		Augered through road bed. Red brown fine SAND and GRAVEL. Broken concrete pieces, FILL	0.0
2-4	5, 6 8, 14	20		Dark brown, medium SAND and GRAVEL, some burnt coal,very faint odor	
4-6	8, 14 16, 12	70			
6-8	14, 12 12, 11	70		Brown, fine silty SAND and interspersed GRAVEL, moist	6.0
8-10	10, 10 14, 20	65			
10-12	20, 14 15, 21	60		Brown silty fine SAND.	10.2
12-14	50/0.4'	70		Brown silty SAND and small gravel, moist collected sample ID# LPEDD 911 OG	12.4
14-16	31, 31 33/0.3	65		Pieces of weathered bedrock.	15.0
				Auger refusal. End of boring at 16.0 feet.	16.0



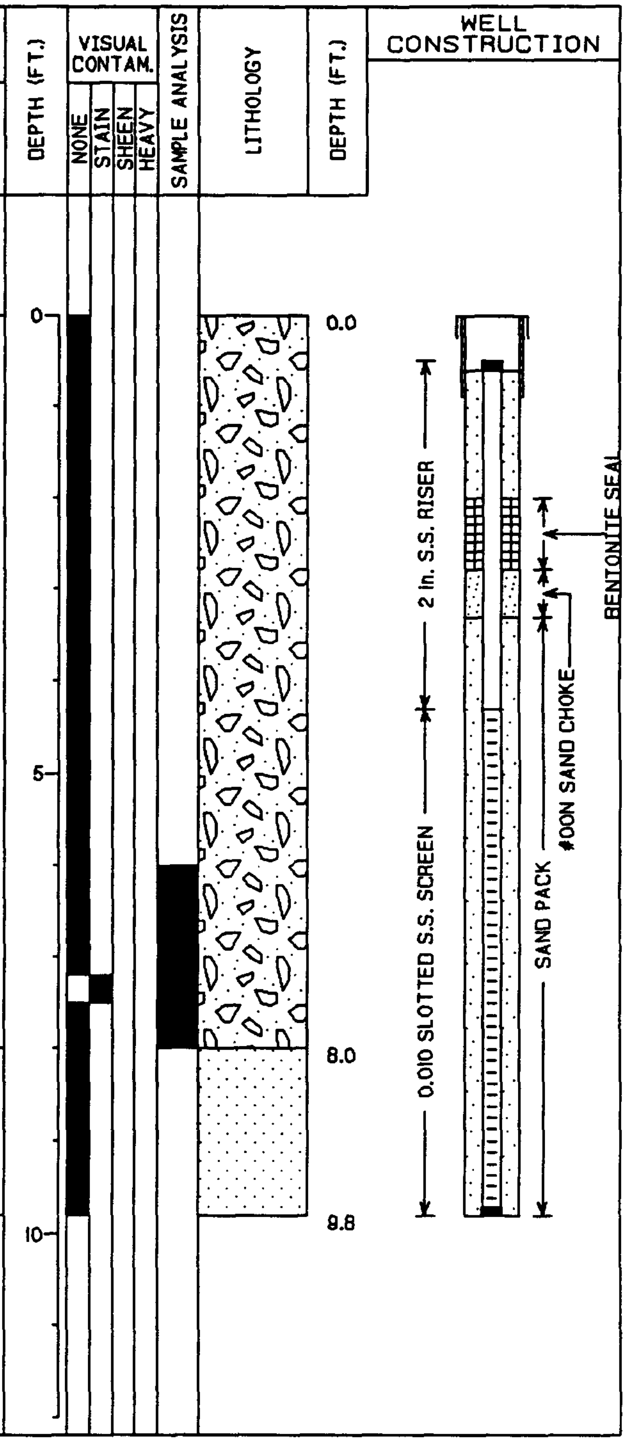
ATLANTIC

BORING LOG SMW-11

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-08-02
LOCATION: Southeast corner of Reed's Gas Station
DATE STARTED: 11/18/91
DATA COMPLETED: 11/18/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION: 598.88
PROTECTIVE CASING ELEVATION: 598.88
WELL ELEVATION: 598.19 FROM TOC
WATER LEVEL: 590.89 ON 1/8/92
DATUM: NGVD
WEATHER: Cloudy 50° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION (color, SOIL, admixture, moisture, other notes, ORIGIN)
0-2	Augered 8, 12	35	0	Augered through roadbed and underlying gravel FILL. Dark brown moist silty-clay and fine to medium sand and rock fragments, FILL.
2-4	4, 4 4, 4	20	0	
4-6	-, - 4, 14	25	0	Cobbles, NO RECOVERY. Dark brown fine to medium sand, trace silt, clay, and ash FILL. SLIGHT ODOR.
6-8	12, 22 24, 25	100	4 40	Sandy-silty FILL, greenish-gray at top grading to red-reddish brown at base. Grayish-black stained soil in reddish fill layer. SLIGHT COAL, TAR AND GASOLINE ODOR. Collected sample ID# LPEDSH811G
8-10	10, 15 3,50/0.3	80	45	Brown wet silty fine SAND. Reddish-brown silty fine SAND. SHEEN AND GASOLINE ODOR.
				Refusal. End of boring at 9.8 feet.

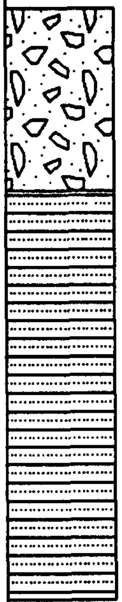


BORING LOG B-4

PROJECT: NYSEG-Lockport Transit St. Site
PROJECT NO: 1284-06-02
LOCATION: North of Walnut St. on East side of Saxton St.
DATE STARTED: 11/20/91
DATA COMPLETED: 11/20/91
DRILLING CONTRACTOR: NORTH STAR DRILLING
DRILLER: JOE ELY AND JEFF GRANT
DRILLING METHOD: 4 1/4"ID HOLLOW STEM AUGER
SAMPLING METHOD: 2"X24" SPLIT SPOON

GROUND ELEVATION:
PROTECTIVE CASING ELEVATION:
WELL ELEVATION:
WATER LEVEL:
DATUM: NOT SURVEYED
WEATHER: Cloudy, Rain 50° F
INSPECTOR: ANNA SULLIVAN
CHECKED BY: MP

SAMPLE DEPTH (ft)	BLOWS PER 6"	% RECOVERY	HNU (ppm)	SOIL DESCRIPTION: color, SOIL, admixture, moisture, other notes, ORIGIN	DEPTH (FT.)	VISUAL CONTAM. (NONE / STAIN / SHEEN / HEAVY)	SAMPLE ANALYSIS	LITHOLOGY	DEPTH (FT.)	WELL CONSTRUCTION
				Augered through road bed.	0	NONE			0.0	
0-2	Augered 8, 9	30		Dark brown silty CLAY / clayey SILT and large rock/concrete pieces. FILL.		NONE				
2-4	8, 3 2, 3	35		Dark brown to orange-brown clayey SILT and crushed rock.		NONE			2.0	
4-6	1, 2 28/0.3'	67		Very moist, tight reddish brown clayey SILT and crushed weathered bedrock, (light tan-grey) at base.	5	NONE				
6-6.5				Auger refusal. End of boring at 6.5 feet.					6.5	
					10					



ATLANTIC

WCC BORING LOGS

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

PROJECT AND LOCATION: NYSEG - LOCKPORT; COORDINATES: N 204.87 E 1522.63		ELEVATION AND DATUM: 607.94'	PROJECT NO.: 82C4495
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 25.4
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	RECOV, %	ROCK CORE RQD	BEDDING	FRACTURE SKETCH	FRACTURE COND.	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							

LOG OF BORING B-1

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 (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	50							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 (Gasport member) highly fractured and moderately weathered		24–28	R-1		4.2/4.4 = 96%	1.5/4.2 = 36%	HORIZONTAL		F, F, G			Crushed zone
SAA Not as fractured Not as weathered		30	R-2		3.1/3.1 = 100%	2.9/3.1 = 94%	Horizontal		F, F			

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LOG OF BORING B-1

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
		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		36–40	R-3		4.7/5 = 94%	4.2/4.7 = 89%	HORIZONTAL		M, G, C, G			
SAA		40–45	R-4		4/5 = 80%	3.5/4 = 88%	HORIZONTAL		G, M, G, G, P			
Dark gray LIMEY SHALE (Rochester Member) fresh, fine horizontal bedding, petroleum odor on fresh fractures		45–49					HORIZONTAL					CRUSHED ZONE

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
Boring terminated at 50 ft. Backfilled with grout to 0.3 below grade - asphalt patch to grade		50										

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

PROJECT AND LOCATION: NYSEG – LOCKPORT; COORDINATES: N 706.38 E 1659.76		ELEVATION AND DATUM: 596.32	PROJECT NO.: 8226495
DRILLING AGENCY: Dominion Soils (Earth Dimensions)	FOREMAN: S. Leschychian	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" I.D. 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.	PENETR. RESIST. BL/6IN	RECOV., %	ROCK CORE: RQD	BEDDING	FRACTURE: SKETCH	COND.	WEATHERING	WATER TEST	REMARKS
Asphalt; Sand + coarse gravel fill		0–2										
Brick red SILT, and c-f GRAVEL (dry)		2–4	S-1	11, 20, 12, 9	50%							
Brick red CLAY (dry)		4–6	S-2	4, 4, 5, 8	75%							
Brick red silty CLAY trace fine sand (dry)		6–8	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		8–11.6	R-1		2.4/2.6 = 92%	1.7/2.4 = 71%						Refusal at 8.2 ft.
SAA		11.6–	R-2									

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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: RQD	ROCK CORE: BEDDING	FRACTURE: SKETCH	FRACTURE: COND.	WEATHERING	WATER TEST	REMARKS
SAA		14, 16, 18, 20	R-2		100%	81%			P, P, P, P, P, M, P, P, M, M			..
SAA		22, 24, 26	R-3		100%	98%	Horizontal					
Dark gray fine grained Shaley Dolomite (Da Cew member) thinly bedded, horizontal laminae, petroleum odor on fresh fractures: Fresh		28, 30										Fractures filled with Calcite

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

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: PENETR. RESIST. BL/6IN.	RECOV., %	ROCK CORE: RQD	BEDDING	FRACTURE: SKETCH	FRACTURE: COND.	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		34–38	R-4		7.4/7.4 = 100 %	6.8/7.4 = 92%	HORIZONTAL		G, G, G, G, G			
Boring terminated at 38.8 ft. Backfilled with grout to 0.3' below grade. Asphalt patch to grade												

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

OJECT AND LOCATION: NYSEG – LOCKPORT; COORDINATES: N 461.7 E1745.18		ELEVATION AND DATUM: 607.32	PROJECT NO.: 8264495
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.	PENETR. RESIST. BL/6IN.	RECOV. %	ROCK CORE: RQD	BEDDING	FRACTURE: SKETCH	COND.	WEATHERING	WATER TEST	REMARKS
Concrete		0–1										
No sample recovered, very fine brown SAND on Augers Split Spoon wet		1–2	S-1	7	0							water in hole at 1.3ft
Red brown very fine silty SAND (water saturated)		2–4	S-2	5 8 11 11	100%							
SAA		4–6	S-3	7 10 14 18	100%							
SAA		6–8	S-4	9 17 20 25	100%							
SAA		8–10	S-5	8 18 28 31	100%							
SAA		10–12	S-6	7 15 21 91	100%							
Mottled green brown CLAY (dry)		~11.8										
RED brown SILT (moist)		12–	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: RQD	ROCK CORE: BEDDING	FRACTURE: SKETCH	FRACTURE: COND.	WEATHER-ING	WATER TEST	REMARKS
Red brown SILT (moist)			S-7	18, 31	100%							
SAA		14	S-8	14, 29, 100/3"	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"
												Roller cone to 18 ft
Well rounded coarse GRAVEL not derived from underlying rocks in core barrel		18	R-1									
Light gray crinoidal DOLOMITE (GASPORT MEMBER) Moderately weathered, fractured and pitted, some stylolites		20										
SAA, not as fractured or as weathered		22, 24, 26	R-2		5.1/5.0 = 102%	4.7/5.0 = 94%	Horizontal		M, M, G			
SAA		28, 30	R-3		5/5 = 100%	5/5 = 100%	Horizontal					

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LOG OF BORING B-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 36	R-4		5/5 = 100%	5/5 = 100%	Horizontal		G G			
SAA		38 40	R-5		5/5 = 100%	4.7/5 = 94%	Horizontal		P/G G G			
Boring terminated at 41.8 ft Backfilled to grade with grout												

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

Field	Value
PROJECT AND LOCATION	LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK
ELEVATION AND DATUM	603.39 FT.
PROJECT NO.	82C4495
DRILLING AGENCY	NORTH STAR DRILLING CO.
FOREMAN	J. THEW
DATE STARTED	11/16/83
DATE FINISHED	11/17/83
DRILLING EQUIPMENT	TRAILER MOUNTED C.M.E. 45 HYDROROTARY DRILL RIG
COMPLETION DEPTH	51.5 FT
ROCK DEPTH	16.3 FT
SIZE AND TYPE OF BIT	3 7/8 / 2 15/16 TRICONE ROLLER BITS
SIZE AND TYPE CORE BARREL	3 IN DIAMOND IMPREGNATED BIT NX DOUBLE TUBE C.B.
CASING	4 IN HW / 3 IN NW FLUSH JOINT
NO. SAMPLES	DIST. N/A / UNDIST. N/A
CORE	N/A / 34 FT
WATER LEVEL	N/A
COMPL.	N/A / 24 HR. N/A
CASING HAMMER	WEIGHT N/A, DROP N/A
SAMPLER	N/A
SAMPLER HAMMER	WEIGHT N/A, DROP N/A
BORING ANGLE AND DIRECTION	35° FROM VERTICAL N 72 W
INSPECTOR	DAVID MUSCALO

DESCRIPTION	DEPTH, FT	SAMPLE TYPE / NO.	RECOVERY %	CRACK SKETCH	RQD	CORE TIME	REMARKS
	1–8						DRILLER TURNED 4 IN. HW CASING TO 5 FT. DRILLER TELESCOPED 3 IN CASING TO 10 FT. NO WASH RETURN. DRILLER TURNED 3 IN. CASING TO 15.4 FT. DRILLED THROUGH OBSTRUCTION AT 5 FT. NO WASH RETURN. DRILLED THROUGH OBSTRUCTION AT 8 FT
	10						NO WASH RETURN
	14–16						NO WASH RETURN. DRILLER TURNED 3 IN. CASING TO 17.6 FT. COAL TAR ODOR AND IRIDESCENT SLICKS ON WATER
TOP OF ROCK 16.3 FT ELEV. 587.27 FT. MSL. Rock highly fractured 16.3 FT to 17.6 FT.	16–17						DRILLS ROUGH AS FRACTURED ROCK
Light gray DOLOMITE (Gasport Member) Fractures weathered - contain clay	17.6–20	NX RUN-1 5.0 / 4.0	100 %	POOR	100 %	2.5 MIN/FT.	FRACTURES AT 0°, 70° AND 60° FROM HORIZONTAL AXIS

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

Description	Depth, ft	Type / No.	Recov. ft	Recovery %	Cond.	RQD	Core time	Remarks
	21							COLOR OF WASH WATER ALTERNATES FROM MILKY WHITE TO [illegible] CORE BLOCK AT 21.6 FT
Light gray DOLOMITE (Gasport Member) Fracture weathered	22–26	NX RUN-2 C.B.	5.0	100%	POOR	100%	2.5 min/ft	SINGLE FRACTURE AT ≈ 55° FROM HORIZONTAL AXIS. NUMEROUS STYOLITES
No fractures	27–31	NX RUN-3 C.E.	5.0	100%	EXCELLENT	100%	2.5 min/ft	No fractures numerous STYOLITES
Elev. 574.39 FT. M.S.L. Fractures at 70° weather with some clay – fractures at 0° and 30° slightly weathered. Dark gray shaly DOLOMITE (De Cew Member)	32–36	NX RUN-4 C.B.	5.0	100%	FAIR TO POOR	80%	2.5 min/ft	WASH WATER COLOR CHANGE AT 33 FT FROM MILK WHITE TO MEDIUM GRAY/ BACK TO MILKY WHITE AT 34 FT THEN GRAY. FRACTURES AT 0°, 20° AND 70° TO HORIZONTAL AXIS. [illegible] TAR ODOR [illegible] 30° FRACTURE SURFACES
	37–41	NX RUN-5 C.B.	5.0	100%	FAIR	100%	2.5 min/ft	ONE FRACTURE 80° TO HORIZONTAL AXIS. TWO FRACTURES 60° TO HORIZONTAL AXIS. COAL TAR ODOR ON FRACTURE SURFACES AND ALONG FRACTURES [illegible]
Irregular fracture badly weathered. 70° FRACTURES weathered	42–45	NX RUN-6 C.B.	5.0	100%	POOR	95%	2.5 min/ft	STRONG [illegible] TAR ODOR AT START OF RUN – WASH WATER YELLOW– [illegible] GOES

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

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6IN.	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK: SKETCH	ROCK CORE: CRACK: COND	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
Dark gray shaly DOLOMITE (De Cew Member)		46										IRREGULAR 0° FRACTURE: 6 — 2 AT 70° FRACTURES PARALLEL TO BEDDING – ALL FRACTURES [illegible] WITH [illegible]
elev. 561.39 FT. MSL Dark gray limey SHALE (Rochester Member) single fracture slightly weathered		47 48 49 50 51	NX RUN-7 C.B.	5.0			100		FAIR	100%	2.5 MIN/FT	ONE 85° FRACTURE · CORE [illegible] STAINING COAL THE [illegible] AND IRIDESCENT [illegible]
BOREHOLE TERMINUS 51.5 FT. elev. 558.79 FT. MSL.		52										

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

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 595.89 FT.	PROJECT NO.: 82C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 15 NOVEMBER 1983	DATE FINISHED: 16 NOVEMBER 1983
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E. 45 HYDROROTARY RIG		COMPLETION DEPTH: 50.0 FT	ROCK DEPTH: 10.0 FT
SIZE AND TYPE OF BIT: 2 7/8 IN. TRICONE ROLLER BIT [illegible]	SIZE AND TYPE CORE BARREL: 4 IN. DIAMOND IMPREGNATED BIT NX DOUBLE TUBE C.B.	NO. SAMPLES: N/A; UNDIST.: N/A	CORE: 39.5 FT
CASING: 4 IN HW/3 IN NW FLUSH JOINT		WATER LEVEL: FIRST N/A	COMPL. N/A; 24 HR. N/A
CASING HAMMER	WEIGHT N/A	DROP N/A	BORING ANGLE AND DIRECTION: 35° FROM VERTICAL N70W
SAMPLER N/A			INSPECTOR: DAVID MUSCALO
SAMPLER HAMMER	WEIGHT N/A	DROP N/A	

Piezometer: NONE INSTALLED (0–8 ft)

DESCRIPTION	DEPTH, FT	SAMPLE TYPE	RECOV. FT	RECOVERY %	RQD CLASS	RQD	CORING TIME	REMARKS
	1–10							DRILLER TURNED 5.0 FT SECTION OF 4 IN HW CASING TO 5 FT. DRILLER TELESCOPED 3 IN. NW CASING TO FIVE FT. DRILLER MADE UNSUCCESSFUL ATTEMPT TO OBTAIN SAMPLE AT 5 FT - UNABLE TO DRIVE SPOON. DRILLER DRILLED OUT 3 IN CASING WITH [illegible] IN. [illegible] BIT. DRILLER DRILLED CASING TO TOP OF ROCK AT 10 FT. NW TO 10.4 FT. ROLLER BITTED TO 10.5 FT -
TOP OF ROCK 10.0 FT elev. 587.23 FT. M.S.L. Fractures weathered	10.5–11.7	NX RUN-1 C.B.	1.2	100%	POOR	0	10 MIN/FT	BEGAN ROCK CORING AT 10.5 FT. FRACTURES 0° AND 30°. WASH WATER MILKY WHITE IN COLOR. DRILL RATE = 10 MIN/FT 10.5 TO 11.7 FT
Light gray DOLOMITE (Gasport Member) Fractures slightly weathered	11.7 (11/15/83)–16.8	NX RUN-2 C.B.	5.1	100%	FAIR	98%	2.5 MIN/FT	MILKY COLORED WASH WATER. DRILLER DRILLED CASING TO 11.3 FT. MOST FRACTURES ≈ 55 TO 50° LOWEST 30 TO 35° TO HORIZONTAL AXIS
Fracture slightly weathered	16.8–20	NX RUN-3 CB	5.0	100%	GOOD	100%	2 MIN/FT	SINGLE FRACTURE AT 55° TO HORIZONTAL AXIS. DOLOMITE FOSSILIFEROUS

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

DESCRIPTION	DEPTH, FT	SAMPLES: TYPE / NO. LOC	RECOV., FT	RECOVERY %	CRACKS: SKETCH	CRACKS: COND.	RQD	CORE TIME	REMARKS
	21–22								WASH WATER MILKY WHITE IN COLOR
Light gray Dolomite (Gasport Member) Fractures unweathered	22–27	NX RUN-4 C.B.	5.0	100%		GOOD	100%	2.5 MIN/FT	DOLOMITE FOSSILIFER-OUS FRACTURES ≈ 55° TO HORIZONTAL AXIS WASH WATER COLOR MILK WHITE 27 ft - gray to 27.8 FT
Massive dolomite with several shale lenses - mineralized vugs at 31 FT - 32 FT elev. 569.04 FT. M.S.L.	27–32	NX RUN-5 C.B.	5.0	100%		POOR TO FAIR	98%	3.0 MIN/FT	SHALE LENS AT 26 TO 26.8 FT FRESHLY BROKEN CORE HAS PETROLEUM ODOR PARTIAL LOSS OF DRILL WATER AT 30 FT. FRACTURES IN SHALE ≈ 55°, ONE ≈ 0° TO HORIZONTAL AXIS.
Dark gray shaly DOLOMITE (De Cew Member) elev. 563.85 FT. M.S.L.	32–37	NX RUN-6 C.B.	5.0	100%		FAIR	100%	3.0 MIN/FT	LOSS OF DRILLING FLUID AT 32 FT TO 38 FT FAINT COAL TAR ODOR IN SHALE IRIDESCENT SHEEN ON CORE FRACTURES 10 TO 30° WASH MEDIUM GRAY IN COLOR
Irregularly shaped mineralized vugs at 41.5 FT with attendant strong coal tar odor	37–42	NX RUN-7 CB	5.0	100%		FAIR / GOOD	100%	3. MIN/FT	COAL TAR ODOR IN CORE - IRRIDESCENT SHEEN ON CORE WASH WATER HAS IRRIDESCENT SLICK FRACTURE 20° TO HORIZONTAL AXIS
Dark gray limey SHALE (Rochester Member)	42–45	NX RUN-8 CB	5.0	100%		POOR / FAIR	100%	3 MIN/FT	DARK GRAY WASH WATER STRONG COAL TAR ODOR AT FRESH BREAKS IN CORE INCLINATION OF FRAC-

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

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6IN.	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK: SKETCH	ROCK CORE: CRACK: COND.	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
		46										TURES 60° AND 30° TO HORIZONTAL AXIS
		47–50	NX RUN-9 CB	3.2			100%		EXCELLENT	100%	3 MIN/FT	COAL TAR ODOR ON CORE RUNS ALONG BROKEN SURFACE OF CORE
BOREHOLE TERMINUS 50.0 FT ELEV. 552.59 FT M.S.L.		50										UPON COMPLETION OF BORING, DRILLER GROUTED CORE HOLE TO SURFACE

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LOG OF BORING MW-1a

PROJECT AND LOCATION	NYSEG – LOCKPORT
ELEVATION AND DATUM	
PROJECT NO.	82C4495
COORDINATES	
DRILLING AGENCY	Pittsburgh Testing Labs (Earth Drilling)
FOREMAN	S. Misner
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	NX
NO. SAMPLES	DIST. 4 / UNDIST. — / CORE 2
CASING	3" ID. Black Steel
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. Good
SAMPLER HAMMER	WEIGHT 140 LBS / DROP 30"

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC.	PENETR. RESIST. BL/6 IN	RECOV. %	RQD	BEDDING	FRACTURE SKETCH	FRACTURE COND.	WEATHERING	WATER TEST	REMARKS
ASPHALT + CONCRETE (Road bed)												
Orange brown fine SAND (dry)			S-1	9								Probably fill
Black fine SAND (cinders? – dry)				8	66							
Brown silty CLAY (dry)				6								
Brown silty CLAY (moist) (fill)		2	S-2	6, 9, 8, 7	75							
Gray c–m GRAVEL, some sand – (dry – fill)		4	S-3	5, 4, 6, 7	60							
SAA		6	S-4	7, 5								
Black organic SILT – sulfurous smell (Peat? – dry)				15	50							Refusal at 7.8' 60 blows/3"
Brown CLAY (dry)				60/3"								Augered to 8.1' Set casing 0.3' into 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)		8–12	R-1		10'/10' = 100%	9.7'/10' = 97%			P, P, P, P, P	m, m, m, m, m		

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LOG OF BORING MW-1a

SHEET 2 OF 2

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
		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

PROJECT AND LOCATION NYSEG - LOCKPORT		ELEVATION AND DATUM 594.33'	PROJECT NO. 8264495-2
COORDINATES N 831.21 E 1553.76			
DRILLING AGENCY Pittsburgh Testing (Earth Dimensions)	FOREMAN S. Misner	DATE STARTED 12/6/53	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.	PENETR. RESIST. BL/6IN	RECOV. %	ROCK CORE: RQD	BEDDING	FRACTURE: SKETCH	COND.	WEATHER-ING	WATER TEST	REMARKS
See log of MW-1A for soil descriptions		0–7.9 (2, 4, 6)										6" Auger Through overburden
												Top of Rock
See log of MW-1A for Rock core description		8–12 (8, 10, 12)										Roller cone to 18'

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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: RQD	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 coinside with shaly partings (GASPORT MEMBER) some stylolites		18–20	R-1		4.7/5.0 = 94 %	4.5/4.7 = 96 %	Poorly defined HORIZONTAL		P, P			Gasport/DeCew Contact preserved in core
Dark Gray dolomitic LIMESTONE some shale, fine grained/lens of sparry calcite, petroleum odor on fresh fractures. (De Cew Member) some stylolites		22					Horizontal Laminae		P, 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, 26	R-2	3.1/3 min	4.6/5.0 = 96 %	4.5/4.6 = 97 %	Horizontal Laminae		G, P, P, P, P, P			healed fractures cemented with calcite; Crushed zone
? — ? — ? — ? — ? — ? — ? —												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)		28, 30	R-3		5.1/5 = 102 %	3.4/5 = 68 %			P, P, P, P			Crushed zone

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LOG OF BORING MW 1

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							P P P P			Perm test with open rock hole to 33 ft. Crushed zone
SAA - but slightly more weathered - some Iron staining, fractures very weathered, mechanically abraded during coring		34, 36	R-4		4.7/5.0 = 94%	3.2/4.7 = 68%	Horizontal Laminae		M P P M P P P	Slight, fractures more deeply 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, 40, 42	R-5	1 ft/15 min	4.6/5.0 = 92%	3.1/4.6 = 67%			P P P P P M			crushed zone; weathered + pitted; weathered + pitted; weathered + pitted layer
SAA Oily coating on core		44, 46	R-6	1 ft/15 min	5.3/5 = 106%	"			M P P 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 COORDINATES: N 568.26 E 1431.07		ELEVATION AND DATUM: 595.00'	PROJECT NO.: 82C4495
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.	PENETR. RESIST. BL/6IN.	RECOV., %	ROCK CORE: RQD	BEDDING	FRACTURE: SKETCH	COND.	WEATHERING	WATER TEST	REMARKS
Asphalt (Road bed) Concrete												
Tan C-F SAND		2	S-1	8 8 7 8	25%							
Brown sandy CLAY, some silt (moist) - - - - - - - Red brown clayey fine SAND (moist)		4	S-2	6 5 6 9	75%							
Green + Brown mottled Gravelly CLAY, some fine Sand (moist)		6	S-3	5 14 5 15	25%							
SAA (Dry)		8	S-4	5 6 8 5	100%							
SAA (Dry) Green Brown CLAY and C-F GRAVEL		10	S-5	3 8 7 13	100%							
		12	S-6	5 7								

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LOG OF BORING MW-? **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	Fracture: Sketch	Fracture: Cond.	Weathering	Water Test	Remarks
SAA		13–14		9 9								
		16–17	S-7	45 16								Refusal at 17' 50bl/0" 4" Roller to 18.4'
Light gray medium grained Crinoidal LIMESTONE (Gasport)		18.4–20.6	R-1	2ft/10min	2/2.3 = 86%	1.5/2 = 75%			P			Cracks coated with calcite
Gray fine grained shaley DOLOMITE (De Cew Member) Some stylolites – vertical fractures are filled with calcite and coated with a black tarry substance		20.6–26.2	R-2	5'/15min	6.6/5.6 = 100%	4.6/5.6 = 82%	Horizontal		G G P P G			
SAA		26.2–30.6	R-3		4.4/4.4 = 100%	3.7/4.4 = 84%	Horizontal		P P P G			
— ? — ? — ? — ? — ? — ? —												
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: RQD	ROCK CORE: BEDDING	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHER-ING	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, P, G, G, G, G			
SAA		42, 44, 46, 48	R-5		10/10 = 100%	9.6/10 = 96%	HORIZONTAL		M, G, M			CRUSHED ZONE

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LOG OF BORING MW-2

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
								—	G			
		50										
								—	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.: 82C 4495
COORDINATES: N 431.76 E 1518.10			
DRILLING AGENCY: Pittsburgh Testing Labs. (Earth Dimensions)	FOREMAN: D. Oscar, S. Misner	DATE STARTED: 11/23/82	DATE FINISHED: 11/30/82
DRILLING EQUIPMENT: Truck Mounted Mobil B-40L		COMPLETION DEPTH: 60 ft.	ROCK DEPTH: 12.5'
SIZE AND TYPE OF BIT: 6" AUGER	SIZE AND TYPE CORE BARREL: NX	NO. SAMPLES: DIST. 7	UNDIST. — CORE 47.5 ft
CASING: 3" ID Black Steel		WATER LEVEL: FIRST	COMP. 24 HR.
CASING HAMMER	WEIGHT: 140 LBS DROP: 30"	BORING ANGLE AND DIRECTION: Vertical	
SAMPLER: 2 in O.D. Split Spoon		INSPECTOR: S. Helbig / H. Gold	
SAMPLER HAMMER	WEIGHT: 140 LBS DROP: 30"		

DESCRIPTION	DEPTH, FT	SAMPLE NO.	PENETR. RESIST. BL/6 IN.	RECOV.	REMARKS
Gray GRAVEL (Fill - dry)	0	S-1	3	15"/24"	
Red brown SILT, trace clay, fine sand (Black discoloration 4" in middle) (sl. moist)			6, 6, 7		
SAA (moist)	2	S-2	3, 50	12"/24"	
Fragments of DOLOMITE (coarse grained) Brown Black SAND, some silt			36		ATTEMPT PERM. TEST @ 4' - N.G. water flowed up - outside auger
GRAVEL, moist - (wet with coal tar?)			22		
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, 9, 15	15"/24"	Perm. test @ 8.0 ft.
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"	
SAA	10	S-6	14, 27, 40	23"/24"	
Black + Brown GRAVEL, some sand, silt; coal tar + WATER soaked			35		Perm. test Auger at 8 ft. open hole to 12 ft.
no sample	12	S-7	50/1"	0	Top of rock 12.5 ft. 3" casing grouted into rock - 11/23/82

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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
Gray fine grained Dolomite Irregular Bedding - Discontinuous and wavey dark laminations Tr. coral Fossils - All fractures are sub parallel to bedding		14, 16	R-1	45 min	3.75/4.0 = 94%	2.75/3.75 = 73%	Horizontal, undulatory		Fair, Fair, G, G, G	M, S, FRESH		START 11/24/82 Cleaned hole to 13.0ft START NX Core 10:30 Brown Ret. for 1st 6" White milky Return
SAA - some stylolites + black Shaley partings - accidental break yielded characteristic petroleum odor		18	R-2		101%	97%	Horizontal irregular - undulatory	shaly parting				11:15 11:30 - 12:15 Lunch 12:15 - 12:55
Gray Dolomite - fine grained matrix containing numerous Crinoid Fossils (Gasport Member)		20, 22, 24							G, G, G			
SAA		26, 28	R-3		10/10 = 100%	9.5/10 = 95%	Poorly defined horiz	stylolite, stylolite		FRESH		H. Good - 11/25/82 Core barrel coated with black oily material
Gray well laminated fine grained shaley DoLomite with some black shaley partings - (De Cew Member)		30							F			

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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	FRACTURE: SKETCH	FRACTURE: COND.	WEATHER-ING	WATER TEST	REMARKS
		to 35	R-3						G, G, G	Slight weathering on cracks		
SAA – oily smell on fresh fractures		35 – 40	R-4	60 min	4.5/5.0 = 90%	4.2/5.0 = 84%	Horizontal laminae		P, P, P, G			Started coring 10:15 on 11/25/82 Core coated with oily water; wash water is very oily for first 5 min. then clears to milky gray white.
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		40 – 42 – 44 – 46 – 48	R-5	3'/60 minutes	10.3/10 = 103%	9.6/10 = 96%	Horizontal laminae with some coarse layers		M, M, G, M, P, 3, 3	S, S, F		Oily coating on core when removed from core barrel

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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	ROCK CORE: FRACTURE SKETCH	ROCK CORE: FRACTURE COND.	ROCK CORE: WEATHER-ING	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.		52							P, P			
		54							P, P			Some pitting
									P, P			CRUSHED ZONE
		56	R-6		10.3/10 = 103%	8.5/10 = 85%	Horizontal Laminae		PM, P			
		58							P, P			
		60										
Boring terminated @ 60.6 ft. Monitoring well installed												

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LOG OF BORING MW-4 **SHEET** 1 **OF** 5

JECT AND LOCATION: NYSEG - LOCKPORT		ELEVATION AND DATUM: 627.57	PROJECT NO.: 8264495
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 B0A 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	TYPE NO. LOC.	PENETR. RESIST. BL/6IN.	RECOV. %	RQD	BEDDING	FRACTURE SKETCH	FRACTURE COND.	WEATHERING	WATER TEST	REMARKS
Asphalt + crushed stone (fill)		0–2										
Brick red clayey SILT trace c-f sand (Dry)		2–4	S-1	7, 12, 10, 10	100%							
SAA		4–6	S-2	39, 9, 12, 12	100%							
SAA		6–8	S-3	3, 9, 15, 18	100%							
SAA		8–10	S-4	11, 20, 19, 23	50%							
SAA		10–11	S-5	18, 24, 50/0"	100%							Refusal at 11 ft 50 bl/0"
		11–12.2										Driller reports boulder 11.1-12.2 ft.
SAA		12.2–	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	FRACTURE: SKETCH	FRACTURE: COND.	WEATHER-ING	WATER TEST	REMARKS
SAA			S-6	44 50	100%							
Brick red gravelly SILT some clay (dry)		14	S-7	23 41 47 56	100%							
		16										
Brick red medium SAND, trace coarse gravel (moist)		18	S-8	28 25 25 50	100%							
		20										
		22										
		24										
Brick-red silty CLAY (wet) Brick red + green mottled CLAY		26	S-9	15 17 23 30	100%							
		28										
Brick red silty CLAY (moist) trace coarse sand		30	S-10	29 30								

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LOG OF BORING MW-4

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.	WEATHER-ING	WATER TEST	REMARKS
SAA		32	S-10	38, 32	100%							
		34										
SAA		36	S-11	56, 50, 65, 97		100%						
		38										
Light grey medium grained Crinoidal LIMESTONE some stylolites, poorly defined horizontal bedding slightly weathered (GASPORT member)		40	R-1		1.6/1.9=89%	1.6/1.6=100%			G			Refusal at 39.4 ft.
		42–48	R-2		10/10=100%	8.1/10=81%	HORIZONTAL		P, P, C, G, P, G, G, C, C			

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LOG OF BORING MW-4   SHEET 4 OF 5

DESCRIPTION	DEPTH, FT	SAMPLES: TYPE NO. LOC.	SAMPLES: RECOV. %	ROCK CORE: RQD	FRACTURE: SKETCH / COND.	REMARKS
SAA	50–56				~51 G	
Dark gray fine grained shaley DOLOMITE thin horizontal bedding some stylolites (DeCew member) petroleum odor on fresh fractures	56–65	R-3	10/10 = 100%	9.8/10 = 98%	~56 G; ~58 G; ~59 G; ~60 G	
		R-4	10/10=100%	9.1/10 = 91%	~62 m; ~63 M; ~64 m; ~65 m; ~65 M; ~66 G	
Dark Gray fine grained Limey SHALE - thin horizontal laminae (Rochester Shale) Petroleum odor on fresh fractures	65–					

Column headings: DESCRIPTION; PIEZOMETER; DEPTH, FT; SAMPLES (TYPE NO. LOC.; PENETR. RESIST. BL/6IN.; RECOV. %); ROCK CORE (RQD; BEDDING; FRACTURE SKETCH; COND.; WEATHERING); WATER TEST; REMARKS

Depth scale: 50, 52, 54, 56, 58, 60, 62, 64, 66

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LOG OF BORING MW-4

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.	ROCK CORE: WEATHER-ING	WATER TEST	REMARKS
		68										
		70						—	G			
SAA		72						—	G			
								—	G			
		74						—	G			
								—	G			
		76	R-5		10/10 = 100%	9.2/10 = 92%		—	P			
								—	P			
								—	P			
		78										
								—	G			
		80						—	M			
								—	M			
		82										
Boring terminated at 82.2 ft. 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	DATE STARTED: 12/2/82	DATE FINISHED: 12/3/82
DRILLING AGENCY: Pittsburgh Testing (Earth Dimensions) — FOREMAN: S Mis[illegible]	COMPLETION DEPTH: 11.6	ROCK DEPTH: 7.9
DRILLING EQUIPMENT: Mobil Truck Mounted - B40L	NO. SAMPLES: DIST. 5; UNDIST. —; CORE 2	
SIZE AND TYPE OF BIT: [illegible] — SIZE AND TYPE CORE BARREL: NX	WATER LEVEL: FIRST; COMP.; 24 HR.	
CASING: 3" Black Steel	BORING ANGLE AND DIRECTION: Vertical	
CASING HAMMER — WEIGHT: 140 LBS — DROP: 30"		
SAMPLER: 2" OD Split Spoon	INSPECTOR: H Good	
SAMPLER HAMMER — WEIGHT: 140 LBS — DROP: 30"		

DESCRIPTION	PIEZOMETER	DEPTH, FT	TYPE NO. LOC.	PENETR. RESIST. BL/6IN.	RECOV. %	RQD	BEDDING	SKETCH	COND.	WEATHERING	WATER TEST	REMARKS
Asphalt + Concrete Road bed												Advanced auger through brick
Brown fine GRAVEL and SILT (moist) (fill)			S-1	6	100							
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 (dry) (fill)			S-3	21, 17, 9	50							
Brown gravelly SILT (dry-fill); Gray C-F GRAVEL, some sand, silt, clay (dry) - spoon may be advancing through weathered rock		4	S-4	6, 9, 14, 4	75							Spoon advanced 3" with 1 blow
Black silty CLAY (organic) (moist) (peat) some wood fragments, sulfur smell; Gray silty CLAY (wet) trace fine sand		6	S-5	3, 1, 2, 60/5"	20							Perm. test w/augers at 6ft. + 2in spoon hole 6-8FT Refusal at 7.9 ft
Gray crinoidal dolomitic LIMESTONE (GASPORT MEMBER) Rock is slightly weathered but moderately weathered on fracture surfaces		8, 10	R-1		97%	33%			P, P			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 1699.54			
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: 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	RECOV. %	RQD	BEDDING	FRACTURE SKETCH	FRACTURE COND.	WEATHER-ING	WATER TEST	REMARKS
Asphalt Brick		0										
Brown black CLAY, trace medium gravel (moist)		2	S-1	5 2 2 1	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

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
SAA				10								
				14								
		14	S-7	25	100							
				33								
Brown silty c-f GRAVEL (Dry)				87								
				70								
SAA (wet)		16	S-8	44	100							
				100								
				73								
				70								
		18										Roller cone to 21 ft.
		20										
Boring terminated at 21 ft. Monitoring well installed												

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LOG OF BORING MW-5 **SHEET** 1 **OF** 3

Field	Value
PROJECT AND LOCATION	LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK
ELEVATION AND DATUM	604.91 FT.
PROJECT NO.	82C4495
DRILLING AGENCY	NORTH STAR DRILLING CO.
FOREMAN	MR. J. THEW
DATE STARTED	10/25/83
DATE FINISHED	10/26/83
DRILLING EQUIPMENT	TRAILER MOUNTED C.M.E. 45 HYDROROTARY DRILL RIG
COMPLETION DEPTH	50.0 FT.
ROCK DEPTH	18.6 FT
SIZE AND TYPE OF BIT	3.25 I.D. - 6.25 O.D. HOLLOW STEM AUGER
SIZE AND TYPE CORE BARREL	3 IN. DIAMOND SET NON-CORING BIT NX DOUBLE TUBE C.B.
NO. SAMPLES	DIST. 5; UNDIST. NONE; CORE NONE
CASING	4 IN. I.D. HW FLUSH JOINT
WATER LEVEL	FIRST 7.9 FT; COMPL. 7.6 FT; 24 HR. 6.9 FT.
CASING HAMMER	WEIGHT N/A; DROP N/A
BORING ANGLE AND DIRECTION	VERICAL
SAMPLER	2 IN. O.D./1 3/8 IN. I.D. SPLIT BARREL
SAMPLER HAMMER	WEIGHT 140 LB; DROP 30 IN.
INSPECTOR	DAVID MUSCALO

DESCRIPTION	S.U.=0	PERIMETER	DEPTH, FT	SAMPLES: TYPE NO.	RECOV. FT	PENETR. RESIST. BL/6"	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	BRACK: DETCH	BRACK	RQD	CORE TIME	REMARKS
6 IN. CONCRETE (SIDEWALK)		3-IN. I.D. STEEL RISER PIPE TO 0.5 FT BELOW GROUND SURFACE											
ASH FILL													
Red-brown f sandy CLAY with trace organics (Plastic) (moist)			1	S-1	0.9 FT	2 2 1							
			2–4										
Red-brown f sandy CLAY with trace organics (Plastic) (MOIST) (Glacio-lacustrine)			5–6	S-2	1.1 FT	2 2 3							
			7–9										DRILLER NOTED CHANGE IN DRILLING PRESSURE AT 9FT
Red-brown clayey f-m SAND (WET) (Glacio-lacustrine)			10–11	S-3	1.5 FT	2 3 4							
Red-brown f-m sandy f-c GRAVEL with trace to some clay (WET) (TILL)			12–14										DRILLER NOTED CHANGE IN DRILLING PRESSURE [illegible]
			15–16	S-4	1.5 FT	9 40 36							DRILLER SET 4 IN DIA. TEMPORARY CASING INTO TOP OF ROCK TO 18.9FT
			17–18										Driller DRILLED 3 1/4 IN Ø Socket into rock to 21.8 FT
TOP OF ROCK 18.6 FT elev. 586.31 FT. M.S.L.			19–20										DRILLER GROUTED 2 IN. O.D. BLACK STEEL SCH. 40 PIPE INTO ROCK SOCKET TO 21.8 FT.

