GEI Consultants, Inc.

FINAL RI/FS WORK PLAN
PORT JERVIS FORMER MGP SITE
NYSDEC CONSENT ORDER # D03-0001-99-01
PORT JERVIS, NEW YORK

Submitted to:

Orange & Rockland Utilities, Inc.
Monroe, New York

188 Norwich Avenue
Colchester, CT 06415
(860) 537-0751

June 22, 2000
Project 97679-1001

J:\WPROC\Dbt\O&R\PORTJERV\Ri-fs\rifs-wp-Rev__02.wpd

FINAL RI/FS WORK PLAN

PORT JERVIS FORMER MGP SITE

NYSDEC CONSENT ORDER # D3-0001-99-01

PORT JERVIS, NEW YORK

June 22, 2000

Submitted to:

Orange & Rockland Utilities, Inc.
500 Route 208
Monroe, NY 10950

Prepared by:

GEI Consultants, Inc.
188 Norwich Avenue
Colchester, CT 06415
(860) 537-0751

Project 97679-1001

David B. Terry
Project Manager

CONTENTS

CONTENTS (continued)

SECTION **PAGE**

CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This document is a work plan to conduct a Remedial Investigation/Feasibility Study (RI/FS) required under the Administrative Order on Consent (AOC) (Index #D3-0001-99-01) between the New York State Department of Environmental Conservation (NYSDEC) and Orange and Rockland Utilities, Inc. (O&R). The work plan presents the proposed work scope and methods to implement an RI/FS at the former manufactured gas plant (MGP) site in Port Jervis, New York. A Preliminary Site Assessment (PSA) was completed by GEI Consultants, Inc. (GEI), on behalf of O&R in 1998 under a previous AOC between NYSDEC and O&R (Index # D3-0002-9412, January 8, 1996). Upon review of the PSA report, NYSDEC determined that an RI/FS would be necessary. Therefore, in conjunction with the findings from the PSA, the scope of the RI described in this work plan fulfills the requirements of the current AOC.

This work plan addresses comments and recommendations made in the following documents and meeting.

- April 16, 1999 letter from NYSDEC providing comment on the PSA report
- October 21, 1999 letter from NYSDEC providing comment on the draft RI/FS Work Plan
- November 23, 1999 on-site meeting between O&R, NYSDEC, and GEI personnel
- December 16, 1999 letter from GEI to NYSDEC regarding the proposed Delaware River Sediment Probing Study
- December 29, 1999 letter from NYSDEC providing comment on the proposed Delaware River Sediment Probing Study
- March 10, 2000 letter from GEI to NYSDEC providing a response to NYSDEC's October 21, 1999 comment letter on the draft RI/FS Work Plan
- March 10, 2000 letter from GEI to NYSDEC providing a response to NYSDEC's December 29, 1999 comment letter on the proposed sediment probing study
- May 16, 2000 letter from NYSDEC accepting the March 10, 2000 responses to comments on the draft RI/FS and the proposed sediment probing study

2.0 SITE BACKGROUND

The following subsections provide detailed historic and environmental information relevant to the field investigation. Subsection 2.1 presents the physical setting and site description. Subsection 2.2 describes the surrounding land use and regional demographics. Subsection 2.3 presents the site operational history, and subsection 2.4 lists previous site investigations. Subsection 2.5 summarizes the findings of an environmental records review. Subsection 2.6 reports the regional climatology and regional geology. Subsection 2.7 presents the regional geology and subsection 2.8 presents the hydrogeology.

2.1 Physical Setting and Site Description

The Port Jervis former MGP site is located in the western portion of the city of Port Jervis, New York, 160 feet northeast of the Delaware River. The site consists of a 1.2±-acre commercial/industrial parcel. The property is currently occupied by an O&R service center. A site location map is provided as Figure 1. Current site conditions are depicted in Figure 2.

2.2 Surrounding Land Use/Regional Demographics

The Port Jervis former MGP site is located in an urbanized area. Features of note include the nearby Delaware River (160 feet southwest of the site), a large railyard facility (less than 1,000 feet northwest of the site), and nearby railroad tracks (less than 1,000 feet northeast of the site, running in a southeast/northwesterly direction).

Port Jervis Demographics. The total population of Port Jervis is 15,181 persons and 5,515 households. Forty-nine percent of the population is male, while 51 percent is female. The ethnic breakdown is as follows.

White:	95 percent
Black:	2.5 percent
Other:	2.5 percent

2.3 Site Operational History

The development of the manufactured gas industry in this country typically started with small, local enterprises that joined/evolved into larger network operations involved with the manufacture and distribution of gas from hub facilities, as occurred in Orange and Rockland counties. Site uses were variable following the decline of gas manufacturing and the increase in use of natural gas.

The operational history for the Port Jervis MGP site was generated using the following resources.

- Production records from *Brown's Directory of American Gas Companies (Brown's Directory).* Site-specific records were available from 1887 to 1917; thereafter, the annual data were combined with records for production at the Middletown MGP site. Table 1 summarizes these records.
- Sanborn Fire Insurance (Sanborn) Maps from 1888, 1900, 1912, 1921, 1931, 1945, and 1961
- New York State Public Service Commission (NYSPSC) Case 94-M-1016 file information
- Current and Historic Topographic Maps from 1906, 1936, 1969 photorevised 1983, and 1992
- 1995 Site Map

The Port Jervis MGP site was initially a coal gas plant sometime before 1880, and had a long service life. A change in manufacturing technology occurred in 1880, when the Lowe water gas process, Granger variation, was adopted (*Water Gas Journal,* 1883). It should be noted that records were not available from *Brown's Directory* until 1887. The site continued in gas production as a water gas plant until sometime between 1946 and 1961. A brief summary of the site history follows.

- **Prior to 1880.** The site was an active coal gas manufacturing plant.
- **1880.** Production at the site shifted to the Lowe water gas process.
- **1887.** *Brown's Directory* indicates that gas production continued with the use of the Lowe water gas process, Granger variation. This variation placed the generator in a pit and utilized naphtha. Sanborn maps show that the site was split by a canal raceway perpendicular to the Delaware River. The canal extended into the adjacent block to the northeast. Naphtha feedstock was piped underground to storage tanks

on the northern side of the site from the railroad a block away. From storage, naphtha was piped across the canal raceway to the generator room. Lime purifiers were on the northern side of the site. Two gas holders were present, an 8,000-cubic foot (cf) holder to the south of the canal, and a 37,000-cf holder to the north of the canal. A tar well was adjacent to the canal to the south. Coal was stored east of the generator room. (Site features depicted on the 1888 Sanborn map are shown in Figure 3.)

- **1892.** *Brown's Directory* indicates that the gasification method used was modified to the Granger-Collins method.

- **1900.** *Brown's Directory* indicates that the Lowe water gas process was used in production. The specific gasification method used was not included in *Brown's Directory*. Sanborn maps show that the canal was partially filled under Water Street, in the vicinity of the river, and identified as a brook. An additional naphtha tank was located in the generator room. Gas purifying was accomplished in the same location with a combination of sawdust and bog iron. A slight increase in gas holder capacities was noted, 9,000 cf and 39,000 cf. (Site features depicted on the 1900 Sanborn map are shown in Figure 4.)

- **1906.** A historic topographic map shows that the brook was completely filled.

- **1912.** The Sanborn map shows that the small gas holder was removed. One naphtha tank on the northern side of the site was relocated in the same vicinity, as was piping to the generator room. The tar well south of the former canal/brook was relocated near the eastern site boundary, still south of the former water course. Added structures included a large (75,000 cf) gas holder in the northeastern corner of the site, a tar extractor next to the purifier room, and additional generator and purifier buildings. (Site features depicted on the 1912 Sanborn map are shown in Figure 5.)

- **1921.** The Sanborn map shows that one naphtha tank near the northern site boundary was removed and the capacity of the 39,000 cf gas holder was reduced to 25,000 cf. The underground naphtha pipe from the railroad was not identified. Coal storage was shifted to the northern side of the original generator room which was converted to storage. Added structures included gas oil tanks near the northwestern corner and in a pit in the vicinity of the former 8,000 cf gas holder. (Site features depicted on the 1921 Sanborn map are shown in Figure 6.)

- **1931.** The Sanborn map shows that the site property extended westward to Water Street. A larger gas holder of unknown capacity was located in the northwestern corner. The original purifier house was relocated to the west. (Site features depicted on the 1931 Sanborn map are shown in Figure 7.)

- **1945.** No changes were evident. (Site features depicted on the 1945 Sanborn map are shown in Figure 8.)

- **1961.** The Sanborn map shows that the largest gas holder and governor room remained, but the rest of the site was modified to function as an office and service center. No gas production structures were evident. The largest gas holder was removed sometime before 1970. (Site features depicted on the 1961 Sanborn map are shown in Figure 9.)

Figure 10 reflects the substantial modifications made to the MGP operations at the site over the years. One notable feature at this site is the former canal that traversed the site and discharged to the Delaware River. It was a component for operation of the Delaware-Hudson Canal, which was located north of the site. The canal on site was filled in between 1900 and 1906. The only visible remaining MGP structure on site is a small brick building that was formerly the governor house. A composite map of historical site structures is shown in Figure 10.

2.4 Previous Investigations

Previous investigation of this site by Orange and Rockland is documented in the report titled *Preliminary Site Assessment Report, Port Jervis Former MGP Site, NYSDEC Consent Order #D03-0002-9412.*

2.5 Environmental Records Review

Federal and state environmental lists were reviewed for potential impacts to the site. Table 2 summarizes the lists reviewed and the number of environmentally significant locations in the vicinity of the site.

A brief summary of each location is provided below.

Orange & Rockland Utilities, Inc.; 16 Pike Street (the subject site). This site is currently a Hazardous Substance Waste Disposal site and a bulk petroleum storage facility. The site has been delisted from the CERCLIS database. A 1,000-gallon gasoline underground storage tank (UST) was removed from the eastern side of the site during late 1997. An 8,000-gallon diesel tank was removed in 1996 due to a failed tank test. The ERNS database indicates that 20 gallons of transformer oil were spilled at the site in February 1987 (Spill Number 1943). According to this database, 10 gallons of transformer oil was released to water.

Calligo Residence; 43 King Street (413 feet east/southeast of the site). On May 29, 1992 NYSDEC was informed of deliberate oil dumping. This case was found to be a neighbor dispute. This case was closed.

Mile Post 87; Pike Street (distance from site is unknown). Ten gallons of sulfuric acid was spilled at this location.

Conrail; 75 Pike Street/1 Bell Crossing Road (867 feet northeast of the site). This location is a listed hazardous waste generator/transporter. The status is unknown.

US Post Office; 20 Sussex Street (1,306 feet east/northeast of the site). On August 14, 1989, a tank containing No. 2 fuel oil failed tank tightness testing. A noticeable leak was identified in the manway. A 3,000-gallon fuel tank was removed from this property in 1990. This site is also listed as an air discharge facility (potential uncontrolled emissions, less than 100 tons per year).

Port Jervis Solid Waste Landfill; 1 Franklin Street (1,740 feet to the east/northeast). This is a mixed solid waste landfill.

Monroe Residence; 15 Franklin Street (1,894 feet east of the site). On August 29, 1984, an odor was detected in well water at this residence. The site is in close proximity to an earlier spill. The site water was tested.

Williams Candle Shop; 17 Delaware Street (2,122 feet northeast of the site). On September 15, 1993, a 275-gallon outdoor oil tank was overfilled. Oil leaked into the basement. The quantity of oil was estimated to be 1 gallon.

Tank Site; Pike and East Main Street (2,567 feet northeast of the site)). On April 4, 1997, three 2,000-gallon gasoline tanks failed tank tightness testing.

Barrier Industries; 200 East Main Street (4,532 feet southeast of the site). This site is listed as a CERCLA site and a Hazardous Substance Waste Disposal Site. This is an industrial site. Contamination sources include leaking tanks, drums, lagoons, and other containers.

2.6 Regional Climatology

Climatological data recorded at West Point, New York are a good representation of the climatology of Orange County. Data collected from 1951 to 1971 are summarized in Table 3. The data are typical of the northeastern United States.

2.7 Regional Geology

According to the Soil Survey of Orange County, New York, United States Department of Agriculture, Soil Conservation Service, in cooperation with Cornell University Agricultural Experiment Station (1981), the Port Jervis site is underlain by soil classified as Tioga silt loam. These soils are generally deep (greater than 60 inches) and consist of well-drained, nearly level soils. These soils formed in alluvial deposits on floodplains and low terraces along streams and rivers. Tioga soils are characterized by three soil horizons. The first horizon is a silt loam and ranges in depth from 0 to 3 inches below grade. The second horizon is classified as a silt loam, loam, gravelly fine sandy loam and ranges in depth from 3 to 40 inches below grade. The third horizon is from 40 to 60 inches below grade and is classified as a silt loam, gravelly loam, very gravelly loamy sand.

Four geologic units were identified during the subsurface investigation of the PSA. The uppermost unit was identified as fill material consisting of demolition debris, bottom ash, cinders, sand, silt, and gravel. The fill unit ranged in thickness from 7 to 13 feet throughout the site. The second unit was identified as a fine-grained alluvium deposit consisting of moderately to well-sorted fine sand and silt. This unit was consistently encountered below the fill and ranged in thickness from 2 to 9 feet. The third unit encountered at the site was a coarse-grained alluvium consisting of rock fragments, cobbles, and sand. This unit was transitional from the overlying fine-grained alluvium. The coarse-grained alluvium was typically encountered approximately 17 feet below ground surface (bgs). Two borings, MW-1D and MW-2, extended through the entire coarse-grained alluvium. In both of these borings the layer was 13 feet thick. The coarse-grained alluvium is underlain by glacial outwash consisting of poorly-sorted silt, sand, and gravel. The thickness of the glacial outwash unit is unknown, but results from the deep boring completed on site indicated that this unit extends to at least 62 feet bgs. A confining layer was not encountered during the subsurface boring investigation.