LOG OF BORING MW-5 **SHEET** 2 **OF** 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6IN	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK: SKETCH	ROCK CORE: CRACK: COND	ROCK CORE: RQD	ROCK CORE: CORE TIME FT	REMARKS
Light-gray DOLOMITE (Gasport Member)		21										
		21.8 (10/25/83) 22										DRILLER BEGAN USING A NON-CORING DIAMOND SET BIT
		23										DRILL RATE = 4 MIN/FT. TO 29FT
		24										WASH MILKY colored - no odor TO 30 FT.
		25										
		26										LIGHT GRAY DOLOMITE FRAGMENTS IN WASH
		27										DRILLER REPORTS SEVERAL PERTURBATIONS IN DRILLING RATE
		28										
		29										DRILL RATE =
		30										4 TO 4.5 min./FT 29 FT - 33 FT LIGHT GRAY DOLOMITE FRAGMENTS IN WASH - NO ODOR TO 35 FT
		31										
		32										
	OPEN ROCK 21.8 - 50.0 FT	33										
elev. 570.91 FT. M.S.L. Dark gray shaly DOLOMITE (DeCew Member)		34										WASH COLOR CHANGE TO DARK GRAY - DOLOMITE AND SHALE FRAGMENTS IN WASH
		35										
		36										
		37										DRILL RATE 3 MIN/FT 33 FT TO 44 FT
		38										FAINT PETROLEUM ODOR IN WASH FRAGMENTS
		39										
		40										
		41										
		42										
elev. 561.91 FT M.S.L. Medium to dark gray limey SHALE (Rochester Member)		43										FAINT PETROLEUM ODOR
		44										DRILL RATE = 8 MIN/FT. FROM 43 - 48FT
		45										

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LOG OF BORING MW-5 **SHEET** 3 **OF** 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	REMARKS
Medium to dark gray limey SHALE (Rochester Member)	OPEN ROCK 21.8 - 50.0 FT	46	STRONG COAL TAR ODOR FOR ~15 SEC. AT 46 FT.
		47	STRONG COAL TAR ODOR AT 47.5 FT - IRIDESCENT SHEEN IN WASH WATER
		48	
		49	
		50	
BOREHOLE TERMINUS 50.0 FT elev. 554.91 FT. M.S.L.			OBSERVED COAL TAR COATINGS ON SHALE ROCKS WITH ATTENDANT STRONG COAL TAR ODOR

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LOG OF BORING MW-6

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE - LOCKPORT, NEW YORK		ELEVATION AND DATUM: 604.41 FT.	PROJECT NO.: P2C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 11/1/83	DATE FINISHED: 11/1/83
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E. 45 HYDROROTARY RIG		COMPLETION DEPTH: 50.0 FT	ROCK DEPTH: 14.8 FT
SIZE AND TYPE OF BIT: 3 7/8 TRICONE [illegible]	SIZE AND TYPE CORE BARREL: 3 IN DIAMOND SET NON-CORING BIT NX [illegible] TUBE C.B.	NO. SAMPLES: DIST. 3	UNDIST. [illegible]; CORE [illegible]
CASING: 4 IN. FLUSH JOINT HW		WATER LEVEL: FIRST ≈ 10 FT	COMPL. 8.4 FT; 24 HR. 10.5 FT
CASING HAMMER — WEIGHT: N/A	DROP: N/A	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 1 3/8 IN ID / 2 IN OD SPLIT BARREL		INSPECTOR: DAVID MUSCALO	
SAMPLER HAMMER — WEIGHT: 140 LB	DROP: 30 IN		

S.U. = 0 FT

DESCRIPTION	DEPTH, FT	SAMPLE TYPE / NO.	RECOV., FT	BLOWS	REMARKS
ASPHALT OVER BRICK PAVEMENT	0				
Gray f sandy CLAY with piece of cobble and trace gravel and m-sand (MOIST) (FILL) coal tar odor	1–2	S-1	1.0	4 3 3	COAL TAR ODOR AND OIL SLICKS OBSERVED AS CASING ADVANCED BY DRILLING. DRILLER DRILLED CASING TO 5 FT
Red-brown silty f SAND with trace clay and trace to some angular rock fragments (DAMP) (TILL)	5–6	S-2	1.3	5 5 5	
Red-brown silty f-m SAND (WET) (Glacio-Fluvial)	10–11	S-3	0.5	7 13 11	DRILLER DRILLED CASING TO 10 FT. Red-brown silty SAND WASH with some gravel 12.5–14.8 FT
TOP OF ROCK 14.8 FT ELEV. 589.61 FT. M.S.L. Light gray DOLOMITE (Gasport Member)	15	S-4	0	50/0 IN	SPLIT BARREL REFUSED AT 14.8 FT - NO RECOVERY - 50/0 IN. DRILLER DRILLED CASING TO 15.0. DRILLER BEGAN ROCK DRILLING WITH 3 7/8 IN TRICONE ROLLER BIT AT 15 FT. MILKY COLORED WASH WATER

2 IN. I.D. BLACK STEEL RISER PIPE TO 0.5 FT BELOW GROUND SURFACE (depth 1–20 FT)

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LOG OF BORING MW-6

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	RECOV. FT	PENETR. RESIST. BL/6IN	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	CRACK: CONC	RQD	CORE TIME	REMARKS
Light gray DOLOMITE (Gasport Member)	2 IN. I.D. BLACK STEEL RISER PIPE TO 0.5 BELOW GROUND SURFACE	21–29										WEATHERING ZONE 17–[illegible] FT (brown [illegible]) DRILL RATE = 8 MIN/FT TO 18 FT, 7 MIN/FT [illegible] FT. WEATHERING ZONE [illegible] ([illegible]) DRILLER [illegible] NON-CORING CORE BARREL AT [illegible] DRILL RATE = 4 MIN/FT 20–[illegible] FT, [illegible] 2.5 MIN/FT [illegible] FT. WASH WATER [illegible] COLOR. DRILL RATE = 4 MIN/FT 25–30. DRILLER REAMED BOREHOLE TO [illegible] IN FROM [illegible]–30 FT.
elev. 574.41 FT. M.S.L. Dark gray shaly DOLOMITE (DeCew Member)		30–36										WASH WATER COLOR CHANGE AT 30 FT FROM MILKY WHITE TO MEDIUM GRAY. DRILL RATE = 3 MIN/FT 30–33.5 FT. DRILLER CONTINUES TO DRILL WITH 2 7/8 IN. ROLLER BIT FROM 33.5 FT TO TERMINAL DEPTH. DRILL RATE = 4 MIN/FT 33.5–36.5, 36.5–38 3 MIN/FT. COLOR CHANGE IN WASH FROM MEDIUM GRAY TO DARK GRAY AT 36.5 FT
elev. 567.91 FT. M.S.L. Dark gray limey SHALE (Rochester Member)	BENTONITE SEAL; 0.010 IN SLOTS SET 39.5–49.5 FT AND	37–45										STRONG COAL TAR ODOR AT [illegible] FT AND 37.5 FT. 38–43 FT DRILL RATE = 2.5 MIN/FT. COAL TAR ODOR IN WASH AT 44.0 FT. DRILL RATE 2 MIN/FT 43–48 FT. WASH DARK GRAY [illegible]

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LOG OF BORING mw-6

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES	ROCK CORE	REMARKS
Dark gray liney SHALE (Rochester Member)	2 in. PD. WELL SCREEN with	46			
		47			
		48			
		49			STRONG COAL TAR ODOR 49.[illegible]
BOREHOLE TEMINUS 50.0 FT elev. 554.41 FT. M.S.L.	[illegible]	50			OBSERVED COAL TAR COATING INSIDE CASING WHEN CASING WAS PULLED

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LOG OF BORING MW-7

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 600.48 FT	PROJECT NO.: 32C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 11/3/83	DATE FINISHED: 11/3/83
DRILLING EQUIPMENT: TRAILER MOUNTED CME 45 HYDROROTARY DRILL RIG		COMPLETION DEPTH: 55.0 FT	ROCK DEPTH: 10.7 FT
SIZE AND TYPE OF BIT: 3 7/8 TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: N/A	NO. SAMPLES: DIST. 3 / UNDIST. NONE	CORE: NONE
CASING: 4 in. HW FLUSH JOINT		WATER LEVEL: FIRST ≈ 9 FT / COMPL. 9.6 FT / 24 HR. 1.75 FT	
CASING HAMMER / WEIGHT N/A / DROP N/A		BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 1 3/8 in I.D./2.0 in O.D. SPLIT BARREL			
SAMPLER HAMMER / WEIGHT 140 LB / DROP 30 in.		INSPECTOR: DAVID MUSCALO	

Well construction (column): SU-2 FT; 2-IN. I.D. BLACK STEEL RISER TO 1.79 FT ABOVE GROUND SURFACE

DESCRIPTION	DEPTH, FT	SAMPLE TYPE/NO.	RECOV. FT	PENETR. RESIST. BL/6 IN	REMARKS
CRUSHED STONE					
Red-brown f sandy SILT with trace clay (Damp) faint coal tar odor (FILL)	1–2	S-1	0.5	3 2 2	DRILLER AUGERED TO 10 FT. DRILLER DRILLED 4 in TEMPORARY CASING TO 11.0 FT
BOULDER	3–5				
Yellow-brown to black f sandy SILT with coal tar (strong coal tar odor) (Damp) (FILL)	6–7	S-2	1.5	3 2 2	
Red-brown f sandy CLAY with trace to some gravel - trace silt - coal tar odor - (WET) (FILL)	10–11	S-3	1.0	3 2 2	SPLIT BARREL REFUSED AT 10.7 FT. DRILLER BEGAN USING 3 7/8 in ROLLER BIT AT 10.7 FT
TOP OF ROCK 10.7 FT elev. 589.78 FT. M.S.L.					DRILL RATE= 10 min/FT 10.7 to 12.5 FT WASH MILKY WHITE [illegible] NO ODOR.
Light gray DOLOMITE (Gasport Member)	12–20				DRILL RATE= 6 MIN/FT 12.5 to 17.5 FT. MILKY COLORED WASH

LOG OF BORING MW-7 SHEET 2 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6IN	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK SKETCH	ROCK CORE: CRACK COND	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
Light gray DOLOMITE (Gasport Member)	2-IN I.D. BLACK STEEL RISER TO 1.79 FT ABOVE GROUND SURFACE	21–27										DRILL RATE = 6 MIN/FT 17.5 TO 22.5 FT WASH WATER MILKY COLORED ROCK FRAGMENTS WHITE TO LIGHT GRAY DRILL RATE = 4 MIN/FT 22.5 TO 27.5
elev. 572.98 FT. M.S.L. Dark gray shaly DOLOMITE (DeCew Member)		28–39										WASH WATER COLOR CHANGE FROM MILKY WHITE TO MEDIUM GRAY AT 27.5 FT ROCK FRAGMENTS DARK AND LIGHT DRILL RATE = 8 MIN/FT 27.5 TO 32.5 WASH COLOR CHANGE TO DARK GRAY AT 33.0 FT DRILL RATE = 6 MIN./FT 32.5 TO 37.5 WASH COLOR DARK GRAY - ROCK FRAGMENTS ALL DARK COLORED
elev. 560.48 FT. M.S.L. Dark gray limey DOLOMITE (Rochester Member)	BENTONITE SEAL (40–42) SAND (42–45)	40–45										DRILL RATE = 4 MIN/FT 37.5 TO 42.5

LOG OF BORING MW-7 SHEET 3 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	REMARKS
	2-IN. I.D. SLOTTED SCREEN 44.5-54.5 FT	46	
Dark gray limey SHALE (Rochester Member)		47	DRILL RATE = 3 MIN/FT 42.5 - 47.5 FT
		48	
		49	
		50	
		51	DRILL RATE = 3 MIN/FT 47.5 - 52.5
		52	
		53	
		54	DRILL RATE = 3 min/FT 52.5 TO 55.0 FT
BOREHOLE TERMINUS 55.0 FT elev. 545.48 FT. M.S.L.	SAND	55	

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LOG OF BORING MW-8 **SHEET** 1 **OF** 2

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 574.47 FT.	PROJECT NO.: 82C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: MR. J. THEW	DATE STARTED: 10/31/83	DATE FINISHED: 10/31/83
DRILLING EQUIPMENT: TRAILER MOUNTED CME 45 HYDROROTARY RIG		COMPLETION DEPTH: 30.0 FT	ROCK DEPTH: 4.3 FT
SIZE AND TYPE OF BIT: 3 5/8 IN. TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: 3 IN. DIAMOND SET NON-CORING BIT NX DOUBLE TUBE C.B.	NO. SAMPLES: DIST 1	UNDIST: NONE; CORE: NONE
CASING: 4 IN. HW FLUSH JOINT		WATER LEVEL: FIRST N/A	COMPL. 10.75 FT; 24 HR. 10.9 FT
CASING HAMMER	WEIGHT: N/A	DROP: N/A	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: 1 3/8 in. I.D. / 2.0 IN. O.D. SPLIT BARREL			
SAMPLER HAMMER	WEIGHT: 140 LB	DROP: 30 IN	INSPECTOR: DAVID MUSCHLO

DESCRIPTION	PIEZOMETER (S.U.=2ft)	DEPTH, FT	SAMPLE TYPE NO.	RECOV. FT	PENETR. RESIST. BL/6 IN.	REMARKS
CONCRETE FLOOR SLAB	3-IN I.D. RISER TO 2 FT ABOVE					DRILLER AUGERED TO 4.5 FT WITH 8 IN. HOLLOW STEM AUGER
Yellow-brown silty f SAND and CINDERS (Moist) (FILL)		1, 2, 3, 4	S-1	0.6	3 / 1 / 2	DRILLER SET 4 IN. I.D. CASING TO 4.5 FT
TOP OF ROCK 4.3 FT. elev. 570.17 FT M.S.L. Light gray DOLOMITE (Gasport Member)		5, 6, 7, 8, 9				DRILLER FORMED ROCK SOCKET FROM 4.3 TO 6.3 FT. FAINT COAL TAR ODOR IN MILKY WASH WATER. DRILLER BEGAN USING 3 IN. [illegible] NX C.B. AT 6.3 FT. DRILL RATE [illegible] MIN/FT TO 6.3 FT WITH ROLLER BIT. DRILL RATE 3 MIN/FT TO 8.0 FT WITH C.B. WASH WATER MILKY COLORED. DRILL RATE 3 MIN/FT TO 9 FT.
elev. 565.47 FT. M.S.L. Dark gray shaly DOLOMITE (DeCew Member)	OPEN ROCK 30.0 TO 6.3 FT	10, 11, 12, 13, 14, 15, 16				WASH WATER MEDIUM GRAY TO DARK GRAY COLORED FROM 10 FT. DRILL RATE = 5 MIN/FT FROM 10 - 13 FT. 5 MIN/FT FROM 13 - 18 FT.
elev. 557.97 FT. M.S.L. Dark grey limey SHALE (Rochester Member)		17, 18, 19, 20				OIL SLICKS AND COAL TAR ODOR AT 18 FT.

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LOG OF BORING MW-8 SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	REMARKS
Dark gray limey SHALE (Rochester Member)	OPEN ROCK 30.0 FT – 6.3 FT.	21	COAL TAR ODOR AND LARGE OIL SLICK 21.5
		22	DRILL RATE = 6 MIN/FT 18 – 23 FT
		23	
		24	
		25	DRILL RATE = 6 MIN/FT 23 – 28 FT
		26	
		27	
		28	DRILL RATE = 6 MIN/FT 28 – 30 FT
		29	
TERMINUS OF BOREHOLE 30.0 FT. elev. 544.47 FT. M.S.L.		30	
		31	
		32	
		33	
		34	
		35	
		36	
		37	
		38	
		39	
		40	
		41	
		42	
		43	
		44	
		45	

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LOG OF BORING MW-9 **SHEET** 1 **OF** 2

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE - LOCKPORT, NEW YORK		ELEVATION AND DATUM: 602.12 FT.	PROJECT NO.: [illegible]
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 10/27/83	DATE FINISHED: 10/28/83
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E 45 HYDROROTARY RIG		COMPLETION DEPTH: 56.0 FT	ROCK DEPTH: 16.8 FT
SIZE AND TYPE OF BIT: 3 7/8 IN TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: 2 IN DIAMOND SET NON-CORING BIT	NO. SAMPLES: DIST. 4	UNDIST. N/A / CORE N/A
CASING: 4 IN HW FLUSH JOINT	NX [illegible] C.B.	WATER LEVEL: FIRST N/A	COMPL. 24.3 FT / 24 HR. 16.2 FT
CASING HAMMER / WEIGHT: N/A	DROP: N/A	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 1 3/8 IN I.D./2.0 IN O.D. SPLIT BARREL		INSPECTOR: DAVID MASCALO	
SAMPLER HAMMER / WEIGHT: 140 LB	DROP: 30 IN		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLE TYPE NO.	RECOV. FT	PENETR. RESIST. BL/6 IN	REMARKS
ASPHALT						
OLD BRICK ROADWAY						
Red-brown silty f-m SAND with trace to some gravel (COAL TAR ODOR) (DAMP) (FILL) OVA reads 10 PPM	3 IN. I.D. STEEL RISER PIPE TO 0.5 FT BELOW GROUND SURFACE	1–3	S-1	0.5	5 6 7	
Red-brown gravelly CLAY with piece of cobble (MOIST) (Glacio-lacustrine)		4–6	S-2	0.5	12 50/0 in	DRILLER TURNED 4 IN. CASING TO 5.0 FT
Red-brown f sandy SILT with trace Clay (Moist) (Glacio-lacustrine)		7–14	S-3	0.9	15 11 12	DRILLER TURNED 4 IN CASING TO 10.0 FT
Red-brown f sandy CLAY with trace to some gravel (Moist to damp) (TILL)		15–16	S-4	0.75	20 21 19	DRILLER SET TEMPORARY CASING TO 16.8 FT.
TOP OF ROCK 16.8 FT elev. 585.32 FT. M.S.L. Light gray DOLOMITE (GASPORT Member)		17–20 (10/27/83)				DRILLER BORED ROCK SOCKET TO 19.0 FT WITH 3 7/8 ROLLER BIT. DRILLER GROUTED 3 IN. RISER PIPE FROM 19 FT TO 0.5 FT BELOW GROUND SURFACE

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LOG OF BORING MW-9 SHEET 2 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES	ROCK CORE	REMARKS
Light gray DOLOMITE (Gasport Member)	OPEN ROCK 50.0 FT – 19.0 FT	21–26			WASH MILKY COLORED OVA'S <1 ppm DRILL RATE = 2 MIN/FT 19 – 24 FT
elev. 575.62 FT. M.S.L. Dark gray shaly DOLOMITE (DeCew Member)		27–32			WASH FROM MILKY COLORED TO MEDIUM GRAY COLORED DRILL RATE = 2-3 MIN/FT 24-29 FT OVA READS < 5 PPM DRILL RATE = 5 MIN/FT. 29-34 FT. OVA READS < 1 PPM
elev. 569.62 FT. M.S.L. Dark gray limey SHALE (Rochester Member)		33–45			WASH WATER COLOR CHANGE AT 32.5 FT FROM MEDIUM GRAY TO DARK GRAY DRILL RATE = 8 MIN/FT. FROM 34-37 FT 5 MIN./FT 37-39 FT WASH COLOR MEDIUM GRAY OVA READS 7 PPM OIL SLICKS OBSERVED AT 39.5 FT - NO DETECTABLE ODOR (HIGH WINDS) DRILL RATE = 8 MIN/FT 39-44 FT OIL SLICKS OBSERVED AT 44 FT WITH ATTENDENT STRONG COAL TAR ODOR OVA READS 10 PPM

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DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6IN	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK SKETCH	ROCK CORE: CRACK COND	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
Dark gray limey SHALE (Rochester Member)	OPEN ROCK	46										DRILL RATE = 7 MIN/FT. 44 FT TO 49 FT 8 MIN/FT 44-50 FT
		47										OVA READS 10 PPM CON- TAM- ODOR AND FILM ON DRILL RODS
		48										DRILLER REPORTS PARTIAL LOSS OF DRILLING FLUID 42-50 FT.
		49										
BOREHOLE TERMINUS 50.0 FT elev. 552.12 FT. M.S.L.		50										

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LOG OF BORING MW-10 **SHEET** 1 **OF** 3

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 597.97 FT.	PROJECT NO.: 32C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 11/8/83	DATE FINISHED: 11/8/83
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E. 45 HYDRO-ROTARY RIG		COMPLETION DEPTH: 50.0 FT	ROCK DEPTH: 12.0 FT
SIZE AND TYPE OF BIT: 3 7/8 IN. TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: 3 IN. DIAMOND IMPREGNATED BIT	NO. SAMPLES: DIST. 3	UNDIST. NONE / CORE 36 FT
CASING: 4 IN. HW FLUSH JOINT	NX DOUBLE TUBE C.B.	WATER LEVEL: FIRST ≈ 10 FT.	COMPL. 8.25 FT / 24 HR. 10.1 FT
CASING HAMMER	WEIGHT: N/A	DROP: N/A	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: 1 3/8 IN I.D./2.0 IN O.D SPLIT BARREL			
SAMPLER HAMMER	WEIGHT: 140 LB	DROP: 30 IN.	INSPECTOR: DAVID MUSCALO

DESCRIPTION	USCS	PIEZOMETER	DEPTH, FT	SAMPLE TYPE NO. LOC.	RECOV. FT	PENETR. RESIST. BL/6 IN.	RECOVERY %	CRACK SKETCH	COND.	RQD	CORE TIME	REMARKS
ASPHALT			0									DRILLER RAISED TO TOP OF ROCK AT FT 12.0 F. DRILLER TURNED TEMPORARY 4 IN CASING TO 12.1 FT
Brown to black f sandy SILT and ORGANICS - trace gravel (MOIST) (FILL)		3 IN BLACK STEEL RISER PIPE TO 0.5 FT BELOW G.S.	1–2	S-1	1.1	8 5 4						
Gray f sandy CLAY with trace tan sand, gravel and organics - piece of cobble (MOIST) FILL			5–6	S-2	1.5	11 3 17						
Gray f sandy SILT with trace organics and gravel - COAL TAR ODOR (WET) (FILL)			10–11	S-3	1.5	10 10 16						
TOP OF ROCK 12.0 FT elev. 585.97 FT. M.S.L.			12									DRILLER BORED ROCK SOCKET TO 14.0 FT - GROUTED 3 IN RISER PIPE TO 0.5 FT FROM G.S. AS CASING WAS PULLED
Light gray DOLOMITE (Gasport Member) Fossiliferous with styolitic partings - fractures slightly weathered		OPEN ROCK	14–18	NX RUN-1 CB	4.5		100%		FAIR	76%	1 min/FT	MILKY WHITE TO LIGHT GRAY WASH WATER
			19–20									

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LOG OF BORING MW-10

SHEET 2 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6IN.	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	CRACK: COND	RQD	CORE TIME MIN/FT	REMARKS
Light gray DOLOMITE (Gasport Member) Less fossiliferous – few styolites. Core contains irregularly shaped dark mineral probably sphalerite	OPEN ROCK 50.0 – 14.0 FT	21–23	NX RUN-2 CB	5.0			100%		EXCELLENT	100%	2 MIN/FT	WASH COLOR FROM MILKY WHITE TO LIGHT GRAY AT 22.1 TO MILKY WHITE AT 22.7 FT
elev. 573.47 FT. M.S.L. Dark gray shaly DOLOMITE (DeCew Member) Gypsum filled vugs at 31.9 FT. Styolites in core to 33 FT. Fractures slighty weathered to unweathered		24–28	NX RUN-3 C.B.	4.8			96%		FAIR TO GOOD	93%	2 MIN/FT	WASH WATER LIGHT GRAY AT 25.0 FT. COAL TAR ODOR 28.5 FT – COAL TAR ON DRILL RODS – COAL TAR IN WASH WATER WHEN DRILLER RESUMED DRILLING AT 28.6 FT
		29–33	NX RUN-4 CB	5.0			100%		GOOD	92%	3 MIN/FT	WASH MEDIUM GRAY. COAL TAR ODOR ON CORE AND ON FRESHLY BROKEN SURFACE
elev. 564.47 FT. M.S.L. Dark gray limey SHALE (Rochester Member)		34–38	NX RUN-5 C.B.	5.0			100%		GOOD	98%	3 MIN/FT	WASH MEDIUM gray COLORED TO DARK GRAY. COAL TAR ODOR AND IRIDESCENT SHEEN ON CORE
		39–43	NX RUN-6 CB	5.0			100%		POOR TO FAIR	98%	3.5 MIN/FT	WASH DARK GRAY. COAL TAR ODOR
		44–45										

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LOG OF BORING MW-10

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6IN.	POCKET PENETROMETER TSF TOP	ROCK CORE: RECOVERY %	ROCK CORE: CRACK SKETCH	ROCK CORE: CRACK COND	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
Dark gray limey SHALE (Rochester Member)	OPEN ROCK	46, 47, 48	NX RUN-7 C.B.						FAIR			COAL TAR ODOR ON CORE - IRIDESCENT SHEEN ON CORE
		49, 50	NX RUN-8 C.B.	1.5			100%		EXCELLENT	100%		STRONG COAL TAR ODOR - IRIDESCENT SHEEN ON CORE. DRILL RODS COATED WITH COAL TAR
BOREHOLE TERMINUS 50.0 FT elev. 547.97 FT. M.S.L.												

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LOG OF BORING MW-11

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE – LOCKPORT, NEW YORK		ELEVATION AND DATUM: 596.49 FT.	PROJECT NO.: 82C4495
DRILLING AGENCY: NORTH STAR DRILLING	FOREMAN: J. THEW	DATE STARTED: 11/2/83	DATE FINISHED: 11/3/83
DRILLING EQUIPMENT: TRAILER MOUNTED CME 45 HYDROROTARY DRILL RIG		COMPLETION DEPTH: 30 FT.	ROCK DEPTH: 9.5 FT
SIZE AND TYPE OF BIT: 3 7/8 IN. TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: 3 IN. DIAMOND SET NON-CORING BIT	NO. SAMPLES: DIST 1	UNDIST NONE; CORE NONE
CASING: 4 IN. HW FLUSH JOINT	NX DOUBLE TUBE C. B.	WATER LEVEL: FIRST N/A	COMPL. 7.25; 24 HR. 7.50 FT
CASING HAMMER: WEIGHT N/A	DROP N/A	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 1 3/8 IN. I.D./2 IN. O.D. SPLIT BARREL		INSPECTOR: DAVID MUSCALO	
SAMPLER HAMMER: WEIGHT 140 LB	DROP 30 IN.		

Column headings: DESCRIPTION | S.U.=OF | PIEZOMETER | DEPTH, FT | SAMPLES (TYPE/NO., RECOV. FT, PENETR. RESIST. BL/6 IN.) | POCKET PENETROMETER TSF | ROCK CORE (RECOVERY %, FRACK: NATURAL, INDUCED; RQD; CORE TIME) | REMARKS

Piezometer: 3-in. I.D. BLACK STEEL RISER TO 0.5 FT BELOW G.S.; OPEN ROCK 30.0 FT – 11.4 FT

Depth, ft	Description	Sample	Recov. ft	Blows	Remarks
0–1					DRILLER PUSHED TO 5 FT WITH 8 IN O.D. AUGER
5–6.5	Red-brown f sandy SILT with pieces of cobble-trace organics (Moist) (FILL)	S-1	0.5	9, 12, 6	DRILLER TURNED TEMPORARY 4 IN CASING TO 5 FT. DRILLER BEGAN USING A 3 7/8 IN TRICONE ROLLER BIT AT 5 FT
9–9.4					DRILLER TURNED CASING TO 9.4 FT
9.4–11.4	TOP OF ROCK 9.4 FT elev. 587.09 FT. M.S.L.				DRILLER BORED ROCK SOCKET FROM 9.4 TO 11.4 FT. DRILLER GROUTED RISER PIPE TO 0.5 FT BELOW G.S.
12–20	Light gray DOLOMITE (Gasport Member)				WASH WATER MILKY COLORED. DRILLER BEGAN USING NON-CORING CORE BARREL AT 11.4 FT. WASH WATER MILKY COLORED. DRILL RATE = 2 min/FT 11.4 – 13.5 FT. PARTIAL LOSS OF DRILLING WATER AT 18.3 FT. DRILL RATE = 3 MIN./FT 13.5 – 18.5 FT

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LOG OF BORING MW-11

SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6 IN.	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK: SKETCH	ROCK CORE: CRACK: COND	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
Light gray DOLOMITE (Gasport Member)	OPEN ROCK 30.0 – 11.4 FT	21 – 26										DRILL RATE = 2.5 MIN/FT 18.5-22.5 FT COLOR CHANGE IN WASH WATER MILKY COLORED. PARTIAL LOSS OF DRILLING FLUID AT 24.5 FT
elev. 569.99 FT. M.S.L. Dark gray shaly DOLOMITE (DeCew Member)		27 – 30										DRILL RATE = 3 MIN/FT 23.5 - 28.5 FT WASH WATER MEDIUM GRAY IN COLOR AT 26.5 FT DRILL RATE = 3 [illegible] FT. **COAL TAR ODOR IN WELL** UPON COMPLETION
BOREHOLE TERMINUS 30.0 FT elev. 566.49 FT. M.S.L.												

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LOG OF BORING MW-12 **SHEET** 1 **OF** 3

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 596.35 FT.	PROJECT NO.: 83C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 11/2/83	DATE FINISHED: 11/2/83
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E 45 HYDRO ROTARY DRILL RIG		COMPLETION DEPTH: 53.5 FT	ROCK DEPTH: 9.6 FT.
SIZE AND TYPE OF BIT: 3 7/8 TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: NON CORING BIT 4 IN DIAMOND SET	NO. SAMPLES: DIST. 2	UNDIST. NONE / CORE NONE
CASING: 4 IN. HW FLUSH JOINT	NX DOUBLE TUBE C.B.	WATER LEVEL: FIRST N/A	COMPL. 11.9 FT / 24 HR. 3.5
CASING HAMMER	WEIGHT N/A	DROP N/A	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: 1 3/8 in. I.D./2 in. O.D. SPLIT BARREL			
SAMPLER HAMMER	WEIGHT 140 LB	DROP 30 IN.	INSPECTOR: DAVID MUSCALO

Elev. 0 = 596.35 (approx.)

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLE TYPE/NO.	RECOV., FT	BLOWS	REMARKS
Gray-brown f sandy SILT with trace to some organics (roots, grass and leaves) (Damp to Moist) (FILL and TOP SOIL)	2 IN. I.D. BLACK STEEL RISER PIPE TO 0.5 FT BELOW GROUND SURFACE	0–2	S-1	0.7	3 3 2	DRILLER AUGERED TO 5.0 FT with 8 IN OD AUGER. DRILLER BEGAN DRILLING AT 5 FT WITH 3 7/8 IN TRICONE ROLLER BIT
Gray-brown f sandy SILT with some c gravel and trace f-m gravel, m-c sand and organics (Damp) (FILL)		5–6.5	S-2	0.1	30 50/2 IN	SPLIT BARREL REFUSED AT 5.5 FT. DRILLER SET CASING TO 9.9 FT BY TURNING WITH DIAMOND DRILL SHOE 0.3 FT INTO ROCK
TOP OF ROCK 9.6 FT elev. 586.75 FT. M.S.L.		9.6–11	S-3	0	50/0 IN	SPLIT BARREL REFUSED AT 9.6 FT 50/0 IN.
Light gray DOLOMITE (Gasport Member)		11–20				DRILL RATE = 6 MIN/FT FROM 10-13 FT. WASH WATER MILKY WHITE. DRILL RATE = 5 MIN./FT FROM 13-18 FT. MILKY WHITE WASH WATER

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LOG OF BORING MW-12 SHEET 2 OF 3

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES TYPE NO. LOC	RECOV. FT	PENETR. RESIST. BL/6IN.	POCKET PENETROMETER TSF	ROCK CORE RECOVERY %	CRACK SKETCH	CRACK COND	RQD	CORE TIME	REMARKS
Light gray DOLOMITE (Gasport Member)	2-IN. ID. BLACK STEEL RISER PIPE TO 0.5 FT BELOW GROUND SURFACE	21–27										DRILL RATE= 3.5 MIN/FT 18-23 FT WASH WATER MILKY COLORED; COLOR CHANGE IN WASH WATER FROM MILKY WHITE TO MEDIUM GRAY AT 27.5 FT
elev. 568.85 FT. M.S.L. Dark gray sha'y DOLOMITE (De Cew Member)		28–32										DRILL RATE=6MIN/FT 23-28 FT; DRILL RATE= 4MIN/FT. 28-32 FT
elev. 563.85 FT. M.S.L. Dark gray limey SHALE (Rochester Member)		33–39										COLOR CHANGE IN WASH WATER FROM MEDIUM GRAY TO DARK GRAY 32.5 FT; FAINT COAL TAR ODOR IN WASH AT 33.4 FT. DRILL RATE= 3 MIN/FT 33-38 FT; DRILL RATE= 2 MIN./FT. 38-43 FT COAL TAR ODOR IN WASH WATER
	BENTONITE SEAL	39–41										
	SAND	41–43										
	OPENINGS	43–45										DRILL RATE= 2 MIN/FT. 43-48 FT

LOG OF BORING MW-12

DESCRIPTION	PIEZOMETER	DEPTH, FT	REMARKS
	2-in. I.D. SLOTTED WELL SCREEN WITH 0.010 in.	46	COAL TAR ODOR IN WASH
Dark gray limey SHALE (Rochester Member)		47	
		48	STRONG COAL TAR ODOR AT 48.5 FT
		49	
		50	
		51	STRONG COAL TAR ODOR WITH ATTENDENT OIL SLICKS AND COAL TAR GLOBULES IN WASH WATER
		52	
		53	
BOREHOLE TERMINUS 53.5 FT elev. 542.85 FT. M.S.L.		54	
		55	

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LOG OF BORING MW-13 **SHEET** 1 **OF** 3

PROJECT AND LOCATION	LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK
ELEVATION AND DATUM	593.73 FT.
PROJECT NO.	82C 4495
DRILLING AGENCY	NORTH STAR DRILLING CO.
FOREMAN	JEFF THEW
DATE STARTED	10/26/83
DATE FINISHED	10/27/83
DRILLING EQUIPMENT	TRAILER MOUNTED C.M.E. 45 HYDROROTARY DRILL RIG
COMPLETION DEPTH	50.0 FT
ROCK DEPTH	8.4 FT
SIZE AND TYPE OF BIT	3⅞ TRICONE ROLLER BIT
SIZE AND TYPE CORE BARREL	[illegible] NON-CORING [illegible]
NO. SAMPLES	DIST. 2 / UNDIST. NONE / CORE NONE
WATER LEVEL	FIRST N/A / COMPL. 15.8 FT (?) / 24 HR. 17.1 FT
CASING	4 IN HW FLUSH JOINT
CASING HAMMER	WEIGHT N/A / DROP N/A
SAMPLER	2 IN O.D. / 1 3/8 IN I.D. SPLIT BARREL
SAMPLER HAMMER	WEIGHT 140 LB / DROP 30 IN
BORING ANGLE AND DIRECTION	VERTICAL
INSPECTOR	[illegible]

DESCRIPTION	SYMBOL	DEPTH, FT	SAMPLES: TYPE/NO.	RECOV., FT	BLOWS	REMARKS
ASPHALT		0–0.75				9 IN. OF ASPHALT
Brown f-m sandy f-c GRAVEL (damp) (FILL)	3-IN. BD. STEEL RISER TO 0.6 FT BELOW G.S.	2–3.5	S-1	0.7	2 3 3	
Red-brown f-m sandy f-c GRAVEL with piece of cobble (damp) (FILL)		5–6.5	S-2	0.9	[illegible]	DRILLER SET TEMPORARY 4-IN CASING TO [illegible] FT.
TOP OF ROCK 8.4 FT elev. 585.33 FT. M.S.L.		8.4				DRILLER REAMED ROCK SOCKET TO 10.7 FT; GROUTED STEEL RISER PIPE ANNULUS TO 0.5 FT BELOW GROUND SURFACE
Light gray DOLOMITE (Gosport Member)	OPEN ROCK 50.0 FT - 10.7 FT	10.7 (10/26/83) – 20				DRILLER BEGAN NON-RECOVERY CORING AT 8.4 FT; WASH light gray, no DISTINCTIVE ODOR; DRILL RATE = 2 MIN/FT. 11-18 FT; OVA READS 2 PPM; 18.2 DRILLS HARDER (SLOWER)

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LOG OF BORING MW-13 SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOG	RECOV. FT	PENETR. RESIST. BL/6 IN.	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	CONS.	RQD	CORE TIME	REMARKS
Light gray DOLOMITE (Gasport Member)	OPEN ROCK 50.0 FT - 10.7 FT	21, 22, 23, 24										DRILL RATE 3 MIN./FT 19-25 FT OVA READS < 2 PPM. WASH LIGHT [illegible] TINCTIVE [illegible] DRILLS VERY HARD FROM 25 FT TO FT. OVA READS < PPM
elev. 568.73 FT. M.S.L. Dark gray shaly DOLOMITE (De Cew Member)		25, 26, 27, 28, 29, 30, 31										DRILL RATE= 5 MIN/FT 24-29 FT. OVA READS < 2 PPM WASH MEDIUM GRAY [illegible] TINCTIVE ODOR DRILL RATE= [illegible]
elev. 561.73 FT. M.S.L. Dark gray limey SHALE (Rochester Member)		32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45										WASH MEDIUM GRAY OVA READS < 2 PPM NO DISTINCTIVE ODOR DRILL RATE 6 MIN/FT 34-39 FT AT 39.0 FT OVA READS < 2 PPM DRILL RATE= 6 min/FT 39-44 Ft NO DISTINCTIVE ODOR WASH MEDIUM TO DARK GRAY

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LOG OF BORING MW-13   SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR RESIST BL/6IN	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK SKETCH	ROCK CORE: CRACK COND	ROCK CORE: RQD	ROCK CORE: CORE TIME FT	REMARKS
Dark gray limey SHALE (Rochester Member)	OPEN ROCK	46 47 48 49										DRILL RATE = 6 [illegible] FT 44-49 FT OIL SLICKS ON WASH AT 48-48.5 FT COAL TAR [illegible] 49 FT [illegible] TAR [illegible] ON LOWER [illegible] [illegible] [illegible] [illegible]
BOREHOLE TERMINUS 50.0 FT elev. 543.73 FT. M.S.L.		50										

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LOG OF BORING MW-14 **SHEET** 1 **OF** 3

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 617.12 FT.	PROJECT NO.: 82C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 11/9/83	DATE FINISHED: 11/10/83
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E. 45 HYDROROTARY DRILL RIG		COMPLETION DEPTH: 70.0 FT	ROCK DEPTH: 31.5 FT
SIZE AND TYPE OF BIT: 3 7/8 IN. TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: 3 IN. DIAMOND SET NON-CORING BIT	NO. SAMPLES: DIST. 7	UNDIST. NONE / CORE NONE
CASING: 4 IN. HW FLUSH JOINT	NX DOUBLE TUBE C.B.	WATER LEVEL: FIRST 11.4 FT	COMPL. 12.91 / 24 HR. 10.9 FT
CASING HAMMER	WEIGHT N/A	DROP N/A	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: 1 3/8 IN. I.D./2.0 IN O.D. SPLIT BARREL			
SAMPLER HAMMER	WEIGHT 140 LB	DROP 30 IN.	INSPECTOR: DAVID MUSCALO

Piezometer column: 3-IN. I.D. BLACK STEEL RISER PIPE TO 0.5 FT BELOW GROUND SURFACE (SU. 0 FT)

DESCRIPTION	DEPTH, FT	SAMPLE TYPE NO.	RECOV. FT	BLOWS	REMARKS
ASPHALT OVER BRICK PAVEMENT					
Red-brown f sandy SILT with trace to some gravel (Damp) FILL	1–3	S-1	0.9	4 5 7	DRILLER AUGERED TO TOP OF ROCK AT 31.5 FT. CASED WITH 4 IN TEMPORARY CASING TO 31.7 FT. DRILLER BORED ROCK SOCKET TO 33.5
Red-brown f sandy SILT with trace m-c sand and gravel (Damp) Glacio-lacustrine	3–10	S-2	1.5	18 24 27	
Red-brown f sandy SILT with trace to some c-m sand and gravel (WET) Glacio-lacustrine	10–14.5	S-3	1.5	17 26 49	
Red-brown silty m-c SAND with trace f gravel and f sand (WET) Glacio-lacustrine	14.5–19	S-4		10 15 17	
Red-brown f-sandy SILT with rounded and subangular rock fragments (TILL)	19–20				DRILLER REPORTS ROUGHNESS INDICATING

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LOG OF BORING MW-14

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO.	RECOV. FT	BLOWS	REMARKS
Red-brown f sandy SILT with rounded and subangular rock fragments (MOIST) TILL	[illegible] BLACK STEEL RISER PIPE TO 0.5 FT BELOW G.S.	21	S-5	1.5	21, 31, 35	
		22–24				DRILLER REPORTS SMOOTH DRILLING FROM 24.0 FT
Red-brown SILT with trace f-m sand (WET) Glacio-lacustrine		25–26	S-6	1.5	18, 25, 31	
		27–29				
Red-brown SILT with trace clay and f-m sand (WET) Glacio-lacustrine		30–31.5	S-7	1.5	9, 14, 18, [illegible]	DRILLER: PULLED 4 IN CASING - INSTALLED 33 FT OF RISER PIPE - GROUTED RISER PIPE INTO ROCK SOCKET AND SURROUNDING ANNULUS TO 0.5 FT BELOW G.S.
Top of Rock 31.5 FT elev. 585.62 FT. M.S.L. Light gray DOLOMITE (Gasport Member)	OPEN ROCK 70.0 FT - 33.5 FT	32–45				WASH WATER MILKY WHITE IN COLOR 33.5 TO 38.5 FT. DRILL RATE = 4 MIN/FT. DRILLER BEGAN USING NON-[illegible] CORE BARREL AT 33.5 FT. WASH WATER MILKY WHITE WITH BLUISH TINGE. DRILL RATE = 4 MIN./FT. 38.5 - 43.5

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LOG OF BORING MW-14 SHEET 3 OF 3

DESCRIPTION	DEPTH, FT	REMARKS
Light gray DOLOMITE (Gasport Member)		
elev. 571.12 FT. M.S.L.	46	WASH WATER COLOR CHANGE FROM MILKY WHITE TO MEDIUM GRAY
Dark gray shaly DOLOMITE (DeCew Member)	47–48	DRILL RATE=3.5 MIN/FT 43.5 - 48.5 FT.
	49–53	WASH WATER MEDIUM GRAY COLORED TO DARK GRAY AT 53.5 FT DRILL RATE = 5 MIN/FT; 48.5 - 51.5 FT; 10 MIN/FT 51.5 FT - 53.0 FT DRILLER BEGAN USING 3 7/8 IN. ROLLER BIT AT 53.0 FT.
elev. 563.62 FT. M.S.L.	54	Gray clay in non-CORING BIT DRILL RATE = 3.5 MIN/FT; 53 - 57 FT
Dark gray limey SHALE (Rochester Member)	55–59	WASH WATER DARK GRAY WITH IRIDESCENT FILM AND PETROLEUM ODOR
	60–61	DRILL RATE = 3.5 MIN/FT 57 to 62 FT
	62–70	wash water Dark BROWNISH-GRAY WASH WATER WITH IRIDESCENT OILY FILM AND ~~PETROLEUM ODOR~~ IN WASH WATER DRILL RATE = 2.0 MIN/FT 62 to 67 FT (DRILLER CHANGED FEED RATE DRILL RATE = 2.0 MIN/FT 67 - 70 FT

OPEN ROCK 70.0 FT – 33.5 FT

BOREHOLE TERMINUS 70.0 FT
Elev. 547.12 FT.

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LOG OF BORING MW-15 **SHEET** 1 **OF** 3

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 591.31 FT.	PROJECT NO.: E2C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 11/10/83	DATE FINISHED: 11/11/83
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E. 45 HYDROROTARY DRILL RIG		COMPLETION DEPTH: 50.0 FT	ROCK DEPTH: 5.3 FT
SIZE AND TYPE OF BIT: 3 7/8 IN TRICONE ROLLER BIT	SIZE AND TYPE CORE BARREL: 3 IN DIAMOND SET NON-CORING BIT	NO. SAMPLES: DIST. 2	UNDIST. NONE; CORE NONE
CASING: 4 IN. HW FLUSH JOINT	NX DOUBLE TUBE C.B.	WATER LEVEL: FIRST 5 FT	COMPL. 9.6 FT; 24 HR. 14.2 FT
CASING HAMMER	WEIGHT N/A; DROP N/A	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 1 3/8 IN. I.D./2.0 IN. OD SPLIT BARREL			
SAMPLER HAMMER	WEIGHT 140 LB; DROP 30 IN.	INSPECTOR: DAVID MUSCKLO	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLE TYPE/NO.	RECOVERY, FT	BLOWS/6 IN.	REMARKS
ASPHALT	3-IN. BLACK STEEL RISER TO 8.2FT BELOW G.S.					DRILLER AUGERED TO TOP OF ROCK AT 5.3 FT
CONCRETE		1				
Gray f-c sandy SILT with pieces of cobbles (Dry) (FILL)		2	S-1	0.75	19 / 24 / 30/NW	DRILLER SET TEMPORARY 4 IN. CASING TO 5.5 FT
		3				
Red-brown f sandy SILT with trace clay and trace to some subangular rock fragments (WET) (TILL)		4				DRILLER BORED ROCK SOCKET FROM 5.3 TO 8.2 FT BELOW G.S. WASH WATER MILKY WHITE COLORED
TOP OF ROCK 5.3 FT elev. 586.01 FT. M.S.L.		5 / 6	S-2	0.5	2 / 1 / 50/0 IN.	DRILLER GROUTED 2 IN RISER PIPE IN ROCK SOCKET AND RISER PIPE ANNULUS AS 4 IN. CASING WAS PULLED
Light gray DOLOMITE (Gasport Member)	OPEN ROCK 50.0 FT - 8.2 FT.	7–17				BROWN COLORED WASH WATER AT 7.2 FT (weathered fracture) COAL TAR ODOR. CORE BARREL DRILL RATE = 6 MIN/FT 8.2 TO 11.5. MILKY WHITE WASH. DRILL RATE = 2 MIN/FT 11.5 - 17.5. DRILL RATE = 5 MIN/FT 17.5 TO 18.5. 2 15/16 IN ROLLER BIT. DRILL RATE = 4 MIN/FT 18.5 TO 20.5 FT
elev. 573.81 FT. M.S.L.		18				IRIDESCENT WATER SLICKS AND COAL TAR ODOR 17.0 FT TO 25.0 FT.
Dark gray shaly DOLOMITE (DeCew Member)		19 / 20				

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DESCRIPTION	PIEZOMETER	DEPTH, FT	REMARKS
Dark gray shaly DOLOMITE (DeCew Member)		21–26	WASH WATER MEDIUM GRAY IN COLOR COAL TAR EJECTED FROM BOREHOLE AT 22 FT WASH WATER MEDIUM GRAY DRILL RATE = 2 MIN./FT 25 - 32 FT
elev. 565.31 FT. M.S.L. Dark gray limey SHALE (Rochester Member)	OPEN ROCK 50.0 - 6.2 FT	26–45	WASH WATER FROM MEDIUM TO DARK IN COLOR AT 26 FT COAL TAR ODOR ~~AND IRIDESCENT SLICK~~ AT 32 FT DRILL RATE = 2 MIN/FT 32 TO 37 FT 42 WASH WATER DARK GRAY DRILL RATE - 2 MIN/FT 42 to 47 FT WASH DARK GRAY IN COLOR

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LOG OF BORING MW-15

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	RECOV, FT	PENETR. RESIST. BL/6 IN	PP POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	CRACK: COND	RQD	CORE TIME	REMARKS
Dark gray limey SHALE (Rochester Member)	OPEN ROCK	46 – 50										DRILL RATE = 2 MIN/FT 47 TO 50 FT COAL TAR ODOR IN WELL AT COMPLETION OF INSTALLATION
BOREHOLE TERMINUS 50.0 FT elev. 541.31 FT. M.S.L.		50										

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LOG OF BORING MW-16 **SHEET** 1 **OF** 2

Field	Value
PROJECT AND LOCATION	LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK
ELEVATION AND DATUM	574.69 FT.
PROJECT NO.	82C4495
DRILLING AGENCY	NORTH STAR DRILLING CO.
FOREMAN	J. THEW
DATE STARTED	11/10/83
DATE FINISHED	[illegible]
DRILLING EQUIPMENT	TRAILER MOUNTED C.M.E. 45 HYDROROTARY DRILL RIG
COMPLETION DEPTH	30.0 FT
ROCK DEPTH	1.2 FT
SIZE AND TYPE OF BIT	3 7/8 TRICONE ROLLER BIT
SIZE AND TYPE CORE BARREL	3 IN. DIAMOND SET NON-CORING BIT / NX DOUBLE TUBE C.B
NO. SAMPLES	DIST. 1 / UNDIST. NONE / CORE NONE
CASING	4 IN. HW FLUSH JOINT
WATER LEVEL	FIRST N/A / COMPL. [illegible] / 24 HR. 9.8 FT
CASING HAMMER	WEIGHT N/A DROP N/A
BORING ANGLE AND DIRECTION	VERTICAL
SAMPLER	1 3/8 IN. I.D./2.0 IN O.D. SPLIT BARREL
SAMPLER HAMMER	WEIGHT 140 LB. DROP 30 IN.
INSPECTOR	DAVID MUSCALO

DESCRIPTION	PIEZOMETER (S.U.=2.0 FT)	DEPTH, FT	SAMPLES: TYPE	RECOV. FT	PENETR. RESIST. BL/6 IN.	REMARKS
CONCRETE FLOOR SLAB	3-IN. I.D. RISER					DRILLER AUGERED TO [illegible] FT – BEGAN USING 3 7/8 IN ROLLER BIT AT [illegible] FT
BLACK [illegible] FILL		1				
TOP OF ROCK 1.2 FT elev. 573.49 FT. M.S.L.		1–2	S-1	0.1 FT	3/2 in 50/0 in	FORMED ROCK SOCKET FROM 1.2 TO 3.2 FT – GROUTED 5.2 FT OF BLACK IRON PIPE TO 2.0 FT ABOVE G.S.
Light gray DOLOMITE (Gasport Member)		3–6				WASH WATER [illegible] [illegible] AT 6.5 FT [illegible] [illegible] [illegible] GRAY [illegible] 10 MIN/FT 1.2 TO 3.2 FT. DRILLER BEGAN USING NON-CORING C.B. AT 3.2 FT
elev. 568.19 FT. M.S.L.		6.5				
DARK gray shaly DOLOMITE (DeCew Member)	OPEN ROCK 30 FT – 3.2 FT	7–13				WASH BROWN COLORED AT 2.3 FT (WEATHERED JOINT?) DRILL RATE 4 MIN/FT TO 8.5 FT. WASH [illegible] GRAY [illegible] COLOR. DRILL RATE [illegible] 8.5 TO 13.5 FT. DRILLER BEGAN USING ROLLER BIT [illegible] FT WITH 2 15/16 IN TRICONE ROLLER BIT
elev. 560.69 FT. M.S.L.		14				
Dark gray limey SHALE (Rochester Member)		14–20				DRILL RATE [illegible] 13.5 TO 17.0 FT. WASH COLOR CHANGE FROM [illegible] GRAY TO DARK BROWN-GRAY AT [illegible]. OIL SLICKS ON WASH AT 17 FT.

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LOG OF BORING MW-16 SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV, FT	SAMPLES: PENETR. RESIST. BL/6IN	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	ROCK CORE: CRACK SKETCH	ROCK CORE: CRACK COND	ROCK CORE: RQD	ROCK CORE: CORE TIME	REMARKS
Dark gray limey SHALE (Rock [illegible])	OPEN ROCK 30.0 FT - 5.2 FT	21										[illegible]
		22										
		23										
		24										
		25										
		26										[illegible]
		27										
		28										
		29										[illegible] N WELL
BOREHOLE TERMINUS 30.0 FT elev. 544.69 FT. M.S.L.		30										

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LOG OF BORING MW-17 **SHEET** 1 **OF** 2

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE - LOCKPORT, NEW YORK		ELEVATION AND DATUM: 594.36 FT.	PROJECT NO.: 83C4495
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 11/7/83	DATE FINISHED: 11/7/83
DRILLING EQUIPMENT: TRAILER MOUNTED C.M.E. 45 HYDROSTATIC DRILL RIG		COMPLETION DEPTH: 35.0	ROCK DEPTH: 8.0 FT
SIZE AND TYPE OF BIT: 3 7/8 IN. TRI-CONE ROLLER	SIZE AND TYPE CORE BARREL: 2 IN. [illegible] IMPREGNATED BIT	NO. SAMPLES: DIST. 2	UNDIST. NONE; CORE 25 FT
CASING: 4 IN. (HW) FLUSH JOINT	NX DOUBLE TUBE C.B.	WATER LEVEL: FIRST NONE	COMPL. 14.5 FT; 24 HR. 12.0 FT
CASING HAMMER	WEIGHT N/A	DROP N/A	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER 1 3/8 IN. I.D./2.0 IN. O.D. SPLIT BARREL			INSPECTOR: DAVID MUSCALO
SAMPLER HAMMER	WEIGHT 140 LB	DROP 30 IN.	

DESCRIPTION	USCS	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO.	RECOV. FT	BLOWS/0.5 FT	POCKET PENETROMETER	ROCK CORE: RECOVERY %	FRACTURE: SKETCH	ROCK QUALITY	RQD	CORE TIME	REMARKS
ASPHALT / CONCRETE		3-IN. I.D. BLACK STEEL RISER											[illegible] AUGERED [illegible] AT 8.0 FT USING [illegible] IN. [illegible] AUGERS
Red-brown to gray f sandy SILT with ashes - trace clay - m-c sand (damp) (FILL)			1–2	S-1	1.5	20 / 23 / 26							PETROLEUM ODOR ON AUGERS
Gray-brown silty CLAY with trace f-sand and organics - pieces of cobbles (moist) (FILL)			5–6	S-2	1.5	3 / 10 / 8							DRILLER FORMED ROCK SOCKET FROM 8.0 - 10.0 [illegible] WITH [illegible] BIT
TOP OF ROCK 8.0 FT elev. 586.36 FT. M.S.L.			8										
Light gray DOLOMITE (Gasport Member) Some shale present - Fossiliferous - Styolitic partings			10–15	NX RUN-1 C.B.	4.9 FT			98%		GOOD	98%	2 MIN/FT	
Less fossiliferous from 18 FT			15–20	NX RUN-2 C.B.	5.0 FT			100%		GOOD		3 MIN/FT	CORE RATE CHANGE FROM 19 - 20 FT 3 TO 2 min/FT

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LOG OF BORING MW-17 SHEET 2 OF 2

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	SAMPLES: RECOV. FT	SAMPLES: PENETR. RESIST. BL/6in.	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	CRACK: COND	RQD	CORE TIME	REMARKS
Light gray DOLOMITE (Gasport Member) Massive with shaly layers elev. 569.86 FT. M.S.L.	OPEN ROCK 35.0 FT – 10.0 FT	21–25	NX RUN-3 C.B.	5.0 FT			100%		GOOD	98%	2 MIN/FT	COAL TAR ODOR AT 20 FT WASH WATER CHANGE FROM MILKY WHITE TO MEDIUM GRAY
Dark gray shaly DOLOMITE (DeCew member) Predominantly shale with lesser quantities of dolomite elev. 563.36 FT. M.S.L.		25–30	NX RUN-4 C.B.	5.0 FT			100%		FAIR TO GOOD	100%	3 MIN/FT	COAL TAR ODOR AT ~5 FT WASH WATER CHANGE BEGINS AT 29.0 FT
Dark gray limey SHALE (Rochester Member) Light and dark laminated shale with uneven laminae surfaces		30–35	NX RUN-5 C.B.	5.0 FT			100%		FAIR–GOOD	100%	2 MIN.	STRONG COAL TAR ODOR IN CORE [illegible] 30 FT
BOREHOLE TERMINUS 35.0 FT elev. 559.36 FT. M.S.L.		35										

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LOG OF BORING MW-18   SHEET 1 OF 3

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 598.94	PROJECT NO: 82C4495-7
DRILLING AGENCY: NORTH STAR DRILLING COMPANY	FOREMAN: J. THEW	DATE STARTED: 8/23/84	DATE FINISHED: 8/24/84
DRILLING EQUIPMENT: TRAILER MOUNTED [illegible]		COMPLETION DEPTH: 53.0 FT	ROCK DEPTH: 12.5 FT
SIZE AND TYPE OF BIT: [illegible]	SIZE AND TYPE CORE BARREL: [illegible]	NO. SAMPLES: DIST [illegible]	UNDIST [illegible] CORE [illegible]
CASING: [illegible]	[illegible]	WATER LEVEL: FIRST [illegible]	COMPL. 6.4 FT 24 HR 9.9
CASING HAMMER	WEIGHT [illegible]	DROP [illegible]	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: [illegible]			
SAMPLER HAMMER	WEIGHT [illegible]	DROP [illegible]	INSPECTOR: [illegible]

DESCRIPTION	DEPTH, FT	SAMPLES TYPE NO.	RECOV. FT	BLOWS	REMARKS
ASPHALT PAVEMENT					[illegible]
CONCRETE SLAB	1				
Tan m SAND and f-m GRAVEL with trace asphalt (DRY) (FILL)	2–3	S-1	[illegible]	[illegible]	[illegible]
	4–5				
	5–6	S-2	1.5	[illegible]	
Reddish-brown f sandy SILT with trace [illegible] (Damp) (Glacio-lacustrine)	7–9				
Reddish-brown SILT with trace organics (WET) (Glacio-lacustrine)	10–11	S-3	1.0	4 / 7 / 19	
	12				[illegible]
TOP OF ROCK 12.5 FT. ELEV. 586.4 FT M.S.L.	13–14				[illegible]
Light Gray DOLOMITE (Gasport Member)	15–19	NX RUN-1 C.B.	0		[illegible] COLORED WATER. [illegible]
	20				

Casing/riser notes along depth column: [illegible] CASING SURFACE; 1.5 IN. [illegible] TO 6.5 FT; 3 IN. DIA. [illegible]

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LOG OF BORING MW-18 **SHEET** 2 **OF** 3

DESCRIPTION	DEPTH, FT	SAMPLES: TYPE	RECOV., FT	W_n,%	LL,%	PL,%	-200,%	REMARKS
Light Gray DOLOMITE (Gasport Member)	21–24	NX RUN-2 C.B.	0					[illegible]
ELEV. 573.9 FT. M.S.L. Dark Gray Shaly DOLOMITE (DeCew Member)	25–33	[illegible]	0					[illegible] 32 FT. [illegible] 26 FT. DRILL RATE = 4 MIN/FT TO 34 FT
ELEV. 564.9 FT. M.S.L. Dark Gray Limy SHALE (Rochester Member)	34–45							DRILL RATE 2.5 TO 2 MIN/FT. WASH COLOR CHANGE FROM MEDIUM GRAY TO DARK GRAY. WASH COLOR DARK GRAY

3 INCH DIA. OPEN HOLE TO 14.5 FT

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LOG OF BORING MW-18 SHEET 3 OF 3

DESCRIPTION	[illegible]	DEPTH, FT	TYPE NO. LOC	RECOV. FT	[illegible]		W_n,%	LL,%	PL,%	-200,%		REMARKS
Dark Gray Limy SHALE (Rochester member)	[illegible]	46–50										[illegible]
BOREHOLE TERMINATED 50.0 FT ELEV. 548.9 FT. M.S.L.		50										

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LOG OF BORING MW-19 | SHEET 1 OF 2

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NEW YORK		ELEVATION AND DATUM: 592.41	PROJECT NO.: 82C4405
DRILLING AGENCY: NORTH STAR DRILLING CO.	FOREMAN: J. THEW	DATE STARTED: 8/28/84	DATE FINISHED: 8/28/84
DRILLING EQUIPMENT: TRAILER MOUNTED CME 35 HYDROROTARY DRILL RIG		COMPLETION DEPTH: 45.0 FT	ROCK DEPTH: 9.0 FT
SIZE AND TYPE OF BIT: 5 7/8 IN TRICONE ROLLER BIT - 6 IN HOLLOW STEM AUGER	SIZE AND TYPE CORE BARREL: 3 IN. NON-CORING BIT	NO. SAMPLES: DIST 2	UNDIST NONE; CORE NONE
CASING: 4 IN. HW FLUSH JOINT	NX "DOUBLE TUBE" C.B.	WATER LEVEL: FIRST N/A	COMPL. 10.5 FT; 24 HR. 19.0 FT
CASING HAMMER: WEIGHT 300 LB.	DROP 24 IN.	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: 2 IN. O.D./1 IN. I.D. SPLIT SPOON		INSPECTOR: D. MUSCALO	
SAMPLER HAMMER: WEIGHT 140 LB	DROP 30 IN.		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	RECOV. FT	PENETR. RESIST. BL/6IN.		W_n,%	LL,%	PL,%	-200,%		REMARKS
ASPHALT PAVEMENT / CONCRETE PAVEMENT / BRICK PAVEMENT	3 IN. I.D. BLACK STEEL RISER TO 0.5 FT BELOW G.S.	0–1										
Reddish-brown gravelly CLAY with trace to some sand and organics - (Damp) (FILL)		2–3	S-1	0.5	7 7 4							
Reddish-brown gravelly CLAY with trace to some sand and organics - trace cinders - piece of cobble - (moist to wet) - (FILL)		5–6	S-2	0.5	5 10 25							DRILLER DRILLED 4 IN. CASING TO 9.2 FT - DRILLED ROCK SOCKET 2 FT INTO ROCK TO 11 FT. - USE 3 7/8 IN ROLLER BIT
TOP OF ROCK 9.0 FT ELEV. 583.41 FT. M.S.L.		9										
Light Gray DOLOMITE (Gasport Member)	3 IN. I.D. OPEN ROCK TO 11.0 FT	11–17	NX RUN-1 6.0	0	2 MIN./FT							WASH WATER COLOR MILKY WHITE. DRILL RATE = 2 MIN/FT TO 17 FT. WASH WATER COLOR CHANGE FROM MILK WHITE TO MEDIUM GRAY AT 18.0 FT. DRILL RATE INCREASED TO 6 MIN/FT AT 17 FT. DRILLER BEGAN USING 2 15/16 ROLLER BIT AT 18.5 FT
ELEV. 574.4 M.S.L. Dark Gray Shaly DOLOMITE (DeCew Member)	3 IN. I.D.	18–20										

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LOG OF BORING MW-19 SHEET 2 OF 2

DESCRIPTION	PENETRATION	DEPTH, FT	SAMPLES: TYPE / NO. LOG	RECOV. FT	POCKET PEN. / DRY UNIT WT.		W_n,%	LL,%	PL,%	-200,%		REMARKS
		21										DRILL RATE = 3.5 MIN/FT TO 29 FT. Medium gray COLORED WASH WATER
		22										
Dark Gray Shaly DOLOMITE (De Cew Member)		23										
		24										
		25										
		26										
		27										
		28										
ELEV. 563.4 FT. M.S.L.		29										DRILL RATE = 2 min./FT FROM 29 FT WASH WATER COLOR CHANGE FROM MEDIUM GRAY TO DARK GRAY AT 29 FT
		30										
		31										
Dark Gray Limy SHALE (Rochecter Member)		32										
		33										
		34										
		35										
	3 IN. I.D. OPEN ROCK TO 11.0 FT	36										
		27										WASH WATER COLOR DARK GRAY
		38										
		39										
		40										
		41										
		42										DRILL RATE = 2 FT./MIN. WASH WATER COLOR DARK GRAY
		43										
		44										
ELE. 547.4 FT. MS.L.		45										

BORE HOLE TERMINUS 45 FT

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LOG OF BORING AB-1 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, NY		ELEVATION AND DATUM: N/A	PROJECT NO.: [illegible]
DRILLING AGENCY: N.Y.S.E.G.	FOREMAN: J. LYONS	DATE STARTED: 10/19/83	DATE FINISHED: [illegible]
DRILLING EQUIPMENT: AUGER RIG		COMPLETION DEPTH: 9.5 FT	ROCK DEPTH: [illegible]
SIZE AND TYPE OF BIT: 20 IN. AUGER BIT	SIZE AND TYPE CORE BARREL: N/A	NO. SAMPLES: DIST. 1 UNDIST. N/A	CORE N/A
CASING: N/A		WATER LEVEL: FIRST ≈ 8 FT	COMPL. [illegible] 24 HR. N/A
CASING HAMMER	WEIGHT N/A	DROP N/A	BORING ANGLE AND DIRECTION: VERTICAL
SAMPLER: N/A			INSPECTOR: [illegible]
SAMPLER HAMMER	WEIGHT N/A	DROP N/A	

DESCRIPTION	DEPTH, FT	SAMPLES TYPE NO.	REMARKS
Gray-brown silt and bricks, concrete and asphalt (moist) (Demolition FILL)	0–6		coal tar pockets beginning at 3 ft
Coal tar saturated Demolition FILL (moist to wet)	6–8	S-1 (at 7)	Sample of coal tar saturated soil strong coal tar odor
Coal tar saturated Demolition FILL (WET)	8–9.5		coal tar contamination to rock
TOP OF ROCK 9.5 FT			

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LOG OF BORING AB-2 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: LOCKPORT CITY TIP SITE LOCKPORT, N.Y.	ELEVATION AND DATUM: N/A	PROJECT NO.: [illegible]
DRILLING AGENCY: N.Y.S.F.G. / FOREMAN: J. LYONS	DATE STARTED: 10/19/83	DATE FINISHED: [illegible]
DRILLING EQUIPMENT: AUGER RIG	COMPLETION DEPTH: 6.0 FT	ROCK DEPTH: UNKNOWN
SIZE AND TYPE OF BIT: 20 IN. AUGER BIT / SIZE AND TYPE CORE BARREL: N/A	NO. SAMPLES — DIST.: N/A	UNDIST.: N/A / CORE: N/A
CASING: N/A	WATER LEVEL — FIRST: NONE	COMPL.: [illegible] / 24 HR: [illegible]
CASING HAMMER / WEIGHT: N/A / DROP: N/A	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: N/A		
SAMPLER HAMMER / WEIGHT: N/A / DROP: N/A	INSPECTOR: [illegible]	

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE NO. LOC	RECOV., FT	PENETR. RESIST. BL/6IN.	POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	SPACING	RQD	CORE TIME	REMARKS
Red-brown and gray brown silty CLAY and clayey SILT with demolition fill (Bricks, concrete and asphalt and metal)		1 2 3 4 5										OPERATOR UNABLE TO ADVANCE HOLE BEYOND 6 FT SOLID ROCK
BOTTOM OF AUGER HOLE 6 FT		6 7 8 9 10										

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

Field	Value
PROJECT AND LOCATION	LOCKPORT COAL TAR SITE LOCKPORT, N.Y
ELEVATION AND DATUM	N/A
PROJECT NO.	[illegible]
DRILLING AGENCY	N.Y.S.E.G.
FOREMAN	[illegible]
DATE STARTED	10/19/83
DATE FINISHED	10/19/83
DRILLING EQUIPMENT	AUGER RIG
COMPLETION DEPTH	9.0 FT
ROCK DEPTH	9.0 FT
SIZE AND TYPE OF BIT	20 IN. AUGER BIT
SIZE AND TYPE CORE BARREL	N/A
NO. SAMPLES	DIST. 1; UNDIST. N/A; CORE N/A
WATER LEVEL	FIRST 2.5; COMPL. [illegible]; 24 HR. N/A
CASING	
CASING HAMMER	WEIGHT N/A; DROP N/A
SAMPLER	N/A
SAMPLER HAMMER	WEIGHT N/A; DROP N/A
BORING ANGLE AND DIRECTION	VERTICAL
INSPECTOR	DAVID MUSCALO

DESCRIPTION	DEPTH, FT	SAMPLES TYPE NO.	REMARKS
Red-brown to gray brown demolition Fill (bricks, asphalt metal and wood) (moist)	1–8		
Demolition fill with coal tar (wet)	9	S-1	Coal TAR ≈ 6 IN ABOVE ROCK
TOP OF ROCK 9 FT	10		

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

PROJECT AND LOCATION		ELEVATION AND DATUM	PROJECT NO.
Lockport Coal Tar Site Lockport, N.Y.		N/A	[illegible]
DRILLING AGENCY: N.Y.S.E.G.	FOREMAN: [illegible]	DATE STARTED: 10/19/83	DATE FINISHED: 10/1? 83
DRILLING EQUIPMENT: Auger Rig		COMPLETION DEPTH: 4.0 FT	ROCK DEPTH: [illegible]
SIZE AND TYPE OF BIT: [illegible]	SIZE AND TYPE CORE BARREL: N/A	NO. SAMPLES: DIST / UNDIST / CORE	
CASING		WATER LEVEL: FIRST [illegible] / COMPL. [illegible] / 24 HR. [illegible]	
CASING HAMMER — WEIGHT N/A	DROP N/A	BORING ANGLE AND DIRECTION: Vertical	
SAMPLER: N/A		INSPECTOR: [illegible]	
SAMPLER HAMMER — WEIGHT N/A	DROP N/A		

DESCRIPTION	PIEZOMETER	DEPTH, FT	SAMPLES: TYPE / NO.	RECOV., FT	PENETR. RESIST. BL/6IN	PP, POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	CRACK: CONC	RQD	CORE TIME	REMARKS
Gray coarse gravel with trace silt (moist)		0–1										
Gray coarse gravel with trace silt and coal tar (wet)		1–4	S-1									Coal tar oder very strong - coating on all gravel fragments
		4–5										[illegible] unable to [illegible] [illegible] [illegible] to large [illegible].

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LOG OF BORING AB-5 **SHEET** 1 **OF** 1

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, N.Y.		ELEVATION AND DATUM: N/A	PROJECT NO.: [illegible]
DRILLING AGENCY: N.Y.S.E.G.	FOREMAN: J. LYONS	DATE STARTED: 10/19/83	DATE FINISHED: [illegible] 83
DRILLING EQUIPMENT: AUGER RIG		COMPLETION DEPTH: 6.0 FT	ROCK DEPTH: [illegible]
SIZE AND TYPE OF BIT: 20 IN. AUGER BIT	SIZE AND TYPE CORE BARREL: N/A	NO. SAMPLES — DIST: N/A	UNDIST: N/A; CORE: N/A
CASING		WATER LEVEL — FIRST: NONE	COMPL: [illegible]; 24 HR: [illegible]
CASING HAMMER — WEIGHT: N/A	DROP: N/A	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: N/A			
SAMPLER HAMMER — WEIGHT: N/A	DROP: N/A	INSPECTOR: [illegible]	

DESCRIPTION	PENETRATION	DEPTH, FT	SAMPLES: TYPE NO. LOG	RECOV, FT	PENETR. RESIST. BL/6IN	PP POCKET PENETROMETER TSF	ROCK CORE: RECOVERY %	CRACK: SKETCH	CRACK: ...	RQD	CORE TIME	REMARKS
Red-brown clayey silt with some gravel (damp) (Demolition Fill)		1, 2, 3										
Red-brown clayey silt with bricks and asphalt (Demolition Fill)		4, 5										
BOTTOM OF BOREHOLE 6 FT		6										AUGER REFUSED AT 6 FT.

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LOG OF BORING AB-6 SHEET 1 OF 1

PROJECT AND LOCATION: LOCKPORT COAL TAR SITE LOCKPORT, N.Y.		ELEVATION AND DATUM: N/A	PROJECT NO.: [illegible]
DRILLING AGENCY: N.Y. S.E.G.	FOREMAN: J. LYONS	DATE STARTED: 10/19/83	DATE FINISHED: [illegible]
DRILLING EQUIPMENT: AUGER RIG		COMPLETION DEPTH: 15 FT	ROCK DEPTH: [illegible]
SIZE AND TYPE OF BIT: [illegible]	SIZE AND TYPE CORE BARREL: N/A	NO. SAMPLES: DIST. 1	UNDIST.: [illegible] CORE: N/A
CASING		WATER LEVEL: FIRST 3.0 FT	COMPL.: [illegible] 24 HR.: [illegible]
CASING HAMMER / WEIGHT: N/A	DROP: N/A	BORING ANGLE AND DIRECTION: VERTICAL	
SAMPLER: N/A		INSPECTOR: [illegible]	
SAMPLER HAMMER / WEIGHT: N/A	DROP: N/A		

DESCRIPTION	DEPTH, FT	SAMPLES TYPE NO. LOC.	REMARKS
BLACK CINDERS and crushed stone			
Yellow-white ashes with bricks, bottles, wood and asphalt (moist) (Demolition Fill)	1–2		
Yellow-white ashes and demolition fill (wet)	3–11		
Gray ashes and demolition fill with coal tar (wet)	12–15	S-1 (13–14)	
BOTTOM OF BOREHOLE 15 FT	15		[illegible] AUGER REFUSAL [illegible]

ATLANTIC SHALLOW BORING FIELD NOTES

"Rite in the Rain"®

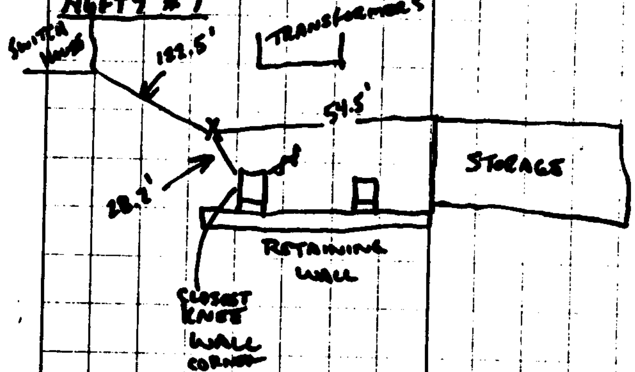
ALL-WEATHER
FIELD
Notebook No. 351

Lockport Transit St. S.k
Proj No 1284-06-02
5/26/92 – 5/29/92

HEFTY BORINGS

5/27/92 B. PRENTIS, R. KORRIGAN

HEFTY # 1



0-1' ~~0-2'~~ - GRAVEL & BROWN FILL

1'-2.5' ~~2-3.5'~~ - GRAVEL w/COAL TAR SATURATION

2.5' ~~3.5'~~ - REFUSAL

SB-1

SAMPLE COLLECTED ID# LPYPB9201-G from auger spoil ~2-4' interval

HEFTY # 02 - REFUSAL @ 2.5' - PROBABLE FOUNDATION

NO SAMPLE TAKEN

0-2.5' CLEAN BROWN FILL w/SOME GRAVEL

DIST TO FENCE CORNER - 63.0'

DIST TO SWITCH HOUSE - 77.0'

HEFTY # 03 - SEE # 2

DIST TO FENCE CORNER - 62.0'

DIST TO SWITCH HOUSE - 76.5'

FIGURE OF REFERENCE FOR HEFTY #02 - #06

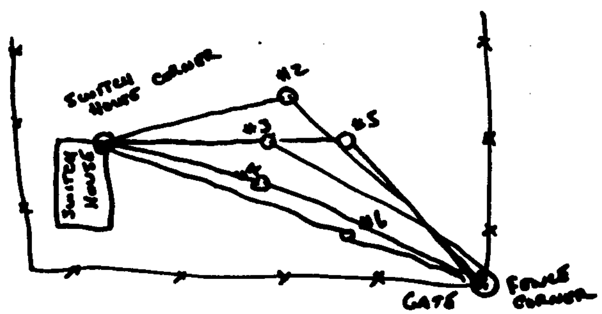
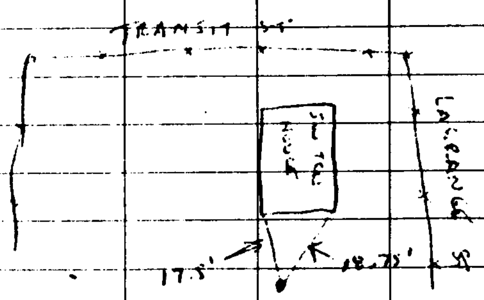


FIGURE OF REFERENCE HEFTY #07



HEFTY BORINGS

HEFTY #04 - SEE HEFTY #02

DIST TO FENCE CORNER - 60.0'

DIST TO SWITCH HOUSE - 75.5'

HEFTY #05 - SEE HEFTY #02

DIST TO FENCE CORNER - 58.5'

DIST TO SWITCH HOUSE - 80.5'

HEFTY #06 -

DIST TO FENCE CORNER - 35.5'

DIST TO SWITCH HOUSE - 86.0'

REFUSAL @ 2.5'

0-2.5' - CLEAN BROWN FILL w/ SOME GRAVEL — SB-6

SAMPLE COLLECTED ID # LPVPB9806-G

FROM AUGER SPOIL - 0-2' INTERVAL

HEFTY #07

0-1' - MIXTURE OF CLINKERS, BROKEN BRICK, STONES,

REACHED WATER @ UNKNOWN DEPTH

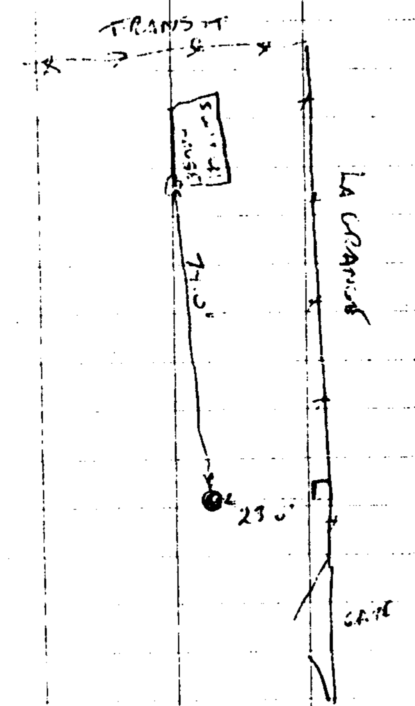
NOT SAMPLED DUE TO LACK OF SOIL

DARK BROWN/BLACK IN COLOR / NO ODOR

NOTE: FOUND PROBABLE FOUNDATION ≈ 2' EAST

OF HEFTY #07 JUST BELOW GRADE

FIGURE OF REFERENCE FOR HEFTY # 08



HEFTY BORINGS

HEFTY # 08

0-3' - BROWN GROUND FILL w/SOME GRAVEL

3'-6' CLEAN VERY FINE DARK GREY SAND SATURATED WITH COAL TAR.

6' - STOPPED BORING FOR FEAR THAT AUGER WOULD BECOME ~~[illegible]~~ STUCK - NO REFUSAL

SAMPLE COLLECTED ~~ID # EEB~~ ID # LPVPB9208-6.

FROM AUGER SPOIL - 3-6' INTERVAL

HEFTY # 09

0-1' GRAVEL, BROKEN BRICK, FILL

1' REFUSAL - POSSIBLE CONCRETE FOUNDATION

DIST TO FENCE - 41'

DIST TO STORAGE - 60' 1"

HEFTY # 10 - SEE # 09

DIST TO FENCE - 44' 11"

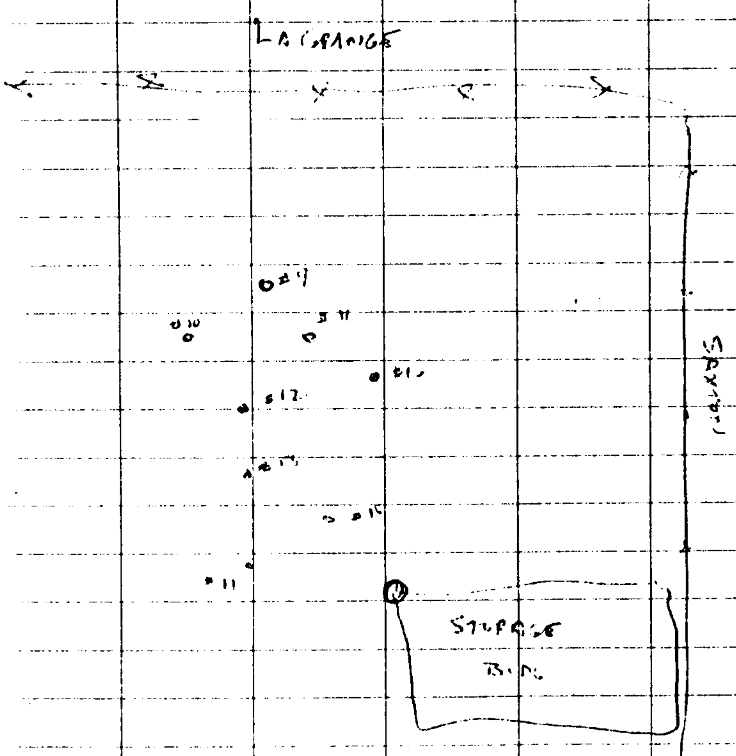
DIST TO STORAGE - 57' 10"

HEFTY # 11 - SEE # 09

DIST TO FENCE - 44' 1"

DIST TO STORAGE - 56' 3"

Figure of Reference Hefty #9 - #15



__Hefty #12__ - Site #09

Dist to Fence - 50' 7"

Dist to Storage - 52' 2"

__Hefty #13__ - Site #09

Dist to Fence - 64' 5"

Dist to Storage - 40' 5"

__Hefty #14__ - Site #09

Dist. to Fence - 82' 5"

Dist to Storage - 30' 4"

__Hefty #15__ - Site #09

Dist to Fence - 71' 10"

Dist to Storage - 26' 10"

__Hefty #16__

Dist to Fence - 50.0'

Dist to Storage - 47.75'

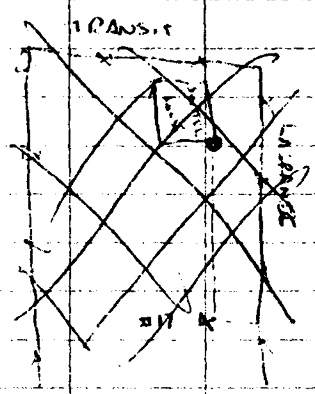
Brown ~~gravel~~ sand fill w/ gravel & broken [illegible]

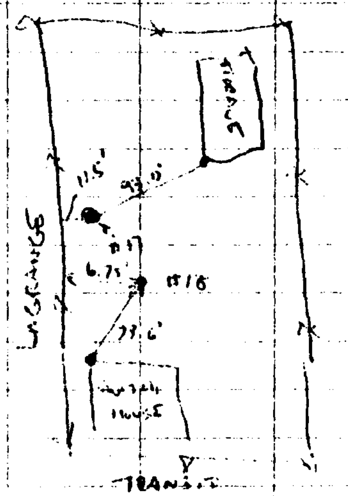
Water found entering hole

Sample collected ID # LPVPE93[illegible]-6 ~~LPVPB1204-6~~

from @ 1-1 1/2' interval from auger spoil

Figures & reference for Hefty # 17 & # 18





5/28/92 Hefty Borings Continued
R. Kerrigan & C. Menini

Hefty # 17

0-4 - Dark brown w/ gravel fill

4-6 - Dark brown sandy fill saturated w/ coal tar & small gravel mixed in

6' - End of boring. Auger became stuck - no refusal

No sample collected

Dist to fence along LaGrange - 11.5'

Dist to corner of storage bldg (~~switch house~~) - 93.0'

Hefty # 18

0-6' - Dark brown fine clayey (~~sandy~~) fill w/ some small stones, burnt coal fragments

No odor / moist - approaching water table @ unknown depth

Sample taken ID # LCVPB12-18-2

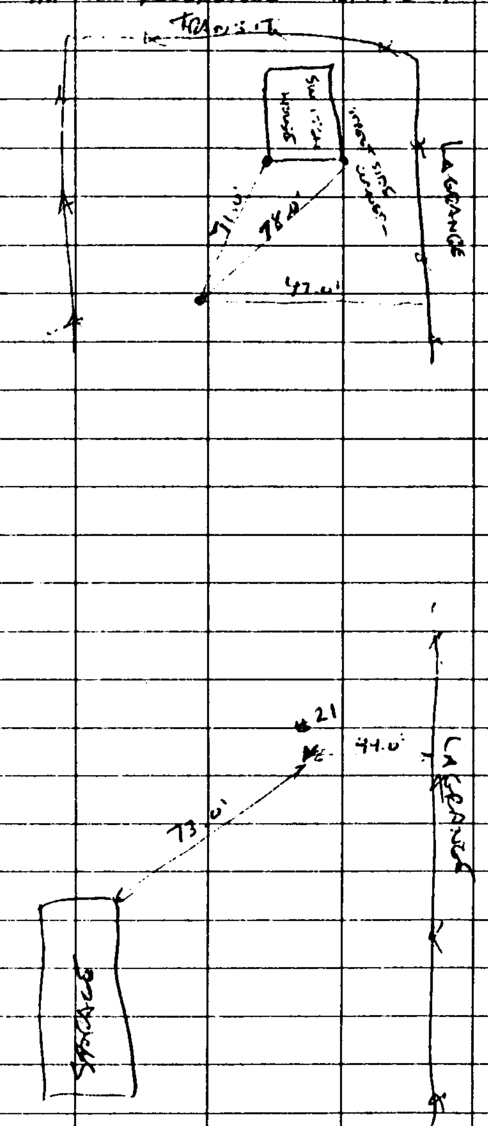
From 2-4' interval from auger spoil

Dist to fence along LaGrange - 6.75'

Dist to corner of switch house - 77.6'

6' - End of boring. Auger became stuck - no refusal

MAP OF REFERENCE HEFTY # 19



HEFTY # 19

0-6' - DARK BROWN FINE SANDY FILL w/ SMALL GRAVEL PIECES, BROKEN BRICK FRAGMENTS, SMALL UNBURNED COAL FRAGMENTS

NO ODOR / MOIST THROUGHOUT / NO SHEEN

6' - END OF BORING - AUGER BECAME STUCK

NO REFUSAL

DIST TO CORNER STREET SIDE OF SWITCH HOUSE 78.3

DIST TO OTHER CORNER ON SAME WALL OF SWITCH HOUSE - 71.0'

SAMPLE TAKEN ID # LPVPB92-19-G

TAKEN FROM AUGER SPOIL @ 4-6' INTERVAL

DIST TO FENCE ALONG LAGRANGE - 43.0'

HEFTY # 20

6" - REFUSAL - PROBABLE FOUNDATION (0-6 - GRAVEL)

DIST TO FENCE @ LAGRANGE - 31.75'

DIST TO SWITCH HOUSE CORNER - STREETSIDE (STR BROWN) - 55.5'

HEFTY # 21

0-3' - DR. BROWN SANDY FILL w/ 50% MIXTURE OF SMALL GRAVEL, COAL FRAGMENTS, CONCRETE FRAGMENTS - MOIST / NO ODOR

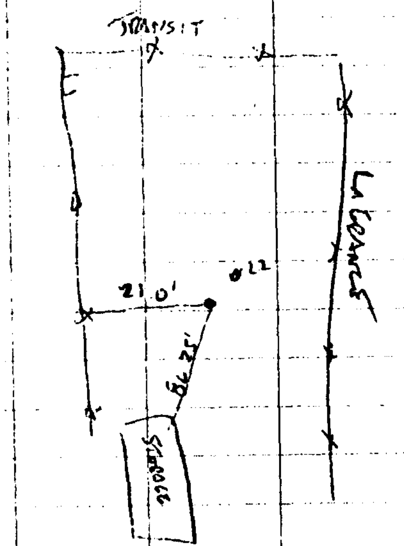
3' - REFUSAL - FEELS LIKE FOUNDATION - WATER IN HOLE - SAMPLE ID # LPVPB92-21-G

SAMPLE TAKEN FROM AUGER SPOIL 1-3' INTERVAL

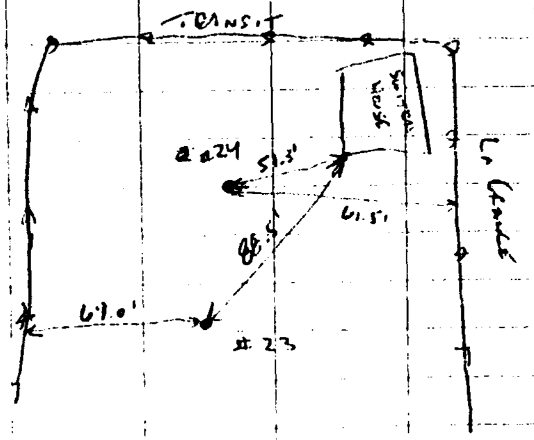
DIST TO ~~CORNER OF SWITCH HOUSE (STR~~ FENCE @ LAGRANGE - 44.0

DIST TO CORNER OF STORAGE BLDG - 73.0'

MAP & REFERENCE FOR HEFTY # 22



MAP of REFERENCE FOR HEFTY # 23



HEFTY # 22

0-2.5' - DARK BROWN SANDY FILL w/ MEDIUM GRAVEL. MOIST / NO ODOR

2.5' - REFUSAL. PROBABLE FOUNDATION or PAD

DIST TO FENCE - 21.0'

DIST TO CORNER OF STORAGE - 86.25'

NO SAMPLE TAKEN

HEFTY # 23

0-2' - DK. BROWN/BLACK SANDY FILL w/ SMALL GRAVEL

2-3' - FINE SAND DK. BROWN/BLACK SATURATED w/ COAL TAR = VERY STRONG ODOR. - WATER ≈ 3'

3' - END of BORING - NO REFUSAL

DIST TO FENCE - 69.0'

DIST TO CORNER of SWITCH HOUSE - 88.5'

HEFTY # 24

0-1.5' - BLACK MOIST MEDIUM SANDY-SIZED COFFEE-GROUND CONSISTANCY, UNIDENTIFIABLE ODOR, STRONG ODOR, IDENTIFIED VERY THIN WOOD SHAVINGS INTERMIXED - NO STONES - SOME SMALL GRAVEL, COMPOST LIKE

SAMPLES TAKEN ID # LPVPB9224-G

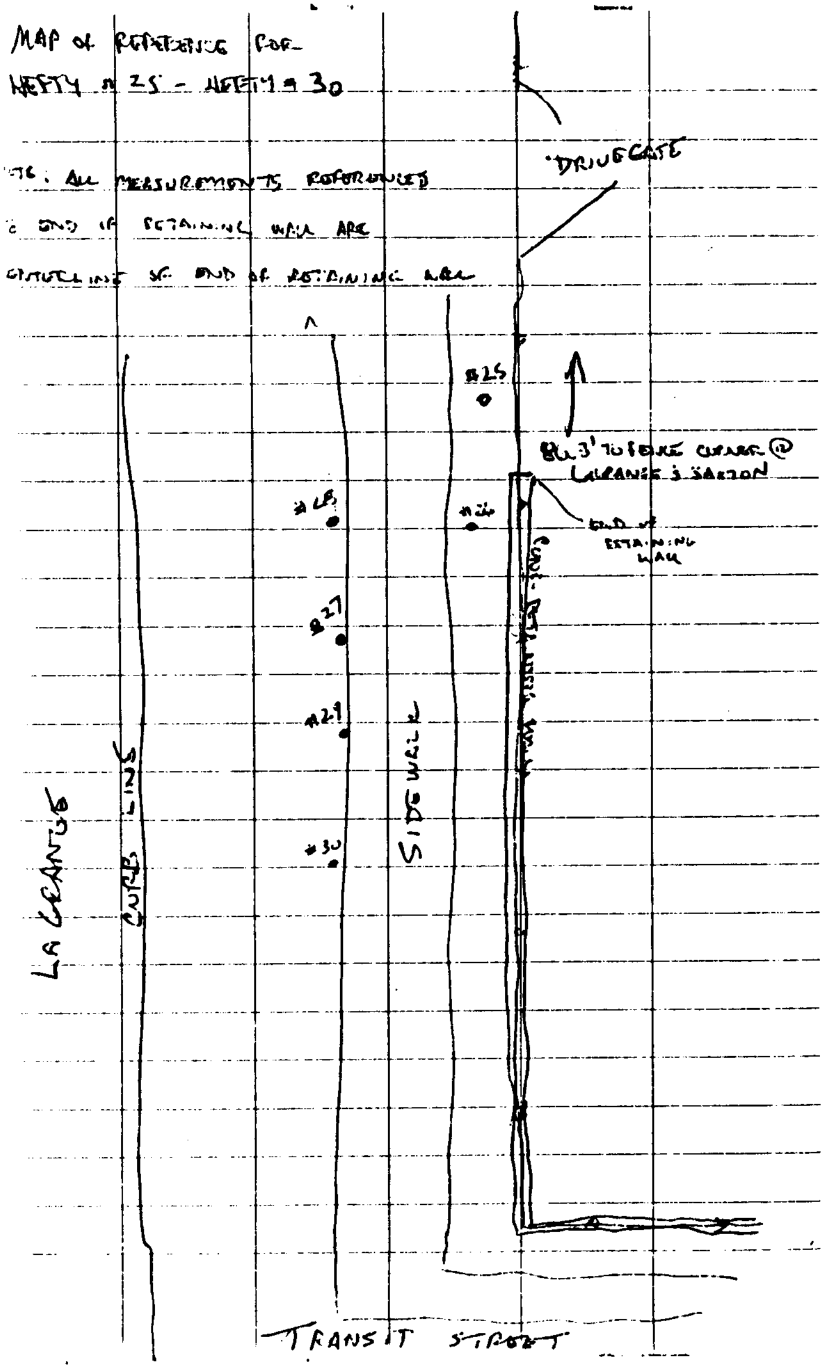
TAKEN FROM INNER EDGE of BORING @ 0-1' INTERVAL

DIST TO FENCE @ LAGRANGE - 61.5'

DIST TO CORNER of SWITCH HOUSE - 51.3'

MAP of REFERENCE FOR
HEFTY # 25 - HEFTY # 30

NOTE: ALL MEASUREMENTS REFERENCED
@ END OF RETAINING WALL ARE
CENTERLINE OF END OF RETAINING WALL



HEFTY # 25

0-0.5' - GRAVEL & COBBLES

0.5' - REFUSAL. CONCRETE - POSSIBLE DUCT COVERING.