2.8 Hydrogeology

The physical and chemical properties of the three Tioga soil horizons are summarized in Table 4. Brief flooding from November through May is common in areas underlain by Tioga soils. The high water table is generally 3 to 6 feet bgs, and occurs from February to April. Little information is available regarding aquifers in the site vicinity. Depth to bedrock is unknown.

A confining unit for the aquifer was not encountered. Groundwater is present within the fine-grained alluvium, coarse-grained alluvium, and glacial outwash units. The depth to groundwater ranged from 14.3 to 16.5 feet. The groundwater flow direction is to the southwest, toward the Delaware River. The average hydraulic gradient across the site is 0.004 foot/foot.

3.0 RI SCOPE OF WORK

This work plan outlines the additional field work required at the Port Jervis former MGP site to address: NYSDEC's comments on the Port Jervis PSA, NYSDEC's comments on the July 7, 1999 Draft RI/FS Work Plan, the requirements of the AOC, and to obtain sufficient data to evaluate remedial alternatives for the site. The activities associated with the additional field work and assessment activities are discussed below. Field protocols are included as Appendix A.

To further investigate the possible historic expansion of the MGP footprint, findings from a review of historical documents will be presented to document the lateral extent of the operating footprint of the former MGP over time. Findings from available historic photographs, topographic maps, engineering plans, city building department records, and other appropriate material will be used to determine whether the former MGP (or possible impacts from the MGP) ever extended beyond the known boundaries. This information will be evaluated and the findings will be incorporated into the RI report.

Figure 11 illustrates the locations of the proposed surface and subsurface sampling, monitoring wells, and river sediment sampling. Figure 12 presents the proposed river sediment transect locations. Table 5 presents the rationale for sampling locations and the proposed depth of borings, screen interval, and the number of samples anticipated to be collected. Table 6 summarizes the proposed sampling and analysis program. Analytical procedures will be in accordance with the New York State Analytical Service Protocols. Category B deliverables will be provided by the laboratory. The laboratory and field quality assurance procedures are described in the approved PSA work plan.

3.1 Surface-Soil Investigation

To investigate possible surface-soil impacts from MGP operations, 10 surface- and near surface-soil samples will be collected and analyzed for MGP indicators (Figure 11). Four surface-soil samples (SS-1 through SS-4) will be collected from unpaved areas at the site (Table 5). Three background surface-soil samples (SS-5 through SS-7) will be collected from off-site, public-access locations outside the potential area of MGP impacts. In addition, three shallow, near surface-soil samples (SS-8 through SS-10) will be collected from borings SB-11, SB-12, and SB-13 along Brown Street. The locations of the off-site surface soils will be determined in conjunction with NYSDEC. Additional off-site samples may be collected following the evaluation of the on-site surface-soil analytical results and consultation with NYSDEC.

The surface-soil samples will be collected from a 0 to 1-inch depth within a one-meter square area with vegetation removed. Sample locations will be disturbed and then screened with a photoionization detector (PID). If readings above background are noted, a sample will be collected for analysis for volatile organic compounds (VOCs) analysis (Table 6). Surface-soil samples will be collected at each location for analysis of semivolatile organic compounds (SVOCs), metals, and total cyanide.

Three near surface-soil samples will be collected from MW-11, MW-12, and MW-13 along the northwestern property boundary (SS-8 through SS-10). The near surface-soil samples will be collected at the first depth interval not exhibiting impacts from the roadway. These samples will be screened with a PID and, if readings above background are noted, a sample will be collected for VOC analysis. Samples from each boring will be collected for SVOCs, metals, and total cyanide.

3.2 Subsurface-Soil Investigation

The results of the PSA indicated the presence of tar in several of the borings at the site. Soil and groundwater samples were impacted by MGP residuals. Evidence of tar was found between 15 and 50 feet bgs in borings on the site. However, the PSA did not fully determine the horizontal and vertical extent of the impacts. Further, polycyclic aromatic hydrocarbons (PAHs) were detected in a sediment sample collected adjacent to the riverbank, below the outlet of the storm drain that traverses the site.

The purpose of the subsurface investigation is to place borings and monitoring wells to delineate the extent of the contamination; this will allow more complete characterization of the site and evaluation of applicable remedial alternatives. Either conventional hollow-stem auger drilling methods and/or Rotosonic™ drilling methods will be used to complete the soil borings and install the monitoring wells. At each drilling location, plywood will be placed on the ground surface to facilitate collection of drill cuttings and to minimize the spread of potentially contaminated materials. If HSA drilling is used, the augers will be advanced with a plug between sampling intervals.

3.2.1 Boring and Monitoring Well Installation and Subsurface-Soil Sampling

Nine monitoring wells will be completed to define the potential horizontal and vertical extent of dense nonaqueous phase liquid (DNAPL) impacts at the site (Figure 11, Table 5).

The proposed screen intervals are listed in Table 5. The actual depth of the placement of the well screens will depend on the findings from the soil borings and will be appropriate to the subsurface geology and presence of contaminants.

Two deep wells (MW-3D and MW-5D) will be installed adjacent to existing shallow wells to determine the vertical extent of DNAPL impacts. During the PSA, tar was observed in soil samples collected from MW-3 at the groundwater interface (15.5 feet bgs). Tar blebs, which are defined as a small isolated amorphous occurrence of NAPL on the scale of a few millimeters, were observed in soil collected from MW-3 from 17 to 30 feet bgs. MW-3 was drilled to 30 feet bgs and screened between 13 and 23 feet bgs. Therefore, MW-3D will extend to a confining unit or bedrock (anticipated at 150 feet bgs) in order to determine the vertical extent of impacts in this area. One analytical soil sample will be collected from MW-3D from the bottom of the boring or from the most likely contaminated soil horizon.

Black oil blebs were observed on the water surface from soil samples collected from MW-5 approximately 2 to 7 feet below the water table (17 to 22 feet bgs). Tar blebs were observed in soil from MW-5 from 22 to 24 feet bgs. Accordingly, MW-5D will be installed to determine the vertical extent of DNAPL impacts in this area. MW-5D will also extend to a confining unit or bedrock (anticipated at 150 feet bgs). One analytical soil sample will also be collected from MW-5D from the bottom of the boring or from the most likely contaminated soil horizon.

During the PSA, tar was observed in MW-1D between 15 and 50 feet bgs, and the boring extended to 65 feet bgs. No confining unit or bedrock had been identified at the time that the boring was terminated. Based on the depth of contamination observed at MW-1D, a deeper boring (MW-1DD) will extend to a confining unit or bedrock (anticipated at 150 feet bgs) in the vicinity of MW-1S/D. It is anticipated that two soil samples will be collected from MW-1DD for laboratory analysis: one from an apparently contaminated zone and one from an apparently uncontaminated zone below the observed extent of contamination.

Another boring, MW-7, will be installed southeast of the existing well cluster MW-1S/D, on the eastern side of the former canal, to determine the lateral extent of tar. Due to the presence of numerous buried utilities, the exact location of this boring will be determined in the field. It is anticipated that two soil samples will be collected from MW-7 for laboratory analysis: one from an apparently contaminated zone and one from an apparently uncontaminated zone below the observed extent of contamination. If contamination is present at MW-7, an additional boring will be necessary further to the southeast. Potential additional location(s) will be evaluated after the completion of MW-7.

An upgradient monitoring well (MW-6) will be installed in the northern corner of the site to assist in delineating the horizontal extent of impacts. Based on observations during the PSA, tar and oil blebs were present at the northernmost boring location, MW-5. The expected depth of MW-6 is 50 feet bgs. It is anticipated that one soil sample will be collected for laboratory analysis. If DNAPL impacts are noted at this location, an additional boring/monitoring well may be needed to delineate horizontal extent. Potential additional location(s) will be evaluated after the completion of MW-6, if required.

Three wells (MW-8, MW-9, and MW-10) will be installed between the site and the Delaware River to evaluate whether DNAPL has migrated from the site and possibly into sediments within the Delaware River. The proposed location for these wells is in a restaurant parking lot on Water Street southwest of the site. An access agreement must be obtained from the property owners. An alternate location for these wells is within Water Street, in front of the restaurant. The results of the PSA indicated that on-site impacts extend to approximately 50 feet bgs. The depths of MW-8 to MW-10 will be based on the results from the proposed site borings. At least one will extend to a confining layer or bedrock (anticipated at 150 feet bgs). It is expected that two soil samples will be collected from each boring for laboratory analysis: one in the impacted zone and the second in the underlying unimpacted confining zone to delineate vertical extent.

Three borings that may be finished as wells (MW-11, MW-12, and MW-13) will be installed along Brown Street to determine if NAPL has migrated toward the northwest. These borings will extend approximately 50 feet bgs. If contamination is noted, the boring will extend to unimpacted material to delineate the vertical extent. One analytical sample will be collected from each boring. If contamination is observed at these locations, additional borings/monitoring wells will be needed to determine the lateral extent of NAPL impacts. Potential additional locations will be evaluated, as required, after completion of MW-11, MW-12, and MW-13.

The findings of the PSA indicated that no contamination was encountered at the location of test pit TP-1, adjacent to and within a former gas holder located near Pike Street. Two additional soil borings will be completed to provide analytical data to substantiate the field observations made during the PSA. One boring (SB-14) will be completed within the former gas holder and will extend to the inferred floor of the holder. The other boring (SB-15) will be completed outside the wall of the former holder and will extend approximately 10 feet below the inferred depth of the holder floor.

One soil sample from each boring will be collected for laboratory analysis of benzene, toluene, ethylbenzene, and total xylenes (BTEX), PAHs, metals, and total cyanide. Each sample will be collected from the most contaminated interval within each boring based on PID measurements, visual and olfactory observations of contamination, and any geologic or structural controls that may affect the distribution of contamination. If evidence of contamination is not observed in soils from the borings, then the sample from each boring that is most likely to be contaminated will be submitted for analysis (likely to correspond with the elevation of the holder floor).

The lithology, moisture content, visual and olfactory evidence of contamination, PID readings, blow counts, and percent recovery of each subsurface-soil sample will be logged. Samples will be collected for laboratory analysis from the most contaminated interval (based on field observations) and/or below the most contaminated interval to determine the vertical extent of impacts. When no contamination is evident, a sample will be collected at the bottom of the boring. These subsurface-soil samples will be analyzed for VOCs, SVOCs, metals, and total cyanide. In addition, two impacted and two unimpacted soil samples will be collected and analyzed for total organic carbon (TOC) at locations to be determined in the field (Table 6).

Installation of the proposed monitoring wells will conform to methods described in the approved PSA work plan (Figure 13, Appendix C). The monitoring wells will be constructed of 2-inch inside diameter, flush-threaded polyvinyl chloride (PVC) screen and solid casing. The annular space between the well screen and the borehole will be backfilled with chemically inert sand to promote sufficient groundwater flow to the well and to minimize the passage of any fine-grained formation material into the well. A bentonite clay seal will be placed above the sand pack. The remaining annular space will be filled to grade with cement-bentonite grout. The bentonite seals will prevent the migration of contaminants to the sampling zone (i.e., screened interval) from the surface and overlying material, and will prevent cross-contamination between strata. A concrete pad will surround each well at the ground surface. Each monitoring well will be fitted with a flush-mounted curb box, secured with concrete. The monitoring well screen lengths will be no more than 10 feet.

3.3 River Investigation

Observations during the PSA revealed that fine sediments were distributed along the New York bank of the Delaware River adjacent to the riverside ice meadow, and in the eroded cut in the bank below the discharge for the storm water sewer that crosses the site. Observations made during the PSA also found that the river bottom in the reaches parallel to and downgradient of the site consisted of rounded cobble-sized rocks. Fine particulates were not observed in midchannel at the water-bottom interface. They could be present in deeper areas.

Sediments within the riverbed and on the eastern (New York) shore will be probed on foot (by wading) using lengths of threaded steel rod. A series of eight transects, perpendicular to river flow, will extend approximately 50 feet from the shoreline. As Figure 12 shows, the first transect line will begin approximate 100 feet upstream of the stormwater outfall location. Transects A through D will be completed upstream of the Route 209 bridge and will be spaced at approximately 50-foot intervals. Transects E through H will be completed downstream of the bridge and will be spaced at approximate 300-foot intervals. Probing stations along each transect will be completed at approximately 10-foot intervals. Additional probing along the shoreline after transect H will focus on a small cove-like area on the New York side of the river that may represent an area where contamination could have accumulated.

The transect locations and actual probing stations will be adjusted according to physical field constraints and based on the findings of the probing study. If evidence of MGP impacts is encountered, the probing stations will be adjusted in an attempt to delineate the extent of the observed impacts. If impacts are observed and shallow water conditions extend beyond 50 feet from the New York shoreline, then the transect lengths may be extended to aid in delineation of the observed impacts.

The rods will be inserted by hand into the sediments up to the maximum possible depth (assumed to be 2 to 3 feet) below the riverbed. The rods will be withdrawn and observations of any tar, sheen, or odors that may indicate impacts from the former MGP will be noted/documented. If impacts are observed, an attempt will be made to laterally delineate the observable extent of the impacts.

Where impacts are observed, hand-held Geoprobe™ sampling equipment will be used to obtain sediment samples for characterization. Notes will be recorded as to the textural composition of the sample and the nature of the observed contamination. It is possible that impacts other than those potentially caused by the former MGP will be encountered. The physical characteristics of the observed contamination will be used to determine the potential origin of the observed contamination. For planning purposes, it is assumed that three sediment samples (SED-1 through SED-3) exhibiting evidence of impacts determined in the field to be most likely caused by the MGP operations are planned for laboratory analysis (Table 5). The sediment samples will be analyzed for BTEX, SVOCs, metals, and total cyanide (Table 6). Additional samples may be required to delineate the extent of MGP impacts.

Additional probing stations will be placed within the discharge area of the stormwater conduit that traverses the site (Figure 11). The exact locations will be determined in the field and will depend upon the configuration of the riverbank. In addition, one deep probe will be placed at the most contaminated location or the point most likely to be contaminated. For planning purposes, the deep probe, performed with a hand-held Geoprobe-type sampler, is assumed to extend up to 10 feet below the river bottom. The deep probe will help delineate the depth of the contaminated sediments. One sample will be collected (SED-4) from the most contaminated interval based on PID measurements and visual and olfactory observations of contamination (Table 5). The sediment sample will be analyzed for BTEX, SVOCs, metals, and total cyanide (Table 6).