NO SAMPLE

15" FROM FENCE ALONG LAGRANGE (OUTSIDE SUBSTATION)

DIST FROM FENCE CORNER @ LAGRANGE AND SALTON - 63.5'

HEFTY # 26

0-5' - GRAVEL W/ MED. BROWN TOPSOIL TYPE SOIL. NO ODOR/NO WATER.

NO SAMPLE TAKEN. NO REFUSAL

2' FROM FENCELINE

7' FROM END OF RETAINING WALL

HEFTY # 27

0-3' - BROWN TOPSOIL, MED. SAND, FACE OF STONES

3-4' - BROWN CLAY W/ VERY SMALL GRAVEL, MOIST

4-5.5' - BROWN CLAY W/ VERY COARSE SAND - COAL TAR ODOR & SHEEN, MOIST - WATERTABLE ± 5.5'

SAMPLE TAKEN - ID # LFVPB9227-G

TAKEN FROM AUGER SPOIL @ 4-5.5' INTERVAL

DIST TO FENCELINE - 7.3'

DIST TO END OF RETAINING WALL - 26.0'

HEFTY # 28

0-9' - UNIFORM COLUMN OF CLAYEY - SILTY SAND, DARK BROWN WITH SOME ~~COBBLES~~ GRAVEL & SMALL STONES, NO ODOR, MOIST

SAMPLE TAKEN ID # LPVPB9228-G

TAKEN FROM AUGER SPOIL ≈ 6-8' INTERVAL

DIST TO FENCELINE - 8.3'

DIST TO END OF RETAINING WALL - 9.8'

HEFTY # 29

DIST TO FENCELINE - 7.8'

DIST TO ~~[illegible]~~ END OF RETAINING WALL - 43.3'

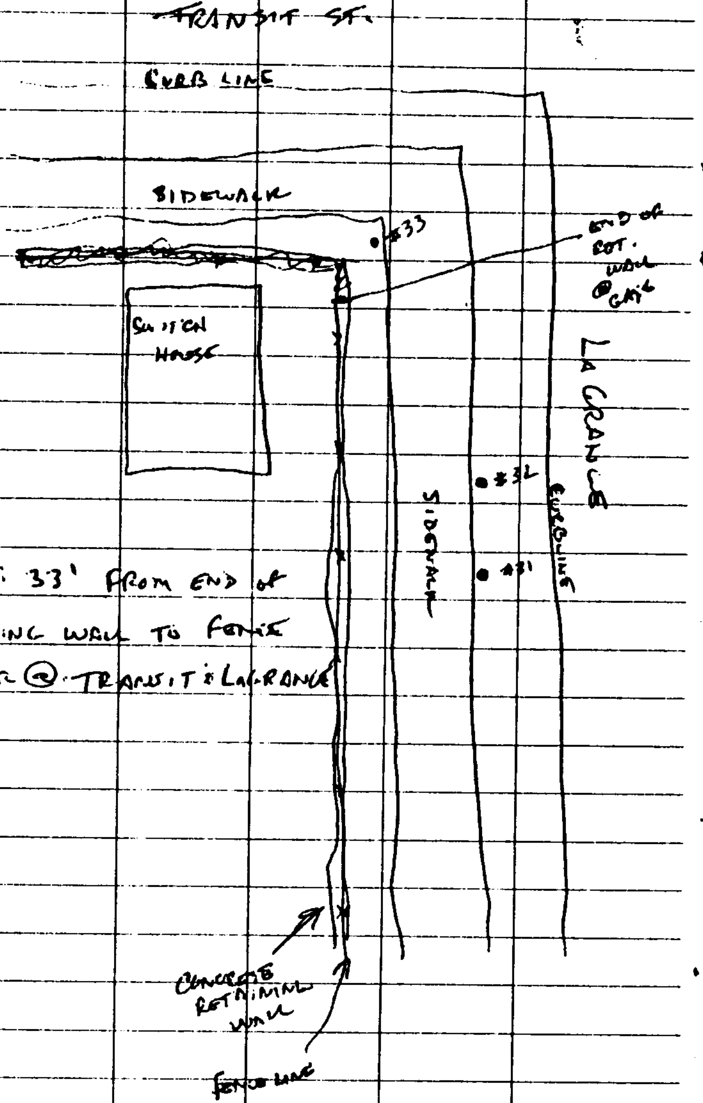
0-4' - UNIFORM COLUMN OF CLAYEY - SILTY SAND, DARK BROWN W/ SOME ~~COBBLES~~ GRAVEL

4-9' - WATER TABLE @ ≈ 4' - SOIL IS DARKER AND SILTY W/ POSSIBLE SHEEN - SOIL DOES NOT HAVE ODOR BUT ODOR IS SLIGHTLY PRESENT IN HOLE

SAMPLE TAKEN. ID # LPVPB9229-G

TAKEN FROM AUGER SPOIL ≈ 7-9' INTERVAL

MAP OF REFERENCE FOR HERTY #31 - HERTY #33



NOTE: 33' FROM END OF RETAINING WALL TO FENCE CORNER @ TRANSIT & LAGRANGE

HERTY #30

DIST FROM FENCELINE - 7.5'

DIST TO ~~RET. WALL~~ ENDPOINT OF RETAINING WALL @ LAGRANGE ~~TRANSIT~~ - 81.0'

0-6' - UNIFORM DK. BROWN MEDIUM SAND TOPSOIL W/ ~~SAND~~ ~~COBBLES~~ GRAVEL, CLINKER FOUND

6' - SATURATED SILT W/ CONCRETE & STONES CAUSE REFUSAL - NO ODOR IN HOLE, BOTTOM OF HOLE WATER SEEN. ATTEMPT TO SLAM FOR SAMPLE. NO ODOR IN SAMPLE

SAMPLE TAKEN ID # LPVPB9230-G

SLAMMED FROM 4'-6' INTERVAL

HERTY #31

DIST TO FENCELINE @ LAGRANGE - 7.6'

DIST TO ℄ END RET. WALL @ TRANSIT ST - 48.7'

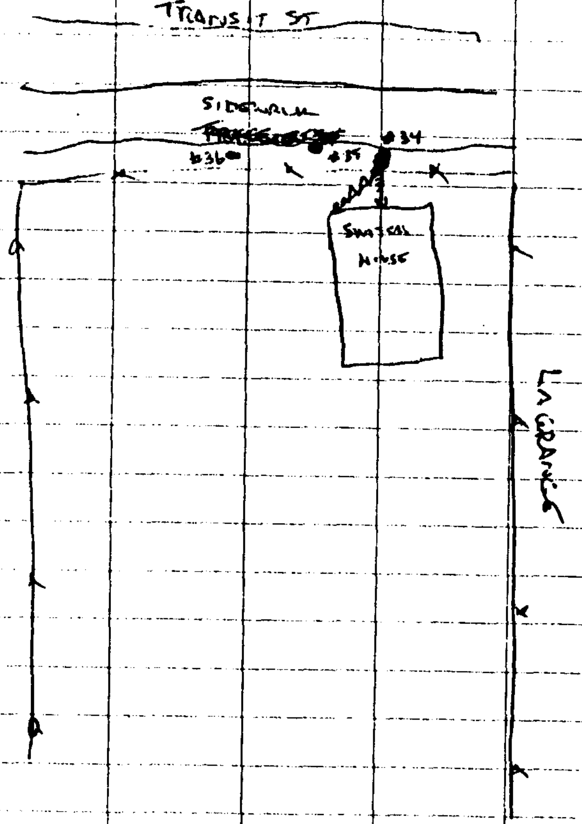
0-4' - BROWN SANDY SOIL W/ ~~COBBLES~~ GRAVEL, NO ODOR, MOIST

4-6' - DK. BROWN - BLACK FINE SILT (CLAY) W/ COHESIVE COBBLE-SIZE GLOBS OF TAR - ODOR IN HOLE, ODOR IN GLOBS, MOIST, SOME GRAVEL ~~[illegible]~~ ~~[illegible]~~

SAMPLE TAKEN ID# LPVPB9231-G

TAKEN FROM AUGER SPOIL @ ≈ 5-6' INTERVAL

MAP of REFERENCE FOR HEFTY # 34 – HEFTY #36



HEFTY #32

DIST TO FENCELINE @ LAGRANGE – 7.3'

DIST TO ℄ END RET. WALL @ TRANSIT ST. – 23.5'

0–4' – BROWN SANDY SILT w/ SOME SMALL STONES, NO ODOR, DRY

4–6' – DK. BROWN MEDIUM SAND SATURATED w/ COAL TAR, MOIST, STRONG COAL TAR ODOR

NO SAMPLE TAKEN – NO REFUSAL

HEFTY #33

DIST TO FENCELINE @ LAGRANGE – 1.8'

DIST PAST END OF RET WALL TOWARD TRANSIT ST – 16.3'

0–1.5' – DK. BROWN ~~SANDY~~ MEDIUM SAND w/ 50% WHOLE BRICKS & RUBBLE

1.5' – REFUSAL – CONCRETE ACROSS BOTTOM OF HOLE – NO ODOR

NO SAMPLE TAKEN

5/27/92 HEFTY BORINGS CONTINUS

HEFTY #34

~~0-4~~

0-3.5' – DK BROWN MOD SAND w/ SOME SMALL GRAVEL, MOIST

3.5-4.0' – DK BROWN-BLACK MEDIUM SAND w/ SOME SMALL GRAVEL, MOIST, w/ COAL TAR LOOKING SATURATION BUT ODOR MORE LIKE THAT OF SEWAGE (NEAR SEWERLINE) – WATER IN BOTTOM of HOLE – COAL TAR DEFINATE @ WATERTABLE

DIST TO FENCECORNER @ TRANSIT'S LAGRANGE – 21.0'

DIST TO ~~CORNER OF SWITCH HOUSE~~ FENCE LINE @ TRANSIT – 1.5'

NO SAMPLE TAKEN

HEFTY #35

DIST TO FENCE CORNER @ TRANSIT'S LAGRANGE – 35.3'

DIST TO FENCE ALONG TRANSIT – 1.5'

0-3' – BROWN MEDIUM SAND w/ SOME SMALL GRAVEL, MOIST

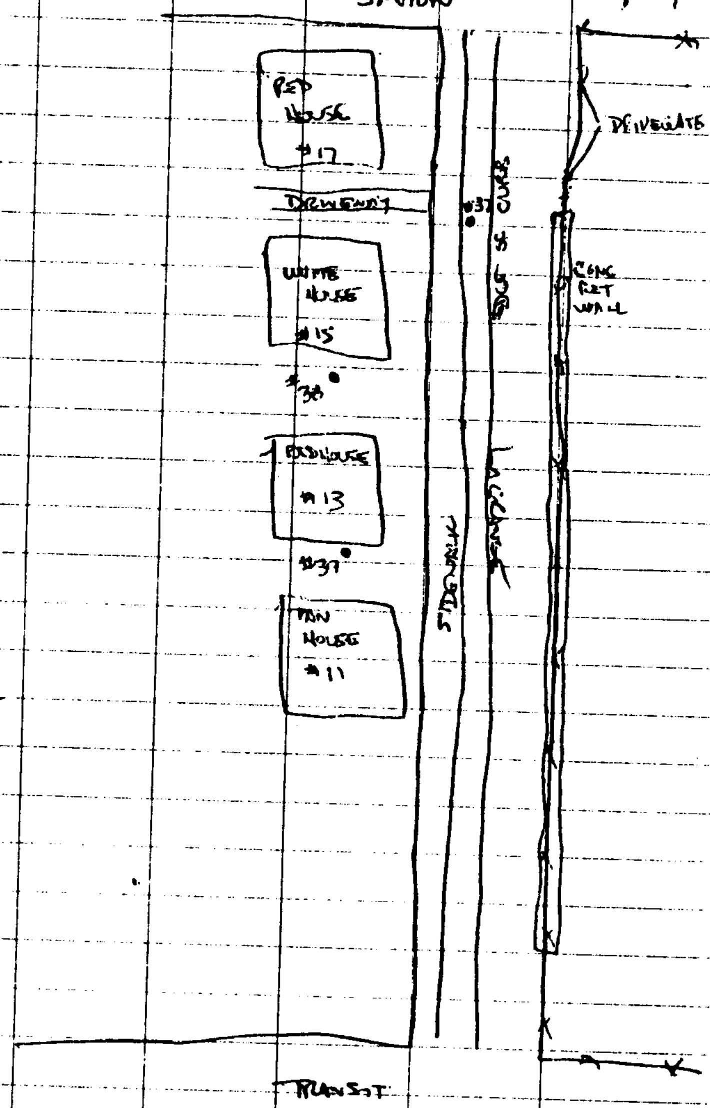
3-4' – BROWN MEDIUM SAND w/ SOME SMALL GRAVEL, SATURATED w/ COAL TAR, MOIST

4' – END OF BORING – NO REFUSAL

NO SAMPLE TAKEN

30 55' 1.3'

MAP of REFERENCE - HEFTY #37 - #39



HEFTY #36

DIST TO FENCE CORNER @ TRANSIT & LAGRANGE - 53.0'

DIST TO FENCE ALONG TRANSIT ST - 1.5'

0-4' - BROWN MEDIUM SAND w/ SOME SMALL GRAVEL

4-6' - BROWN MEDIUM SAND w/ SOME SMALL GRAVEL, SATURATED w/ COAL TAR & MOIST

6' - END OF BORING - NO REFUSAL

NO SAMPLE TAKEN

HEFTY #37

0-8' - DK BROWN MOIST MEDIUM SAND w/ SOME SMALL GRAVEL NO ODOR

8-11' - MOIST LIVER COLORED (EARTHY TAN) VERY FINE CLAYEY SILT w/ NO STONES - NO ODOR, COHESIVE

SAMPLE TAKEN ID# LPVPB9237-G

FROM AUGER SPOIL @ 9-11' INTERVAL

11' - END OF BORING, NO REFUSAL

DIST TO FENCE CORNER @ LAGRANGE & SAYTON - 102.0'

DIST TO END OF CONC. RET. WALL - 41.5'

HOFTY # 38

0-3' - ~~DK~~ BROWN-BLACK MEDIUM SAND FILL w/ ASSORTED (SM. & LG.) GRAVEL

3-7' - DK. BROWN FINE SILT w/ SOME SMALL GRAVEL, COAL TAR ODOR ALTHOUGH NOT VERY VISABLE. WATERTABLE MEASURED @ 5.5'. IT WOULD APPEAR THAT THIS IS ALSO THE POINT AT WHICH THE COAL TAR ODOR BECOMES MORE PRONOUNCED.

SAMPLE TAKEN ID # LPVPB9238-G

TAKEN FROM AUGER SPOILS @ 5-7' INTERVAL

7' - REFUSAL - SOLID OBJECT ACROSS BOTTOM OF HOLE

DIST TO PERP POINT @ FENCE ALONG LAGRANGE - 62.3'

DIST TO ℄ END OF CONC. RET. WALL - 73.0'

DIST TO WALL OF WHITE HOUSE #15 - 4.3'

DIST TO CORNER OF PORCH OF WHITE HOUSE - 14.7'

HOFTY # 39

0-1.5' - DK. BROWN SANDY FILL w/ SM. & LG. GRAVEL & BRICK FRAGMENTS, DRY

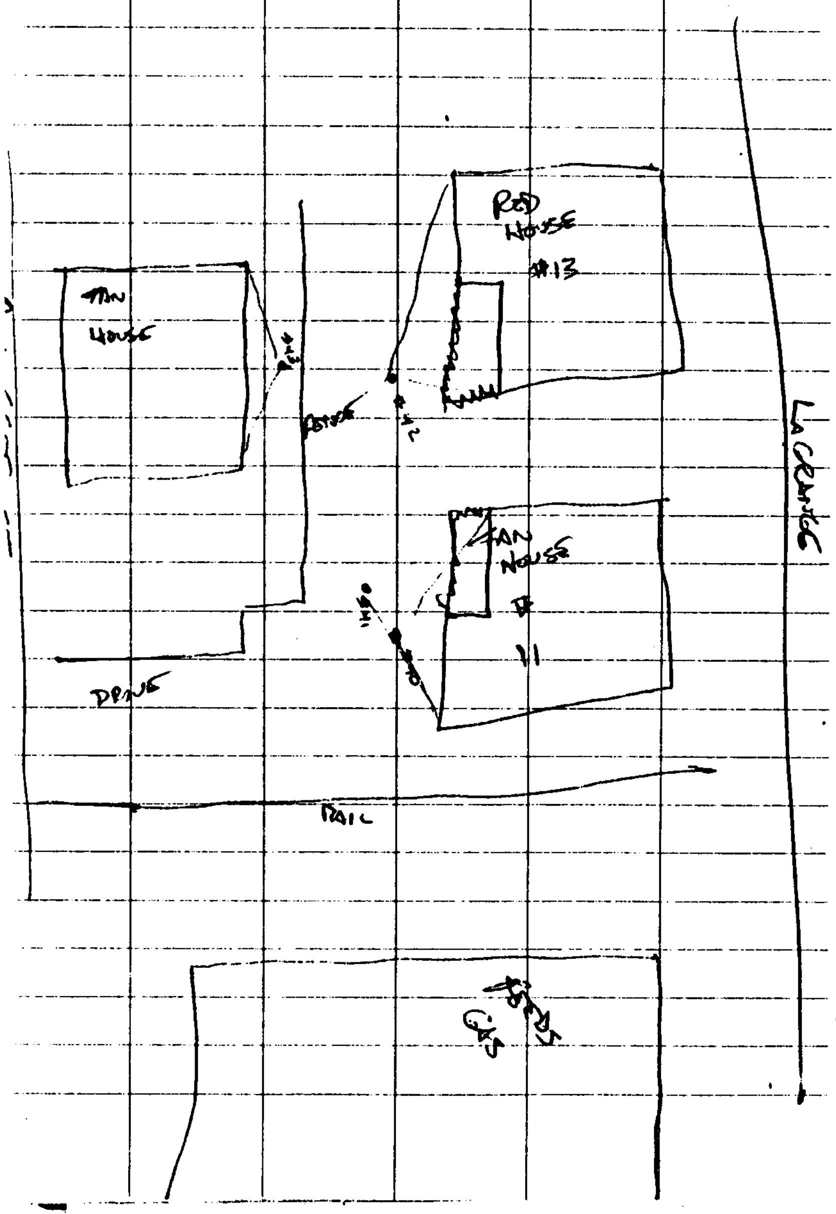
1.5' - REFUSAL - PROBABLE HOUSE FOUNDATION (FIELDSTONE STYLE) NO SAMPLE

DIST TO PERP PT. OF FENCE ALONG LAGRANGE - 58.0'

DIST TO FRONT CORNER OF HOUSE - 4.3'

DIST FROM WALL OF HOUSE - 6.0'

MAP of REFERENCE - HEFTY #40 -



HEFTY #40

0-1' - DK. GREY FILL w/ ASS. GRAVEL, DRY

1' - REFUSAL

DIST TO HOUSE CORNER - 17.0'

DIST TO FAR PORCH CORNER - 15.5

HEFTY #41

0-2' - DK. GREY FILL w/ ASS GRAVEL, DRY

2' - REFUSAL

DIST TO HOUSE CORNER - 14.5

DIST TO FAR PORCH CORNER - 18.5

HEFTY # 42

0-1' - DK. BROWN SANDY FILL w/ LARGE GRAVEL, DRY

1' - REFUSAL

DIST TO HOUSE CORNER 13.8'

DIST TO ~~HOUSE~~ FAR PORCH CORNER - 14.0'

HEFTY # 43

0-5' - DK. BROWN FINE SANDY TOPSOIL w/ SMALL GRAVEL, DRY, NO ODOR

5' - REFUSAL

SAMPLE TAKEN ID # LPVFB9243-G

FROM AUGER SPOIL - ≈ 3-5' INTERVAL

DIST TO HOUSE CORNER ON GAS STATION SIDE - 13.2'

DIST TO OTHER HOUSE CORNER - 13.5'

~~A~~SFTY #44

0-7' - MOIST, DK. BROWN-BLACK ~~[illegible]~~ COHESIVE CLAYEY SILT W/ SOME SMALL GRAVEL

7-9' - MOIST, DK BROWN COHESIVE CLAYEY SILT W/ LITTLE GRAVEL, POSSIBLE FAINT COAL TAR ODOR

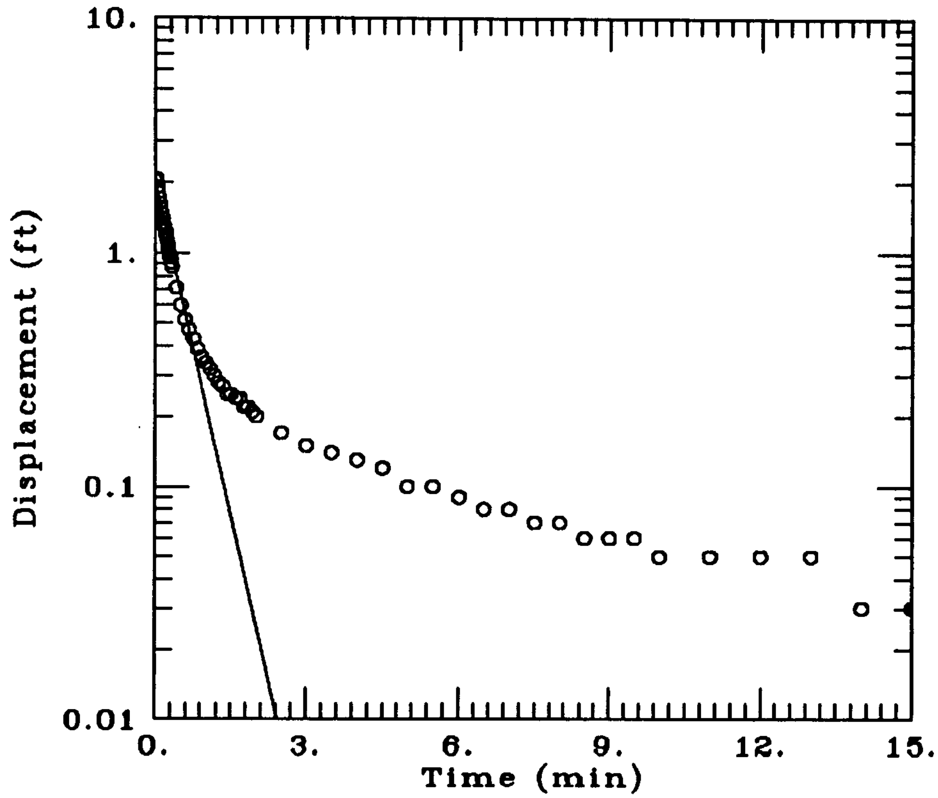
SAMPLE TAKEN FROM AUGER SPOIL @ 7-9' INTERVAL

ID # LPVPB9244-C

DIST TO FENCE CORNER @ TRANSIT & LAGRANGE - 111.0'

DIST TO FENCE ALONG LAGRANGE (PERP) - 43.3'

SLUG TEST PERMEABILITY DATA



DATA SET:
c:\copy\smw3s.dat
10/20/92

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
May 28, 1992

ESTIMATED PARAMETERS:
K = 0.001648 ft/min
y0 = 2.012 ft

TEST DATA:
H0 = 2.07 ft
rc = 0.083 ft
rw = 0.24 ft
L = 11.6 ft
b = 16.9 ft
H = 11.8 ft

Slug Extraction Test SMW-3S

Atlantic Env. Services, Inc.	Client: New York State Electric & Gas
Project No.: 1284-06-02	Location: Lockport Transit St. MGP Site

SMW-3S

SE1000B
Environmental Logger
05/29 09:45

Unit# 01027 Test# 2

INPUT 1: Level (F) TOC

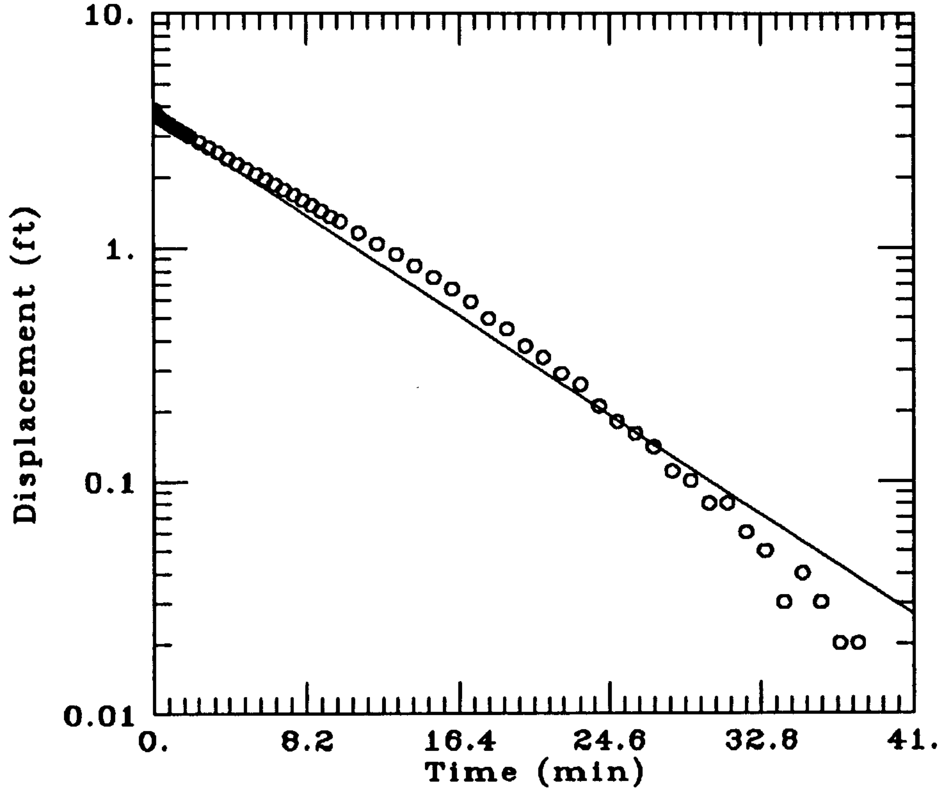
Reference 0.00
Scale factor 20.14
Offset 0.08

Step# 0 05/29 08:34

Elapsed Time	Value
0.0000	-0.00
0.0033	-0.01
0.0066	-0.15
0.0099	2.29
0.0133	2.62
0.0166	2.90
0.0200	1.75
0.0233	1.38
0.0266	2.02
0.0300	2.07
0.0333	2.03
0.0500	1.91
0.0666	1.81
0.0833	1.71
0.1000	1.63
0.1166	1.55
0.1333	1.48
0.1500	1.41
0.1666	1.35
0.1833	1.29
0.2000	1.24
0.2166	1.18
0.2333	1.13
0.2500	1.08
0.2666	1.03
0.2833	0.99
0.3000	0.95
0.3166	0.91
0.3333	0.87
0.4167	0.71
0.5000	0.60
0.5833	0.52
0.6667	0.47
0.7500	0.43
0.8333	0.39
0.9167	0.36
1.0000	0.34
1.0833	0.32
1.1667	0.30
1.2500	0.28
1.3333	0.27
1.4166	0.25
1.5000	0.25

1.5833	0.24
1.6667	0.24
1.7500	0.22
1.8333	0.22
1.9167	0.21
2.0000	0.20
2.5000	0.17
3.0000	0.15
3.5000	0.14
4.0000	0.13
4.5000	0.12
5.0000	0.10
5.5000	0.10
6.0000	0.09
6.5000	0.08
7.0000	0.08
7.5000	0.07
8.0000	0.07
8.5000	0.06
9.0000	0.06
9.5000	0.06
10.0000	0.05
11.0000	0.05
12.0000	0.05
13.0000	0.05
14.0000	0.03
15.0000	0.03
16.0000	0.03
17.0000	0.03
18.0000	0.03
19.0000	0.03
20.0000	0.03
21.0000	0.02
22.0000	0.03
23.0000	0.03
24.0000	0.02
25.0000	0.03
26.0000	0.03
27.0000	0.02
28.0000	0.02
29.0000	0.02
30.0000	0.01
31.0000	0.03
32.0000	0.03
33.0000	0.03
34.0000	0.03
35.0000	0.01
36.0000	0.02
37.0000	0.02
38.0000	0.01
39.0000	0.02
40.0000	0.01
41.0000	0.01
42.0000	0.01
43.0000	0.02
44.0000	0.02
45.0000	0.01
46.0000	0.02
47.0000	0.02
48.0000	0.02

49.0000	0.01
50.0000	0.01
51.0000	0.02
52.0000	0.01
53.0000	0.02
54.0000	0.00
55.0000	0.01
56.0000	0.02
57.0000	0.02
58.0000	0.01
59.0000	0.01
60.0000	0.01
61.0000	0.01
62.0000	0.02
63.0000	0.01
64.0000	0.01
65.0000	0.01
66.0000	0.01
67.0000	0.01



DATA SET:
c:\copy\smw3d.dat
10/20/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
May 28, 1992

ESTIMATED PARAMETERS:
K = 0.0001616 ft/min
y0 = 3.078 ft

TEST DATA:
H0 = 3.9 ft
rc = 0.083 ft
rw = 0.24 ft
L = 7.6 ft
b = 16.96 ft
H = 16.96 ft

Slug Extraction Test SMW-3D

Atlantic Env. Services, Inc.	Client: New York State Electric & Gas
Project No.: 1284-06-02	Location: Lockport Transit St. MGP Site

SMW-3D

SE1000B
Environmental Logger
05/29 09:49

Unit# 01027 Test# 2

INPUT 2: Level (F) TOC

Reference	0.00
Scale factor	19.98
Offset	0.00

Step# 0 05/29 08:34

Elapsed Time	Value
0.0000	-0.03
0.0033	-0.03
0.0066	0.37
0.0099	5.95
0.0133	2.84
0.0166	4.71
0.0200	3.86
0.0233	0.52
0.0266	4.46
0.0300	3.11
0.0333	2.76
0.0500	3.90
0.0666	3.86
0.0833	3.84
0.1000	3.78
0.1166	3.78
0.1333	3.77
0.1500	3.75
0.1666	3.73
0.1833	3.71
0.2000	3.71
0.2166	3.70
0.2333	3.69
0.2500	3.68
0.2666	3.67
0.2833	3.65
0.3000	3.65
0.3166	3.63
0.3333	3.62
0.4167	3.58
0.5000	3.53
0.5833	3.49
0.6667	3.46
0.7500	3.43
0.8333	3.38
0.9167	3.36
1.0000	3.32
1.0833	3.29
1.1667	3.26
1.2500	3.23
1.3333	3.20
1.4166	3.17
1.5000	3.14

1.5833	3.11
1.6667	3.09
1.7500	3.06
1.8333	3.03
1.9167	3.00
2.0000	2.98
2.5000	2.82
3.0000	2.68
3.5000	2.55
4.0000	2.41
4.5000	2.29
5.0000	2.18
5.5000	2.07
6.0000	1.97
6.5000	1.87
7.0000	1.77
7.5000	1.69
8.0000	1.60
8.5000	1.52
9.0000	1.44
9.5000	1.36
10.0000	1.30
11.0000	1.16
12.0000	1.04
13.0000	0.94
14.0000	0.84
15.0000	0.75
16.0000	0.67
17.0000	0.59
18.0000	0.50
19.0000	0.45
20.0000	0.38
21.0000	0.34
22.0000	0.29
23.0000	0.26
24.0000	0.21
25.0000	0.18
26.0000	0.16
27.0000	0.14
28.0000	0.11
29.0000	0.10
30.0000	0.08
31.0000	0.08
32.0000	0.06
33.0000	0.05
34.0000	0.03
35.0000	0.04
36.0000	0.03
37.0000	0.02
38.0000	0.02
39.0000	0.01
40.0000	0.01
41.0000	0.01
42.0000	0.00
43.0000	0.00
44.0000	0.00
45.0000	0.00
46.0000	0.00
47.0000	0.00
48.0000	-0.00

49.0000	0.00
50.0000	-0.00
51.0000	-0.00
52.0000	-0.01
53.0000	-0.00
54.0000	-0.01
55.0000	-0.00
56.0000	-0.00
57.0000	-0.00
58.0000	-0.01
59.0000	-0.00
60.0000	-0.01
61.0000	-0.01
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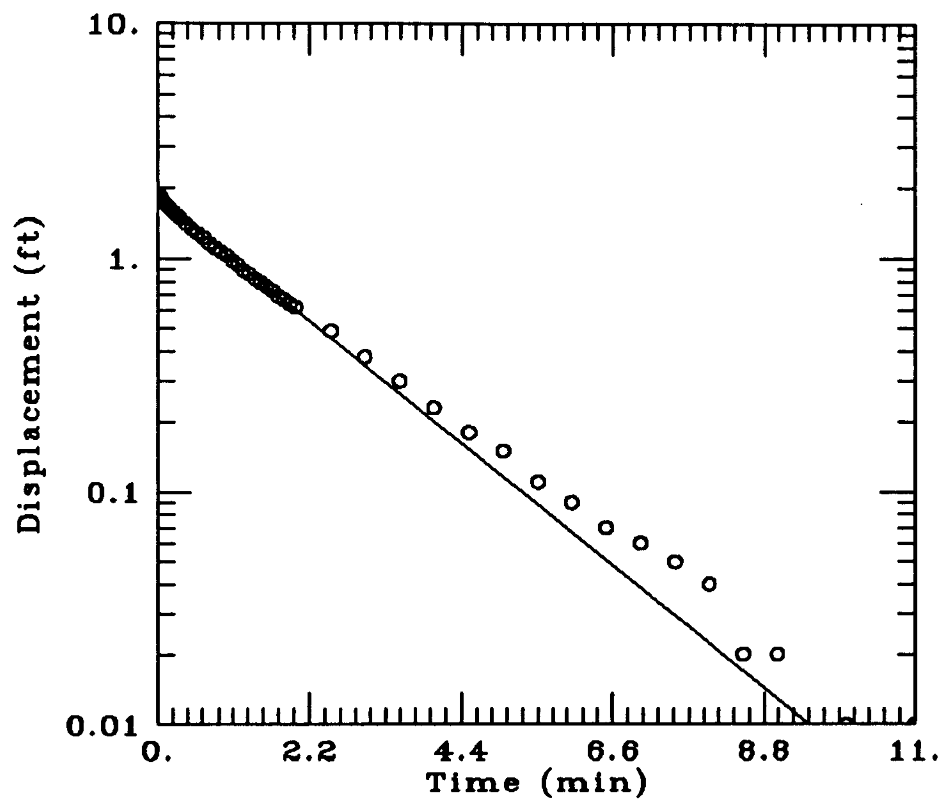
67.0000	-0.00



DATA SET:
c:\copy\smw4s.dat
10/20/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
May 27, 1992

ESTIMATED PARAMETERS:
K = 0.000678 ft/min
y0 = 1.800 ft

TEST DATA:
H0 = 1.84 ft
rc = 0.083 ft
rw = 0.34 ft
L = 6.6 ft
b = 16.6 ft
H = 8.6 ft

Slug Extraction Test SMW-4S

Atlantic Env. Services, Inc.	Client: New York State Electric & Gas
Project No.: 1284-06-02	Location: Lockport Transit St. MGP Site

SMW-4S

SE1000B
Environmental Logger
05/28 06:33

Unit# 01027 Test# 0

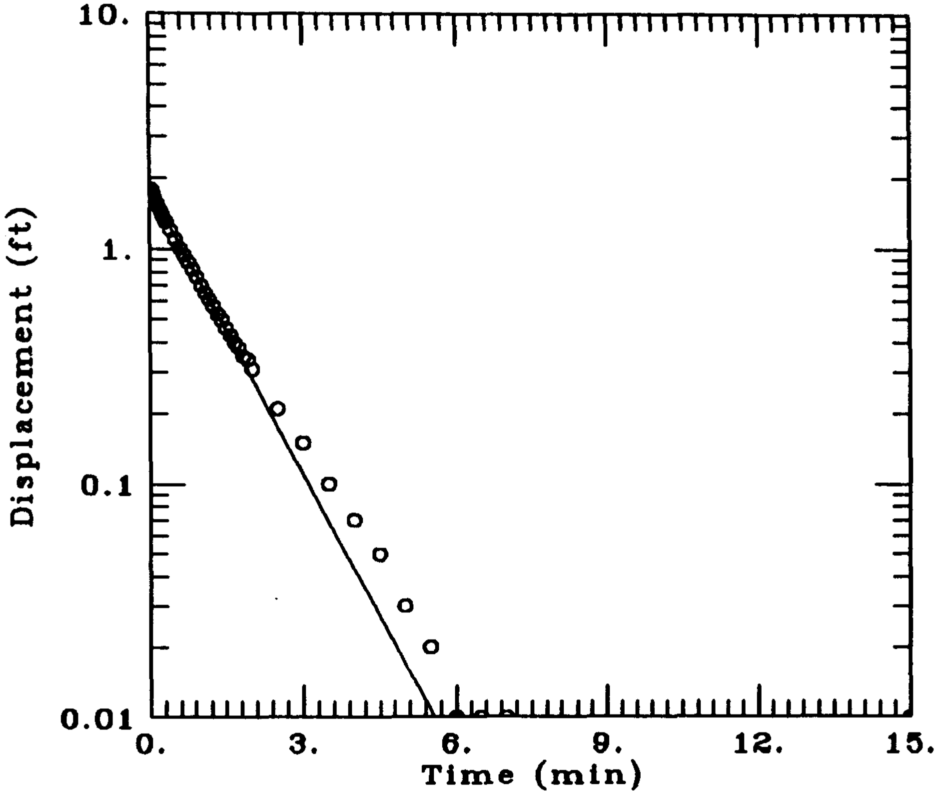
INPUT 2: Level (F) TOC

Reference	0.00
Scale factor	19.98
Offset	0.00

Step# 0 05/27 16:58

Elapsed Time	Value
0.0000	-0.01
0.0033	0.03
0.0066	0.91
0.0099	1.15
0.0133	0.37
0.0166	0.23
0.0200	1.49
0.0233	0.70
0.0266	1.42
0.0300	1.82
0.0333	1.71
0.0500	1.84
0.0666	1.80
0.0833	1.76
0.1000	1.74
0.1166	1.71
0.1333	1.69
0.1500	1.67
0.1666	1.65
0.1833	1.63
0.2000	1.61
0.2166	1.60
0.2333	1.57
0.2500	1.57
0.2666	1.54
0.2833	1.53
0.3000	1.52
0.3166	1.50
0.3333	1.48
0.4167	1.41
0.5000	1.34
0.5833	1.28
0.6667	1.23
0.7500	1.16
0.8333	1.11
0.9167	1.07
1.0000	1.03
1.0833	0.98
1.1667	0.94
1.2500	0.89
1.3333	0.86
1.4166	0.82
1.5000	0.79

1.5833	0.76
1.6667	0.73
1.7500	0.69
1.8333	0.67
1.9167	0.64
2.0000	0.62
2.5000	0.49
3.0000	0.38
3.5000	0.30
4.0000	0.23
4.5000	0.18
5.0000	0.15
5.5000	0.11
6.0000	0.09
6.5000	0.07
7.0000	0.06
7.5000	0.05
8.0000	0.04
8.5000	0.02
9.0000	0.02
9.5000	0.01
10.0000	0.01
11.0000	0.01
12.0000	0.00
13.0000	0.00
14.0000	0.00
15.0000	0.00



DATA SET:
e:\copy\smw4d.dat
10/20/92

AQUIFER TYPE:
Unconfined

SOLUTION METHOD:
Bouwer-Rice

TEST DATE:
May 27, 1992

ESTIMATED PARAMETERS:
K = 0.000752 ft/min
y0 = 1.808 ft

TEST DATA:
H0 = 1.70 ft
rc = 0.083 ft
rw = 0.24 ft
L = 12.6 ft
b = 16.7 ft
H = 16.7 ft

Slug Extraction Test SMW-4D

Atlantic Env. Services, Inc.	Client: New York State Electric & Gas
Project No.: 1284-06-02	Location: Lockport Transit St. MGP Site

SMW-4D

SE1000B
Environmental Logger
05/28 06:31

Unit# 01027 Test# 0

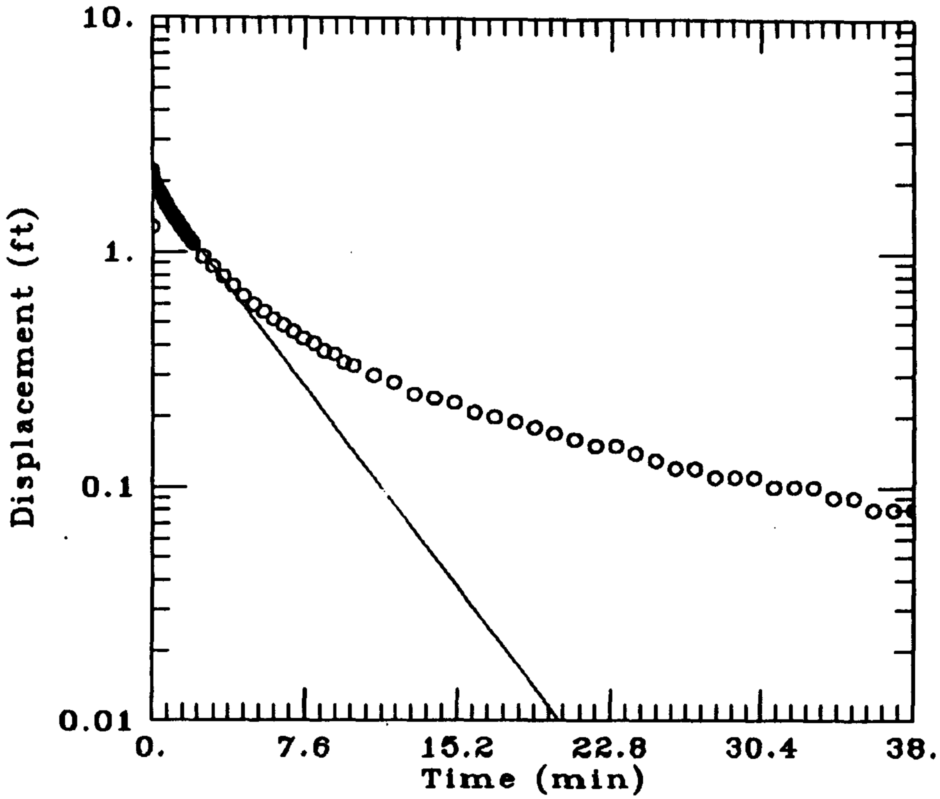
INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 20.14
Offset 0.78

Step# 0 05/27 16:58

Elapsed Time	Value
0.0000	0.02
0.0033	1.75
0.0066	1.59
0.0099	-0.77
0.0133	-0.73
0.0166	2.12
0.0200	0.95
0.0233	0.96
0.0266	1.52
0.0300	1.79
0.0333	1.76
0.0500	1.79
0.0666	1.75
0.0833	1.71
0.1000	1.67
0.1166	1.64
0.1333	1.60
0.1500	1.57
0.1666	1.54
0.1833	1.52
0.2000	1.49
0.2166	1.46
0.2333	1.44
0.2500	1.41
0.2666	1.38
0.2833	1.36
0.3000	1.34
0.3166	1.32
0.3333	1.30
0.4167	1.20
0.5000	1.10
0.5833	1.01
0.6667	0.94
0.7500	0.88
0.8333	0.82
0.9167	0.76
1.0000	0.70
1.0833	0.65
1.1667	0.61
1.2500	0.57
1.3333	0.53
1.4166	0.50
1.5000	0.46

1.5833	0.43
1.6667	0.40
1.7500	0.38
1.8333	0.35
1.9167	0.34
2.0000	0.31
2.5000	0.21
3.0000	0.15
3.5000	0.10
4.0000	0.07
4.5000	0.05
5.0000	0.03
5.5000	0.02
6.0000	0.01
6.5000	0.01
7.0000	0.01
7.5000	0.00
8.0000	0.00
8.5000	0.00
9.0000	0.00
9.5000	0.00
10.0000	0.00
11.0000	0.00
12.0000	-0.00
13.0000	0.00
14.0000	0.00
15.0000	0.01



DATA SET:
c:\copy\smw6d.dat
10/20/92

AQUIFER TYPE:
Unconfined
SOLUTION METHOD:
Bouwer-Rice
TEST DATE:
May 27, 1992

ESTIMATED PARAMETERS:
K = 0.0002034 ft/min
y0 = 1.878 ft

TEST DATA:
H0 = 2.14 ft
rc = 0.083 ft
rw = 0.24 ft
L = 7.6 ft
b = 10. ft
H = 10. ft

Slug Extraction Test SMW-6D

Atlantic Env. Services, Inc.	Client: New York State Electric & Gas
Project No.: 1284-06-02	Location: Lockport Transit St.MGP Site

SMW-6D

SE1000B
Environmental Logger
05/28 06:37

Unit# 01027 Test# 1

INPUT 1: Level (F) TOC

Reference 0.00
Scale factor 19.98
Offset 0.00

Step# 0 05/27 19:36

Elapsed Time	Value
0.0000	1.77
0.0033	0.96
0.0066	-0.21
0.0099	1.55
0.0133	0.82
0.0166	2.14
0.0200	1.28
0.0233	2.22
0.0266	2.14
0.0300	2.09
0.0333	2.07
0.0500	2.04
0.0666	2.01
0.0833	2.00
0.1000	1.99
0.1166	1.97
0.1333	1.96
0.1500	1.96
0.1666	1.94
0.1833	1.92
0.2000	1.91
0.2166	1.91
0.2333	1.89
0.2500	1.88
0.2666	1.87
0.2833	1.86
0.3000	1.85
0.3166	1.84
0.3333	1.83
0.4167	1.77
0.5000	1.72
0.5833	1.67
0.6667	1.62
0.7500	1.57
0.8333	1.53
0.9167	1.49
1.0000	1.45
1.0833	1.41
1.1667	1.38
1.2500	1.35
1.3333	1.31
1.4166	1.28
1.5000	1.25

1.5833	1.22
1.6667	1.19
1.7500	1.17
1.8333	1.14
1.9167	1.12
2.0000	1.09
2.5000	0.96
3.0000	0.87
3.5000	0.79
4.0000	0.72
4.5000	0.65
5.0000	0.60
5.5000	0.56
6.0000	0.52
6.5000	0.49
7.0000	0.46
7.5000	0.43
8.0000	0.41
8.5000	0.38
9.0000	0.37
9.5000	0.34
10.0000	0.33
11.0000	0.30
12.0000	0.28
13.0000	0.25
14.0000	0.24
15.0000	0.23
16.0000	0.21
17.0000	0.20
18.0000	0.19
19.0000	0.18
20.0000	0.17
21.0000	0.16
22.0000	0.15
23.0000	0.15
24.0000	0.14
25.0000	0.13
26.0000	0.12
27.0000	0.12
28.0000	0.11
29.0000	0.11
30.0000	0.11
31.0000	0.10
32.0000	0.10
33.0000	0.10
34.0000	0.09
35.0000	0.09
36.0000	0.08
37.0000	0.08
38.0000	0.08

GRAIN SIZE ANALYSIS

parratt wolff inc
FISHER RD., EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

December 10, 1991

Project No. L-91013
Project Title Laboratory Testing File #2424-009-517

Sieve Analysis ASTM D422

Station Number	Sample Location	2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#10	#30	#40	#60	#100	#200		
		Sieve Size - Percent Passing Sieve														
N8039 SMW-11	LPEDSH9111G	-	-	100	95.6	95.6	88.7	87.5	82.7	73.6	71.0	66.2	60.2	51.3	6-	8
N8040 SMW-6	LPEDSH9106G	-	-	100	92.3	90.8	89.4	89.1	86.7	80.3	77.3	72.2	66.7	60.4	6-	8
N8041 SMW-3S	LPEDUSH913SG	-	-	-	-	-	-	-	100	99.6	99.1	94.3	75.5	47.5	16-	18
N8438 SMW-5	LPEDSH9105G	-	100	87.0	84.3	82.4	78.0	75.0	68.5	57.6	54.7	49.5	44.3	38.4	12-	14
N8439 SMW-15	LPEDSH911SG (U)	-	-	-	-	-	-	-	100	99.8	99.6	96.9	74.5	34.2	30-	32
N8440 [illegible]	LPEDD911DG (U)	-	-	100	93.2	89.5	84.7	80.6	68.9	58.0	54.9	48.8	41.4	32.9	50-	51
N8644 [illegible]	LPEUSH914SG	100	86.7	86.7	86.7	86.7	85.5	84.9	81.3	43.2	29.9	17.6	13.5	11.2	[illegible]	2
N8645 [illegible]	LPEUDG14DG (9)	-	100	91.2	76.7	72.4	65.4	62.0	54.7	46.9	44.9	41.2	37.6	33.6	16-	18
N8646	LPEDD9110G	-	-	100	95.2	93.9	89.3	85.3	75.5	62.0	58.6	53.1	46.8	37.3	14-	16
N8647	LPEDSH9110G	-	-	-	100	95.8	93.4	91.1	84.8	78.0	76.0	72.0	66.7	59.6	10-	11

Remarks:

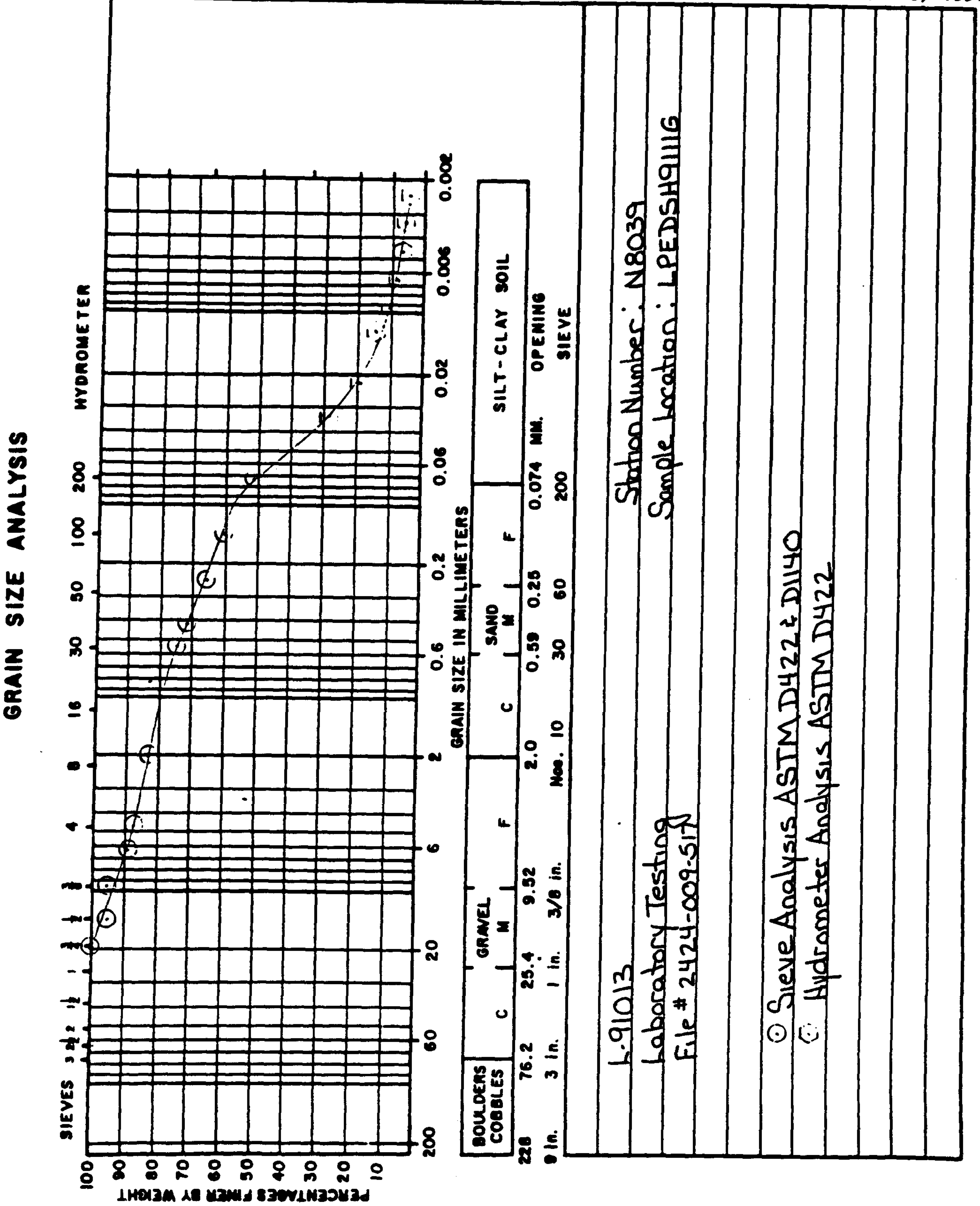
Prewashed ASTM D1140
Yes X No
Performed By SMC,ST

parratt wolff inc

FISHER RD EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. L-91013
REPORT NO. 1

December 10, 1991

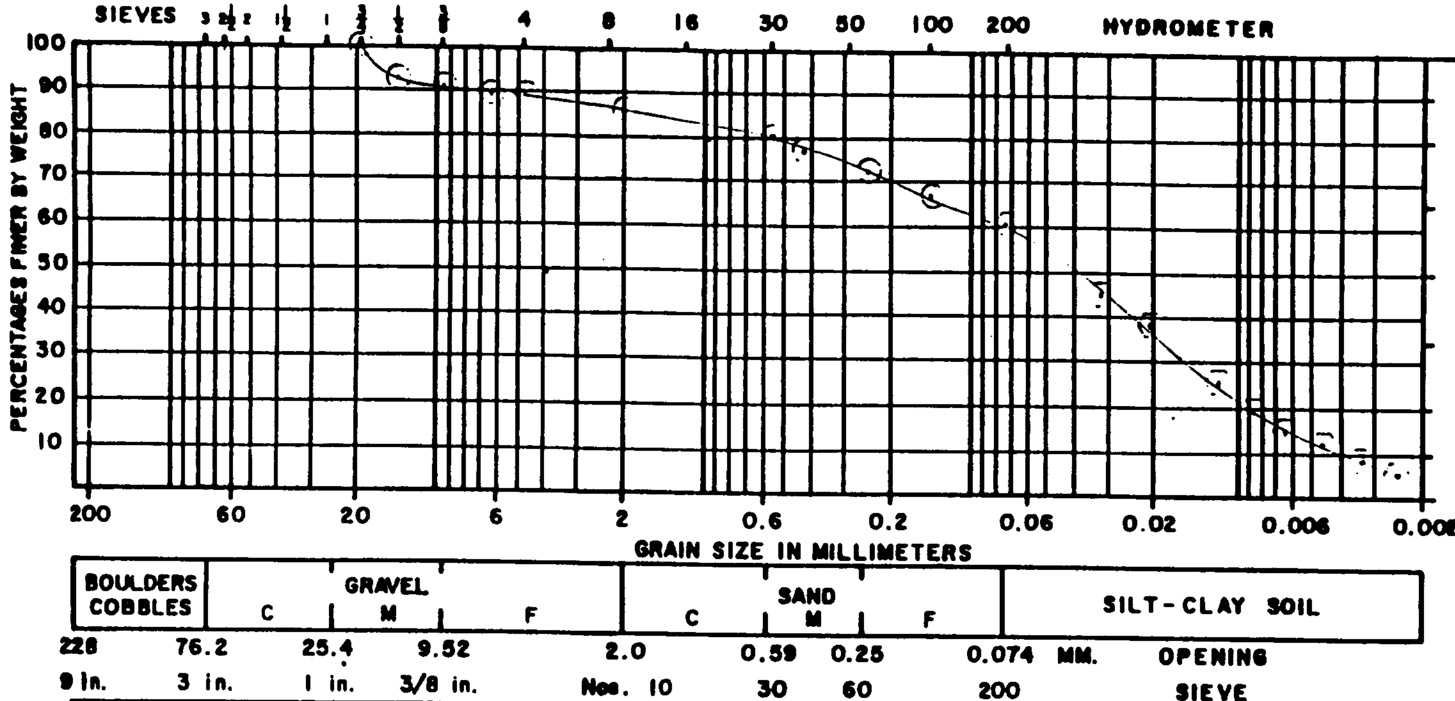


parratt wolff inc
FISHER RD EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 2

December 10, 1991

GRAIN SIZE ANALYSIS



L-91013
Laboratory Testing
File # 2424-009-517

Station Number: N8040
Sample Location: LPEDSH9106G

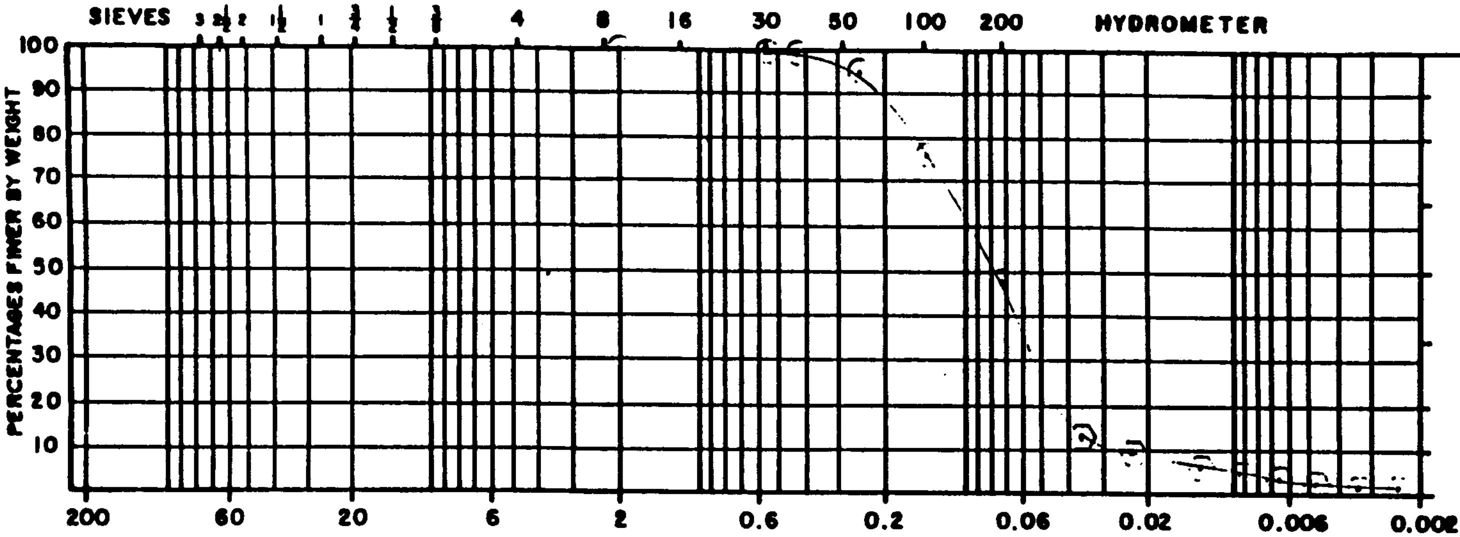
⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. L-91013
REPORT NO. 3

December 10, 1991

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228	76.2	25.4	9.52	2.0	0.59	0.25	0.074	MM.	OPENING
9 in.	3 in.	1 in.	3/8 in.	Nos. 10	30	60	200		SIEVE

L-91013
Laboratory Testing
File # 2424-009-517

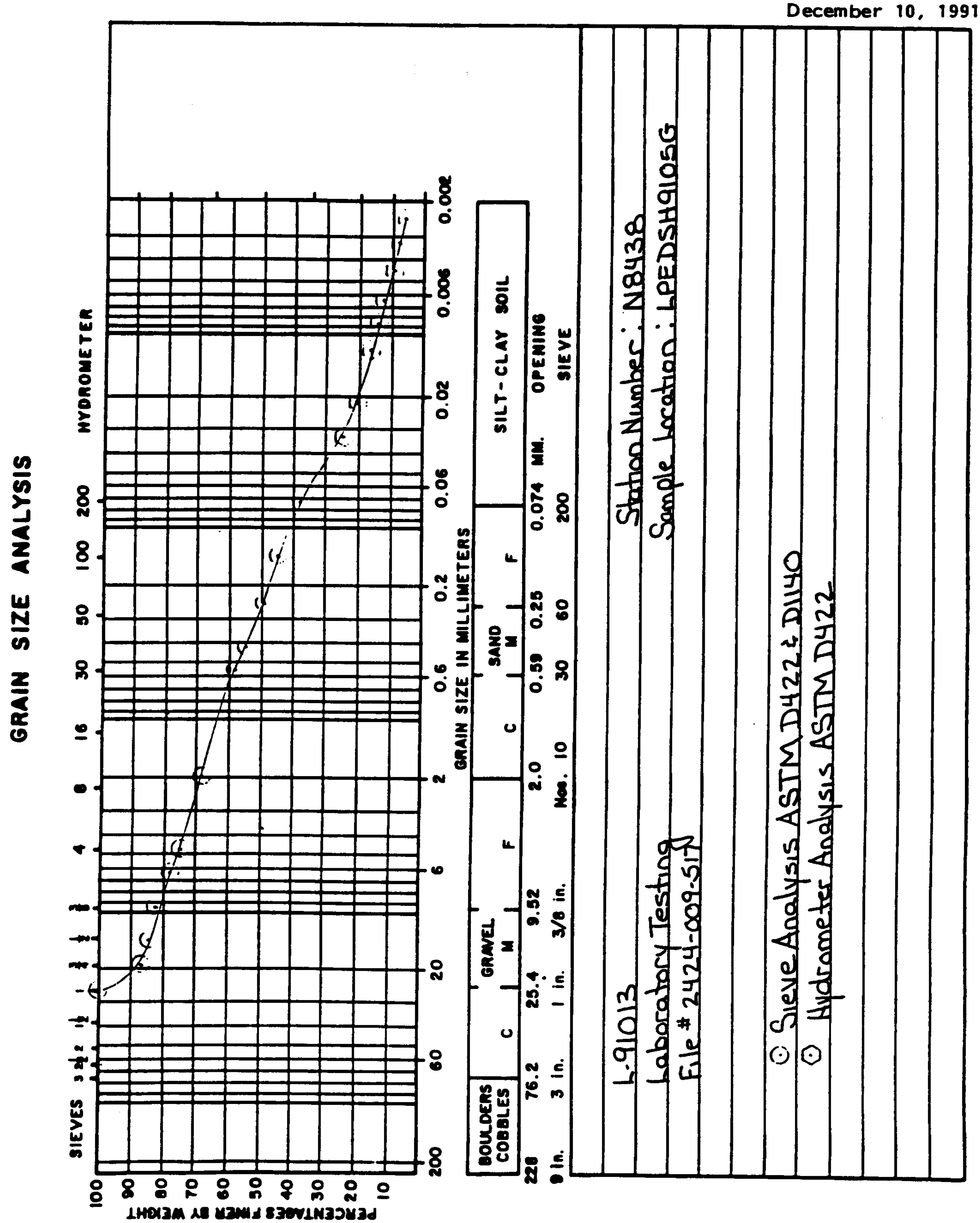
Station Number: N8041
Sample Location: LPEDUSH913SG

⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 4

December 10, 1991

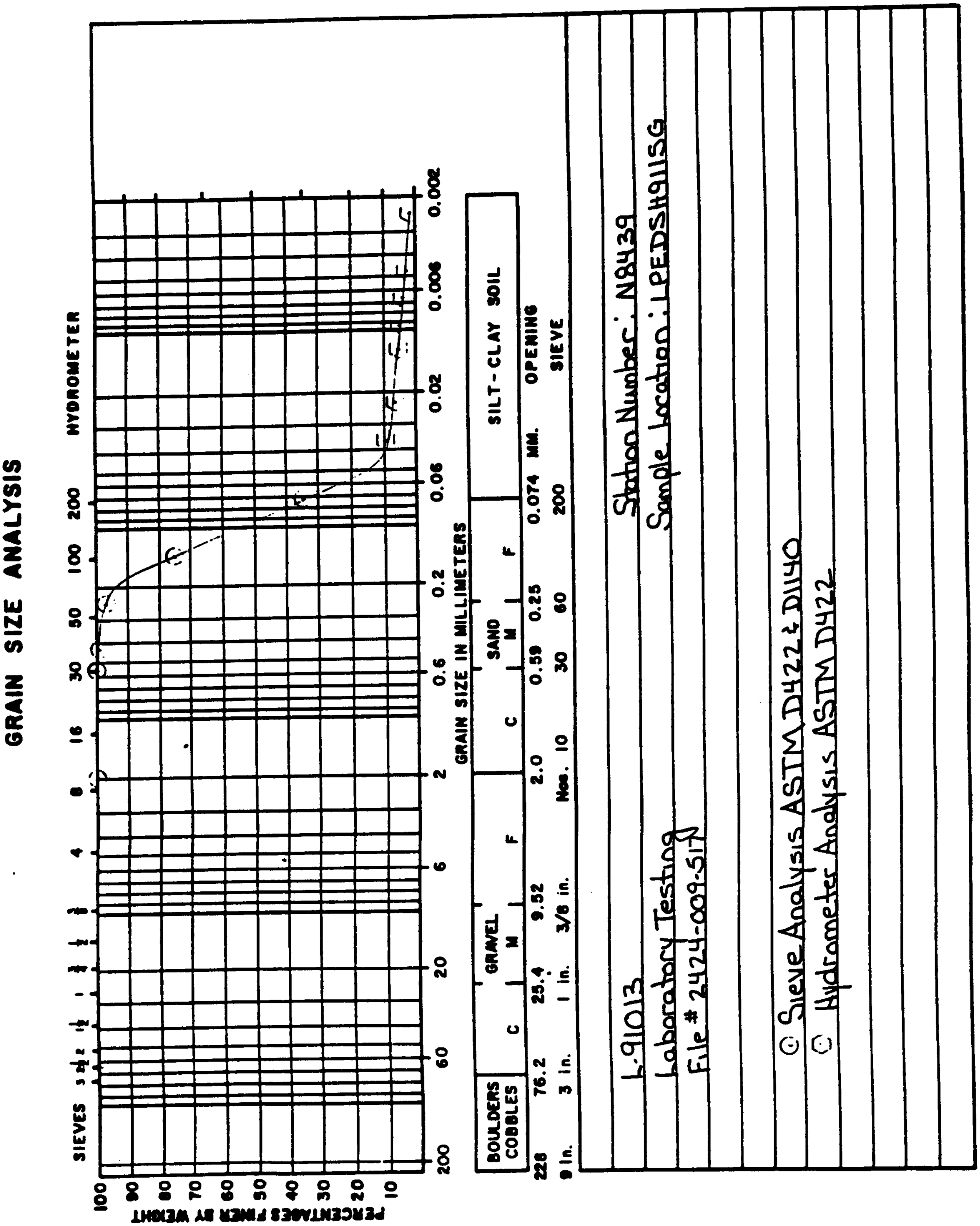


parratt wolff inc

FISHER RD EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO L-91013
REPORT NO. 5

December 10, 1991



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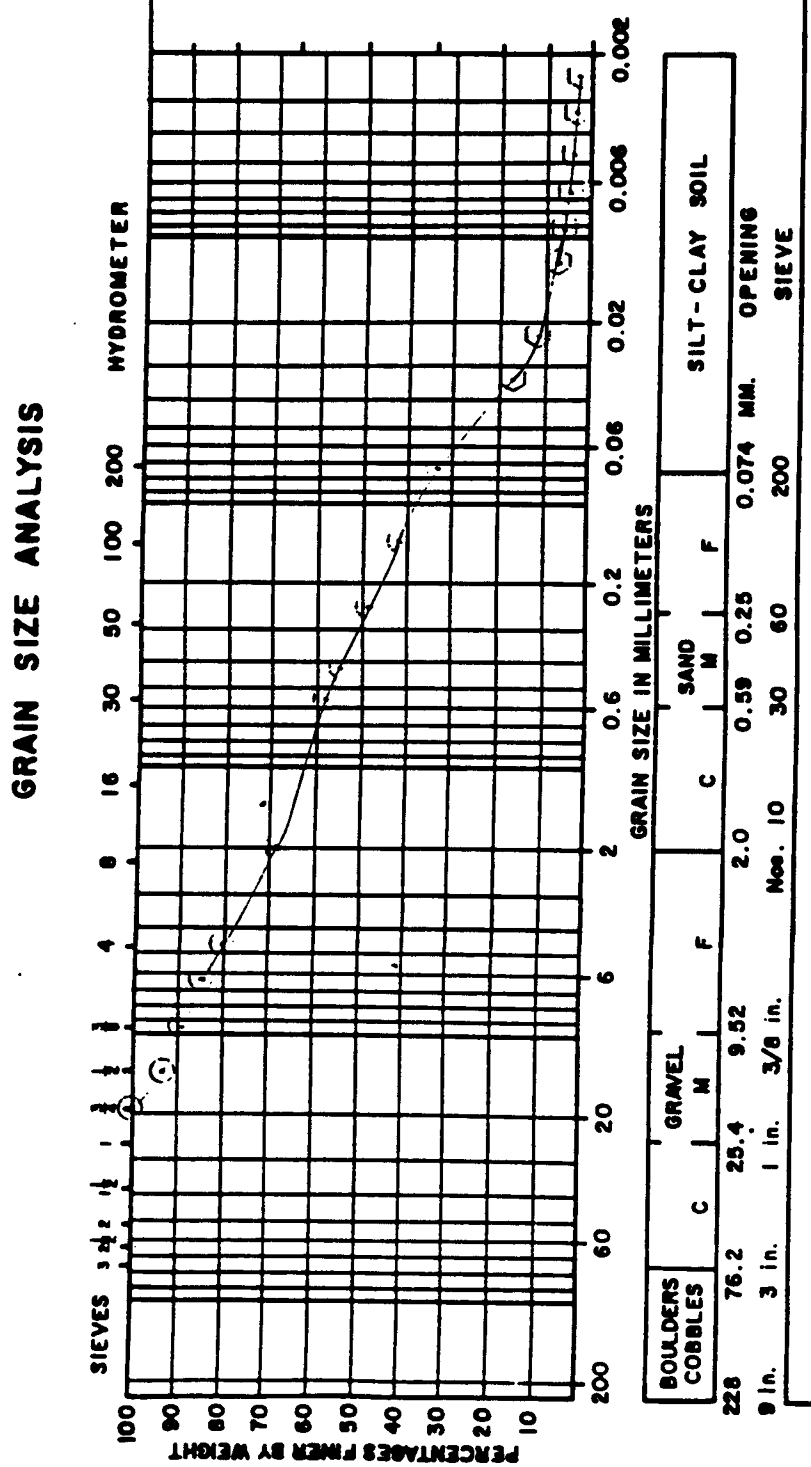
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO	L-91013
REPORT NO.	6

December 10, 1991

GRAIN SIZE ANALYSIS



Station Number: N8440
Sample Location: LPEND911DG

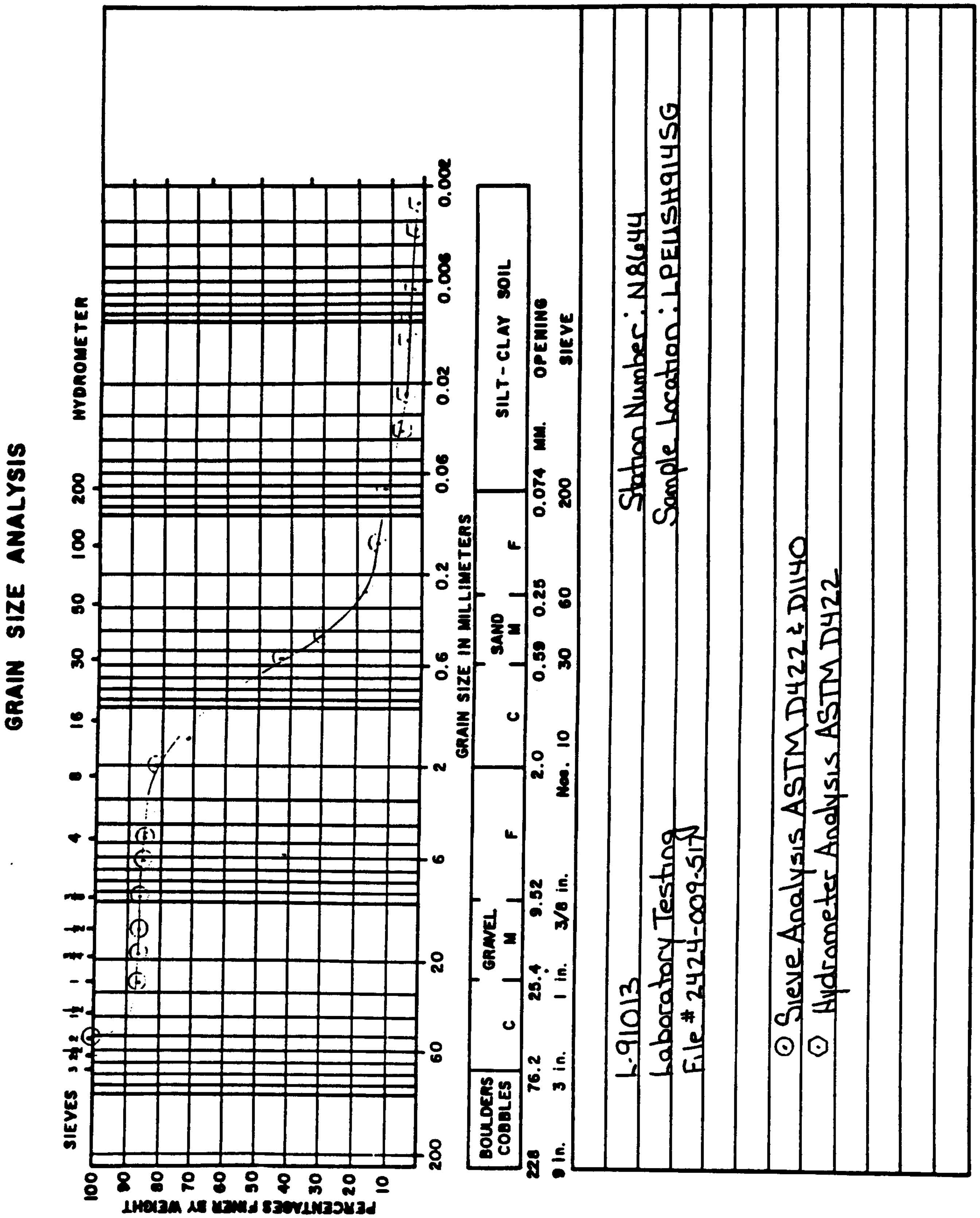
L-91013
Laboratory Testing
File # 2424-009-517

⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 7

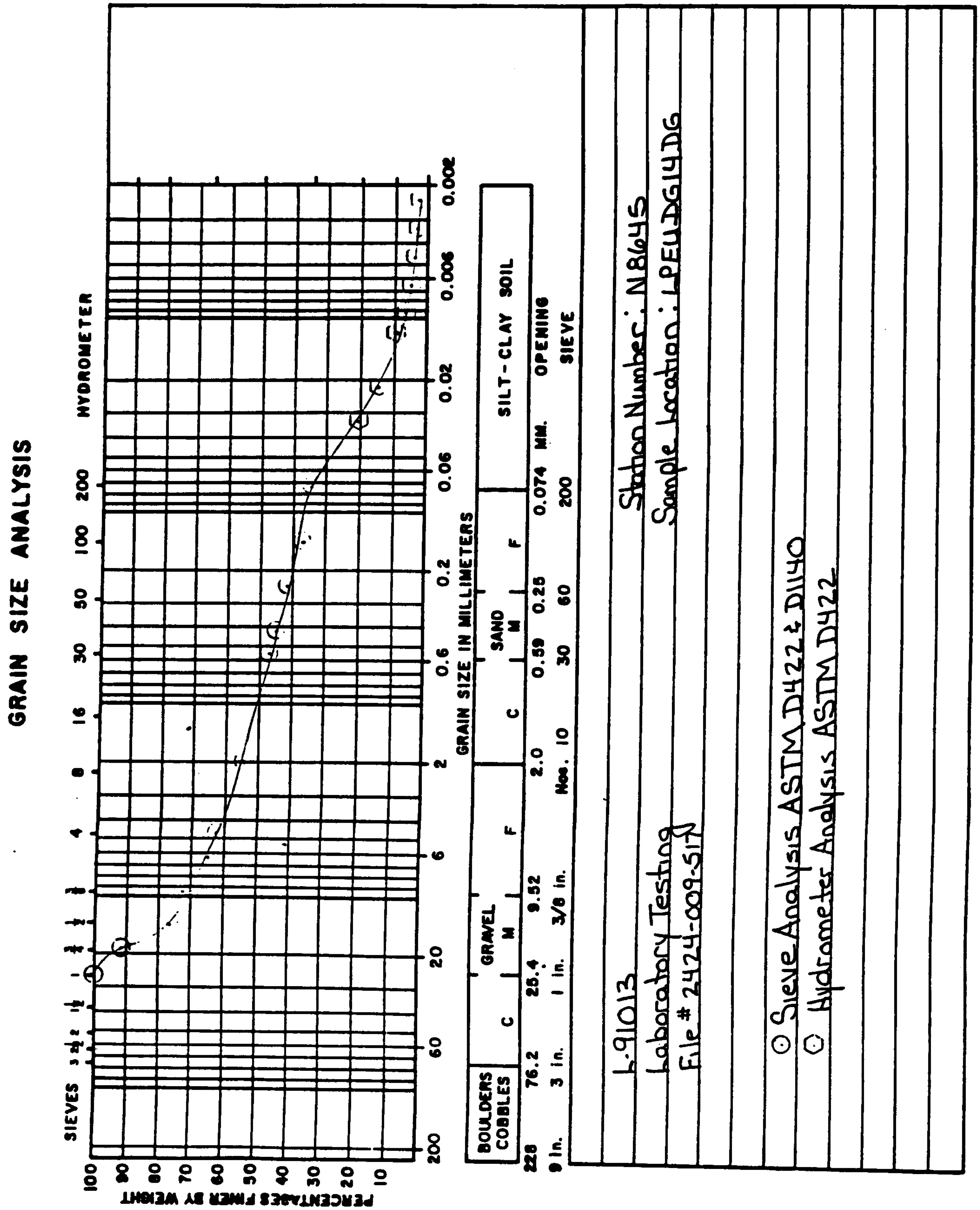
December 10, 1991



parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. 1-91013
REPORT NO. 8

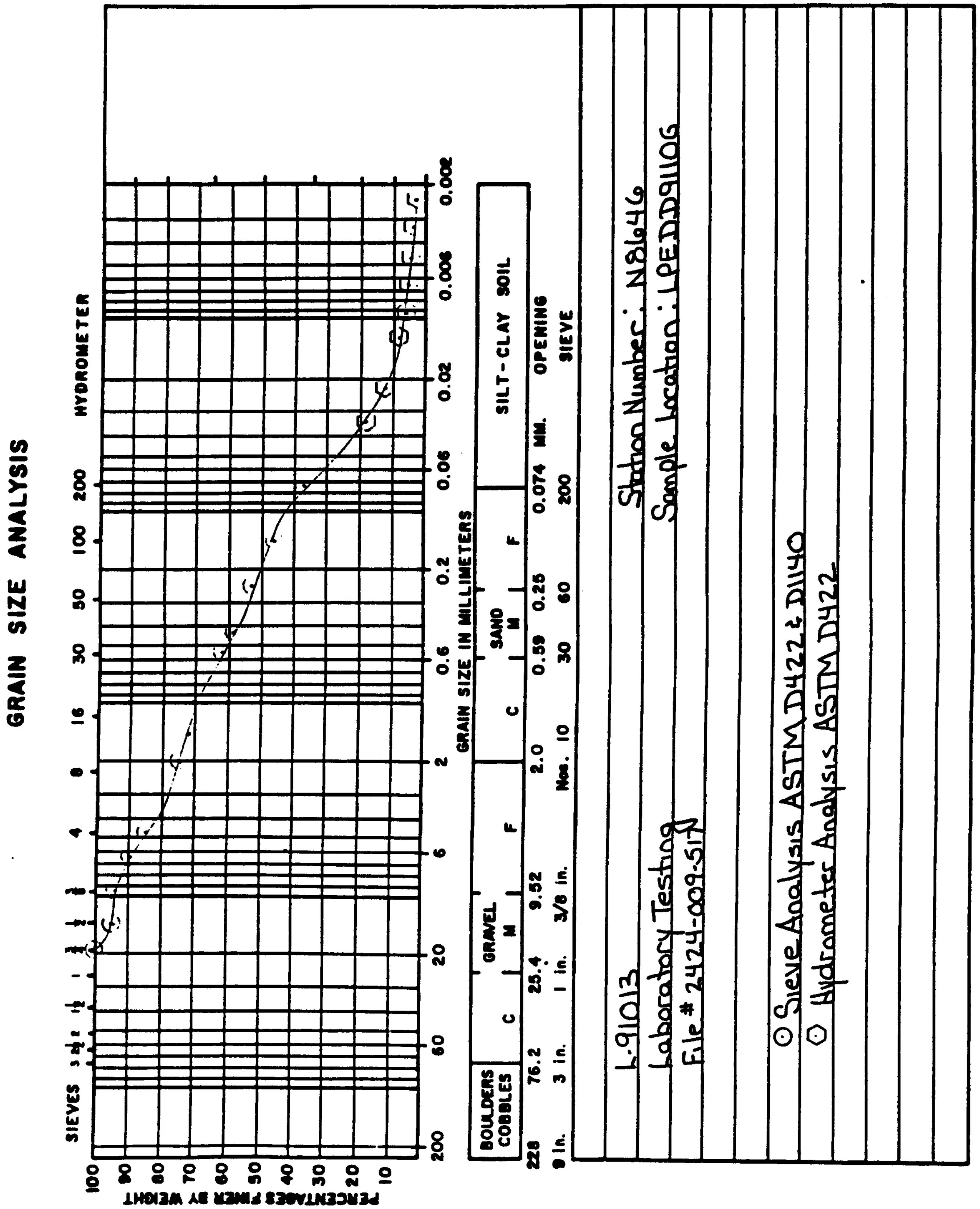
December 10, 1991



parratt wolff inc
FISHER RD EAST SYRACUSE, N Y 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO L-91013
REPORT NO. 9

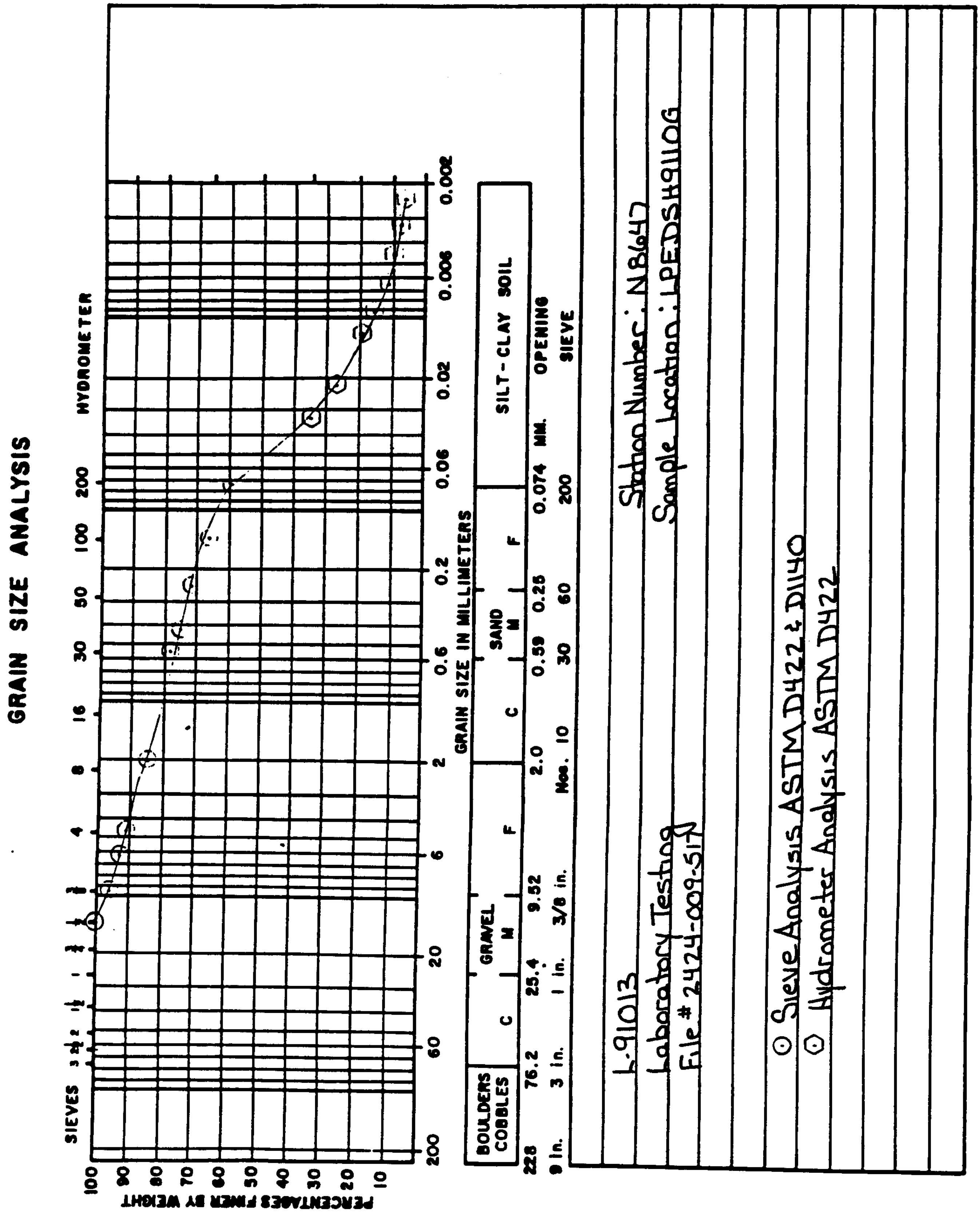
December 10, 1991



parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. L-91013
REPORT NO. 10

December 10, 1991



parratt wolff inc
FISHER RD., EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

December 10, 1991

Project No. L-91013

Project Title Laboratory Testing File #2424-009-517

Sieve Analysis ASTM D422

		Sieve Size - Percent Passing Sieve														
Station Number	Sample Location	2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#10	#30	#40	#60	#100	#200		
N8039	LPEDSH9111G	-	-	100	95.6	95.6	88.7	87.5	82.7	73.6	71.0	66.2	60.2	51.3		
N8040	LPEDSH9106G	-	-	100	92.3	90.8	89.4	89.1	86.7	80.3	77.3	72.2	66.7	60.4		
N8041	LPEDUSH913SG	-	-	-	-	-	-	-	100	99.6	99.1	94.3	75.5	47.5		
N8438	LPEDSH9105G	-	100	87.0	84.3	82.4	78.0	75.0	68.5	57.6	54.7	49.5	44.3	38.4		
N8439	LPEDSH911SG	-	-	-	-	-	-	-	100	99.8	99.6	96.9	74.5	34.2		
N8440	LPEND911DG	-	-	100	93.2	89.5	84.7	80.6	68.9	58.0	54.9	48.8	41.4	32.9		
N8644	LPEUSH914SG	100	86.7	86.7	86.7	86.7	85.5	84.9	81.3	43.2	29.9	17.6	13.5	11.2		
N8645	LPEUDG14DG	-	100	91.2	76.7	72.4	65.4	62.0	54.7	46.9	44.9	41.2	37.6	33.6		
N8646	LPEDD9110G	-	-	100	95.2	93.9	89.3	85.3	75.5	62.0	58.6	53.1	46.8	37.3		
N8647	LPEDSH9110G	-	-	-	100	95.8	93.4	91.1	84.8	78.0	76.0	72.0	66.7	59.6		

Remarks:

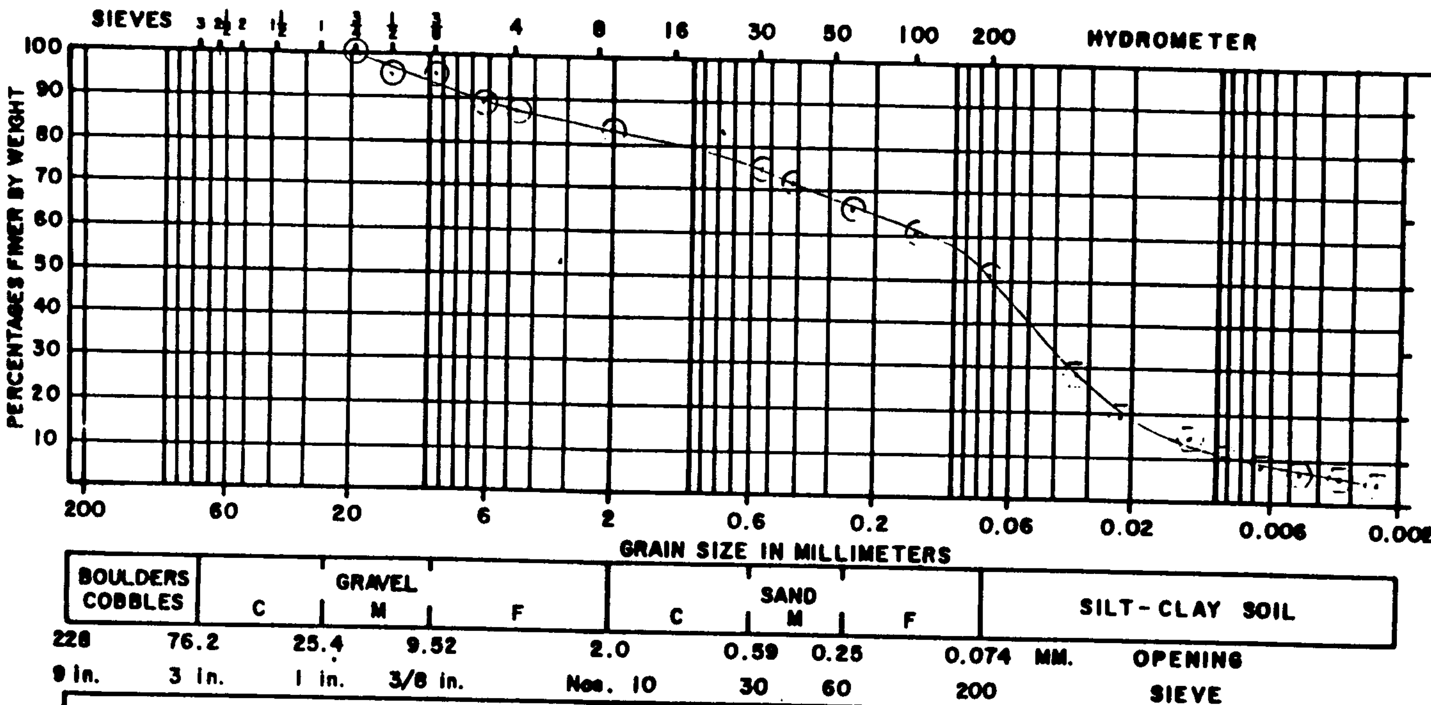
Prewashed ASTM D1140
Yes X No
Performed By SMC,ST