3.4 Groundwater Investigation

3.4.1 Well Development

Subsequent to drilling operations, all monitoring wells will be developed to restore the natural permeability of the formation in the vicinity of the well and to remove silt and clay to provide turbid-free groundwater samples. Development will be performed by alternately surging and pumping, utilizing either a centrifugal or piston pump, for a minimum of 30 minutes. Pumping will then continue until the turbidity of the development water is less than 50 nephelometric turbidity units (NTUs). Wells screened in fine-grained material (e.g., silt and clay) may not develop to a turbidity less than 50 NTUs. In these cases, water quality parameters (pH, temperature, and conductivity) will be monitored and recorded. Well development will continue until these water quality parameters stabilize within 10 percent over several consecutive readings or until a minimum volume of groundwater equal to 10 well volumes is removed. Wells will not be developed until 24 hours after construction, or their recovery is complete (whichever is later). Development water will be contained, labeled, and staged for appropriate disposal by O&R.

3.4.2 NAPL and Water Level Measurements

The depth to groundwater and the depth to NAPL (if present) will be measured using an electronic oil/water interface probe. Two rounds of measurements will be taken and recorded from the existing wells prior to the beginning of the drilling program. One round of measurements will be taken and recorded from the newly installed wells prior to groundwater sampling. Each measurement will be referenced to a permanent survey mark on the top of the well casing. If DNAPL is not measured in a well, a weighted or stainless steel bailer will be lowered to the bottom of the well to confirm the absence of DNAPL.

3.4.3 Groundwater Sampling

One round of groundwater samples will be collected from the existing and newly installed wells. Table 6 summarizes the number of groundwater samples, the analyses to be performed, and the QA/QC samples. These wells will be sampled a minimum of two weeks after the installation of the new wells. Groundwater sampling will be conducted as specified in the approved PSA work plan (Appendix C).

3.4.4 Single Well Pump Tests

To evaluate the feasibility of plume containment as a remedial measure, single well pump tests will be conducted at two shallow wells and two deep wells using a submersible pump, in-situ pressure transducers, and data logger. Results from these tests will be used to estimate hydraulic conductivity and groundwater flow velocities. Prior to each pump test, the static water level will be measured using an electronic water level meter. The submersible pump and transducer will be lowered into the well. The water level will be monitored using the water level meter and transducer until the initial static water level is reached. Once the initial static water level is reached, the pump test will be started. The pumping rates will be measured several times during each test to determine the average pumping rate and to confirm that the rate remains relatively constant. Groundwater drawdown and recovery data will be monitored continuously by the pressure transducer and recorded by the data logger. The pumping interval will continue until drawdown appears to level off after more than one hour of pumping or until the well is dry. Recovery data will be recorded immediately after pumping ends and until drawdown approaches zero or remains constant over a sufficient period of time. The pumping and recovery time required for each well will depend on the aquifer material where the well is screened.

The Theis Recovery Method will be used to estimate the hydraulic conductivity of the aquifer material. Darcy's Law, the estimated hydraulic conductivities, and the hydraulic gradients will be used to estimate the groundwater flow velocities.

3.5 Surveying

A site survey will be performed after the installation of the additional monitoring wells and soil borings by a licensed New York State surveyor. Information will be obtained for the production of a composite map that accurately illustrates the locations and elevations of the existing and new sample locations. Monitoring well elevations will be determined with a vertical accuracy of ± 0.01 foot. Locations and elevations will be referenced to a known benchmark.

3.6 Risk Assessment

The PSA report included an evaluation of current human health risks based on the PSA findings. The PSA report also included an assessment of the ecological setting of the site. Further risk characterization will be performed as part of the RI and will use the information gathered during the PSA, as well as additional information gathered through completion of the RI field investigation. The scope of the risk assessment is presented in the following subsections.

3.6.1 Purpose

The risk assessment will define and evaluate potential human health and environmental risks associated with compounds of concern related to the site. The risk assessment will be conducted according to the United States Environmental Protection Agency's (EPA) *Risk Assessment Guidance for Superfund: Volume I-Human Health Evaluation Manual (Part A)* (1989) and NYSDEC's *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites* (NYSDEC, 1991).

The risk assessment will include the following steps.

Step1: Exposure Assessment identifies current and potential future receptors, routes of chemical migration, and describes how the receptors may contact the compounds of concern.

Step 2: Toxicity Assessment identifies chemical-specific toxicity factors.

Step 3: Risk Characterization estimates current and potential carcinogenic and noncarcinogenic risk for humans and identifies areas of a site that may require remediation.

Step 4: Environmental Assessment identifies potential adverse impacts on ecosystems on and neighboring the site.

Step 5: Cleanup Goals are derived based on site-specific conditions, assumptions and Applicable or Relevant and Appropriate Requirements (ARARs).

3.6.2 Data Evaluation

Data from the PSA, as well as additional data gathered during the RI, will be evaluated to select compounds of concern. Environmental data collected from the site will be evaluated and summarized for use in the risk assessment. The evaluation will assess the suitability of the data for risk assessment based on the potential sources of contamination and the concentrations which have been found. The data for groundwater, sediment and soil will be summarized in tables based on the exposure assessment. These tables will show the ranges of detected concentrations, frequencies of detection, detection limits, and if available, background concentrations. Arithmetic means and 95% upper confidence limits (UCLs) of the arithmetic means will be calculated and included in the tables.

After summarizing the data for the site, chemicals of concern will be selected for quantitative evaluation in the risk assessment. Factors such as occurrence/distribution, carcinogenicity, toxicity, persistence, background, degradation products, and degree of mobility will be considered in identifying the compounds of concern. Compounds present at the site at concentrations below background or NYSDEC criteria will be eliminated at this step in the process.

It is assumed that the major chemicals of concern at the site are BTEX, PAHs, and metals.

3.6.3 Exposure Assessment

3.6.3.1 Land Use Assumptions and Potential Receptors

The site is a commercial/industrial parcel of land that is currently occupied by O&R as an operations center. Commercial properties exist adjacent to the site at the corner of Pike and King Streets and across Pike Street. Residential properties are located across Brown and King Streets and adjacent to the site at the corner of Pike and Water Streets. Orange and Rockland has acquired this corner property immediately adjacent to the site. The site could be redeveloped for either commercial or residential use. Based on these current and future land-use assumptions, the following receptors may potentially be present at the site.

- Current Off-Site Residents (both children and adults)
- Future On-Site Residents (both children and adults)
- On-site workers (current and future)
- Construction workers (current and future)

These are currently considered to be the most sensitive receptors. Other receptors may need to be evaluated, at least qualitatively.

3.6.3.2 Exposure Pathways Selected for Evaluation

Exposure pathways for the receptors selected for evaluation include the following.

Off-Site Child Residents (current)

- Inhalation of volatiles and particulates in outdoor air
- Inhalation of vapors in indoor air

Off-Site Adult Residents (current)

- Inhalation of volatiles and particulates in outdoor air
- Inhalation of vapors in indoor air

Child Residents (future)

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of volatiles and particulates in outdoor air
- Inhalation of vapors in indoor air

Adult Residents (future)

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of volatiles and particulates in outdoor air
- Inhalation of vapors in indoor air

On-Site Workers (future)

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of volatiles and particulates in outdoor air
- Inhalation of vapors in indoor air

Construction Workers (future)

- Incidental ingestion of soil
- Dermal contact with soil
- Inhalation of volatiles and particulates in outdoor air

Two current pathways, on-site workers and construction workers, were evaluated quantitatively in the PSA report.

3.6.3.3 Eliminated Exposure Pathways

The following exposure pathways are eliminated from the quantitative evaluation.

- No pathways for direct exposure to groundwater exist or are likely to exist at the site because the groundwater is not in use as a water supply and the water level was detected from 14.3 to 16.5 feet bgs.

- Exposures to trespassers will not be quantitatively evaluated because the residents would be more sensitive receptors. However, if an unacceptable risk were determined for future residents, quantitative evaluation of the trespasser scenario may be warranted.

- Exposures to off-site workers will not be evaluated quantitatively because off-site residents would be more sensitive receptors. If additional sampling warrants it, then the potential exposures to off-site workers may be evaluated in the risk assessment.

- Exposures to groundwater from household uses will not be evaluated because groundwater is currently not used as a drinking water source and, based on the presence of an alternative public water supply, is not likely to be used as a drinking water source in the future.

3.6.3.4 Exposure Quantification

This evaluation is primarily concerned with the potential health effects that are encountered by residents, workers, and construction workers through various incidental pathways of exposure such as dermal contact, inhalation of particulates, and incidental ingestion of chemicals in the soil, sediment, surface water, and indoor air. This evaluation predicts how much, or what dose, the person is exposed to. The dose is calculated using human health parameters such as contact rates, ingestion rates, and body weights in combination with exposure duration. The EPA recommends using midrange estimates for exposure variables for intake rates, contact rates, and body weights. The values for frequency and duration of exposure will be selected to reflect realistic values for receptors making the fullest use of the site or resource while considering climate conditions in New York. Finally, the 95% UCL of the mean will be used as the exposure point concentrations for soil and surface water and EPA-recommended fate and transport models will be selected to determine the volatilization factors, particulate emission factors, and indoor air concentrations, as necessary.

3.6.4 Toxicity Assessment

The most recent toxicity values for carcinogenic effects (i.e., slope factors) and noncarcinogenic effects (i.e., reference doses) published for each of the compounds of concern will be obtained from EPA's *Integrated Risk Information System (EPA, 1999)* which is a database that contains information on toxic substances. The EPA *Health Effects Assessment Summary Tables (EPA, 1997)*, or other EPA publications will be used as secondary sources of toxicity values.

3.6.5 Human Health Risk Characterization

Estimated exposures to contaminants in soil and groundwater will be calculated for each compound and combined with toxicity values to produce an estimate of potential carcinogenic and noncarcinogenic risks for each exposure pathway for each human receptor. Based on EPA guidance (EPA 1989), the risk assessment will assume that the impacts of each compound are additive, and so the potential risks will be summed over all compounds and pathways.

The calculated risk estimates will be compared to the following risk standards specified by NYSDEC (1994):

(1) an excess upper-bound lifetime cancer risk of 1 in 1,000,000 for EPA Group A and B carcinogens and 1 in 100,000 for EPA Group C carcinogens, and

(2) a Hazard Index of 1.0 for noncancer health effects.

These findings will be interpreted in light of the uncertainties inherent in the site investigation and risk assessment process to provide a comprehensive risk characterization. If the risk levels are higher than NYSDEC's benchmark values, then the site may require remedial action. If the risk estimates are lower, this information would provide evidence in support of no further action.

3.6.6 Environmental Assessment

Ecological information was developed during the PSA, as described in *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites* (NYSDEC, 1991). The PSA report included a topographic map showing sensitive fish and wildlife resources within 2 miles of the site, and a cover type map for the area within 0.5 mile of the site. The impact on the Delaware River will be evaluated during the RI, using NYSDEC guidance for screening contaminated sediments (NYSDEC, 1994) in reference to analytical results from samples collected in the river. Comments on this work plan by staff from the Inactive Hazardous Waste Evaluation Unit in the Division of Fish and Wildlife will be addressed during the environmental analysis.

3.6.7 Derivation of Cleanup Levels

During the RI, findings from the field program will be evaluated against the NYSDEC recommended cleanup objectives. The comparison will be documented in the subsections on analytical results and in the summary of analytical results prepared as part of the risk assessment. Development of remedial action objectives during the FS may require evaluation of site-specific risk-based cleanup criteria. If necessary, this may be performed as part of the FS.

3.7 Remedial Investigation Report

RI findings will be compiled in a report that conforms to the outline shown below.

- Executive Summary
- Introduction
- Study Area Investigation
- Physical Characteristics of the Study Area
- Nature and Extent of Contamination
- Contaminant Fate and Transport
- Baseline Risk Assessment
- Summary and Conclusions

The RI report will include both the PSA results and results of the additional investigation specified in this work plan.

4.0 FS SCOPE OF WORK

An FS will be developed for the Port Jervis site to identify and evaluate remedial action alternatives applicable to the site conditions. The FS will be performed according to the following scope of work, which addresses all of the requirements specified in NYSDEC and Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) RI/FS guidelines and regulations for the development and evaluation of remedial action objectives and alternatives. The scope of work is comprised of the following.

- Preliminary Identification of ARARs
- Development of Remedial Action Objectives
- Development of Remedial Alternatives
- Initial Evaluation of Alternatives
- Detailed Evaluation of Alternatives
- FS Report
- Treatability Studies

4.1 Preliminary Identification of ARARs

ARARs, including applicable New York State Standards, Criteria, and Guidelines (SCGs) and applicable federal and state statutes and regulations, will be identified. The ARARs will be identified concurrently with the RI, based on the nature and extent of contamination in environmental media and the potential exposure pathways.

4.2 Development of Remedial Action Objectives

The development of remedial action objectives (RAOs) is an important step in the RI/FS process. The RAOs will be developed in accordance with NYSDEC TAGM #HWR-90-4030 Section 3.1 and the CERCLA RI/FS guidance document. The RAOs provide the basis for determining the extent of the contamination and the potentially applicable remedial scenarios. Regulatory and risk-based cleanup levels will be determined in accordance with NYSDEC regulations. RAOs will be developed for the Port Jervis former MGP concurrently with the RI, and will consider cleanup levels and the identified ARARs.

4.3 Development of Remedial Alternatives

Remedial alternatives will be developed concurrently with the RI and will be based on the RAOs. Appropriate remedial technologies will be identified, including innovative technologies, and a description of each of the applicable remedial technologies will be provided. Several remedial alternatives will be developed by suitably combining identified remedial technologies to address COCs and extent of contamination at the site as determined during the RI. The alternatives will be developed with the understanding of NYSDEC preference for destruction and treatment technologies as established in the Hierarchy of Remedial Technologies (TAGM #HWR-90-4030 Section 2.1).