Parratt Wolff Inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. 1-91013
REPORT NO. 1

December 10, 1991

GRAIN SIZE ANALYSIS



L-91013
Laboratory Testing
File # 2424-009-517

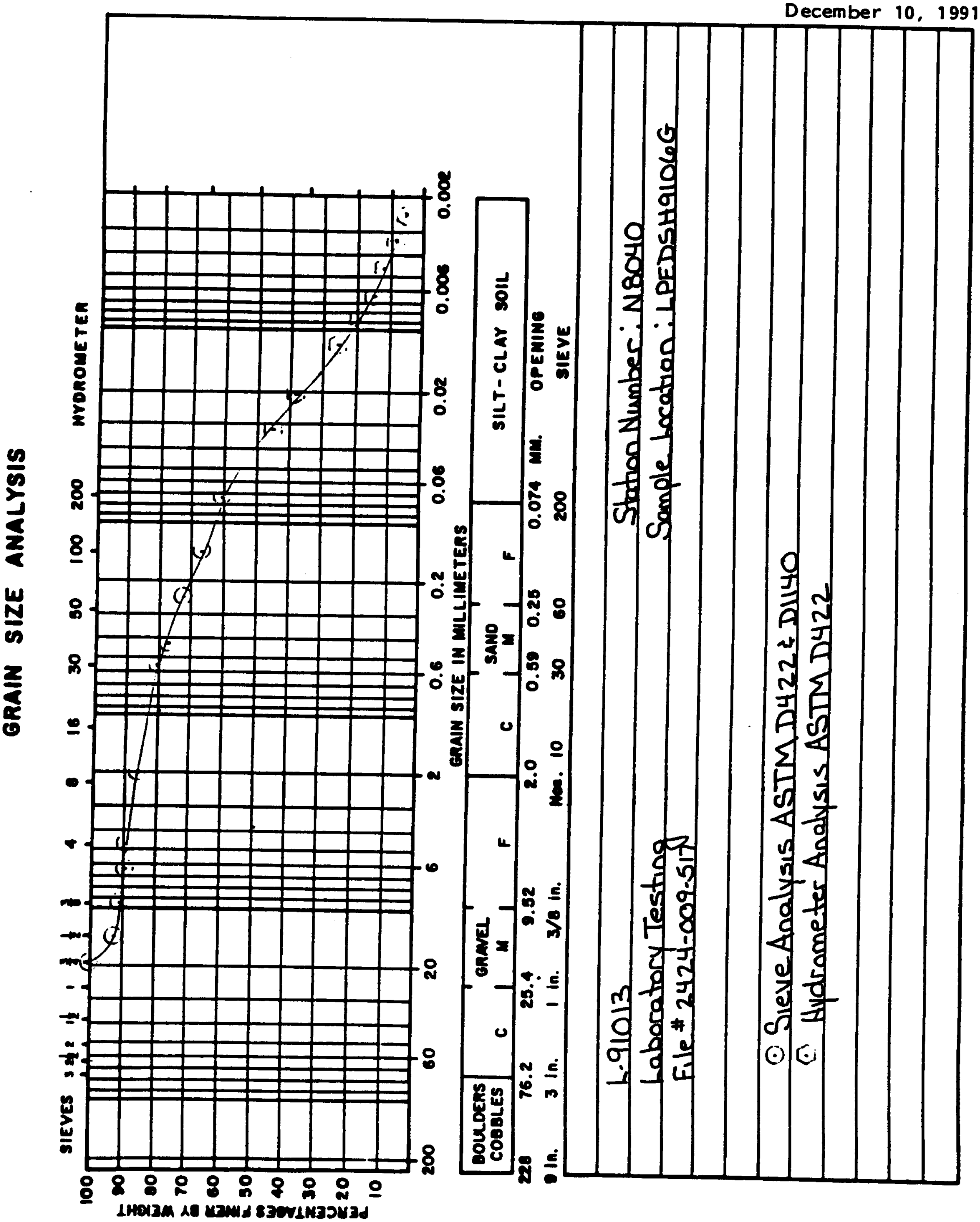
Station Number: N8039
Sample Location: LPEDSH9111G

⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. L-91013
REPORT NO. 2

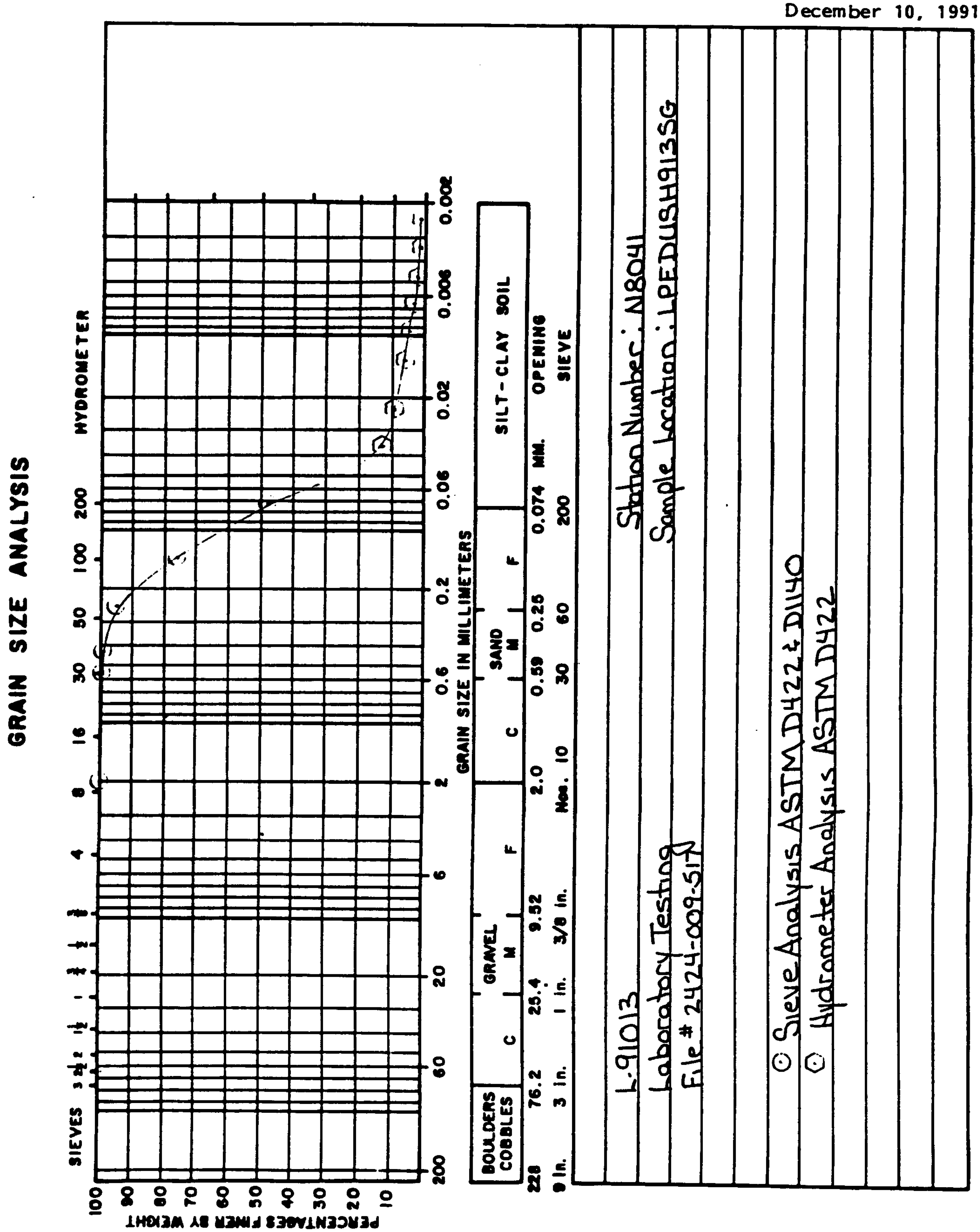
December 10, 1991



parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. L-91013
REPORT NO. 3

December 10, 1991



parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

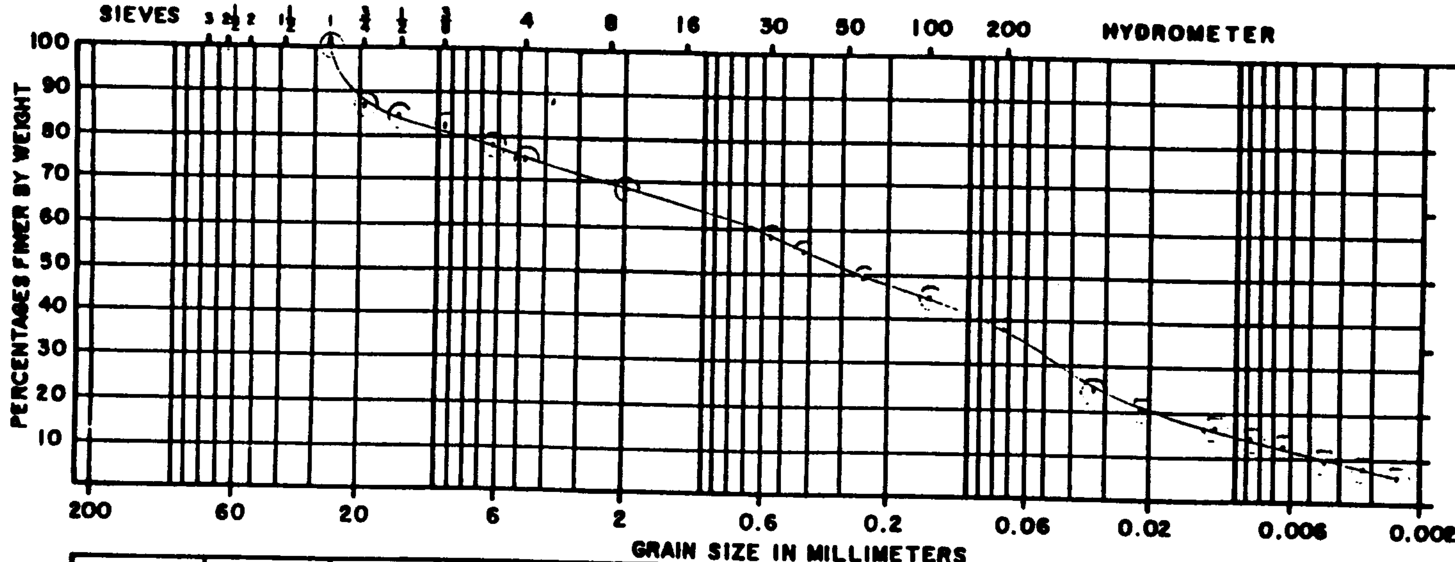
JOB NO
REPORT NO

December

GRAIN SIZE ANALYSIS

SIEVES 3 2½ 2 1½ 1 ¾ ½ ⅜ 4 8 16 30 50 100 200 HYDROMETER

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 | 76.2 | 25.4 | 9.52 | 2.0 | 0.59 | 0.25 | 0.074 MM. | OPENING

9 In. | 3 In. | 1 in. | 3/8 in. | Nos. 10 | 30 | 60 | 200 | SIEVE

L-91013
Laboratory Testing
File # 2424-009-517

Station Number: N8438
Sample Location: LPEDSH9105G

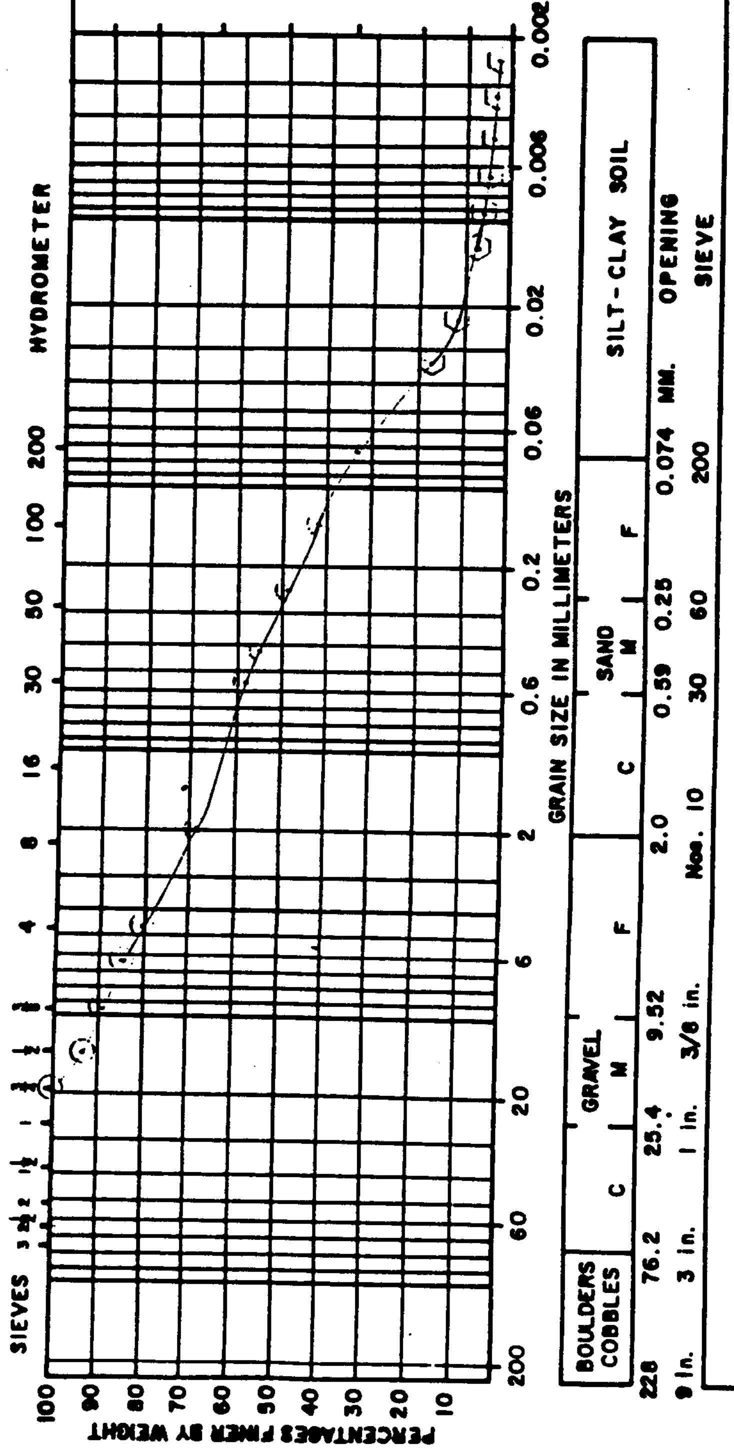
⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 6

December 10, 1991

GRAIN SIZE ANALYSIS



Station Number: N8440
Sample Location: LPEND911DG

L-91013
Laboratory Testing
File # 2424-009-517

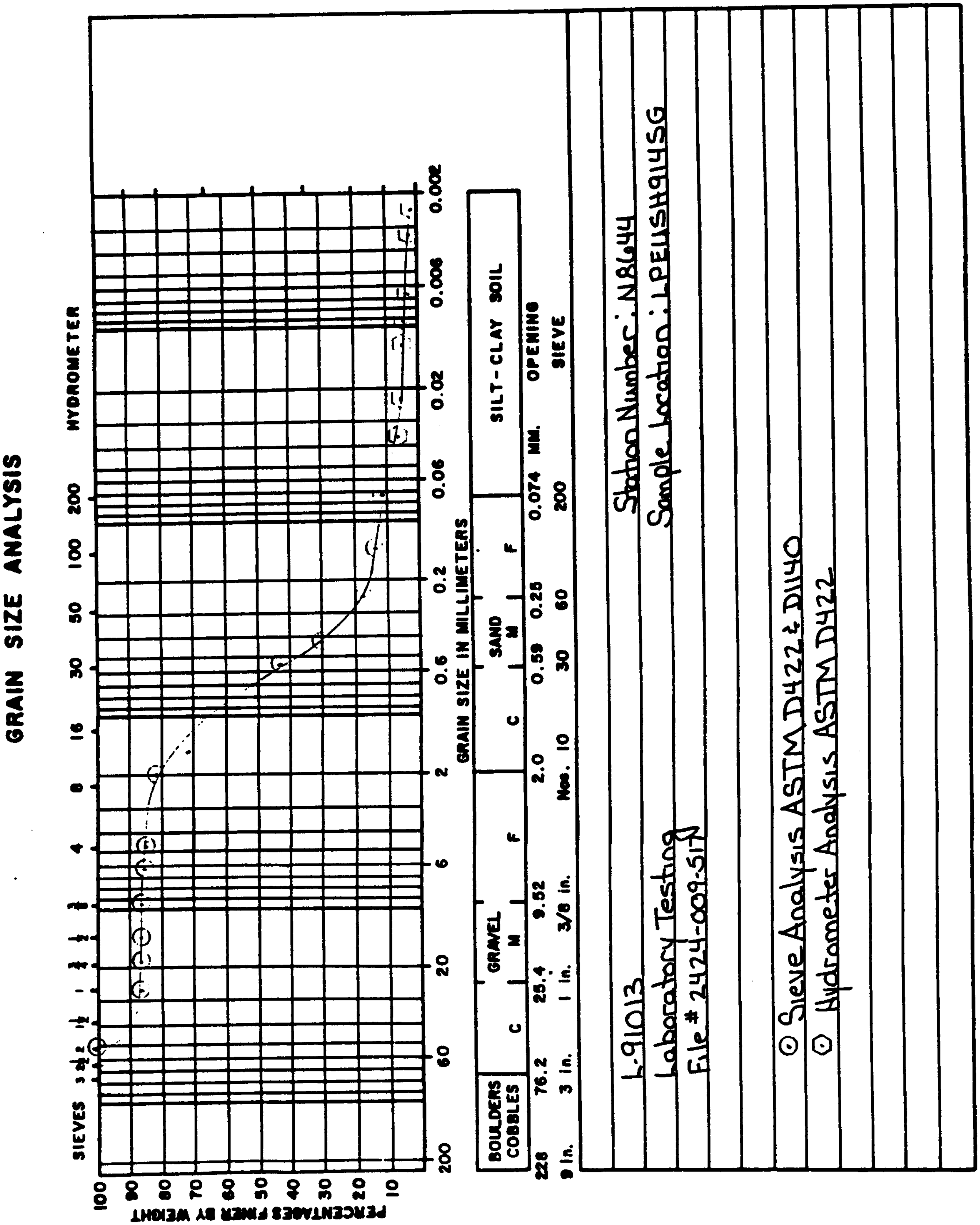
⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

Wolff inc

FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO. L-91013
REPORT NO. 7

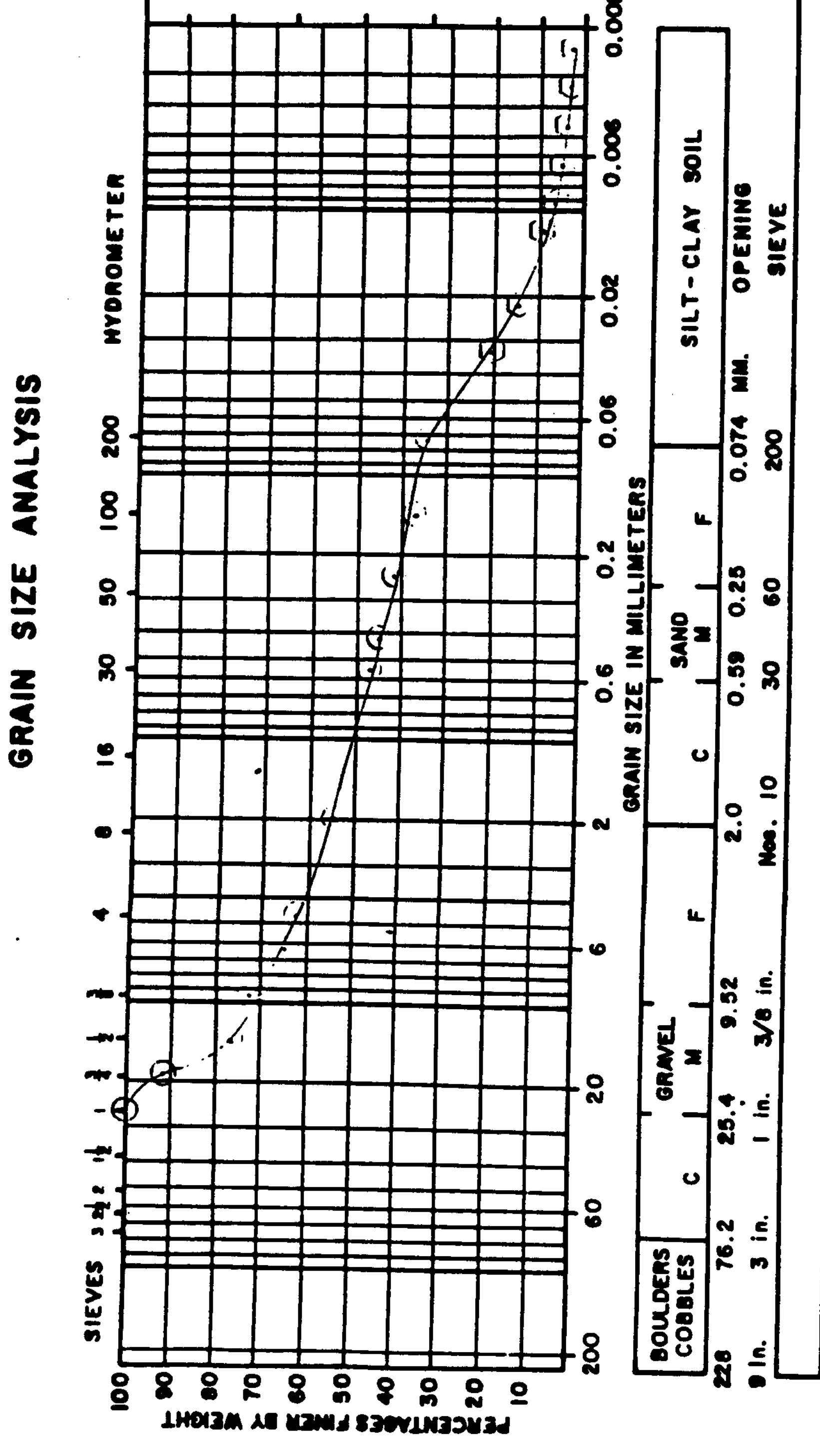
December 10, 1991



parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 8

December 10, 1991



L91013
Laboratory Testing
File # 2424-009-517
Station Number: N8645
Sample Location: LPEUDG14DG

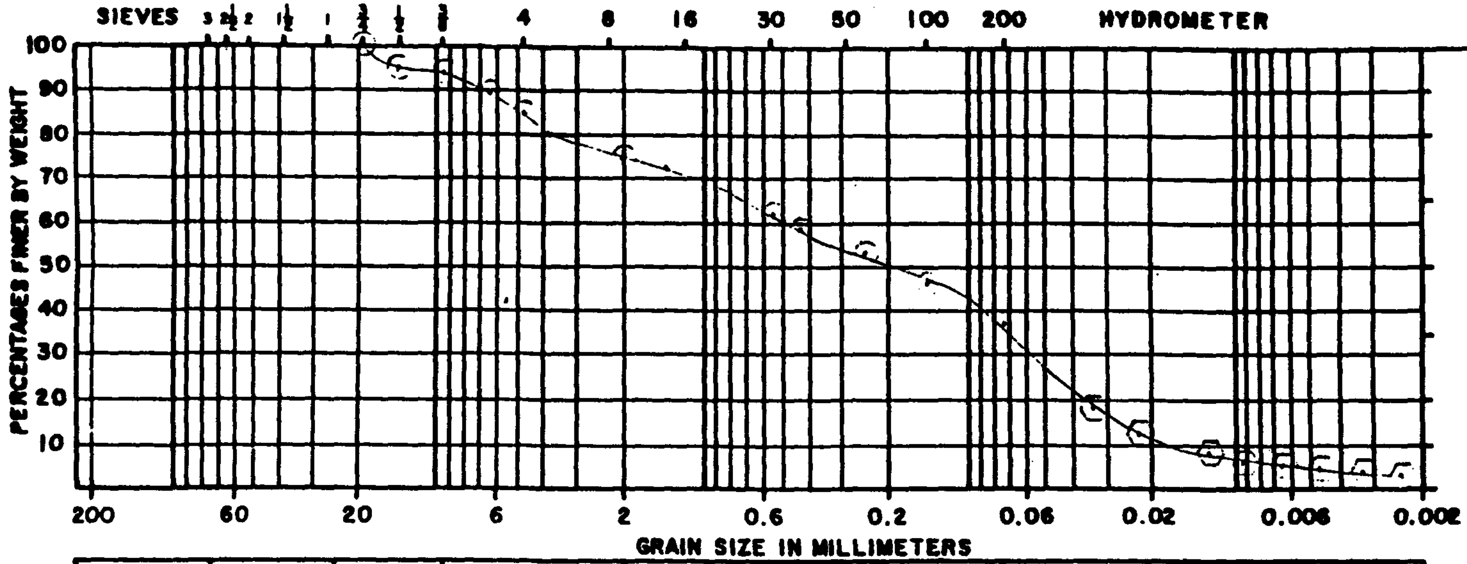
⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO L-91013
REPORT NO. 9

December 10, 1991

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 | 76.2 | 25.4 | 9.52 | 2.0 | 0.59 | 0.25 | 0.074 MM. OPENING

9 In. | 3 In. | 1 In. | 3/8 In. | Nos. 10 | 30 | 60 | 200 SIEVE

L-91013
Laboratory Testing
File # 2424-009-517

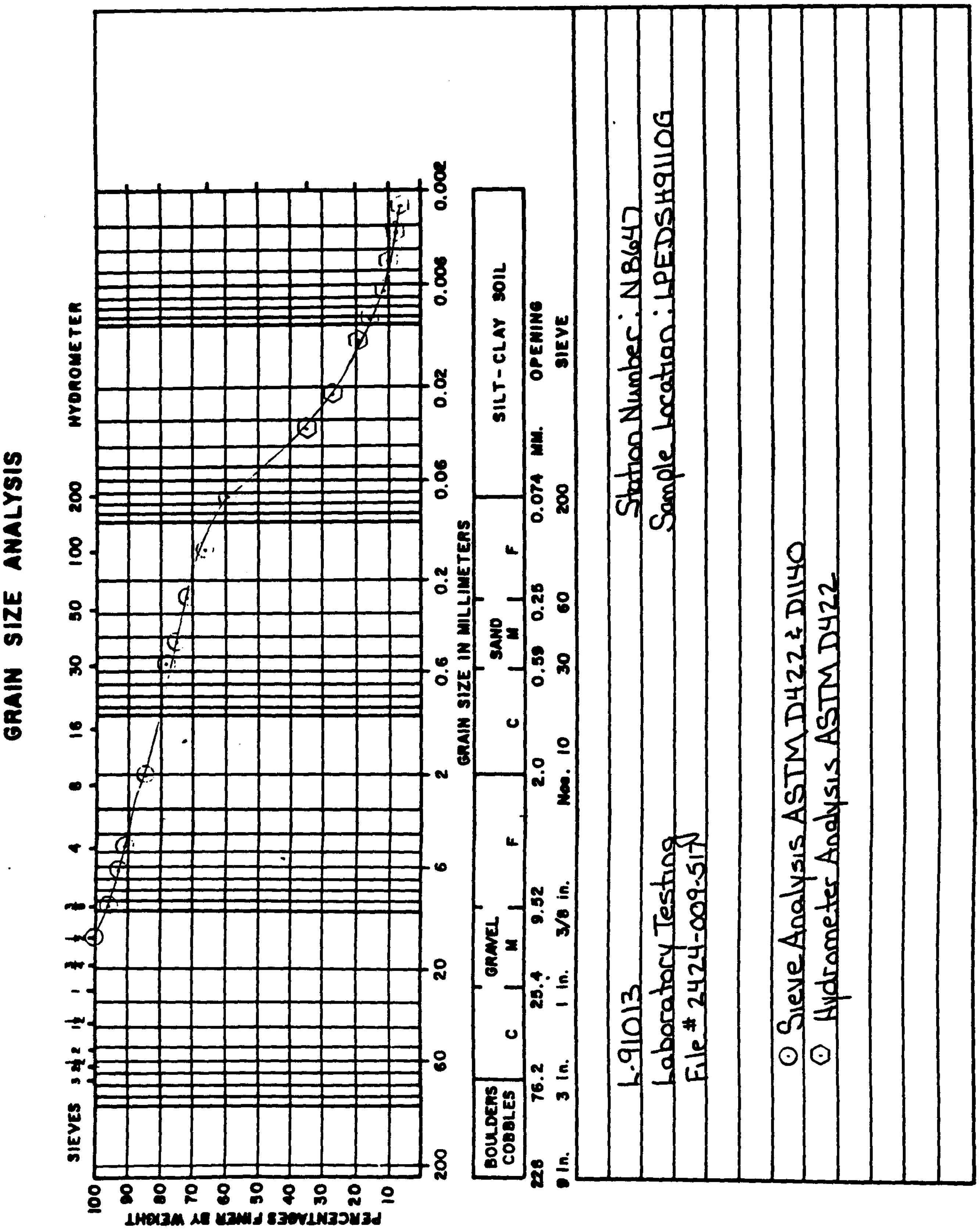
Station Number: N8646
Sample Location: LPEDD9110G

⊙ Sieve Analysis ASTM D422 & D1140
⬡ Hydrometer Analysis ASTM D422

parratt wolff inc
FISHER RD. EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 10

December 10, 1991



parratt wolff inc
FISHER RD., EAST SYRACUSE, N.Y. 13057
TELEPHONE AREA CODE 315/437-1429

December 10, 1991

Project No. L-91013
Project Title Laboratory Testing File #2424-009-517

Sieve Analysis ASTM D422

Station Number	Sample Location	2"	1"	3/4"	1/2"	3/8"	1/4"	#4	#10	#30	#40	#60	#100	#200		
		Sieve Size - Percent Passing Sieve														
N8039	LPEDSH9111G	-	-	100	95.6	95.6	88.7	87.5	82.7	73.6	71.0	66.2	60.2	51.3		
N8040	LPEDSH9106G	-	-	100	92.3	90.8	89.4	89.1	86.7	80.3	77.3	72.2	66.7	60.4		
N8041	LPEDUSH913SG	-	-	-	-	-	-	-	100	99.6	99.1	94.3	75.5	47.5		
N8438	LPEDSH9105G	-	100	87.0	84.3	82.4	78.0	75.0	68.5	57.6	54.7	49.5	44.3	38.4		
N8439	LPEDSH911SG	-	-	-	-	-	-	-	100	99.8	99.6	96.9	74.5	34.2		
N8440	LPEND911DG	-	-	100	93.2	89.5	84.7	80.6	68.9	58.0	54.9	48.8	41.4	32.9		
N8644	LPEUSH914SG	100	86.7	86.7	86.7	86.7	85.5	84.9	81.3	43.2	29.9	17.6	13.5	11.2		
N8645	LPEUDG14DG	-	100	91.2	76.7	72.4	65.4	62.0	54.7	46.9	44.9	41.2	37.6	33.6		
N8646	LPEDD9110G	-	-	100	95.2	93.9	89.3	85.3	75.5	62.0	58.6	53.1	46.8	37.3		
N8647	LPEDSH9110G	-	-	-	100	95.8	93.4	91.1	84.8	78.0	76.0	72.0	66.7	59.6		

Remarks:

Prewashed ASTM D1140
Yes X No
Performed By SMC,ST

parratt wolff inc
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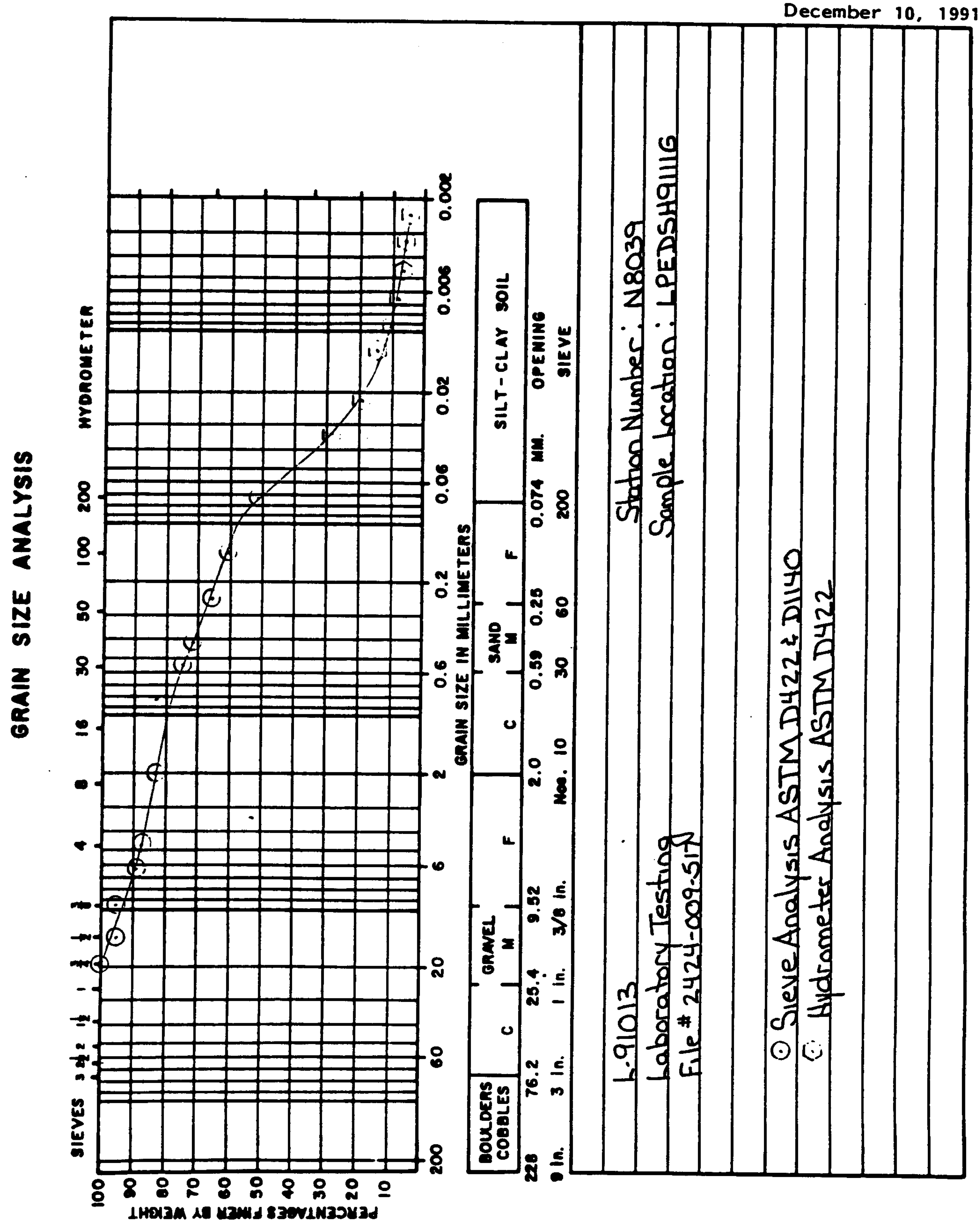
TELEPHONE AREA CODE 315/437-1429

JOB NO. L-91013
REPORT NO. 1

December 10, 1991



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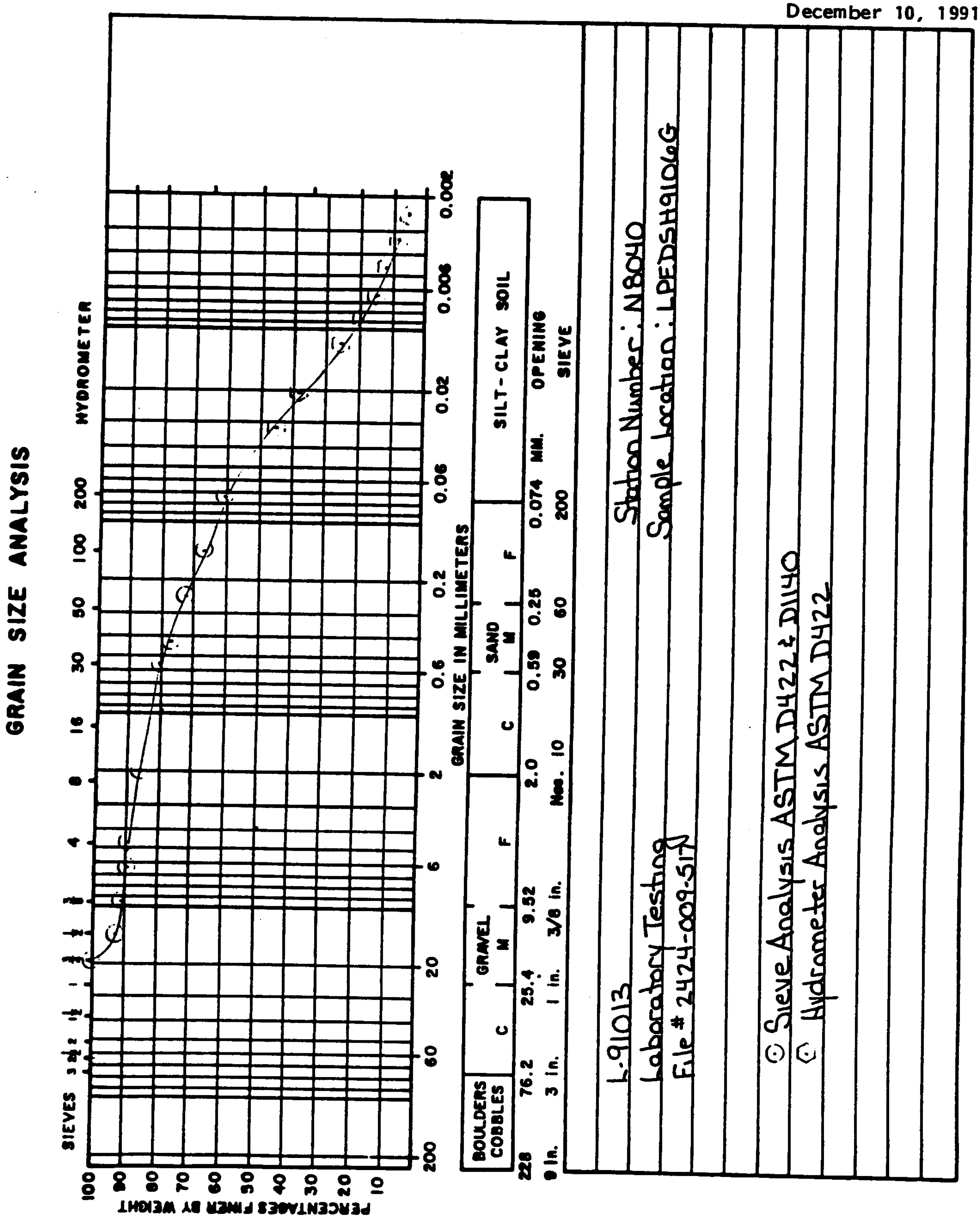
TELEPHONE AREA CODE 315/437-1429

JOB NO L-91013
REPORT NO. 2

December 10, 1991



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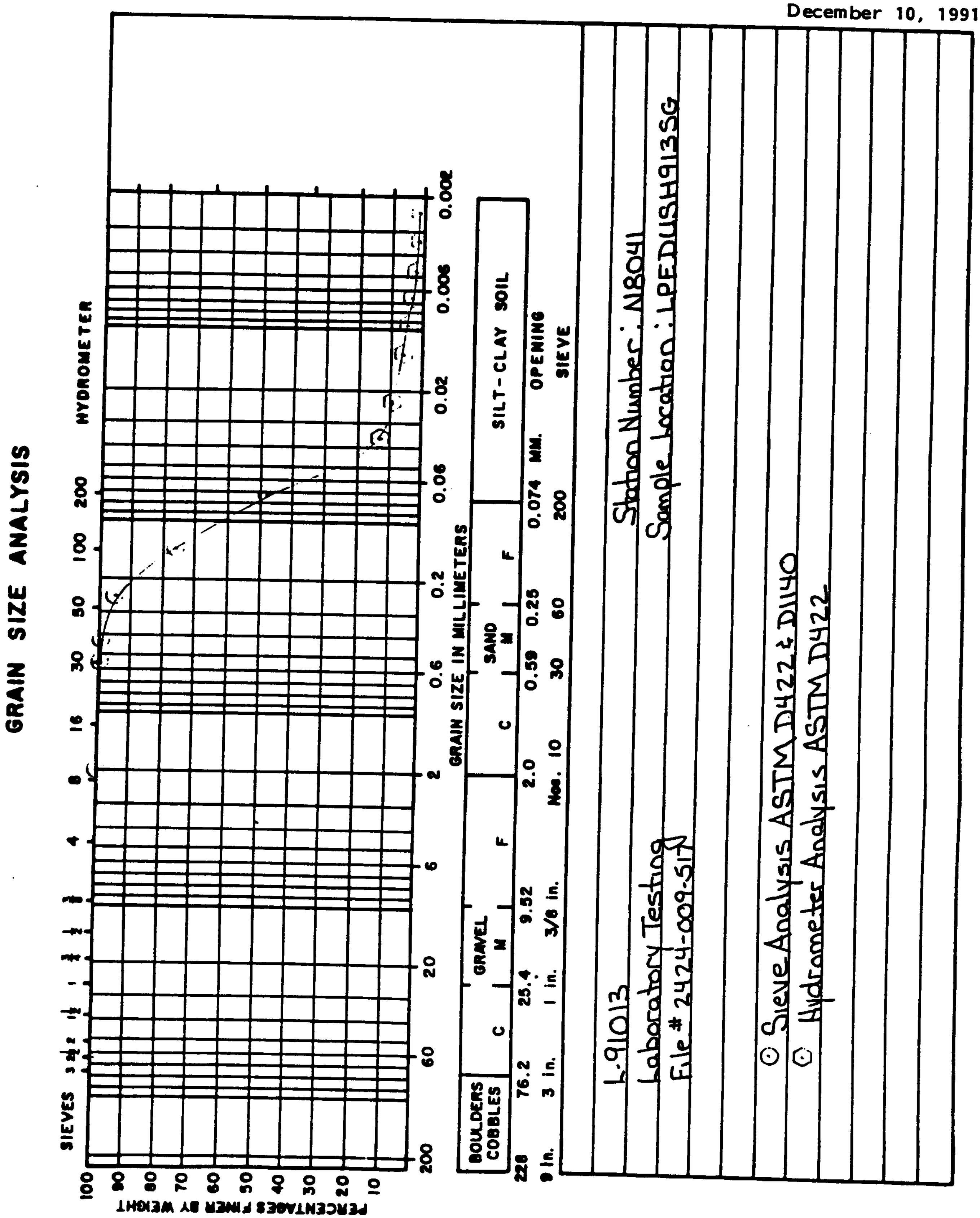
JOB NO. L-91013
REPORT NO. 3

December 10, 1991



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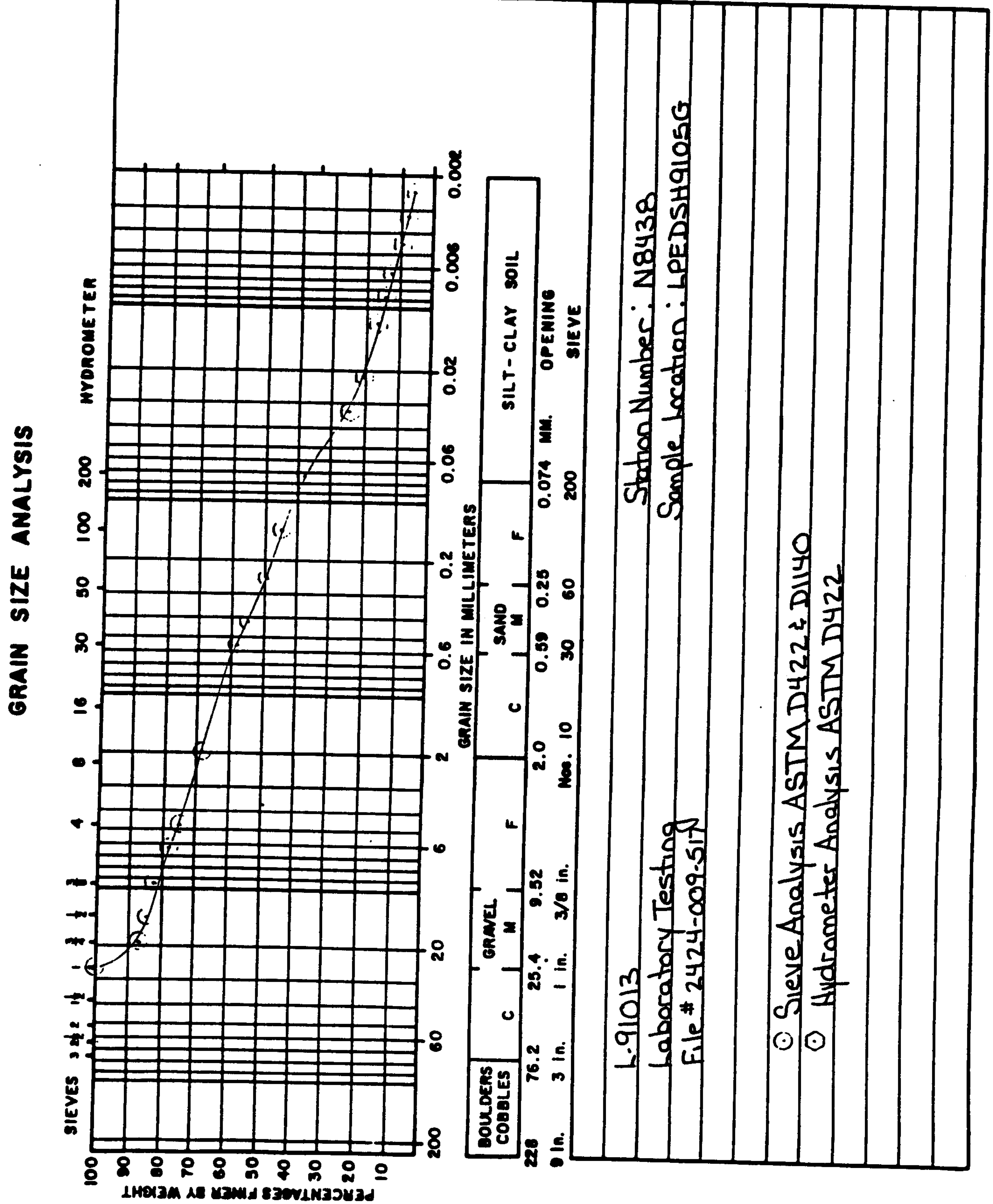
JOB NO. L-91013
REPORT NO. 4

December 10, 1991



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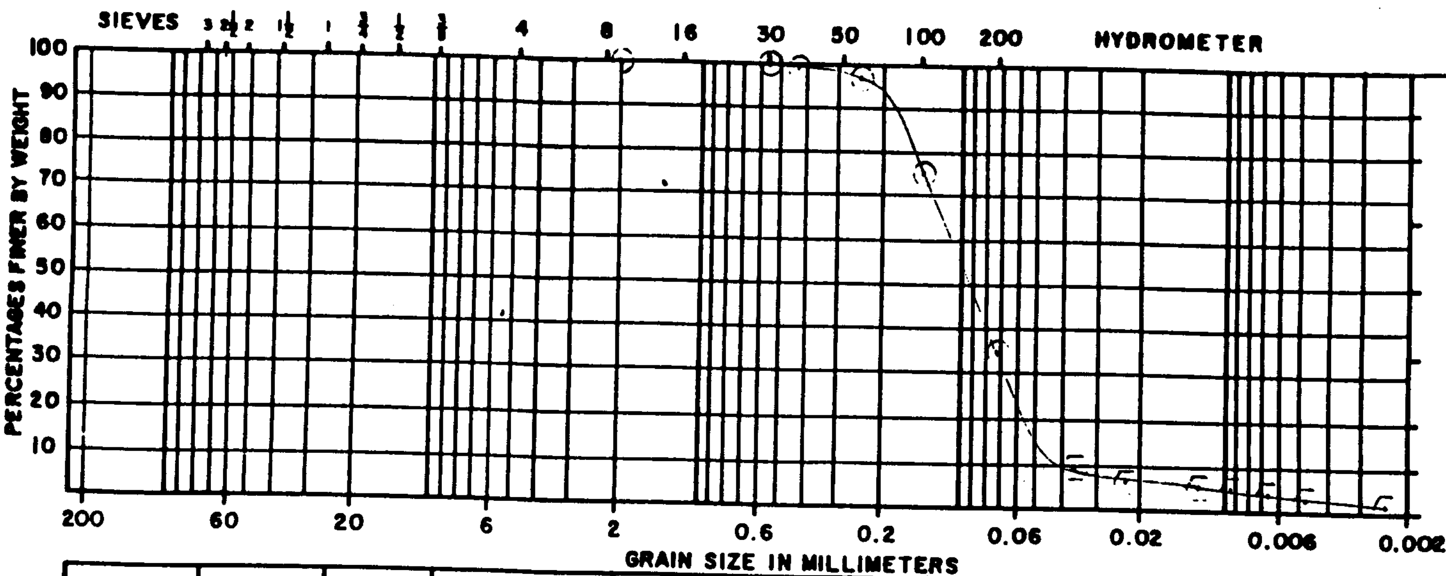
JOB NO 1-91013
REPORT NO. 5

December 10, 1991

GRAIN SIZE ANALYSIS



BOULDERS COBBLES	GRAVEL C	GRAVEL M	GRAVEL F	SAND C	SAND M	SAND F	SILT-CLAY SOIL

228 76.2 25.4 9.52 2.0 0.59 0.25 0.074 MM. OPENING

9 In. 3 In. 1 In. 3/8 In. Nos. 10 30 60 200 SIEVE

L-91013
Laboratory Testing
File # 2424-009-517

Station Number: N8439
Sample Location: LPEDSH9115G

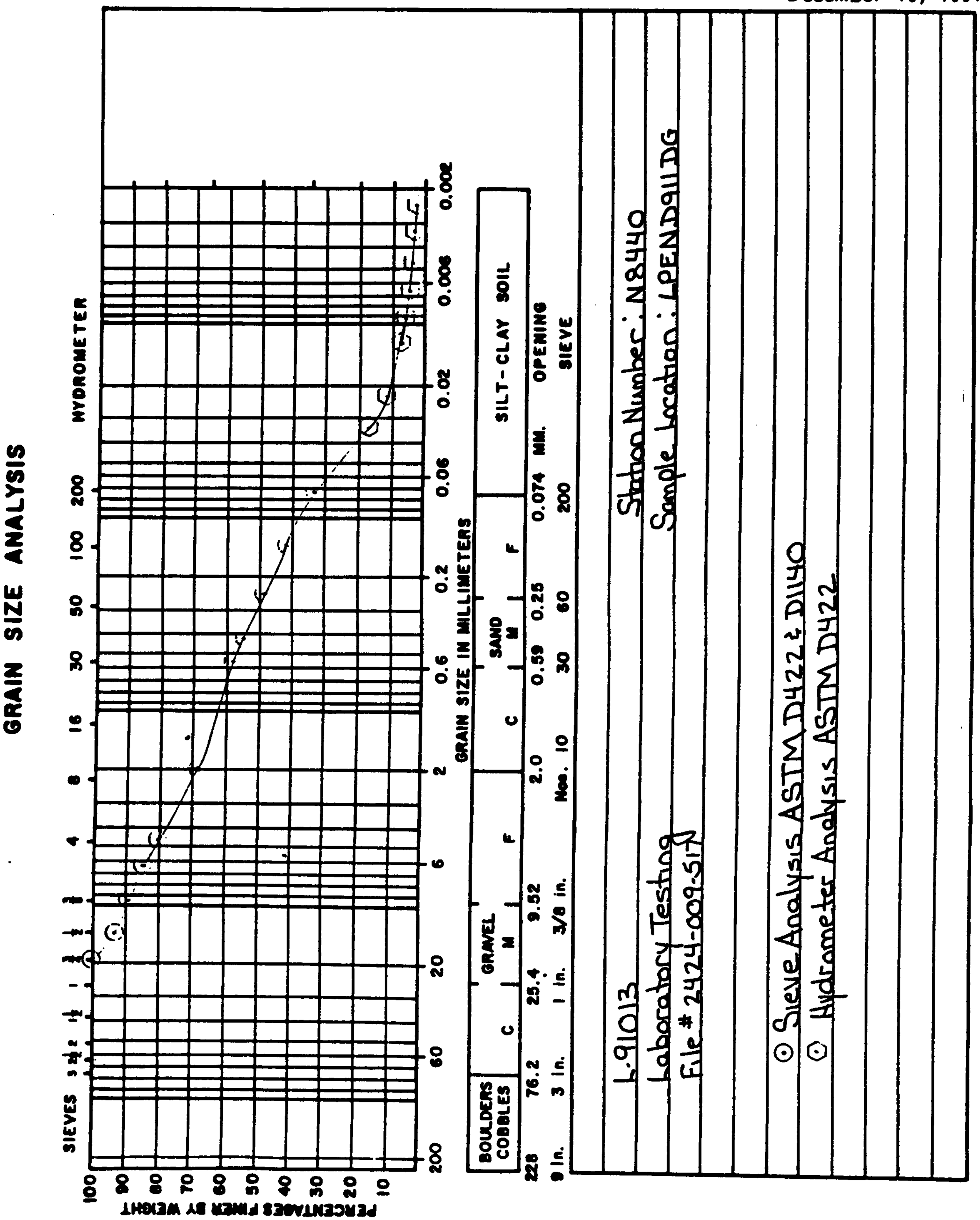
⊙ Sieve Analysis ASTM D422 & D1140
⊖ Hydrometer Analysis ASTM D422

parratt wolff inc

FISHER RD. EAST SYRACUSE, N.Y 13057
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 6

December 10, 1991



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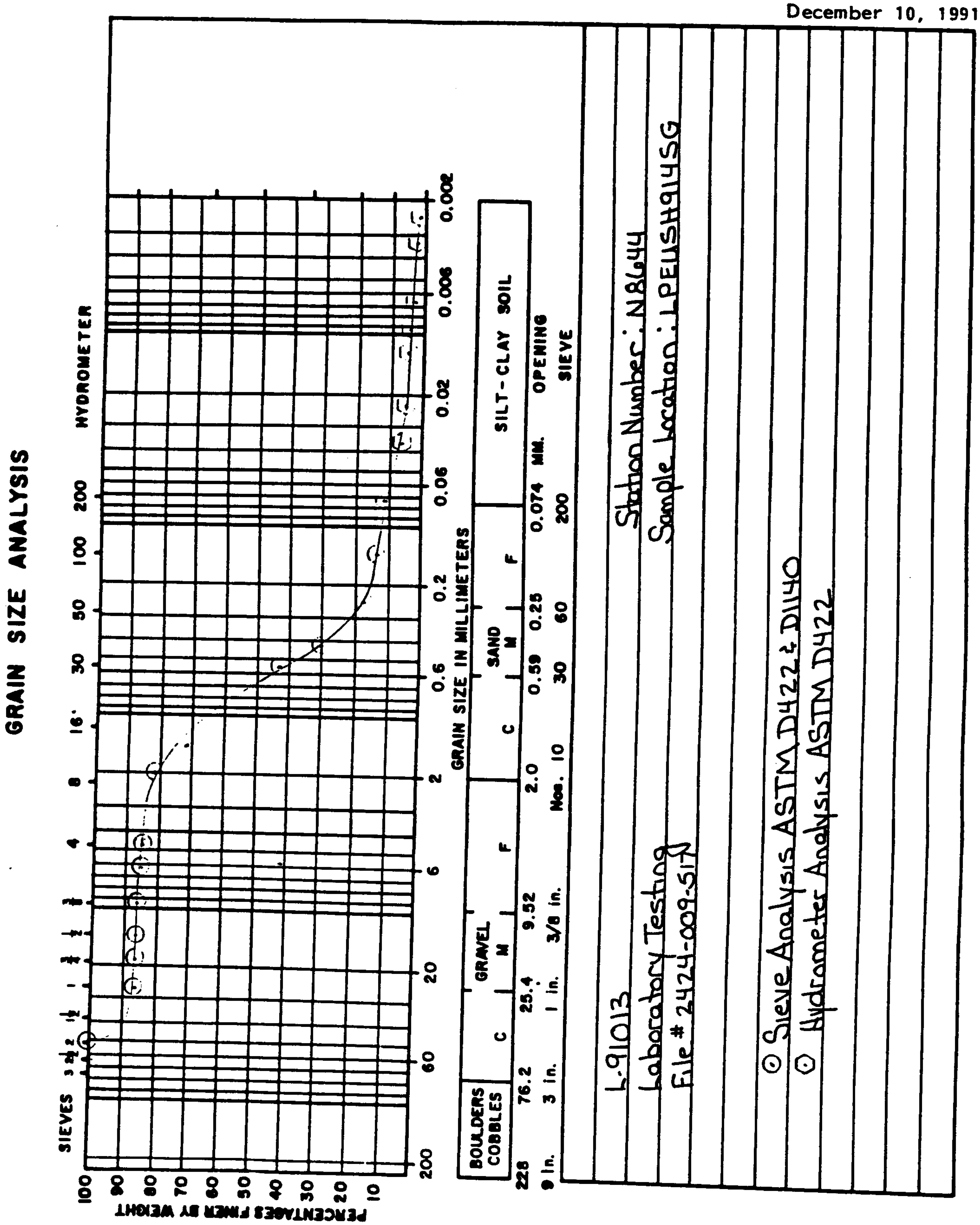
TELEPHONE AREA CODE 315/437-1429

JOB NO 1-91013
REPORT NO. 7

December 10, 1991



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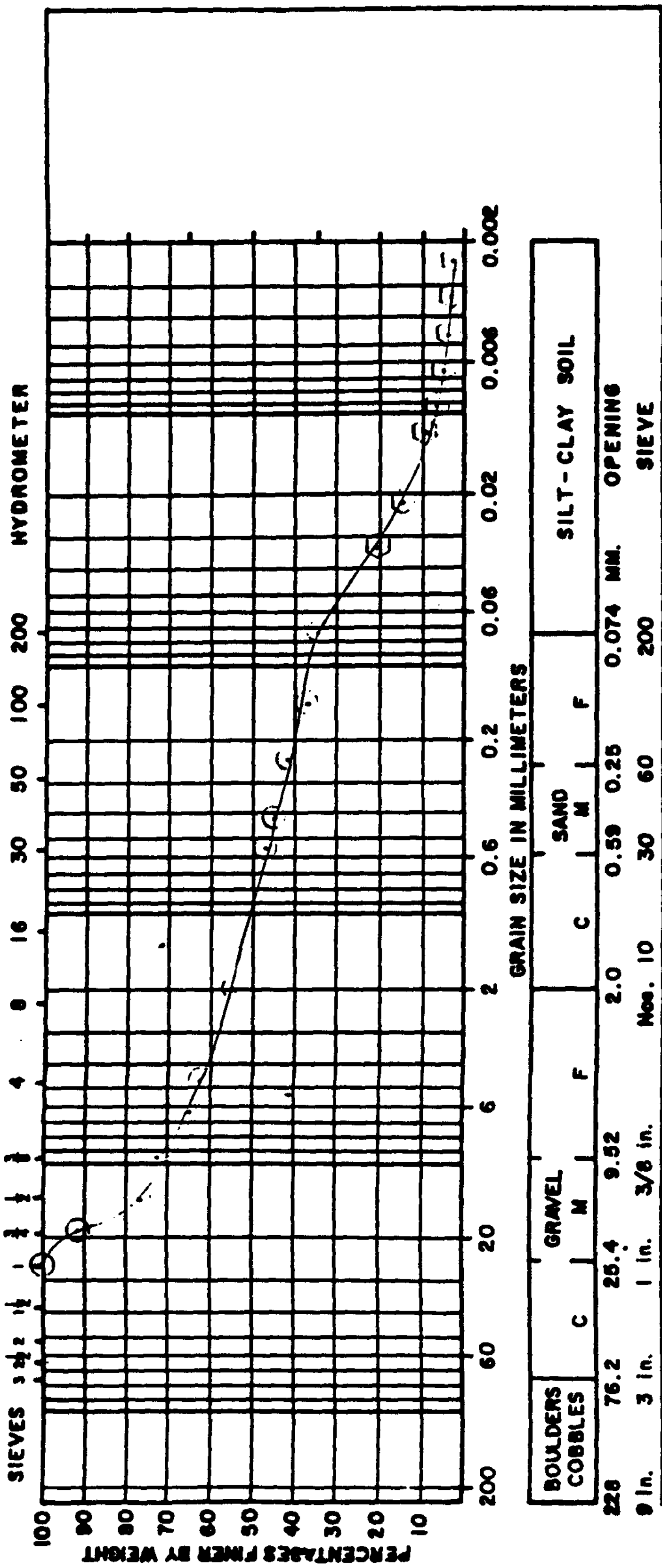
TELEPHONE AREA CODE 315/437-1429

JOB NO L-91013
REPORT NO. 8

December 10, 1991

GRAIN SIZE ANALYSIS



L-91013
Laboratory Testing
File # 2424-009-517

Station Number: N8645
Sample Location: LPEU DG14DG

⊙ Sieve Analysis ASTM D422 & D1140
⊙ Hydrometer Analysis ASTM D422

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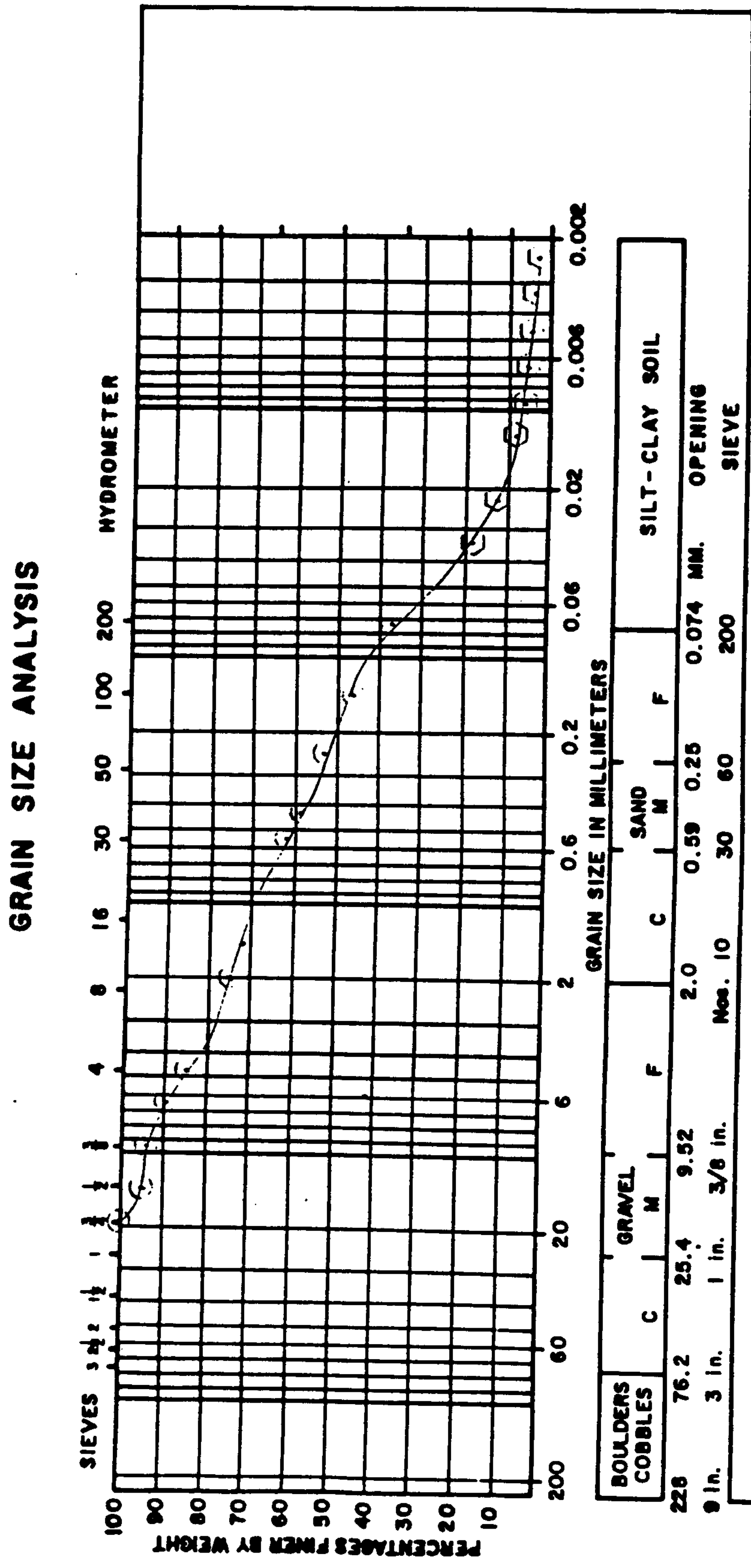
JOB NO 1-91013
REPORT NO. 9

December 10, 1991

GRAIN SIZE ANALYSIS



L-91013
Laboratory Testing
File # 2424-009-517
Station Number: N8646
Sample Location: LPEDD9110G

⊙ Sieve Analysis ASTM D422 & D1140
⬡ Hydrometer Analysis ASTM D422

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JOB NO. L-91013
REPORT NO. 10

December 10, 1991

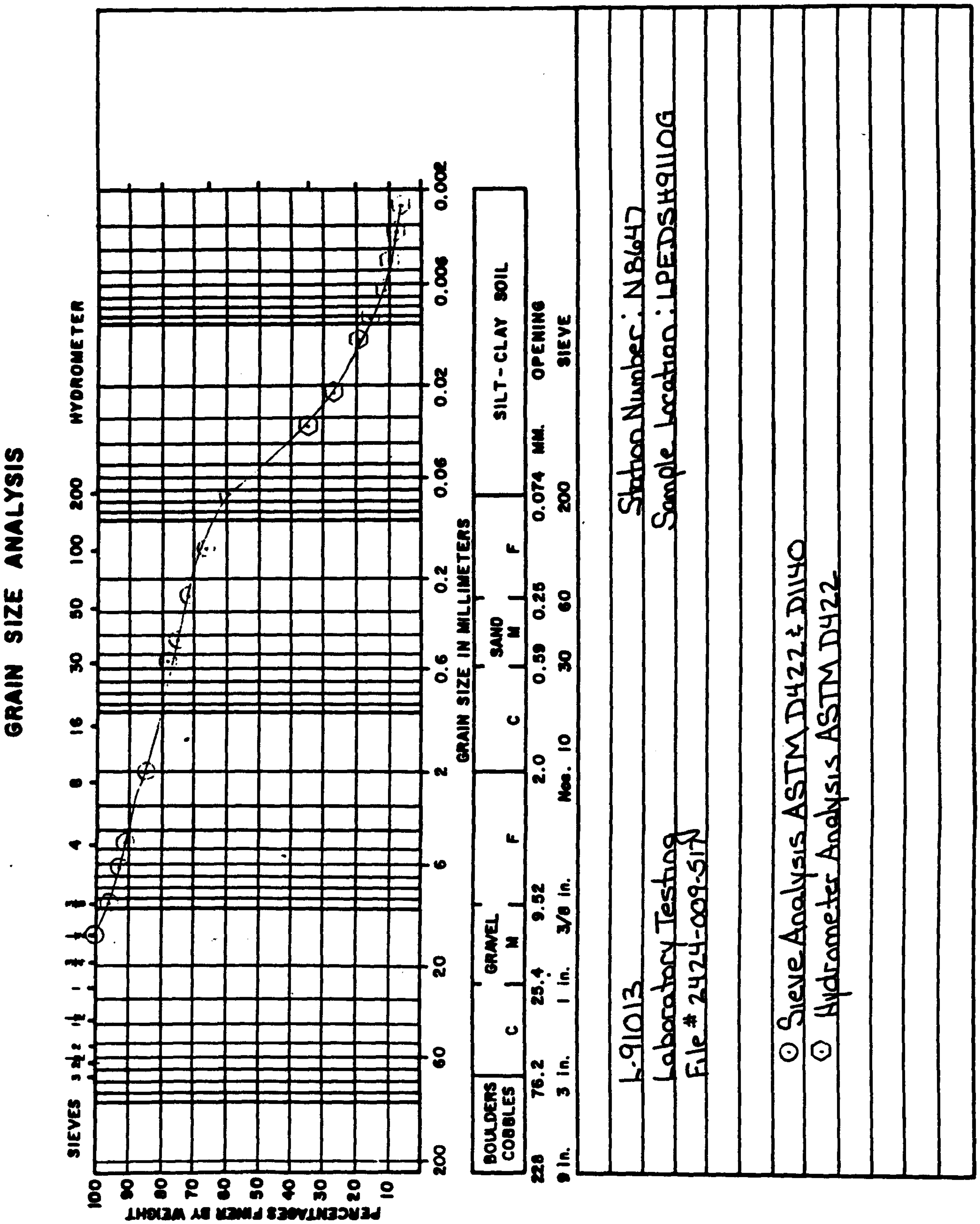

TABLE D-1
LOCKPORT SUMMARY ANALYTICAL RESULTS
SHALLOW SUBSURFACE SOILS (ppm)

ANALYTE	SAMPLE ID																
	LPVPB-9201G	LPVPB-9206G	LPVPB-9208G	LPVPB-9216G	LPVPB-9218G	LPVPB-9219G	LPVPB-9221G	LPVPB-9224G	LPVPB-9227G	LPVPB-9228G	LPVPB-9229G	LPVPB-9230G	LPVPB-9231G	LPVPB-9237G	LPVPB-9238G	LPVPB-9243G	LPVPB-9244G
	SB-01	SB-06	SB-08	SB16	SB-18	SB-19	SB-21	SB-24	SB-27	SB-28	SB-29	SB-30	SB-31	SB-37	SB-38	SB-43	SB-44
VOLATILE ORGANIC COMPOUNDS																	
1,1,1-Trichloroethane	<1.5	<0.006	<0.76	0.005 J	<0.006	0.002 J	0.007	<2.3	<0.016	<0.007	<0.02	0.017	<0.88	0.24 D	0.19 D	<0.007	<0.015
1,1,2,2-Tetrachloroethane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
1,1,2-Trichloroethane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
1,1-Dichloroethane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	0.018	<0.88	0.01 JD	0.018 JD	<0.007	<0.015
1,1-Dichloroethene	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
1,2-Dichloroethane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
1,2-Dichloroethene (total)	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
1,2-Dichloropropane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
2-Butanone	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
2-Hexanone	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
4-Methyl-2-Pentanone	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
Acetone	<3.1	0.011 J	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	0.072 D	<0.014	0.056 D	0.053	<1.8	0.14 D	<0.098	<0.015	<0.03
Bromodichloromethane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Bromoform	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Bromomethane	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
Carbon disulfide	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Carbon tetrachloride	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.002	<0.88	<0.039	<0.049	<0.007	<0.015
Chloroethane	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
Chloroform	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Chloromethane	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
Dibromochloromethane	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Methylene chloride	<1.5	0.019	<0.76	0.01	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	0.018 JD	<0.011	<0.88	0.071 D	0.23 D	<0.007	0.008 JD
Methyl tertiary butyl ether	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Tetrachloroethene	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Trichloroethene	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Vinyl acetate	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
Vinyl chloride	<3.1	<0.013	<1.5	<0.012	<0.012	<0.015	<0.012	<4.6	<0.033	<0.014	<0.039	<0.022	<1.8	<0.078	<0.098	<0.015	<0.03
Xylene (total)	6.2 D	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	3.3 D	0.08 D	<0.007	0.5 D	0.061	1.9	0.039	0.15 D	<0.007	0.15 JD
cis-1,3-Dichloropropene	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
trans-1,3-Dichloropropene	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Benzene	<1.5	<0.006	0.54 J	<0.006	<0.006	<0.007	0.003 J	<2.3	0.007 JD	<0.007	0.19 D	0.25	<0.88	<0.039	0.019 JD	<0.007	<0.015
Chlorobenzene	<1.5	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Ethylbenzene	<1.5	<0.006	2.7	<0.006	<0.006	<0.007	<0.006	<2.3	0.12 D	<0.007	0.68 D	0.01 J	1.1	<0.039	0.38 D	<0.007	0.045 D
Styrene	0.73 JD	<0.006	<0.76	<0.006	<0.006	<0.007	<0.006	<2.3	<0.016	<0.007	<0.02	<0.011	<0.88	<0.039	<0.049	<0.007	<0.015
Toluene	<1.5	<0.006	0.4 J	<0.006	<0.006	<0.007	<0.006	<2.3	0.005 JD	<0.007	0.25 D	0.005 J	<0.88	<0.039	0.034 JD	<0.007	<0.015
SEMI-VOLATILE ORGANIC COMPOUNDS																	
1,2,4-Trichlorobenzene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
1,2-Dichlorobenzene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
1,3-Dichlorobenzene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
1,4-Dichlorobenzene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2,4,5-Trichlorophenol	<39	<2	<2	<2	<2.1	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3

TABLE D-1
LOCKPORT SUMMARY ANALYTICAL RESULTS
SHALLOW SUBSURFACE SOILS (ppm)

ANALYTE	SAMPLE ID																
	LPVPB-9201G SB-01	LPVPB-9206G SB-06	LPVPB-9208G SB-08	LPVPB-9216G SB16	LPVPB-9218G SB-18	LPVPB-9219G SB-19	LPVPB-9221G SB-21	LPVPB-9224G SB-24	LPVPB-9227G SB-27	LPVPB-9228G SB-28	LPVPB-9229G SB-29	LPVPB-9230G SB-30	LPVPB-9231G SB-31	LPVPB-9237G SB-37	LPVPB-9238G SB-38	LPVPB-9243G SB-43	LPVPB-9244G SB-44
2,4,6-Trichlorophenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2,4-Dichlorophenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2,4-Dimethylphenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2,4-Dinitrophenol	<39	<2	<2	<2	<2.1	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
2,4-Dinitrotoluene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2,6-Dinitrotoluene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2-Chloronaphthalene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2-Chlorophenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2-Methylnaphthalene	1000 D	<0.4	7.8 D	0.42 J	0.28 J	0.22 J	0.62	1100 D	4	<0.38	3	1.3	2.4	<0.42	18 D	<0.43	<0.46
2-Methylphenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
2-Nitroaniline	<39	<2	<2	<2	<2.1	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
2-Nitrophenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
3,3'-Dichlorobenzidine	<16	<0.8	<0.81	<0.81	<0.83	<0.9	<0.79	<13	<0.8	<0.77	<0.8	<1.1	<0.94	<0.84	<1	<0.87	<0.93
3-Nitroaniline	<39	<2	<2	<2	<2.1	<2.2	<0.39	<6.7	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
4,6-Dinitro-2-methylphenol	<39	<2	<2	<2	<2.1	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
4-Bromophenylphenylether	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
4-Chloro-3-methylphenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
4-Chloroaniline	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
4-Chlorophenylphenylether	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
4-Methylphenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
4-Nitroaniline	<39	<2	<2	<2	<2.1	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	[illegible]	<2.3
4-Nitrophenol	<39	<2	<2	<2	<2.1	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
Benzoic acid	<39	<2	<2	0.15 J	0.16 J	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
Benzyl alcohol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Butylbenzylphthalate	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Di-n-butylphthalate	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	0.78	<6.7	0.84	0.94	0.62	0.96	0.86	0.58	0.86	0.74	0.84
Di-n-octylphthalate	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Dibenzofuran	44	0.1 J	0.86	0.68	0.65 J	<0.45	0.38 J	88	0.66	<0.38	0.3 J	0.66	<0.47	<0.42	0.44 J	<0.43	<0.46
Diethylphthalate	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Dimethylphthalate	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Hexachlorobenzene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Hexachlorobutadiene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Hexachlorocyclopentadiene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Hexachloroethane	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Isophorone	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
N-Nitroso-di-n-propylamine	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
N-Nitrosodiphenylamine	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Nitrobenzene	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Pentachlorophenol	<39	<2	<2	<2	<2.1	<2.2	<2	<33	<2	<1.9	<2	<2.7	<2.3	<2.1	<2.6	<2.2	<2.3
Phenol	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
bis(2-Chloroethoxy)methane	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
bis(2-Chloroethyl)ether	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46

TABLE D-1
LOCKPORT SUMMARY ANALYTICAL RESULTS
SHALLOW SUBSURFACE SOILS (ppm)

ANALYTE	SAMPLE ID																
	LPVPB-9201G	LPVPB-9206G	LPVPB-9208G	LPVPB-9216G	LPVPB-9218G	LPVPB-9219G	LPVPB-9221G	LPVPB-9224G	LPVPB-9227G	LPVPB-9228G	LPVPB-9229G	LPVPB-9230G	LPVPB-9231G	LPVPB-9237G	LPVPB-9238G	LPVPB-9243G	LPVPB-9244G
	SB-01	SB-06	SB-08	SB16	SB-18	SB-19	SB-21	SB-24	SB-27	SB-28	SB-29	SB-30	SB-31	SB-37	SB-38	SB-43	SB-44
bis(2-Chloroisopropyl)ether	<7.8	<0.4	<0.41	<0.41	<0.42	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
bis(2-Ethylhexyl)phthalate	<7.8	<0.4	<0.41	<0.41	0.28 J	<0.45	<0.39	<6.7	<0.4	<0.38	<0.4	<0.55	<0.47	<0.42	<0.52	<0.43	<0.46
Acenaphthene	820	<0.4	7.6 D	0.46	0.3 J	<0.45	0.26 J	32	6	<0.38	3.8	3.8	2.2	<0.42	7.2	0.092 J	0.38
Acenaphthylene	120	0.24 J	4.2	6.8 D	2.4	0.66	4.4	38	4.2	<0.38	1.4	6.8	1.1	<0.42	1.2	0.092 J	1.5
Anthracene	540 D	0.24 J	6.4	4.2	1.4	0.26 J	2.4	170 E	5	<0.38	2.8	4.8	3.6	0.11 J	3.6	0.22 J	0.64
Benzo(a)anthracene	320 D	0.5	6	58 D	3.6	0.54	8.6 D	100	5	0.2 J	2	17 D	0.98	<0.42	1.8	0.86	1
Benzo(a)pyrene	120	0.52	4.6	9.6 D	4.4	0.88	13 D	22	5.6	0.38	1.8	22 D	1.1	<0.42	1.6	1.4	2.4
Benzo(b)fluoranthene	92	0.42	4.8	8.4 D	3.4	0.68	13 D	64	2.8	0.28 J	1.1	14 D	0.82	<0.42	0.94	0.94	1.5
Benzo(g,h,i)perylene	62	0.26 J	1.2	7.2 D	1.9	0.72	12 D	28	3	0.28 J	0.72	7.4	0.52	<0.42	0.66	0.5	0.76
Benzo(k)fluoranthene	92	0.48 J	2.8	5.4 D	3.2	0.74	5.4	52	3.4	0.32 J	0.9	17 D	0.66	<0.42	0.9	1.4	1.4
Chrysene	100 D	0.52	4.6	6 D	3.2	0.62	4.6	70	3.8	0.22 J	1.8	7.4	1.2	<0.42	1.62	0.86	1.1
Dibenzo(a,h)anthracene	30	0.11 J	0.7	3.4	0.84	0.2 J	2.6	14	1.5	0.12 J	0.32 J	4.2	0.28 J	<0.42	0.28 J	0.3 J	0.24 J
Fluoranthene	700 D	1.5	7.4	11 D	4.2	0.84	5.8	200 D	6	0.3 J	3.2	19 D	2.4	0.2 J	3.4	0.98	1.2
Fluorene	1100	0.2 J	5.4	1.2	0.88	<0.45	0.58	54	4.4	<0.38	2.6	2.6	0.74	<0.42	3.8	<0.43	0.26 J
Indeno(1,2,3-cd)pyrene	58	0.26 J	1.4	5.8 D	2	0.6	5.4	28	2.6	0.24 J	0.66	6.8	0.5	<0.42	0.56	0.58	0.72
Naphthalene	1000 D	0.092 J	13 D	0.52	0.9	0.46	0.74	1800 D	3.8	0.12 J	2.4	5.2	4.8	0.1 J	30 D	<0.43	0.26 J
Phenanthrene	1600 D	1.4	13 D	6.4	3	0.48	3.6	460 D	18 D	0.15 J	6.4 E	8.6	22 D	0.44	15 D	0.7	1
Pyrene	760 D	1.2	7.4 D	10 D	4.6	0.88	12 D	200 D	12 D	0.24 J	3.8	24 D	1.8	0.2 J	3.8	0.88	1.9
INORGANIC COMPOUNDS																	
Aluminum	3810	6130	4720	5000	4130	4680	4510	1430	4330	5200	8410	6310	5450	3680	6000	5790	4800
Antimony	<0.24	<0.25	<0.25	<0.22	<0.23	<0.24	<0.23	2.9 B	<0.24	<0.23	<0.24	<0.32	<0.3	<0.26	<0.29	<0.25	<0.23
Cadmium	0.96	<0.37	0.38 B	0.78	0.35 B	0.85	4.4	1.8	<0.36	0.58	0.6	0.49 B	0.45 B	<0.39	<0.44	0.49 B	0.34 B
Chromium	12.1	7.5	7.9	7.6	7.8	14.5	12.4	24.8	7.4	8.7	13.1	9.7	7.6	7.6	10.1	7.4	7.6
Cobalt	5.1 B	4.5 B	3.6 B	5 B	5.9	5 B	5.6 B	8 B	3.5 B	4.4 B	5.6 B	4.4 B	3.7 B	5 B	2.5 B	3.2 B	3.9 B
Copper	28	11.8	11.1	26.3	20.3	134	461	44.7	14.8	13.8	9.1	44.7	25.4	13.9	40.1	47.2	11.9
Iron	11300	9630	9110	10100	12200	14900	12000	24100	7910	9540	15000	10600	10400	9720	8330	8810	8800
Lead	518	14.6	120	552	159	732	282	1690	199	35.8 B	8.6	364	35.6 B	90.4	467	159	3.1
Manganese	265	527	436	528	403	464	427	602	385	412	508	369	527	611	1150	1770	493
Nickel	8.3	8.6	6.9	6.9	9.3	14.3	16.6	12	7.6	9.7	10.5	11.2	8.2	7.7	12.3	9.7	7.4
Zinc	93.3	33.2	33.3	76.7	34.1	460	5310	520	39.8	47.9	32.9	105	48.7	33.6	189	150	26.8
Cyanide	13.4	<1.2	1.3	<1.2	79.2	6.1	16.2	15	<1.2	<1.2	<1.2	5.9	<1.5	<1.3	<1.4	<1.3	<1.1
Cyanide (amenable)	<1.1	NR	<1.2	NR	<1.1	<1.2	11.9	<1.9	NR	NR	NR	<1.6	NR	NR	NR	NR	NR
Sulfide	<4.9	<5	<5.1	<4.7	7	<4.9	451	761	<5.1	7	<4.9	668	612	52.3	<5.9	<5.1	83.6

Notes:
<0.017 – Not detected, minimum detection limit.
B – Indicates the results is less than the Contract Required Detection Limit (CRDL), but greater than the Instrument Detection Limit (IDL).
D – Identifies compounds analyzed at a secondary dilution.
E – Identifies compounds whose concentrations are outside the calibration range of the anlysis.
J – Indicates estimated value.
NR – Not reported.
Shading indicates detected compound.

TABLE D-2
LOCKPORT SUMMARY ANALYTICAL RESULTS
SUBSURFACE SOIL (ppm)

ANALYTE	BORING ID									
	LPEUD-9110G	LPEUSH-9115G	LPEUSH-9135G	LPEUD-914DG	LPEUSH-9145G	LPEDSH-9105G	LPEDSH-9106G	LPEDD-9110G	LPEDSH-9110G	LPEDSH-9111G
	SMW-1D	SMW-1S	SMW-3D	SMW-4D	SMW-4S	SMW-5	SMW-6	SMW-10D	SMW-10S	SMW-11
VOLATILE ORGANIC COMPOUNDS										
1,1,1-Trichloroethane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
1,1,2,2-Tetrachloroethane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
1,1,2-Trichloroethane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
1,1-Dichloroethane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
1,1-Dichloroethene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
1,2-Dichloroethane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
1,2-Dichloroethene (total)	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
1,2-Dichloropropane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
2-Butanone	<0.012	<0.012	<0.012	<0.012	<0.011	<0.013	<7.6 R[1]	<0.011	<0.012	<3.9 R[1]
2-Hexanone	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<7.6	<0.011	<0.012	<3.9
4-Methyl-2-Pentanone	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<7.6	<0.011	<0.012	<3.9
Acetone	<0.024[2]	<0.012[1]	<0.012[1]	<0.012[1]	<0.011[1]	<0.013[1]	<7.6	0.018[2]	0.031[2]	<3.9
Benzene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	14	<0.006	<0.006	<2
Bromodichloromethane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Bromoform	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Bromomethane	<0.012	<0.012	<0.012	<0.012	<0.011	<0.013	<7.6	<0.011	<0.012	<3.9
Carbon Disulfide	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006[3]	<3.8	<0.006	<0.006	<2
Carbon Tetrachloride	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Chlorobenzene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Chloroethane	<0.012	<0.012	<0.012	<0.012	<0.011	<0.013	<7.6	<0.011	<0.012	<3.9
Chloroform	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Chloromethane	<0.012	<0.012	<0.012	<0.012	<0.011	<0.013	<7.6	<0.011	<0.012	<3.9
Dibromochloromethane	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Ethylbenzene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	34	<0.006	<0.006	3.6 J[2]
Methylene Chloride	<0.006[1]	<0.006[1]	0.007[2]	<0.006[1]	<0.005[1]	<0.006[1]	4.1[2]	<0.006[1]	<0.006[1]	<2[1]
Styrene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	3.4 J[2]
Tetrachloroethene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Toluene	0.002 J	<0.006	<0.006	<0.006[3]	<0.005	0.003 J	2.2 J	<0.006	<0.006	42 J[1]
Trichloroethene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
Vinyl Acetate	<0.012	<0.012	<0.012	<0.012	<0.011	<0.013	<7.6	<0.011	<0.012	<3.9
Vinyl Chloride	<0.012	<0.012	<0.012	<0.012	<0.011	<0.013	<7.6	<0.011	<0.012	<3.9
Xylene (total)	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	25	<0.006	<0.006	21 J[2]
cis-1,3-Dichloropropene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2
trans-1,3-Dichloropropene	<0.006	<0.006	<0.006	<0.006	<0.005	<0.006	<3.8	<0.006	<0.006	<2

TABLE D-2
LOCKPORT SUMMARY ANALYTICAL RESULTS
SUBSURFACE SOIL (ppm)

ANALYTE	BORING ID									
	LPEUD-9110G	LPEUSH-9115G	LPEUSH-9135G	LPEUD-914DG	LPEUSH-9145G	LPEDSH-9105G	LPEDSH-9106G	LPEDD-9110G	LPEDSH-9110G	LPEDSH-9111G
	SMW-1D	SMW-1S	SMW-3D	SMW-4D	SMW-4S	SMW-5	SMW-6	SMW-10D	SMW-10S	SMW-11
SEMI-VOLATILE ORGANIC COMPOUNDS										
1,2,4-Trichlorobenzene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
1,2-Dichlorobenzene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
1,3-Dichlorobenzene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
1,4-Dichlorobenzene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2,2'-oxybis(1-Chloropropane)	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2,4,5-Trichlorophenol	<1.9	<2	<2	<2	<1.9	<2.1	<61	<1.9	<2	<21
2,4,6-Trichlorophenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2,4-Dichlorophenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2,4-Dimethylphenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2,4-Dinitrophenol	<1.9	<2	<2	<2	<1.9	<2.1	<61	<1.9	<2	<21
2,4-Dinitrotoluene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2,6-Dinitrotoluene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2-Chloronaphthalene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2-Chlorophenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2-Methylnaphthalene	<0.39	<0.4	<0.39	<0.39	<0.38	0.12 J	44	0.077 J	<0.4	3.5 J
2-Methylphenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
2-Nitroaniline	<1.9	<2	<2	<2	<1.9	<2.1	<61	<1.9	<2	<21
2-Nitrophenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
3,3'-Dichlorobenzidine	<0.78	<0.79	<0.78	<0.78	<0.76	<0.83	<24	<0.77	<0.79	<8.3
3-Nitroaniline	<1.9	<2	<2	<2	<1.9	<2.1	<61	<1.9	<2	<21
4,6-Dinitro-2-methylphenol	<1.9	<2	<2	<2	<1.9	<2.1	<61	<1.9	<2	<21
4-Bromophenyl-phenylether	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
4-Chloro-3-methylphenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
4-Chloroaniline	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
4-Chlorophenyl-phenylether	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
4-Methylphenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
4-Nitroaniline	<1.9	<2	<2	<2	<1.9	<2.1	<61	<1.9	<2	<21
4-Nitrophenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Acenaphthene	<0.39	<0.4	<0.39	<0.39	<0.38	0.051 J	32	<0.38	<0.4	3.1 J
Acenaphthylene	<0.39	<0.4	<0.39	<0.39	<0.38	0.056 J	2 J	<0.38	<0.4	13
Anthracene	<0.39	<0.4	<0.39	<0.39	<0.38	0.22 J	15	0.08 J	<0.4	10
Benzo(a)Anthracene	<0.39	<0.4	<0.39	<0.39	<0.38	0.76	6.9 J	0.062 J	<0.4	5.9
Benzo(a)Pyrene	<0.39	<0.4	<0.39	<0.39	<0.38	0.75	4.8 J	<0.38	<0.4	3.7 J
Benzo(b)Fluoranthene	<0.39	<0.4	<0.39	<0.39	<0.38	0.88	2.8 J	<0.38	<0.4	3.1 J

TABLE D-2
LOCKPORT SUMMARY ANALYTICAL RESULTS
SUBSURFACE SOIL (ppm)

ANALYTE	BORING ID									
	LPBUD-9110G	LPBUSH-9115G	LPBUSH-9135G	LPBUD-914DG	LPBUSH-9145G	LPBDSH-9105G	LPBDSH-9106G	LPBDD-9110G	LPBDSH-9110G	LPBDSH-9111G
	SMW-1D	SMW-1S	SMW-3D	SMW-4D	SMW-4S	SMW-5	SMW-6	SMW-10D	SMW-10S	SMW-11
Benzo(g,h,i)Perylene	<0.39	<0.4	<0.39	<0.39	<0.38	0.44	1.7 J	<0.38	<0.4	1.2 J
Benzo(k)Fluoranthene	<0.39	<0.4	<0.39	<0.39	<0.38	0.62	2.9 J	<0.38	<0.4	3.1 J
Benzoic Acid	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Benzyl Alcohol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Bis(2-Ethylhexyl)Phthalate	<0.39	<0.4 [1]	<0.39 [1]	<0.39 [1]	<0.38 [1]	<0.42	<12	<0.38 [1]	<0.4 [1]	<4.2
Butylbenzylphthalate	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Chrysene	<0.39	<0.4	<0.39	<0.39	<0.38	0.78	6 J	0.054 J	<0.4	5.1
Di-n-Butylphthalate	<0.39	<0.4	<0.39 J[2]	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Di-n-octylphthalate	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Dibenzo(a,h)Anthracene	<0.39	<0.4	<0.39	<0.39	<0.38	0.31 J	<12	<0.38	<0.4	1 J
Dibenzofuran	<0.39	<0.4	<0.39	<0.39	<0.38	0.094 J	<12	0.078 J	<0.4	8
Diethylphthalate	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Dimethylphthalate	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Fluoranthene	<0.39	<0.4	<0.39	<0.39	<0.38	1	13	0.22 J	<0.4	12
Fluorene	<0.39	<0.4	<0.39	<0.39	<0.38	0.092 J	19	0.14 J	<0.4	14
Hexachlorobenzene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Hexachlorobutadiene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Hexachlorocyclopentadiene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Hexachloroethane	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Indeno(1,2,3-cd)Pyrene	<0.39	<0.4	<0.39	<0.39	<0.38	0.49	1.6 J	<0.38	<0.4	1.6 J
Isophorone	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
N-Nitroso-Di-n-propylamine	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
N-Nitrosodiphenylamine	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Naphthalene	<0.39	<0.4	<0.39	<0.39	<0.38	0.12 J	75	0.16 J	0.058 J	29
Nitrobenzene	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Pentachlorophenol	<1.9	<2	<2	<2	<1.9	<2.1	<12	<0.38	<0.4	<4.2
Phenanthrene	<0.39	<0.4	<0.39	0.046 J	<0.38	0.81	42	0.42	<0.4	23
Phenol	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
Pyrene	<0.39	<0.4	<0.39	<0.39	<0.38	1.1	18	0.14 J	<0.4	9.9
bis(2-Chloroethoxy)methane	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
bis(2-Chloroethyl)ether	<0.39	<0.4	<0.39	<0.39	<0.38	<0.42	<12	<0.38	<0.4	<4.2
INORGANIC COMPOUNDS										
Aluminum	4940	3420	4680	<4640	6490	9080	11900	2840	6760	9630
Antimony	<6 J[3]	<6.2 J[3]	<6.1 J[3]	<6.1 J[3]	<5.9 J[3]	<6.5 J[3]	<9.5 J[3]	<6 J[3]	<6.2 J[3]	<6.5 J[3]
Arsenic	2.7 J[5]	1.4 J[5]	2.6 J[5]	6.6	4.5 J[5]	5.4	2.5 B	2.7	2.2 B	4.9

TABLE D-2

LOCKPORT SUMMARY ANALYTICAL RESULTS

SUBSURFACE SOIL (ppm)

ANALYTE	BORING ID									
	LPEUD-9110G	LPEUSH-9115G	LPEUSH-9135G	LPEUD-914DG	LPEUSH-9145G	LPEDSH-9105G	LPEDSH-9106G	LPEDD-9110G	LPEDSH-9110G	LPEDSH-9111G
	SMW-1D	SMW-1S	SMW-3D	SMW-4D	SMW-4S	SMW-5	SMW-6	SMW-10D	SMW-10S	SMW-11
Barium	66	78.4	151	95.1	68.5	96.4	477	42 B	89.7	211
Beryllium	0.66 B	0.7 B	0.68 B	0.66 B	0.63 B	0.77 B	0.99 B	0.67 B	0.67 B	0.67 B
Cadmium	<0.47	<0.48	<0.47	<0.47	<0.45	<0.5	<0.73	<0.46	<0.48	<0.5
Calcium	50700 J^4	25800 J^4	35700 J^4	35700 J^4	57200 J^4	98500 J^4	206000 J^4	89200 J^4	36200 J^4	48300 J^4
Chromium	7.2	5.1 R^2	6.8	8	9.2	12.3 R^2	15.8	4.7	10.4	14.5
Cobalt	4 B	3 B	4.7 B	4.6 B	5.4 B	5.1 B	5.9 B	3.5 B	6.7 B	7.2
Copper	16.4	6.8 R^2	16	19.8	21.6	40.7	39.8	17.3 R^2	7 R^2	11.7 R^2
Iron	10100	7210	9390	10300	12300	12900	12700	7110	12900	16200
Lead	2.5 J^3	1.6 J^3	2 J^3	1.9 J^3	5.7 J^3	128 J^3	42.9 J^3	2.7 J^3	2.1 J^3	6.4 J^3
Magnesium	7200	5350	6200	6360	10600	16400	21100	13100	7860	9720
Manganese	517	302	462	477	728	365	1760	686	546	925
Mercury	<0.12	<0.12	<0.12	<0.12	<0.11	0.26	<0.18	<0.11	<0.12	<0.12
Nickel	5.7 B	4.9 B	8 B	4.3 B	9.1	9.9 B	11.4 B	3.7 B	11.6	11.9
Potassium	400 B	452 B	937 B	507 B	551 B	1200 B	2380	566 B	1060 B	1290
Selenium	<0.93 J^3	<0.95 J^3	<0.94 J^3	<0.94 J^3	<0.91 J^3	2.6 J^3	<1.5 J^3	<0.92 J^3	<0.95 J^3	<1 J^3
Silver	<0.7	<0.71	<0.71	<0.71	0.74 B	<0.75	<1.1	0.7 B	<0.71	<0.75
Sodium	314 R^2	336 R^2	370 R^2	436 R^2	370 R^2	3180 J^6	1070 R^2	341.43	367 R^2	488 R^2
Thallium	<2.3 J^5	<2.4	<2.4	<2.4	<1.1 J^5	<2.5 J^5	<3.6 J^5	<0.23 J^5	<2.4	<2.5 J^5
Vanadium	15.2	10.8 B	12.7	16	16.7	20.5	29.1	11.3 B	16.1	22
Zinc	21.8	15.5	23.8	20.4	29.8	92.1	108	13.3 R^2	28.9	37

Notes:

<0.017 – Not detected, minimum detection limit.