4.4 Initial Evaluation of Alternatives

Following development, alternatives will be screened through an initial evaluation. The purpose of the initial evaluation of alternatives is to narrow the list of potential alternatives that will be subjected to a detailed evaluation. Individual remedial technologies, including innovative technologies, will be screened based upon their ability to meet medium-specific remedial action objectives and the following broad criteria.

- Implementability
- Effectiveness
- Cost

Implementability refers to the technical and administrative feasibility of constructing, operating, and maintaining a remedial action alternative. The key aspect of effectiveness is protection of human health and the environment. Both short- and long-term effectiveness will be considered. Cost will be evaluated on a qualitative basis for comparison purposes. The fewest appropriate number of alternatives that are determined to be both implementable and effective will be retained for further evaluation.

4.5 Detailed Evaluation of Alternatives

The alternatives retained in the initial evaluation will be subjected to a detailed evaluation. The detailed evaluation provides the rationale for remedy selection, and is conducted in the following three steps. First, the alternatives are evaluated based on seven specific criteria. Next, the alternatives are compared to each other, and finally, a preferred alternative is selected. The seven criteria which serve as the basis for the detailed evaluation are as follow:

- short-term impacts and effectiveness;
- long-term effectiveness and permanence;
- reduction of toxicity, mobility, or volume;
- implementability;
- compliance with ARARs;
- overall protection of human health and the environment; and
- cost.

Section 5.2.3 of TAGM #HWR-90-4030 and the CERCLA RI/FS guidance present specific and detailed descriptions of each evaluation criterion. This section will be used to develop qualitative determinations for each alternative regarding the seven criteria listed above. The FS report will provide a narrative discussion as well as a tabular assessment of each alternative with respect to each of the seven criteria.

In addition to comparing each alternative individually to the seven criteria, the alternatives will also be compared with each other. During this step, interrelationships between alternatives will be considered to identify relative advantages, disadvantages, and key trade-offs. The FS will provide an evaluation of the strengths and weaknesses of each alternative relative to one another.

Based on this evaluation, one remedial alternative will be selected as the preferred remedy. The rationale for this selection will be provided in the FS report.

4.6 FS Report

An FS report will be prepared to document the remedial action objectives, the development and evaluation of remedial alternatives, and the selection of a preferred alternative. The report will present the results of the initial and detailed analyses and tabular comparisons of the alternatives. The justification for the selection of the preferred remedial action alternative will be provided. GEI will submit a draft of the FS report to O&R for review and comment. Upon addressing O&R's comments, the FS report will be finalized for submittal to NYSDEC.

4.7 Treatability Studies

Additional investigation may be necessary in order to fully evaluate the applicability of the remedial alternatives. Treatability studies in the form of bench-scale or pilot-scale tests may be performed to determine the influence of specific site conditions, contaminants of concern, and other factors on a remedial alternative. Treatability studies will evaluate the effectiveness of individual remedial alternatives at the site. The need for treatability studies will be established during the evaluation of the alternatives.

5.0 PROJECT ORGANIZATION

The project will continue to be conducted by personnel from the GEI office in Colchester, Connecticut (Figure 14). The FS will be prepared under the direction of a professional engineer (P.E.) licensed in New York.

In-House Consultant - John Ripp. Mr. Ripp will serve as the in-house consultant responsible for ensuring a corporate-backed commitment to meeting contractual requirements in accordance with this plan. He will provide MGP expertise and guidance with reference to regulatory compliance issues.

Project Manager - Dave Terry. Mr. Terry will serve as the project manager. He will be responsible for overseeing the field investigation, contracting subcontractors, reviewing site characterization data, and report preparation. He will be responsible for the completion of the work in conformance with this work plan and maintenance of the project file. Mr. Terry will be the primary point of contact for O&R and will provide assistance as necessary.

Project Engineer - David Rivard-Lentz (P.E.). Mr. Rivard-Lentz is a New York P.E. who will be responsible for the preparation of the FS.

Staff Engineer/Field Team Leader - Malcolm Beeler. Mr. Beeler will serve as the staff engineer. He will lead the field investigation and will be responsible for coordinating sampling activities and subcontractors on site. He will review site characterization data, aid in the preparation of the RI report, and evaluate remedial alternatives for the FS.

Risk Assessor - Karen Reece. Ms. Reece will serve as the risk assessor for the project and will evaluate the site-specific human health and ecological risks.

Data Validators - Lorie MacKinnon and Elissa McDonagh. Ms. MacKinnon and Ms. McDonagh will validate the data generated from the RI field investigation prior to data evaluation and use.

6.0 SCHEDULE

The proposed project schedule is depicted in Figure 15. The RI field investigation will require approximately eight weeks to complete. The RI report will be submitted to NYSDEC approximately 16 weeks following the completion of field activities. Preparation of the FS report will be conducted following NYSDEC approval of the RI report.

REFERENCES

Correspondence from Gardiner Cross of NYSDEC to Maribeth McCormick of O&R, April 16, 1999, RE: PSA Reports for Middletown (Genung Street) and Port Jervis Former Manufactured Gas Plant Sites.

GEI Consultants, Inc. *Preliminary Site Assessment, Port Jervis Former Manufactured Gas Plant Site.* September 11, 1998.

Long, E.R., and L.G. Morgan, 1990. *The Potential for Biological Effects of Sediment-Sorbed Contaminants Tested in the National States and Trends Program.* National Oceanic Atmopheric Administration (NOAA) Technical Memorandum No. 5, OMA52, NOAA National Ocean Service, Seattle, Washington.

New York State Department of Environmental Conservation (NYSDEC). 1994. *Division Technical and Administrative Guidance Memorandum [TAGM 4046]: Determination of Soil Cleanup Objectives and Cleanup Levels.* Division of Hazardous Waste Remediation. Albany, NY.

NYSDEC. 1990. *Water Quality Standards and Guidance Values, September 25, 1990 (TOGS 1.1.1).* Division of Water. Albany, NY.

NYSDEC. 1991. *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites.* Prepared by: New York State Department of Environmental Conservation. Division of Fish and Wildlife. June 1991.

NYSDEC. *Revised TAGM - Selection of Remedial Actions at Inactive Hazardous Waste Sites,* memo from Michael J. O'Toole, HWR-90-4.030, revised May 15, 1990.

Order on Consent Between NYSDEC and Orange and Rockland, Index #D3-0001-99-01, September 29, 1998.

United States Environmental Protection Agency (EPA). *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA.* EPA 540 G-89004, OSWER Directive 9355-3-01, October 1988.

REFERENCES (continued)

EPA. 1999. *Integrated Risk Information System (IRIS) [On-line Database].* Office of Health Effects Assessment. Washington, D.C.

EPA. March 1997. *Health Effects Assessment Summary Tables (HEAST).* Annual FY 1994. Office of Emergency and Remedial Response. Washington, DC.

EPA. 1991. *Risk Assessment Guidance for Superfund, Volume 1: Human Health Evaluation Manual-Supplement Guidance. "Standard Exposure Factors."* Office of Solid Waste and Emergency Response Directive.

EPA. 1989. *Risk Assessment Guidance for Superfund, Volume I. Human Health Evaluation Manual (Part A).* Office of Emergency and Remedial Response: Washington, D.C. EPA 540/1-89/002.

Table 1
Gas Production at Port Jervis, New York[a]

Year	Process	Annual Output (cf)
1887	Lowe by Granger	Not reported
1892	Granger-Collins	6 million
1893	Granger-Collins	6 million
1900	Lowe	8 million
1904	Lowe	12 million
1905	Lowe	10 million
1906	Lowe	10 million
1907	Lowe	10 million
1908	Lowe	10 million
1909	Lowe	10 (1907)
1910	Lowe	10 (1907)
1911	Lowe	10 million
1912	Lowe	10 million
1913	Lowe	10 million
1914	Lowe	10 million
1915	Lowe	19.7 million
1916	Lowe	23.7 million
1917	Lowe	23.7 million
1918-1921	Production information for the Port Jervis site was combined with production information for the Middletown site. The work plan for the Middletown site is provided under separate cover.	

[a] *Brown's Directory of American Gas Companies*

Table 2
Potential Contaminant Sources Within One Mile

Environmental List	Port Jervis Site	Beyond the Site Boundary 0.125 mile	From 0.125 to 0.25 Mile From the Site Boundary	From 0.25 to 0.5 Mile From the Site Boundary	From 0.5 to 1.0 Mile From the Site Boundary
NYS Inactive Hazardous Waste Disposal Sites	0	0	0	0	0
CERCLIS Sites	Delisted from database	0	0	0	1
National Priority List	0	0	0	0	0
Hazardous Substance Waste Disposal	1	0	0	0	1
NYS Solid Waste Facilities	0	0	0	1	0
NYS Major Oil Storage Facilities	0	0	0	0	0
RCRA Hazardous Waste Treatment, Storage, Disposal Sites	0	0	1	0	0
NYS Toxic Spills (including Leaking Underground Storage Tanks)	0	1	1	4	Not searched
Local & State Petroleum Bulk Storage Sites	1	0	1	Not searched	Not searched
RCRA Hazardous Waste Generators & Transporters	0	0	0	Not searched	Not searched
NYS Chemical Bulk Storage Sites	0	0	0	Not searched	Not searched
Toxic Release Inventory	0	0	0	Not searched	Not searched
Permit Compliance System Toxic Wastewater Discharges	0	0	0	Not searched	Not searched
NYS Air Discharges	0	0	1	Not searched	Not searched
Civil Enforcement Docket Facilities	0	0	0	Not searched	Not searched
ERNS	Transformer oil spill	Not searched	Not searched	Not searched	Not searched

Table 3
Climatological Data Collected at West Point, New York

Temperature	
Average daily temperature, winter	29 degrees F
Average minimum daily temperature, winter	21 degrees F
Lowest recorded temperature	-11 degrees F, 2/8/1963
Average daily temperature, summer	73 degrees F
Average maximum daily temperature, summer	84 degrees F
Highest recorded temperature	105 degrees F, 9/2/1953
Precipitation	
Total annual precipitation	48 inches
Average presently falling between April and September	50%; 24 inches
Heaviest 1-day rainfall	4.76 inches, 9/12/1960
Mean annual lake evaporation	31 inches
Mean net precipitation	17 inches
One year 24-hour rainfall	2.9 inches

Source: *Soil Survey of Orange County, New York*, US Department of Agriculture, Soil Conservation Service, in cooperation with Cornell University Agricultural Experiment Station, 1981

Table 4
Physical and Chemical Properties of the Three Soil Horizons of the Tioga Soils

	Soil Horizon 1 (0-3 inches BG)	Soil Horizon 2 (3-40 inches BG)	Soil Horizon 3 (40-60 inches BG)
Permeability Inches/Hour	0.6 to 6.0	0.6 to 6.0	0.6 to 20
Available water capacity Inch/Inch	0.15 to 0.21	0.07 to 0.20	0.02 to 0.20
Soil reaction pH	5.1 to 7.3	5.1 to 7.3	5.6 to 7.8
Shrink-swell potential	Low	Low	Low
Erosion Factor K	0.49	0.37	0.37
Erosion Factor T	4	4	4

Source: *Soil Survey of Orange County, New York,* US Department of Agriculture, Soil Conservation Service, in cooperation with Cornell University Agricultural Experiment Station, 1981

Table 5
Port Jervis RI
Rationale for Sampling and Analysis

Sample ID	General Location	Depth (ft bgs)	Screen Interval[1] (ft bgs)	Rationale	Number of Soil Analytical Samples
Surface Soil					
SS-1, SS-2, SS-3, SS-4	Unpaved accessible on-site locations.	0 to 1 inch	NA	Evaluate on-site surface-soil conditions.	4
SS-5, SS-6, SS-7	Off-site public access locations	0 to 1 inch	NA	Establish background surface-soil concentrations	3
SS-8, SS-9, SS-10	Northwest property boundary	1 to 2 estimated	NA	Evaluate near-surface-soil quality (below pavement) to document potential lateral extent of former MGP footprint.	3
Subsurface Soil					
MW-1DD, MW-3D, MW-5D	Adjacent to existing wells MW-1, MW-3 and MW-5	To be determined[2]	To be determined	Define vertical extent of DNAPL and depth of confining unit or bedrock	1/well = 3 total
MW-6	Northern corner of the site	50	20 to 30	Define lateral extent of DNAPL; install an upgradient well	1/well = 1 total
MW-7	Southeast of MW-1S/D, opposite side of canal	50	40 to 50	Determine whether DNAPL migrated southeast, through/under the canal	2/well = 2 total
MW-8, MW-9, MW-10[3]	Southwest of the site, along Water Street	50[3]	30 to 40	Determine whether DNAPL migrated toward the river	2/well = 6 total
MW-11, MW-12, MW-13	West of the site, along Brown Street	50	20 to 30	Define lateral extent of DNAPL	1/well = 3 total
SB-14 SB-15	Inside and outside gas holder foundation near Pike Street	10 to 20 estimated	NA	Provide analytical data to substantiate the field observations from the PSA that the location is apparently uncontaminated.	1/boring = 2 total
Sediment					
SED-1, SED-2, SED-3, SED-4	Within the Delaware River, up and downgradient of the stormwater outfall.	10	NA	Determine whether DNAPL migrated into the Delaware River	1/boring = 4 total

Notes:
1. The depth of the placement of well screens will be appropriate to the subsurface geology and presence of contaminants and will depend on the findings from soil borings.
2. Borings will be advanced to bedrock or confining unit (believed to be 150 feet below grade).
3. One boring along Water Street to be advanced to bedrock or confining unit.

Table 6
Port Jervis RI
Proposed Sampling and Analysis Program

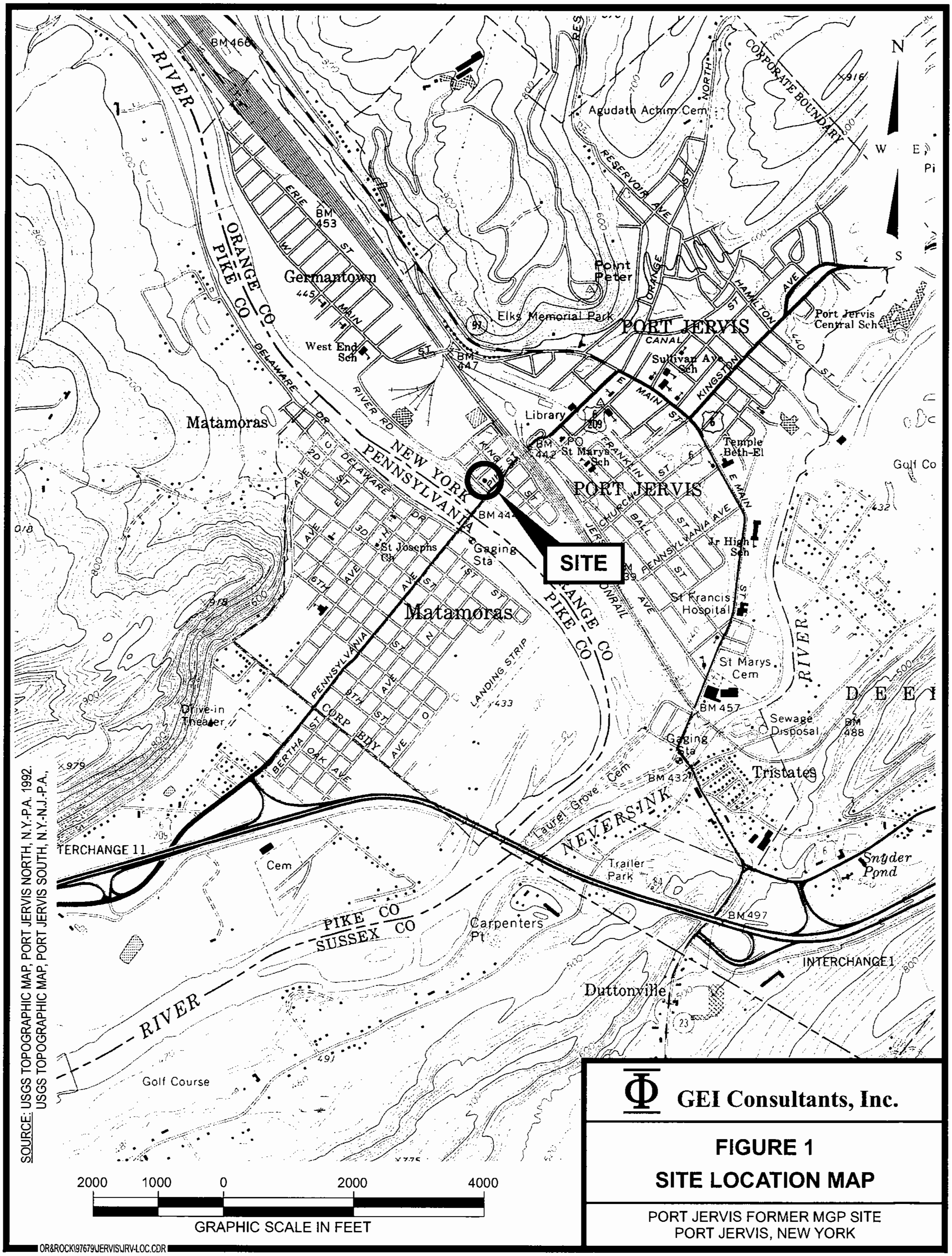
Medium	Sampling Method	Analytical Parameters	Number of Samples	Number of Duplicates	Number of Rinsate Blanks	Number of Trip Blanks
Surface Soil	Trowel/stainless-steel split spoon	VOCs[1] SVOCs TAL metals Total Cyanide	10	1	1	0
Subsurface Soil	Split-Spoon Sampler and RotoSonic core samples	VOCs SVOCs TAL metals Total Cyanide	19	2	2	0
		TOC	2	0	0	0
Sediment[2]	Split-Spoon Sampler	VOCs SVOCs TAL metals Total Cyanide	3	1	1	1
	Grab	BTEX SVOCs TAL metals Total Cyanide	3	1	1	1
Groundwater	Bailer	VOCs	16	2	2	2
	Peristaltic Pump/ Submersible Pump	SVOCs TAL metals Total Cyanide	16	2	2	0

Methods:

VOCs - Method 8260B
SVOCs - Method 8270C
TAL Metals - Method 6010/7000 series
Total Cyanide - Method 9012
TOC - Method 9060-DUP

Notes:

1. Samples collected only if PID readings above background.
2. Samples collected only if DNAPL impacts observed between the site and the river.



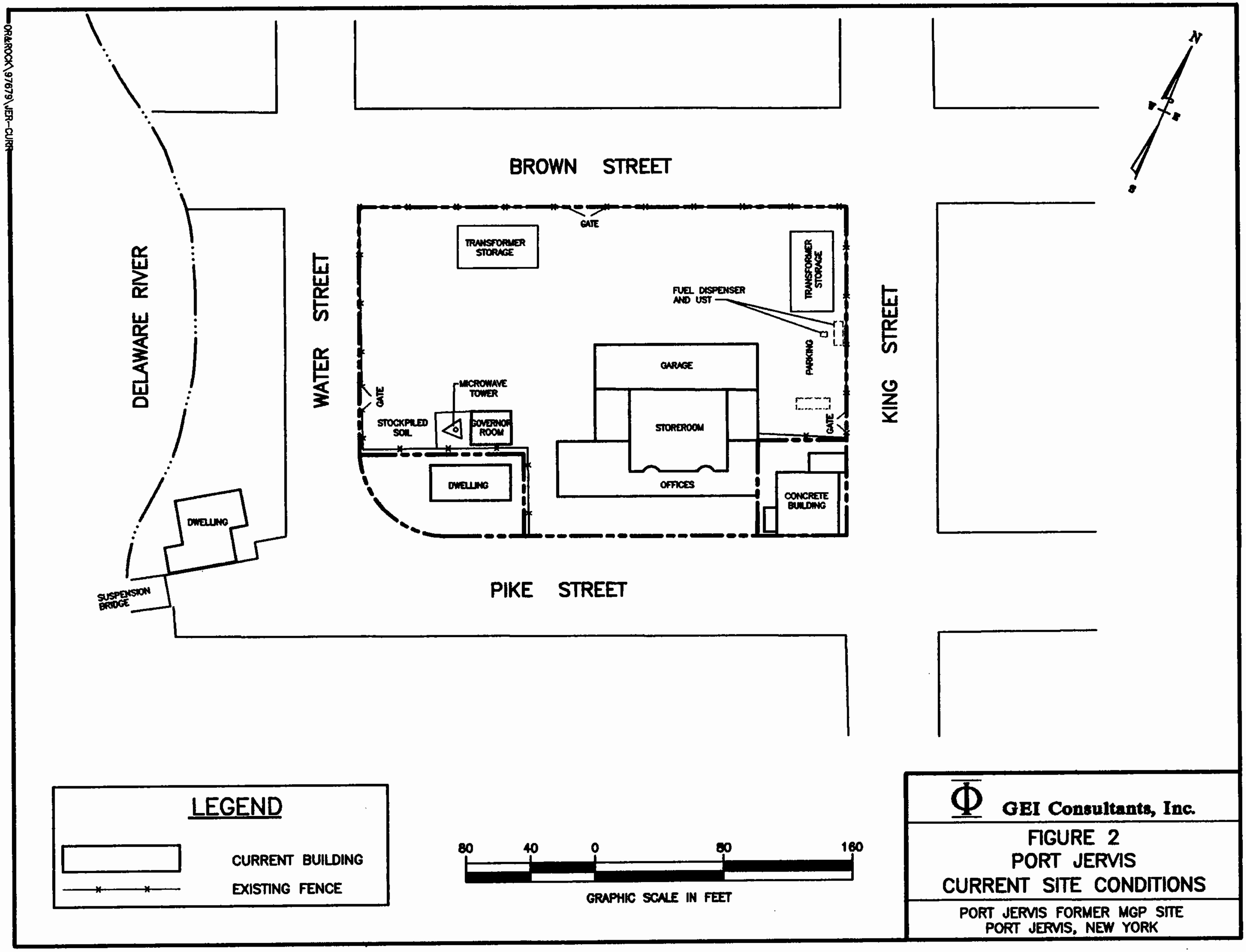
SOURCE: USGS TOPOGRAPHIC MAP, PORT JERVIS NORTH, N.Y.-P.A. 1992.
USGS TOPOGRAPHIC MAP, PORT JERVIS SOUTH, N.Y.-N.J.-P.A.,

GEI Consultants, Inc.

FIGURE 1
SITE LOCATION MAP

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

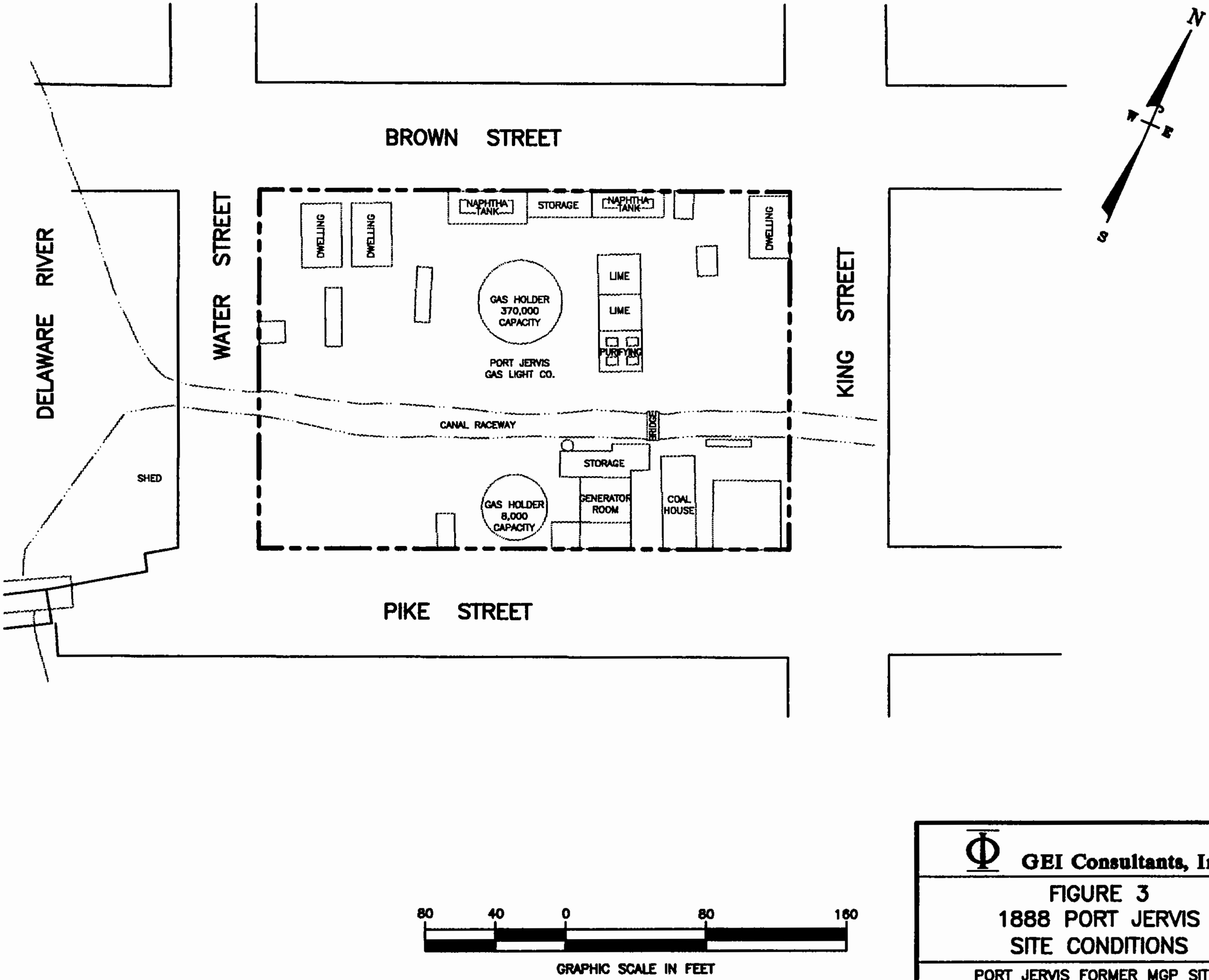
OR&ROCK\97679\JERVIS\JRV-LOC.CDR



GEI Consultants, Inc.

FIGURE 2
PORT JERVIS
CURRENT SITE CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

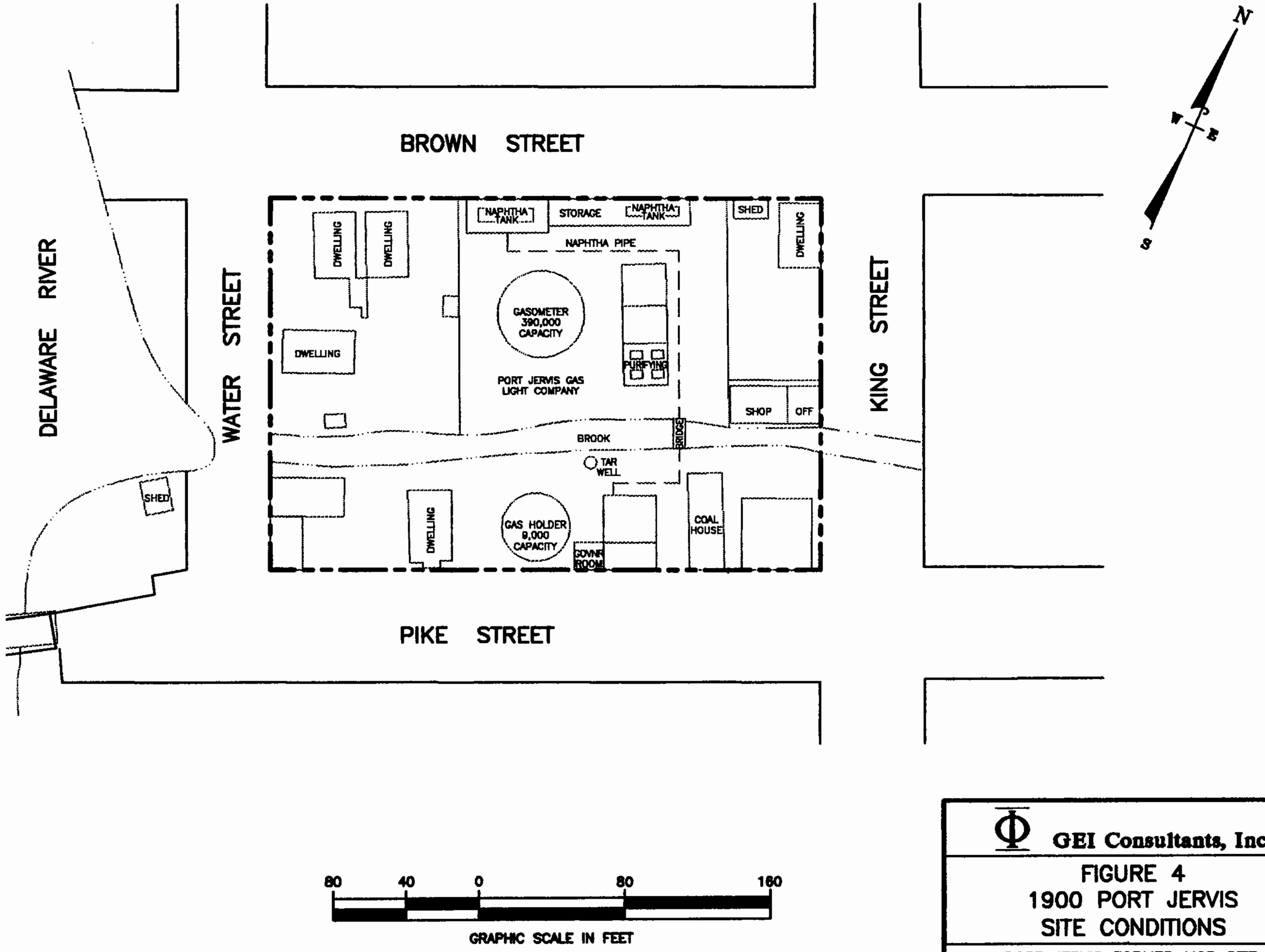


GEI Consultants, Inc.

FIGURE 3
1888 PORT JERVIS SITE CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIGS\JER-1888

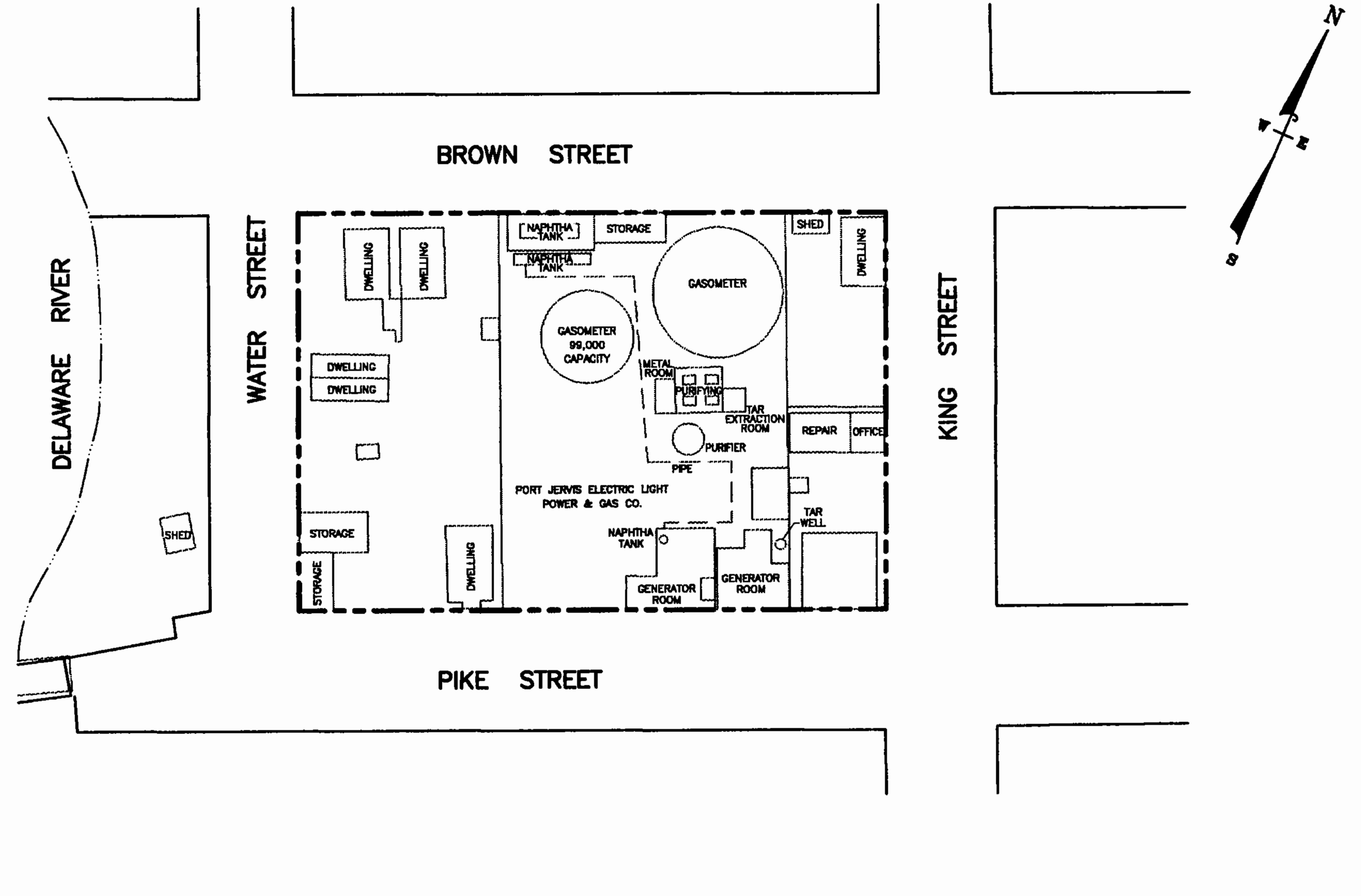


GEI Consultants, Inc.

FIGURE 4
1900 PORT JERVIS SITE CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIGS\JER-1900

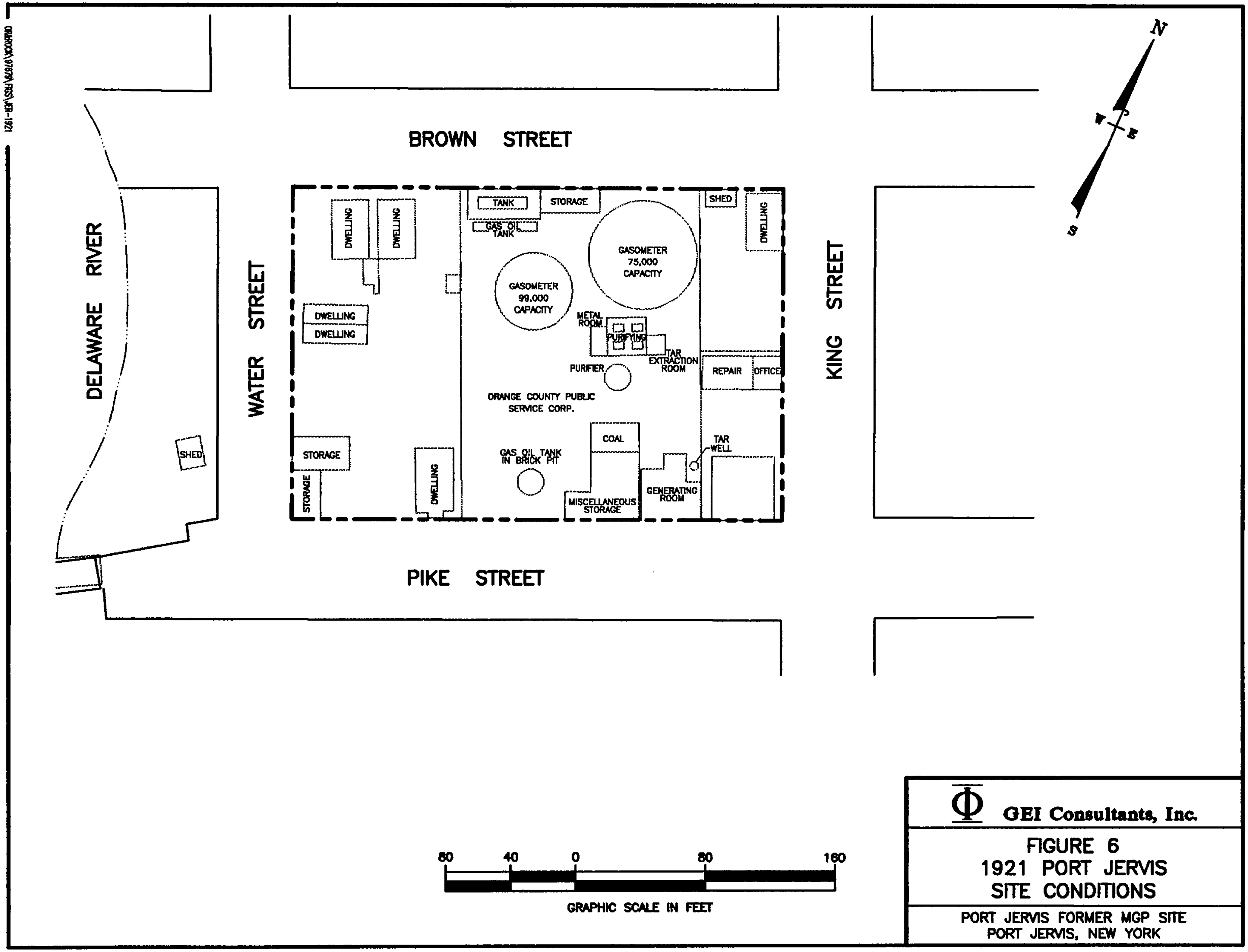


Φ GEI Consultants, Inc.

FIGURE 5
1912 PORT JERVIS
SITE CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIGS\JER-1912

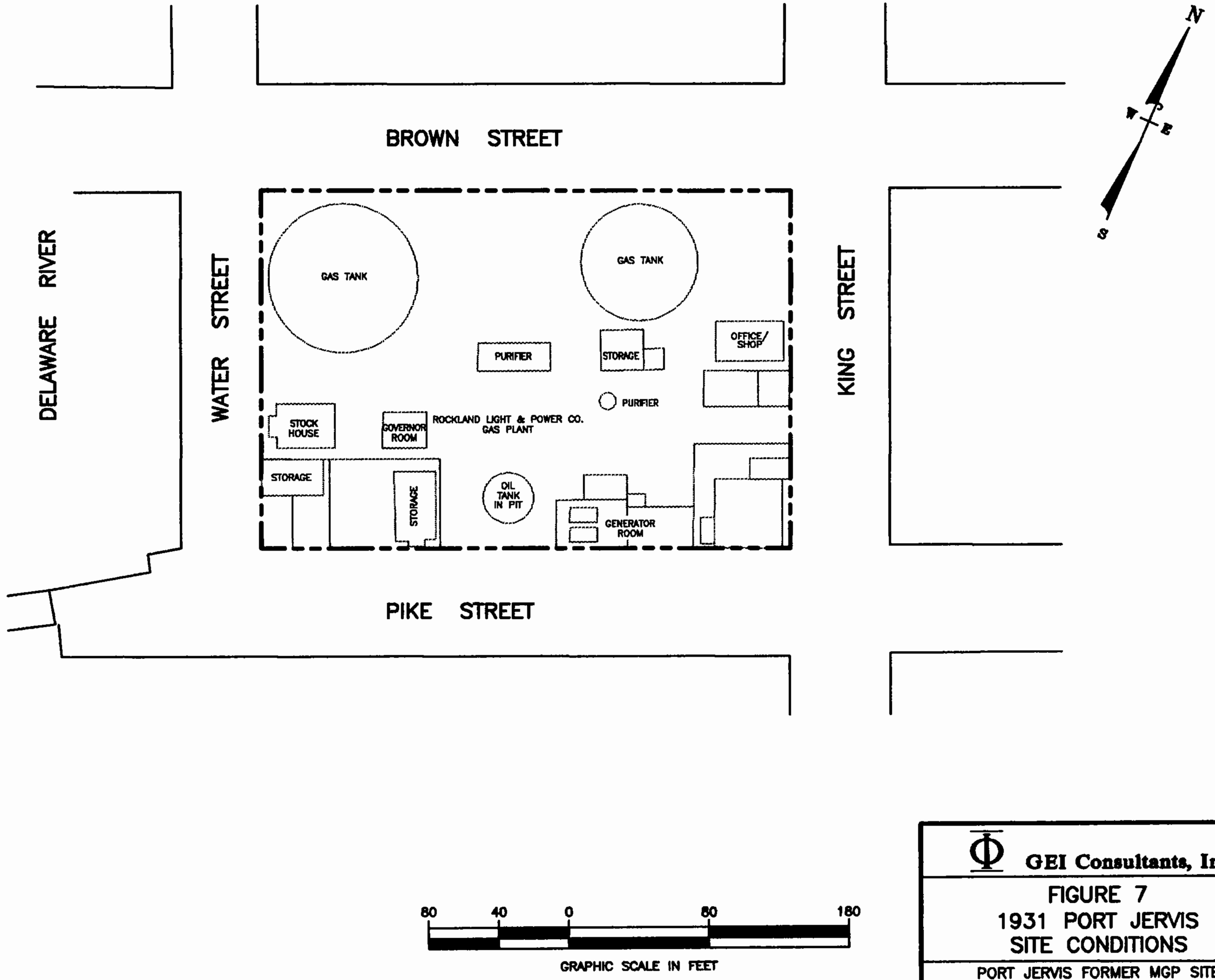


GEI Consultants, Inc.

FIGURE 6
1921 PORT JERVIS
SITE CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

ORAROCK\97679\FIGS\JER-1921

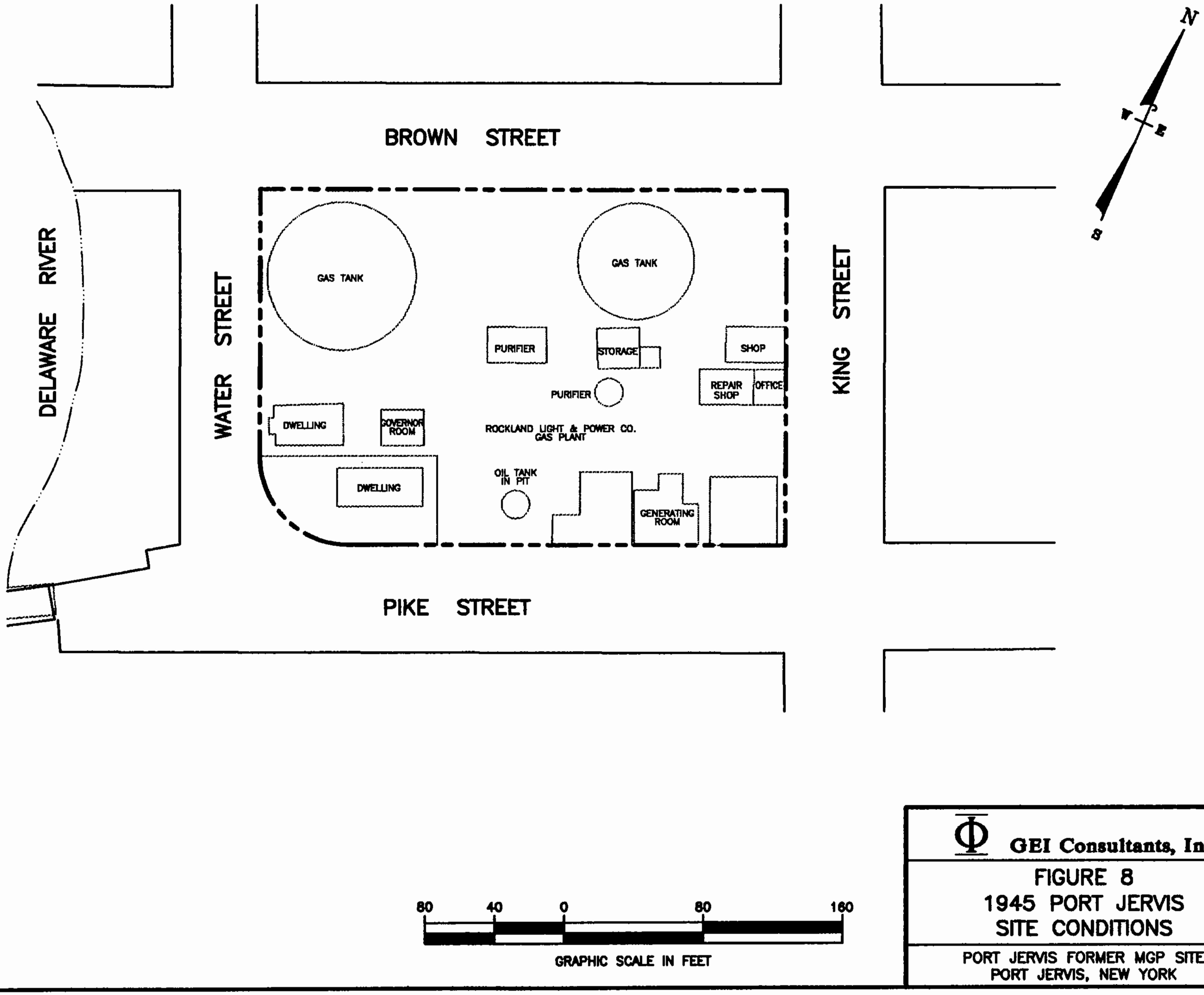


GEI Consultants, Inc.

FIGURE 7
1931 PORT JERVIS
SITE CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIGS\JER-1931

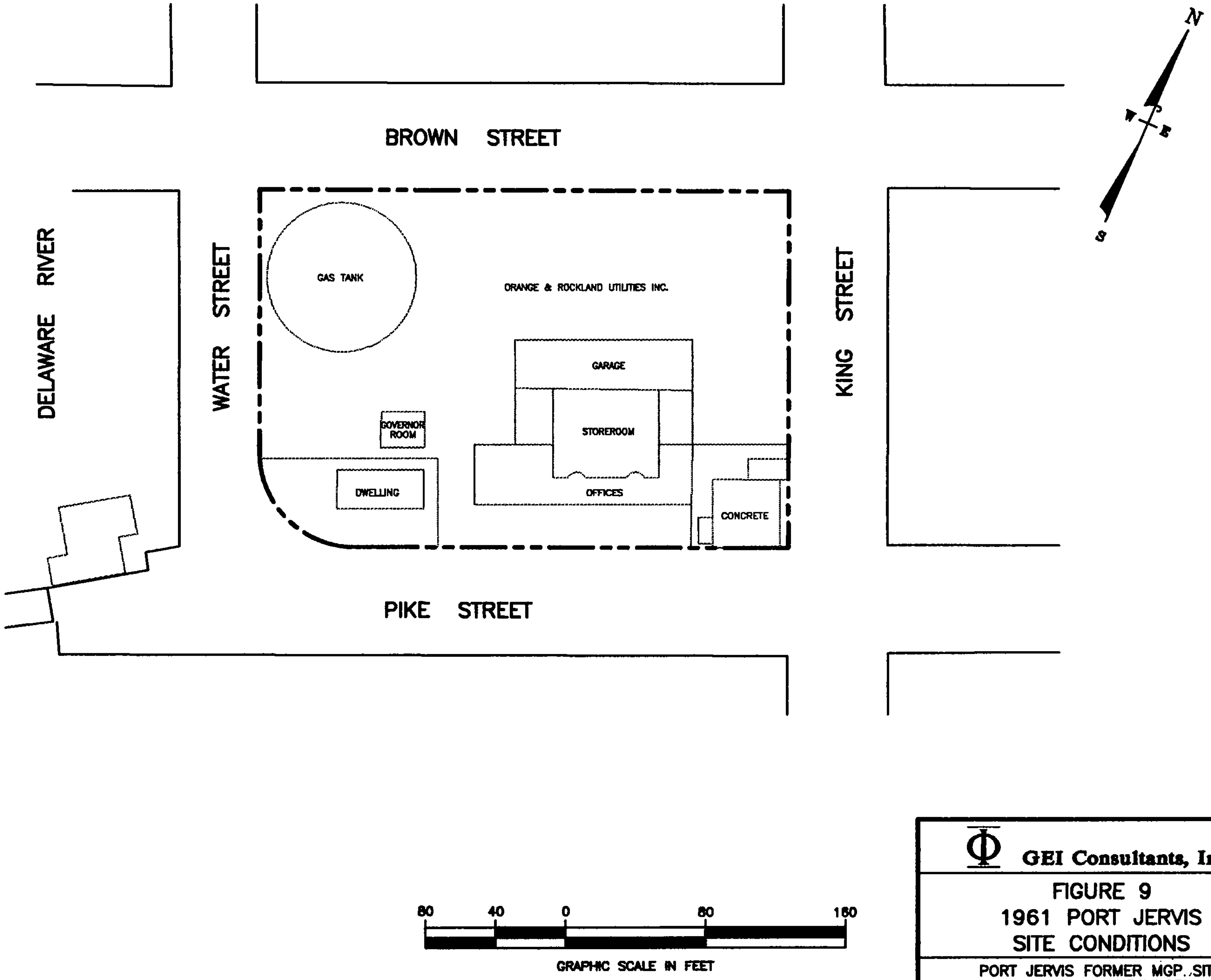


GEI Consultants, Inc.

FIGURE 8
1945 PORT JERVIS
SITE CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97670\FIGS\JER-1945

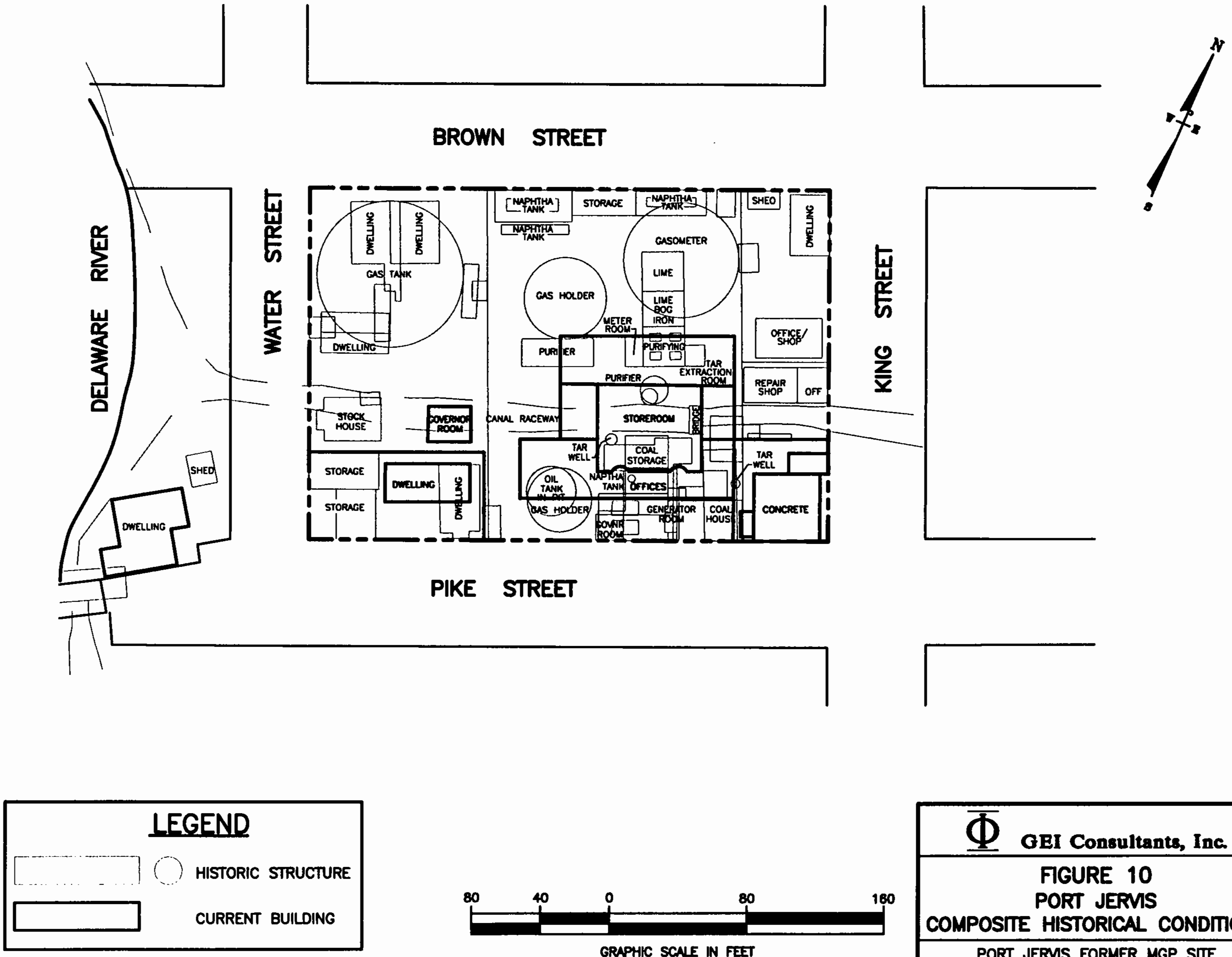


GEI Consultants, Inc.

FIGURE 9
1961 PORT JERVIS
SITE CONDITIONS

PORT JERVIS FORMER MGP. SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIGS\JER-1961



GEI Consultants, Inc.

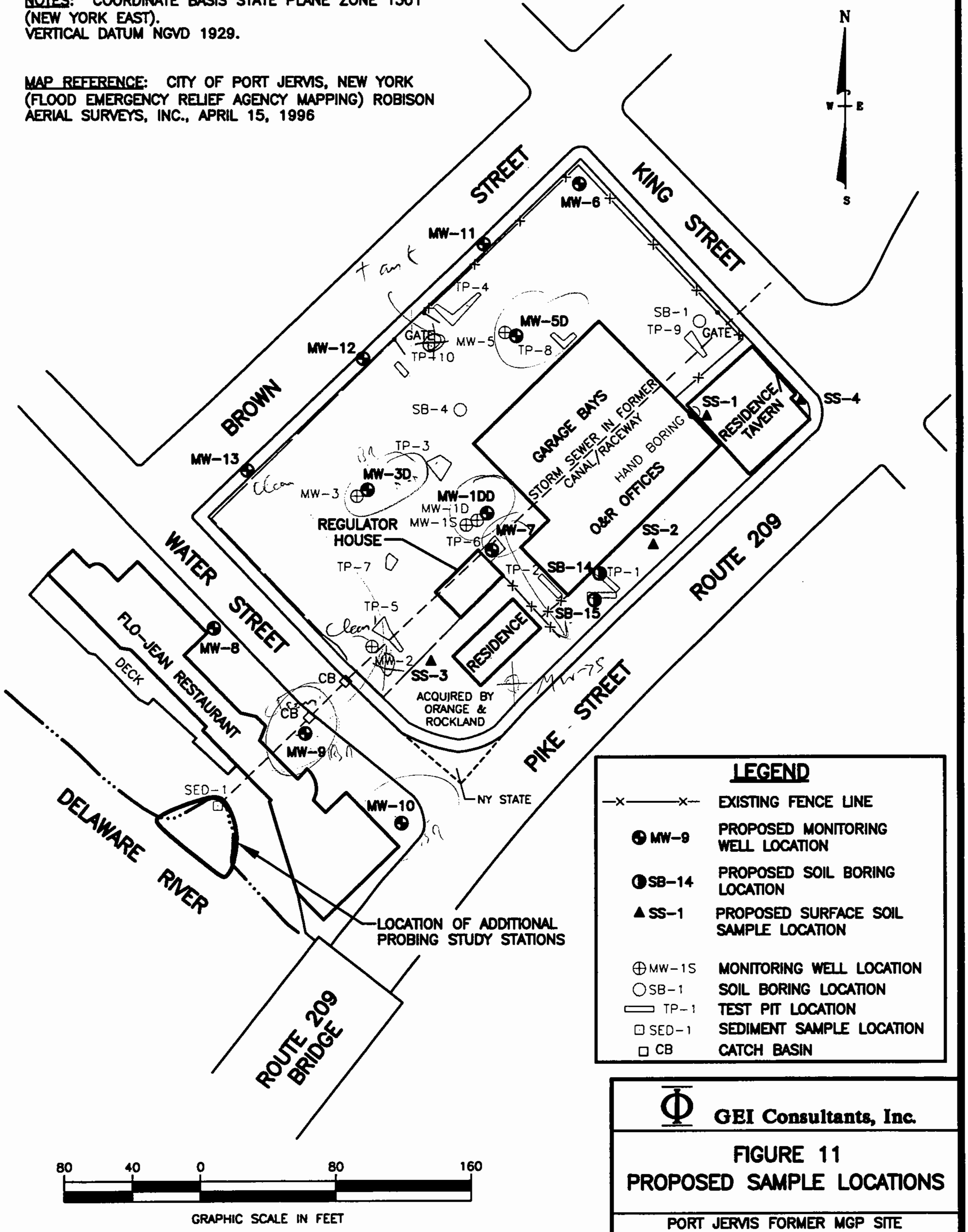
FIGURE 10
PORT JERVIS
COMPOSITE HISTORICAL CONDITIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\JER-HIST

NOTES: COORDINATE BASIS STATE PLANE ZONE 1301 (NEW YORK EAST).
VERTICAL DATUM NGVD 1929.

MAP REFERENCE: CITY OF PORT JERVIS, NEW YORK (FLOOD EMERGENCY RELIEF AGENCY MAPPING) ROBISON AERIAL SURVEYS, INC., APRIL 15, 1996

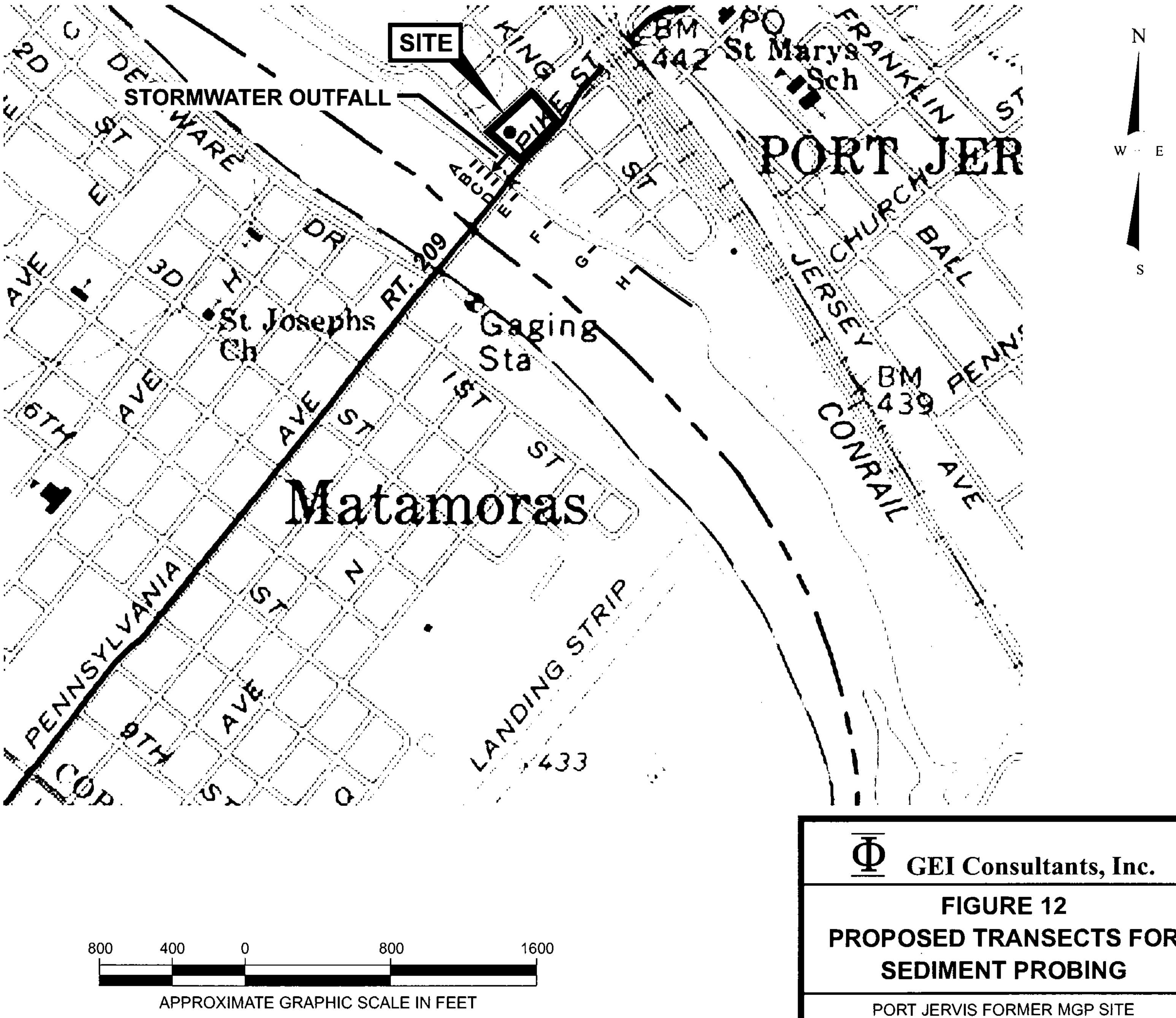


GEI Consultants, Inc.

FIGURE 11
PROPOSED SAMPLE LOCATIONS

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&R\97679\JERVIS\JER-PSMP

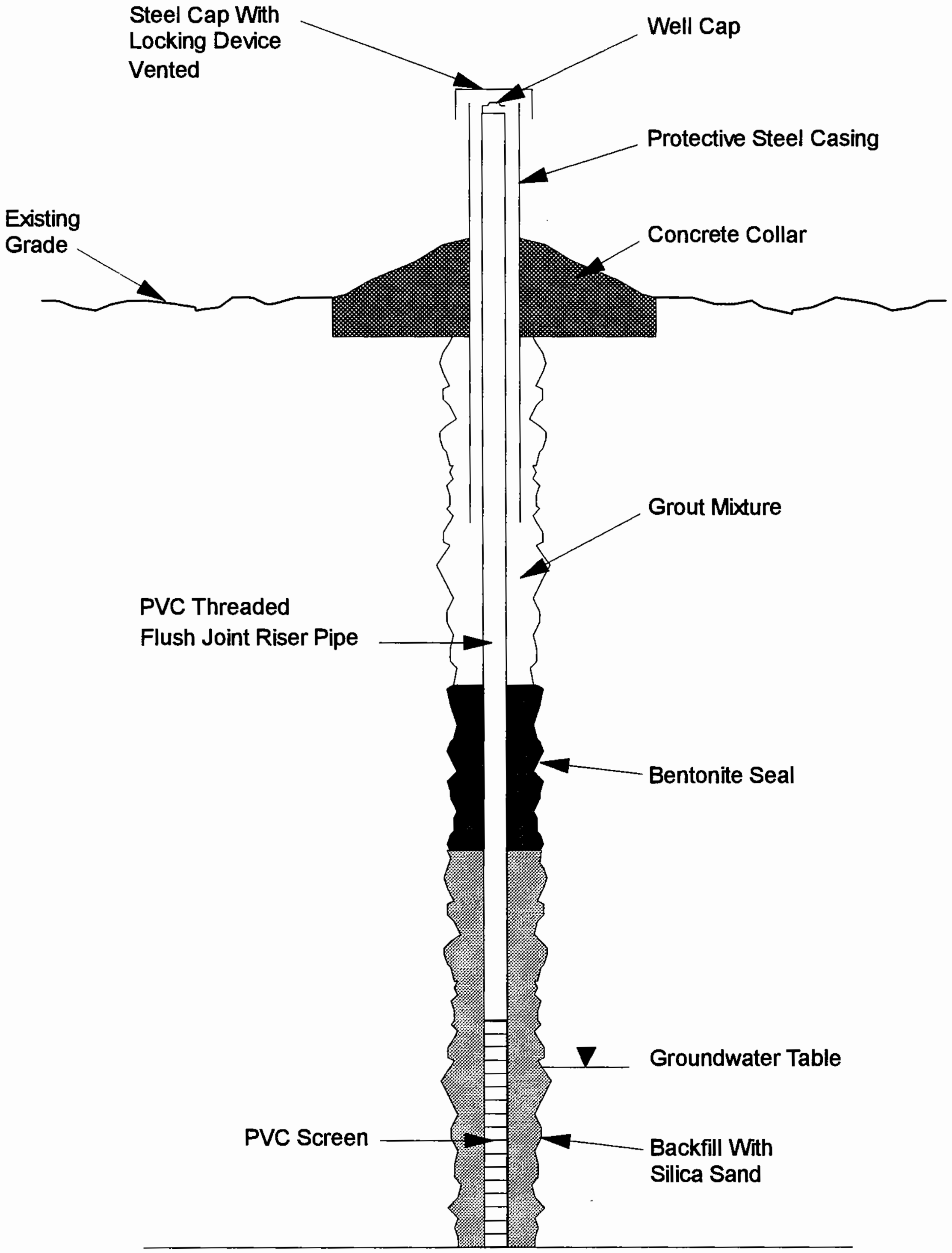


GEI Consultants, Inc.

FIGURE 12
PROPOSED TRANSECTS FOR SEDIMENT PROBING

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR-ROCK\97679\JERVIS\JRV-TRN.CDR



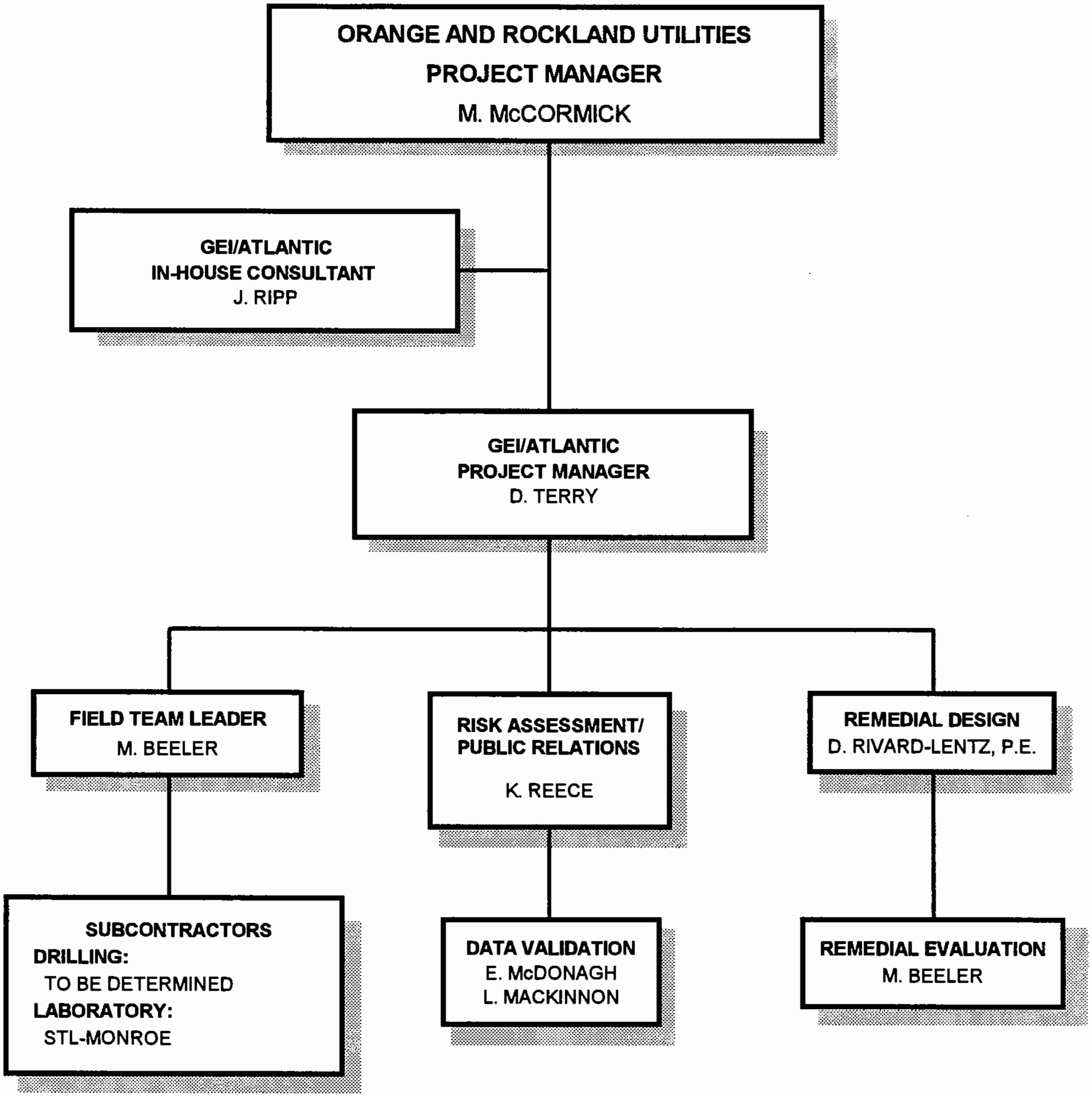
Not To Scale

GEI Consultants, Inc.

FIGURE 13
TYPICAL WELL CONSTRUCTION

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIG\JER-WELL.PRE