1 – Compound was present in the associated blank; compound is present in the sample at a concentraiton less than the CRQL, report CRQL.

2 – Compound was present in the associated blank; compound was present in the sample at a concentration higher than the CRQL, but lower than the "action level" (the Limit of Detection has been raised for that compound, and the result is considered to be a non-detect.

3 – This compound was inappropriately reported at levels below the detection limit, report CRQL.

B – The reported value is greater than or equal to the Instrument Detection Limit, but less than the Contract Required Detection Limit.

J – Indicates the result is less than the sample quantitation limit, but greater than zero; estimated value.

J^1 – The Matrix Spike and/or Matrix Spike Duplicate Percent Recvery were not within the Contract Required Recovery range for this compound, estimated value.

J^2 – This compound was detected above the CRQL in the native sample, but was not detected in the MS and MSD, estimated value.

J^3 – The recovery of the matrix spike for an element is outside of criteria, estimated value.

J^4 – The Relative Percent Difference for duplicate laboratory sample analysis is >20% (>35% for soil), estimated value.

J^5 – The recovery of analytical spikes for GFAA analysis is outside of control limits, estimated value.

J^6 – The results of the ICP Serial Dilution experiment was outside of criteria, estimated value.

R^1 – The initial or continuing calibration RFs were low, estimated value.

R^2 – The compound was present in the associated blank; the sample result was less than the action level of 5x the maximum concentration found in any blank, and has been rejected.

Shading indicates detected compound.

NYSEG SAMPLE I.D.		
Atlantic Well I.D.	**Groundwater Round 1**	**Groundwater Round 2**
SMW-1D	LPGUD-9101G	LPGUD-9201G
SWW-1S	LPGUSH-9101G	LPGUSH-9201G
SWM-3D	LPGUD-9103G	LPGUD-9203G
SWM-3S	LPGUSH-9103G	LPGUSH-9203G
SWM-4D	LPGUD-9104G	LPGUD-9204G
SWM-4S	LPGUSH-9104G	LPGUSH-9204G
SWM-6D	LPGUD-9106G	LPGUD-9206G
SWM-6S	LPGDSH-9106G	LPGDSH-9206G
SWM-10	LPGDSH-9110G	LPGDSH-9210G
SWM-11	Not Sampled	LPGDXX-9211G

TABLE D-3
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 1 (ppm)

ANALYTE	SAMPLE ID								
	LPGUD-9101G	LPGUSH-9101G	LPGUD-9103G	LPGUSH-9103G	LPGUD-9104G	LPGUSH-9104G	LPGDD-9106G	LPGDSH-9106G	LPGDSH-9110G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10
VOLATILE ORGANIC COMPOUNDS									
1,1,1-Trichloroethane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	<0.2 J[1]	<0.1	<0.005 J[1]
1,1,2,2-Tetrachloroethane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
1,1,2-Trichloroethane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
1,1-Dichloroethane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	<0.2 J[1]	<0.1	<0.005 J[1]
1,1-Dichloroethene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	<0.2 J[1]	<0.1	<0.005 J[1]
1,2-Dichloroethane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 J[2]	<0.005 J[2]	<0.005 J[2]	<0.2 J[1]	<0.1	<0.005 J[1]
1,2-Dichloroethene (total)	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	<0.2 J[1]	<0.1	<0.005 J[1]
1,2-Dichloropropane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
2-Butanone	<0.05	<0.05 J[1]	<0.05 J[1]	<0.05	<0.05	<0.05	<2 J[1]	<1	<0.05 J[1]
2-Hexanone	<0.05	<0.05 J[1]	<0.05 J[1]	<0.05 R[3]	<0.05	<0.05	<2 J[1]	<1	<0.05 J[1]
4-Methyl-2-Pentanone	<0.05	<0.05 J[1]	<0.05 J[1]	<0.05 R[3]	<0.05 R[3]	<0.05 R[3]	<2 J[1]	<1	<0.05 J[1]
Acetone	<0.05	<0.05 J[1]	<0.05 J[1]	0.008 J[2]	0.005 J[2]	0.007 J[2]	<2 J[1]	<1	<0.05 J[1]
Benzene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	6.2 J[1]	1.6	<0.005 J[1]
Bromodichloromethane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
Bromoform	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
Bromomethane	<0.01	<0.01 J[1]	<0.01 J[1]	<0.01	<0.01	<0.01	<0.4 J[1]	<0.2	<0.01 J[1]
Carbon Disulfide	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	<0.2 J[1]	<0.1	<0.005 J[1]
Carbon Tetrachloride	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	<0.2 J[1]	<0.1	<0.005 J[1]
Chlorobenzene	<0.005	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
Chloroethane	<0.01	<0.01 J[1]	<0.01 J[1]	<0.01	<0.01	<0.01	<0.4 J[1]	<0.2	<0.01 J[1]
Chloroform	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	<0.2 J[1]	<0.1	<0.005 J[1]
Chloromethane	<0.01	<0.01 J[1]	<0.01 J[1]	<0.01	<0.01	<0.01	<0.4 J[1]	<0.2	<0.01 J[1]
Dibromochloromethane	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
Ethylbenzene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	4.1 J[1]	0.31	<0.005 J[1]
Methylene Chloride	<0.01	<0.01 J[1]	<0.01 J[1]	<0.01 [1]	<0.01 [1]	<0.01 [1]	<0.4 J[1]	<0.2	<0.01 J[1]
Methyl tertiary butyl ether	<0.001	<0.001 J[1]	0.037	0.41	<0.001	<0.001	<0.001	<0.001	<0.001
Styrene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	0.28 J[1]	<0.1	<0.005 J[1]
Tetrachloroethene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
Toluene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	5.5 J[1]	0.46	<0.005 J[1]
Trichloroethene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
Vinyl Acetate	<0.01	<0.01 J[1]	<0.01 J[1]	<0.01	<0.01	<0.01	<0.4 J[1]	<0.2	<0.01 J[1]
Vinyl Chloride	<0.01	<0.01 J[1]	<0.01 J[1]	<0.01	<0.01	<0.01	<0.4 J[1]	<0.2	<0.01 J[1]
Xylene (total)	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005	<0.005	<0.005	3.6 J[1]	0.86	<0.005 J[1]
cis-1,3-Dichloropropene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]
trans-1,3-Dichloropropene	<0.005	<0.005 J[1]	<0.005 J[1]	<0.005 R[3]	<0.005 R[3]	<0.005 R[3]	<0.2 J[1]	<0.1	<0.005 J[1]

TABLE D-3 (Continued)
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 1 (ppm)

ANALYTE	SAMPLE ID								
	LPGUD-9101G	LPGUSH-9101G	LPGUD-9103G	LPGUSH-9103G	LPGUD-9104G	LPGUSH-9104G	LPGDD-9106G	LPGDSH-9106G	LPGDSH-9110G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10
SEMI-VOLATILE ORGANIC COMPOUNDS									
1,2,4-Trichlorobenzene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
1,2-Dichlorobenzene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
1,3-Dichlorobenzene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
1,4-Dichlorobenzene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2,2'-oxybis(1-Chloropropane)	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2,4,5-Trichlorophenol	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
2,4,6-Trichlorophenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2,4-Dichlorophenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2,4-Dimethylphenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2,4-Dinitrophenol	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
2,4-Dinitrotoluene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2,6-Dinitrotoluene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2-Chloronaphthalene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2-Chlorophenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2-Methylnaphthalene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2-Methylphenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
2-Nitroaniline	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
2-Nitrophenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
3,3'-Dichlorobenzidine	<0.02 J[1]	<0.02 J[1]	<0.021 J[1]	<0.021 J[1]	<0.02 J[1]	<0.02 J[1]	<4 J[1]	<0.02 J[1]	<0.02 J[1]
3-Nitroaniline	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
4,6-Dinitro-2-methylphenol	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 R[3]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
4-Bromophenyl-phenylether	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 R[3]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
4-Chloro-3-methylphenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
4-Chloroaniline	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
4-Chlorophenyl-phenylether	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
4-Methylphenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
4-Nitroaniline	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
4-Nitrophenol	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
Acenaphthene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	0.037 J[1]	<0.01 J[1]	<0.01 J[1]
Acenaphthylene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	0.2 J[1]	0.006 J[1]	<0.01 J[1]
Anthracene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	0.012 J[1]	<0.01 J[1]	<0.01 J[1]
Benzo(a)Anthracene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Benzo(a)Pyrene	<0.01 J[1]	<0.01 R[3]	<0.01 R[3]	<0.011 R[3]	<0.01 R[3]	<0.01 R[3]	<2 J[1]	<0.01 J[1]	<0.01 R[3]
Benzo(b)Fluoranthene	<0.01 J[1]	<0.01 R[3]	<0.01 R[3]	<0.011 R[3]	<0.01 R[3]	<0.01 R[3]	<2 J[1]	<0.01 J[1]	<0.01 R[3]
Benzo(g,h,i)Perylene	<0.01 J[1]	<0.01 R[3]	<0.01 R[3]	<0.011 R[3]	<0.01 R[3]	<0.01 R[3]	<2 J[1]	<0.01 J[1]	<0.01 R[3]
Benzo(k)Fluoranthene	<0.01 J[1]	<0.01 R[3]	<0.01 R[3]	<0.011 R[3]	<0.01 R[3]	<0.01 R[3]	<2 J[1]	<0.01 J[1]	<0.01 R[3]

TABLE D-3 (Continued)
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 1 (ppm)

ANALYTE	SAMPLE ID								
	LPGUD-9101G	LPGUSH-9101G	LPGUD-9103G	LPGUSH-9103G	LPGUD-9104G	LPGUSH-9104G	LPGDD-9106G	LPGDSH-9106G	LPGDSH-9110G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10
Benzoic Acid	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
Benzyl Alcohol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Bis(2-Ethylhexyl)Phthalate	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Butylbenzylphthalate	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Chrysene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Di-n-Butylphthalate	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Di-n-octylphthalate	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 R[3]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Dibenzo(a,h)Anthracene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 R[3]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Dibenzofuran	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Diethylphthalate	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Dimethylphthalate	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Fluoranthene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 R[3]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Fluorene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Hexachlorobenzene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 R[3]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Hexachlorobutadiene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Hexachlorocyclopentadiene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Hexachloroethane	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Indeno(1,2,3-cd)Pyrene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Isophorone	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
N-Nitroso-Di-n-propylamine	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
N-Nitrosodiphenylamine	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Naphthalene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	5.6 J[1]	0.013 J[1]	<0.01 J[1]
Nitrobenzene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
Pentachlorophenol	<0.05 J[1]	<0.05 J[1]	<0.052 J[1]	<0.053 J[1]	<0.05 J[1]	<0.05 J[1]	<10 J[1]	<0.05 J[1]	<0.05 J[1]
Phenanthrene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	0.066 J[1]	<0.01 J[1]	<0.01 J[1]
Phenol	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	0.048 J[1]	0.071 J[1]	<0.01 J[1]
Pyrene	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	0.022 J[1]	<0.01 J[1]	<0.01 J[1]
bis(2-Chloroethoxy)methane	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
bis(2-Chloroethyl)ether	<0.01 J[1]	<0.01 J[1]	<0.01 J[1]	<0.011 J[1]	<0.01 J[1]	<0.01 J[1]	<2 J[1]	<0.01 J[1]	<0.01 J[1]
INORGANIC COMPOUNDS									
Aluminum	1	<0.2	<0.2	<0.2	<0.2 R[2]	<0.2	<0.2	<0.2	<0.2
Aluminum (dis)	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	NS	<0.2
Antimony	<0.06	<0.06	<0.06	<0.06	0.47 R[2]	<0.06	<0.06	<0.06	<0.06
Antimony (dis)	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	NS	<0.06
Cadmium	<0.005	0.007	<0.005	<0.005	0.048 R[2]	<0.005	<0.005	<0.005	0.007
Cadmium (dis)	<0.005 J[3]	<0.005 J[3]	<0.005 J[3]	<0.005 J[3]	<0.005 J[3]	<0.005 J[3]	<0.005 J[3]	NS	<0.005 J[3]
Chromium	<0.004	<0.004	<0.004	0.018	0.19 R[2]	0.0086	<0.004	0.0048	0.0059

TABLE D-3 (Continued)
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 1 (ppm)

ANALYTE	SAMPLE ID								
	LPGUD-9101G	LPGUSH-9101G	LPGUD-9103G	LPGUSH-9103G	LPGUD-9104G	LPGUSH-9104G	LPGDD-9106G	LPGDSH-9106G	LPGDSH-9110G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10
Chromium (dis)	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	NS	<0.004
Cobalt	<0.05	<0.05	<0.05	<0.05	0.46 R^2	<0.05	<0.05	<0.05	<0.05
Cobalt (dis)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	NS	<0.05
Copper	0.081	<0.025	<0.025	<0.025	0.24 R^2	<0.025	<0.025	0.026	<0.025
Copper (dis)	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	<0.025	NS	<0.025
Iron	3	<0.1	0.64	0.72	1 R^2	0.14 J^5	0.7	1.9	0.19
Iron (dis)	2	<0.1	0.78	0.11	<0.1	0.1 J^5	0.5	NS	<0.1
Lead	<0.003 J^3	<0.003 J^3	<0.003 J^3	<0.003 J^3	<0.003	<0.003 J^3	<0.003 J^4	0.315 J^3	<0.003 J^3
Lead (dis)	<0.003 J^3	<0.003 J^3	<0.003 J^3	<0.003 J^3	<0.003 J^3	<0.003 J^3	<0.003 J^3	NS	<0.003
Manganese	0.13	0.11 J^5	0.37 J^5	0.13	0.52 R^2	0.075 J^5	0.14	0.37	0.07 J^5
Manganese (dis)	0.094	0.15 J^5	0.46 J^5	0.14	0.5	0.098 J^5	0.16	NS	0.094 J^5
Nickel	<0.04	<0.04	<0.04	0.047	0.5 R^2	0.049 J^5	<0.04	<0.04	<0.04
Nickel (dis)	<0.04	<0.04	<0.04	0.049	<0.04	0.078 J^5	<0.04	NS	<0.04
Zinc	0.054 R^1	0.072 R^1	0.028 R^1	0.03 R^1	0.49 R^2	0.023 R^1	0.05 R^1	0.05 R^1	0.09 R^1
Zinc (dis)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	NS	<0.02
Cyanide	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	<0.01	<0.01
Cyanide (dis)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	NS	<0.01
Cyanide (ammenable)	NA	NA	NA	NA	NA	NA	NA	NA	NA
Sulfide	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

<0.017 – Not detected, minimum detection limit.

1 – Compound was present in the associated blank; compound is present in the sample at a concenration less than the CRQL.

J^1 – The sample was analyzed outside the 12-hour clock from the last acceptable time.

J^2 – The inital or continuing calibration %RSD or %D was high.

J^3 – The inital or continuing calibration recovery was outside of criteria or the correlation coefficient of initial calibration (AA, Hg, or CN) is <0.99: estimate positive results and/or non-detects.

J^4 – The recovery of analytical spikes for GFAA analysis is outside of control limits.

J^5 – The dissolved metal result is greater than the total metal result by >20%.

R^1 – The compound was present in the associated blank; the sample result was less than the action level of 5x the maximum concentration found in any blank, and has been rejected.

R^2 – There was an error in the laboratory preparation of this sample; all positive results are rejected.

R^3 – The internal standard area performance could not be evaluated because the necessary information was not provided: estimate all positive results and reject all non-detected results.

NA – Not analyzed.

NS – Not sampled due to slow recharge rate (deletion of dissolved metals sample approved by client 1/9/92 at 5:30 p.m.

Shading indicates detected compound.

TABLE D-4
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 2 (ppm)

ANALYTE	SAMPLE ID									
	LPGUD-9201G	LPGUSH-9201G	LPGUD-9203G	LPGUSH-9203G	LPGUD-9204G	LPGUSH-9204G	LPGDD-9206G	LPGDSH-9206G	LPGDSH-9210G	LPGDXX-9211G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10	SMW-11
VOLATILE ORGANIC COMPOUNDS										
1,1,1-Trichloroethane	<0.001	<0.001	<0.005	<0.005	<0.001 [1]	<0.001	<0.025 [1]	0.0027	<0.001	<0.025
1,1,2,2-Tetrachloroethane	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001 J [1]	<0.001	<0.025
1,1,2-Trichloroethane	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
1,1-Dichloroethane	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	0.04 [2]	0.0075	<0.001	<0.025
1,1-Dichloroethene	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
1,2-Dichloroethane	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
1,2-Dichloroethene (total)	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
1,2-Dichloropropane	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
2-Butanone	<0.002 R [1]	<0.002 R [1]	<0.01 R [1]	<0.01 R [1]	<0.002 R [1]	<0.002 R [1]	<0.05 R [1]	<0.002 R [1]	<0.002 R [1]	<0.05 R [1]
2-Hexanone	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.05	<0.002 J [1]	<0.002	<0.05
4-Methyl-2-Pentanone	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.05	<0.002 J [1]	<0.002	<0.05
Acetone	<0.002	<0.002	<0.01	<0.01	0.027 [2]	<0.002	<0.05	<0.002	<0.002	<0.05
Benzene	0.0014	<0.001	0.0025 J	<0.005	0.003	0.0068	1.1	0.0003 J	<0.001	0.68
Bromodichloromethane	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Bromoform	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Bromomethane	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.05	<0.002	<0.002	<0.05
Carbon Disulfide	<0.001	<0.001	<0.005	<0.005	0.001 J	<0.001	<0.025	<0.001	<0.001	<0.025
Carbon Tetrachloride	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Chlorobenzene	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001 J [1]	<0.001	<0.025
Chloroethane	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.05	0.0022	<0.002	<0.05
Chloroform	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Chloromethane	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.05	<0.002	<0.002	<0.05
Dibromochloromethane	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Ethylbenzene	<0.001	<0.001	<0.005	<0.005	<0.001	0.0004 J	0.041	<0.001 J [1]	<0.001	0.41
Methylene Chloride	<0.001	<0.001	<0.005 [1]	<0.005 [1]	<0.001	<0.001	<0.025	<0.001 [1]	<0.001	<0.025
Methyl tertiary butyl ether	<0.001	<0.001	0.05	0.23	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Styrene	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001 J [1]	<0.001	0.77
Tetrachloroethene	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001 J [1]	<0.001	<0.025
Toluene	<0.001	<0.001	<0.005	<0.005	<0.001	0.0016	1.13	<0.001 J [1]	<0.001	4.3 E
Trichloroethene	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
Vinyl Acetate	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.05	<0.002	<0.002	<0.05
Vinyl Chloride	<0.002	<0.002	<0.01	<0.01	<0.002	<0.002	<0.05	<0.002	<0.002	<0.05
Xylene (total)	<0.001	<0.001	<0.005	<0.005	<0.001	0.0018	3.51	<0.001 J [1]	<0.001	3.6
cis-1,3-Dichloropropene	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025
trans-1,3-Dichloropropene	<0.001	<0.001	<0.005	<0.005	<0.001	<0.001	<0.025	<0.001	<0.001	<0.025

TABLE D-4
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 2 (ppm)

ANALYTE	SAMPLE ID									
	LPGUD-9201G	LPGUSH-9201G	LPGUD-9203G	LPGUSH-9203G	LPGUD-9204G	LPGUSH-9204G	LPGDD-9206G	LPGDSH-9206G	LPGDSH-9210G	LPGDXX-9211G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10	SMW-11
SEMI-VOLATILE ORGANIC COMPOUNDS										
1,2,4-Trichlorobenzene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
1,2-Dichlorobenzene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
1,3-Dichlorobenzene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
1,4-Dichlorobenzene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2,2'-oxybis(1-Chloropropane)	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2,4,5-Trichlorophenol	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
2,4,6-Trichlorophenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2,4-Dichlorophenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2,4-Dimethylphenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.047 J	<0.01	<0.01	0.026 J
2,4-Dinitrophenol	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
2,4-Dinitrotoluene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2,6-Dinitrotoluene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2-Chloronaphthalene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2-Chlorophenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
2-Methylnaphthalene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	1	<0.01	<0.01	0.45
2-Methylphenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.041 J	<0.01	<0.01	<0.097 [3]
2-Nitroaniline	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
2-Nitrophenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
3,3'-Dichlorobenzidine	<0.019	<0.019	<0.02	<0.027	<0.019	<0.019	<0.19	<0.02	<0.02	<0.19
3-Nitroaniline	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
4,6-Dinitro-2-methylphenol	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
4-Bromophenyl-phenylether	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
4-Chloro-3-methylphenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
4-Chloroaniline	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
4-Chlorophenyl-phenylether	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
4-Methylphenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.062 J	<0.01	<0.01	0.032 J
4-Nitroaniline	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
4-Nitrophenol	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
Acenaphthene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.096	0.014	<0.01	0.015 J
Acenaphthylene	<0.01	<0.01	0.001 J	<0.014	0.002 J	<0.01	0.47	<0.01	<0.01	0.21
Anthracene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.015 J	<0.01	<0.01	<0.097
Benzo(a)Anthracene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Benzo(a)Pyrene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Benzo(b)Fluoranthene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Benzo(g,h,i)Perylene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097

TABLE D-4
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 2 (ppm)

ANALYTE	SAMPLE ID									
	LPGUD-9201G	LPGUSH-9201G	LPGUD-9203G	LPGUSH-9203G	LPGUD-9204G	LPGUSH-9204G	LPGDD-9206G	LPGDSH-9206G	LPGDSH-9210G	LPGDXX-9211G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10	SMW-11
Benzo(k)Fluoranthene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Benzoic Acid	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Benzyl Alcohol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Bis(2-Ethylhexyl)Phthalate	<0.01	0.006 J	<0.01	<0.014	0.0007 J	<0.01	<0.097	<0.01	0.002 J	<0.097
Butylbenzylphthalate	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Chrysene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Di-n-Butylphthalate	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Di-n-octylphthalate	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Dibenzo(a,h)Anthracene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Dibenzofuran	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.012 J	<0.01	<0.01	0.022 J
Diethylphthalate	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Dimethylphthalate	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Fluoranthene	<0.01	<0.01	0.0007 J	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Fluorene	<0.01	<0.01	0.0007 J	<0.014	<0.01	<0.01	0.096 J	<0.01	<0.01	0.023 J
Hexachlorobenzene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Hexachlorobutadiene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Hexachlorocyclopentadiene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Hexachloroethane	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Indeno(1,2,3-cd)Pyrene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Isophorone	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
N-Nitroso-Di-n-propylamine	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
N-Nitrosodiphenylamine	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Naphthalene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	3.1	<0.01	<0.01	3
Nitrobenzene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
Pentachlorophenol	<0.049	<0.048	<0.05	<0.068	<0.048	<0.048	<0.49	<0.05	<0.051	<0.49
Phenanthrene	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.081 J	<0.01	<0.01	0.011 J
Phenol	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	0.059 J	0.085	<0.01	<0.097
Pyrene	<0.01	<0.01	0.0007 J	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
bis(2-Chloroethoxy)methane	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
bis(2-Chloroethyl)ether	<0.01	<0.01	<0.01	<0.014	<0.01	<0.01	<0.097	<0.01	<0.01	<0.097
INORGANIC COMPOUNDS										
Aluminum	<0.04 R^2	<0.04	<0.04 R^2	<0.04	<0.04 R^2	<0.04	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2
Aluminum (dis)	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2	<0.04 R^2
Antimony	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002 R^2	<0.002	<0.002
Antimony (dis)	<0.002 R^2	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002 R^2	<0.002	<0.002	<0.002
Cadmium	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003 R^2	<0.003	<0.003

TABLE D-4
LOCKPORT SUMMARY ANALYTICAL RESULTS
GROUND WATER ROUND 2 (ppm)

ANALYTE	SAMPLE ID									
	LPGUD-9201G	LPGUSH-9201G	LPGUD-9203G	LPGUSH-9203G	LPGUD-9204G	LPGUSH-9204G	LPGDD-9206G	LPGDSH-9206G	LPGDSH-9210G	LPGDXX-9211G
	SMW-1D	SMW-1S	SMW-3D	SMW-3S	SMW-4D	SMW-4S	SMW-6D	SMW-6S	SMW-10	SMW-11
Cadmium (dis)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003 R^2	<0.003	<0.003	<0.003
Chromium	<0.003	<0.003	<0.003	<0.003 R^2	<0.003	<0.003	<0.003	<0.003 R^2	<0.003	<0.003
Chromium (dis)	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Cobalt	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Cobalt (dis)	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Copper	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005 R^2	<0.005 R^2	<0.005
Copper (dis)	<0.005	<0.005 R^2	<0.005 R^2	<0.005 R^2	<0.005 R^2	<0.005 R^2	<0.005 R^2	<0.005 R^2	<0.005 R^2	<0.005 R^2
Iron	0.797	<0.008 R^2	0.894	<0.008 R^2	<0.008 R^2	<0.008 R^2	1.15 J^3	<0.008 R^2	<0.008 R^2	3.91
Iron (dis)	0.654	<0.008	0.608	<0.008 R^2	<0.008	<0.008 R^2	<0.008 R^2	<0.008 R^2	<0.008	2.27
Lead	<0.001	<0.001 R^2	<0.001 R^2	<0.001	<0.001	<0.001	<0.001	<0.001 R^2	<0.001 R^2	<0.001 R^2
Lead (dis)	<0.001 R^2	<0.001 R^2	<0.001 R^2	<0.001 R^2	<0.001 R^2	0.0115 J^3	<0.001 R^2	<0.001 R^2	0.01	<0.001 R^2
Manganese	0.063	0.045	0.298	0.057	0.081	0.049 J^3	<0.001 R^2	0.457	0.056	0.71
Manganese (dis)	0.061	0.039	0.251	0.068	0.08	0.048 J^3	0.323 J^3	<0.001 R^2	0.044	0.595
Nickel	<0.005	<0.005	<0.005	<0.005 R^2	<0.005	<0.005 R^2	<0.005	<0.005 R^2	<0.005	<0.005
Nickel (dis)	<0.005	<0.005 R^2	<0.005	<0.005 R^2	<0.005	<0.005 R^2	<0.005 R^2	<0.005 R^2	<0.005	<0.005 R^2
Zinc	<0.003 R^2	<0.003 R^2	0.108	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2
Zinc (dis)	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2	<0.003 R^2
Cyanide	<0.01	<0.01	0.017	<0.01	<0.01	<0.01	0.017	0.043	<0.01	0.12
Cyanide (ammenable)	NA	NA	0.017	NA	NA	NA	<0.01	<0.01	NA	0.033
Sulfide	<1	<1	<1	<1	3.6	<1	<1	<1	<1	<1

Notes:

<0.017 – Not detected, mimimum detection limit.

1 Compound was present in the associated blank; compound is present in the sample at a concentration less than the CRQL.

2 Compound was present in the associated blank; compound was present in the sample at a concentration higher than the CRQL but lower than the "action level".

3 The reported isomer of this compound should have been a false positive, based on retention time characteristics.

D – Indicates all compounds identified in an analysis at a secondary dilution.

E – Identifes compounds whose concentrations exceed the calibration range of the instruments for specific analysis.

J – Indicates the result is less than the sample quantitation limit, but greater than zero; estimated value.

J^1 One or more Internal Standard areas were not within the Contract Required Recovery range.

J^2 The initial or continuing calibration RFs were low (positive values – estimate).

J^3 The dissolved metal result is greater than the total metal result by >20%.

R^1 The initial or continuing calibration RFs were low (non-detects – reject).

R^2 The compound was present in the associated blank; the sample result was less than the action level of 5x the maximum concentration found in any blank, and has been rejected.

NA – Not analyzed.

NR – Not reported.

Shading indicates detected compound.

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Tel (315) 432-0506
Fax (315) 437-0509

AREA SAMPLING DATA SHEET

Facility: NYSEG STUDY
Location: LOCKPORT, NY
Galson Project No.: G1.224
Address: FORMER COAL GASIF. SITE
LOCKPORT, NY
Date of Survey: 5.27.92
RAIN . 8-10 AM
CLEARING,
PT. CLOUDY 10 AM – 12 00
Sampled By: CJS/SDD

Field Sampling Data / Contaminants / Results

	Sample No.	Blank No.	Sample Media	Pump No.	Flow Rate (cc/min)	Time On	Time Off	Duration (Min.'s)	Sample Vol. (Liters)	( )	( )	( )	( )	( )
1	dwelling 1: bas	527.B1	TENAX	1164	183.5	0908	1003	55	10.1					
2	dwelling 2: bas	↓	↓	1165	189.5	0930	1032	62	11.7			SEE		
3	dwelling 3 OUT			1167	170.5	0959	1101	62	10.6		DATA TABLES			
4	dwelling 4 bas			1165	183.5	1050	1146	56	10.6					
5	dwelling 4 bas. D			1164	183.5	1050	1147	~~57~~ VOID, TUBE BROKEN						

Location Description: 1. MOTHBALLS IN JAR ON FLOOR / HEAT ON
2. MOTHBALLS IN X-MAS DECORATIONS. HEAT ON
3. PORCH . S . SIDE
4. ONE EMPTY 'Krylon' PAINT CAN ON FLOOR
URINE ODOR
5. TUBE BROKEN UPON COMPLETION

Abbreviations: ug/m3 - micrograms per cubic meter
mg/m3 - milligrams per cubic meter
ppm - parts per million

Calculations / Standards

Time Weighted Ave.					
OSHA – Transitional Limits - Permissible Exposure Limit		NOT APPLICABLE			
- Action Level		FOR			
- Short Term Exposure Limit		RESIDENCES			
- Ceiling Limit					
OSHA – Final Limits * - Permissible Exposure Limit					
- Short Term Exposure Limit					
- Ceiling Limit					

* Phased in March 1, 1989 through December 31, 1992

67% RH @ 1055 INDOORS
75% RH @ 1104 OUTDOORS

Environmental Conditions

66-62 Dry Bulb 56-62 Wet Bulb (Temperature /Fahrenheit)

67.75 % Relative Humidity

Calibration

Date	Pump No.	PRE Flow Rate / POST Flow Rate	Corrected Flow Rate for Temperature	Calibration Method
5/27	1165	189 / 190		Gillian gilibrator
5/27	1167	182 / 159		
5/27	1164	183 / 184		
5/27	1168	186 / 185		
5/27	1166	162		

Activities

Engineering Controls

Galson CORPORATION

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E. Syracuse, NY 13057
Tel (315) 432-0506
Fax (315) 437-0509

AREA SAMPLING DATA SHEET

Facility: NYSEG STUDY
Location: LOCKPORT
Galson Project No.: G1.224

Address: FORMER COAL GAS.F. SITE
LOCKPORT, NY
Date of Survey: 5.27.92
Sampled By: CJS/SDD

Field Sampling Data / Contaminants / Results

Sample No.	Blank No.	Sample Media	Pump No.	Flow Rate (cc/min)	Time On	Time Off	Duration (Min.'s)	Sample Vol. (Liters)	( )	( )	( )	( )	( )
6 dwellings 523	527 B1	TENAX	1168	185.5	1111	1159	48	8.9		SEE DATA TABLES			

Location Description:
6. BASEMENT NEAR SUMP
62°F / 66% RH · ONE BSMT. WINDOW OPEN
URINE ODOR

Abbreviations: ug/m3 - micrograms per cubic meter
mg/m3 - milligrams per cubic meter
ppm - parts per million

Calculations / Standards

Time Weighted Ave.					
OSHA – Transitional Limits - Permissible Exposure Limit		NOT APPLICABLE FOR RESIDENCES			
- Action Level					
- Short Term Exposure Limit					
- Ceiling Limit					
OSHA – Final Limits * - Permissible Exposure Limit					
- Short Term Exposure Limit					
- Ceiling Limit					

* Phased in March 1, 1989 through December 31, 1992

Environmental Conditions

________ Dry Bulb ________ Wet Bulb (Temperature /Fahrenheit)

________ % Relative Humidity

Calibration

Date	Pump No.	PRE Flow Rate / POST Flow Rate	Corrected Flow Rate for Temperature	Calibration Method
		/		
	See Previous	DATA SHEET		
		/		
		/		

Activities

Engineering Controls

A

Galson Corporation
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E. Syracuse, NY 13057
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Fax (315) 437-0509

AREA SAMPLING DATA SHEET

Facility: NYSEG STUDY Location: LOCKPORT NY Galson Project No.: G1.224

Address: FORMER COAL GAS SITE Date of Survey: 5.28.92

LOCKPORT, NY Sampled By: CJS/SDD

Field Sampling Data / Contaminants / Results

	Sample No.	Blank No.	Sample Media	Pump No.	Flow Rate ( )	Time On	Time Off	Duration (Min.'s)	Sample Vol. (Liters)	( )	( )	( )	( )	( )
	~~dwelling 9 bas~~	~~CJS~~				CJS ~~1006~~								
2	dwelling 6 bas	328 bnk	TENAX	1168	183.5	1006	1120	74	13.6		SEE			
3	dwelling 7 bas	528 bnk	↓	1164	186	1104	1159	55	10.2		DATA	TABLES		
4	dwelling 7 LVL	528 bnk	↓	1165	190	1109	1202	53	10.1					
5	dwelling 7 out	528 bnk	↓	1167	161	1118	1229	71	11.4					

Location Description:
2. CONTROL HOUSE. CLEAN BSMT

Abbreviations: ug/m3 - micrograms per cubic meter
mg/m3 - milligrams per cubic meter
ppm - parts per million

Calculations / Standards

Time Weighted Ave.					
OSHA – Transitional Limits - Permissible Exposure Limit		NOT			
- Action Level		APPLICABLE			
- Short Term Exposure Limit		FOR			
- Ceiling Limit		RESIDENCES			
OSHA – Final Limits * - Permissible Exposure Limit					
- Short Term Exposure Limit					
- Ceiling Limit					

* Phased in March 1, 1989 through December 31, 1992

(Temperature / Fahrenheit)

50 % Relative Humidity

Clear sunny

Calibration

Date	Pump No.	PRE Flow Rate /	POST Flow Rate	Corrected Flow Rate for Temperature	Calibration Method
5/28	1168	185 ~~~~ /	182		Gillian gilibrator
5/28	1164	184 /	188 / 194		
5/28	1165	190 /	190 / 190		
5/28	1167	152 /	163		
	1166		159		

Activities

dwelling 7 BSMT 3 one gal latex paint, 1 gal bonding agent; chlorinated floor prep ½ full fuel tank
no odor apparent

Engineering Controls

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E. Syracuse, NY 13057
Tel (315) 432-0506
Fax (315) 437-0509

AREA SAMPLING DATA SHEET

Facility: NYSEG STUDY   Location: LOCKPORT   Galson Project No.: 61.224

Address: FORMER COAL GAS SITE   Date of Survey: 5.28.92
LOCKPORT, NY   Sampled By: CJS / SDD

Field Sampling Data / Contaminants / Results

	Sample No.	Blank No.	Sample Media	Pump No.	Flow Rate ( )	Time On	Time Off	Duration (Min.'s)	Sample Vol. (Liters)	( )	( )	( )	( )	( )
1	dwelling 8 Bas.	528 bnk	TENAX	1164	186	1357	1453	56	10.4					
2	dwelling 8 LIV	528 bnk	TENAX	1168	183.5	1407	1457	50	9.2			SEE		
3	dwelling 4 Bas.	528 bnk	TENAX	1165	190	1524	1622	58	11.0		DATA	TABLES		
4	dwelling 3 Bas	528 bnk	TENAX	1164	191	1827	1924	57	10.8					
5	dwelling 3 Bas. D	528 bnk	TENAX	1165	190	1828	1925	57	10.8					

Location Description: 1. BSMT. W SIDE opp. STAIRS
2. ~~DINING ROOM~~ LIVING ROOM, NR DRYER ON
3. N center of bsmt.

Abbreviations: ug/m3 - micrograms per cubic meter
mg/m3 - milligrams per cubic meter
ppm - parts per million

Calculations / Standards

Time Weighted Ave.					
OSHA – Transitional Limits - Permissible Exposure Limit					
- Action Level		NOT	APPLICABLE		
- Short Term Exposure Limit			FOR		
- Ceiling Limit		RESIDENCES			
OSHA – Final Limits * - Permissible Exposure Limit					
- Short Term Exposure Limit					
- Ceiling Limit					

* Phased in March 1, 1989 through December 31, 1992

1430 55°F WB
RH 45% 75°F DB

_____ Dry Bulb _____ Wet Bulb (Temperature /Fahrenheit)

_____ % Relative Humidity

Clear, sunny

Calibration

Date	Pump No.	PRE Flow Rate / POST Flow Rate	Corrected Flow Rate for Temperature	Calibration Method
	See other sheet			

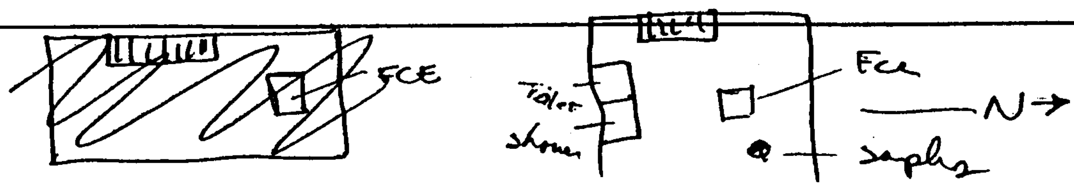
Activities

dwelling 8: paint stripper, gasoline additive, "Touch n Foam" stain ~6 gal latex paint, plastic roof sealer (no coal tar), joint compound spray enamels – odor was that of a musty basement – no organics odor noticeable

dwelling 9 Coleman lantern fuel, lantern & "Preen" furniture polish w/ pet. naptha stored in bsmt. Sample in ~ center of bsmt. Some nearly empty cans (pt/enamel paints liquid sander (Aromatics) – musty odor.
no organic odor apparent

Engineering Controls

dwelling 3 – Removed lawnmower & 1 gal gascan from bsmt. down @ 9AM
odor not apparent upon sampling @ 1:00 PM




HISTORIC SCHEMATIC OF MGP SITE
HISTORIC MGP RELATED STRUCTURE
EXISTING STRUCTURE
PURIFIERS
GATE
NYSEG SWITCH HOUSE
OFFICE AREA
PUMPS & SCRUBBERS (1919)
18,000 cu.ft. GAS HOLDER
50,000 cu.ft. GAS HOLDER
150,000 cu.ft. GAS HOLDER
RETORTS
COAL SHED
COAL BUCKET RUNWAY
COAL STORAGE (WATER/GAS DEPT.) 1919
POWER STATION
STORAGE
OIL TANKS
N
W
E
S
BARGE CANAL
FLOW
CHURCH
KENYON'S VARIETY STORE
WALNUT STREET
GENESSEE STREET
REED'S GAS STATION
LAGRANGE STREET
SITE BOUNDARY
NEW YORK STATE
SOUTH TRANSIT STREET
SAXTON STREET
HARVEY STREET
LUTHERAN CHURCH
GARLOCK'S RESTAURANT
PARKING AREA
STATE ROAD
ATLANTIC GAS STATION
FUEL PUMPS
PUMP & TREAT SYSTEM
HIGH STREET
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
MW-7
MW-8
MW-9
MW-10
MW-11
MW-12
MW-13
MW-14
MW-15
MW-16
MW-17
MW-18
MW-19
IW-1
IW-2
SMW-1D
SMW-1S
SMW-3S
SMW-3D
SMW-4D
SMW-4S
SMW-5
SMW-6S
SMW-6D
SMW-7
SMW-8
SMW-9
SMW-10
SMW-11
LEGEND
SOIL GAS SAMPLE LOCATION
SB-41 SHALLOW BORING LOCATION
SMW-1 ATLANTIC MONITORING WELL LOCATION
MW-1 WCC MONITORING WELL LOCATION
NOTE: LOCATIONS INDICATED HEREIN ARE APPROXIMATE.
GRAPHIC SCALE IN FEET
ATLANTIC ENVIRONMENTAL SERVICES, INC.
188 NORWICH AVENUE
COLCHESTER, CT 06415
PLAN PREPARED FOR
NEW YORK STATE ELECTRIC AND GAS CORP.
TRANSIT STREET MGP SITE
LOCKPORT, NEW YORK
PLATE 1—SAMPLE LOCATIONS
SCALE: 1"=50'
DRN BY: RKK
PROJECT NO. 1284-06-05
DATE: MAR93
CHK BY: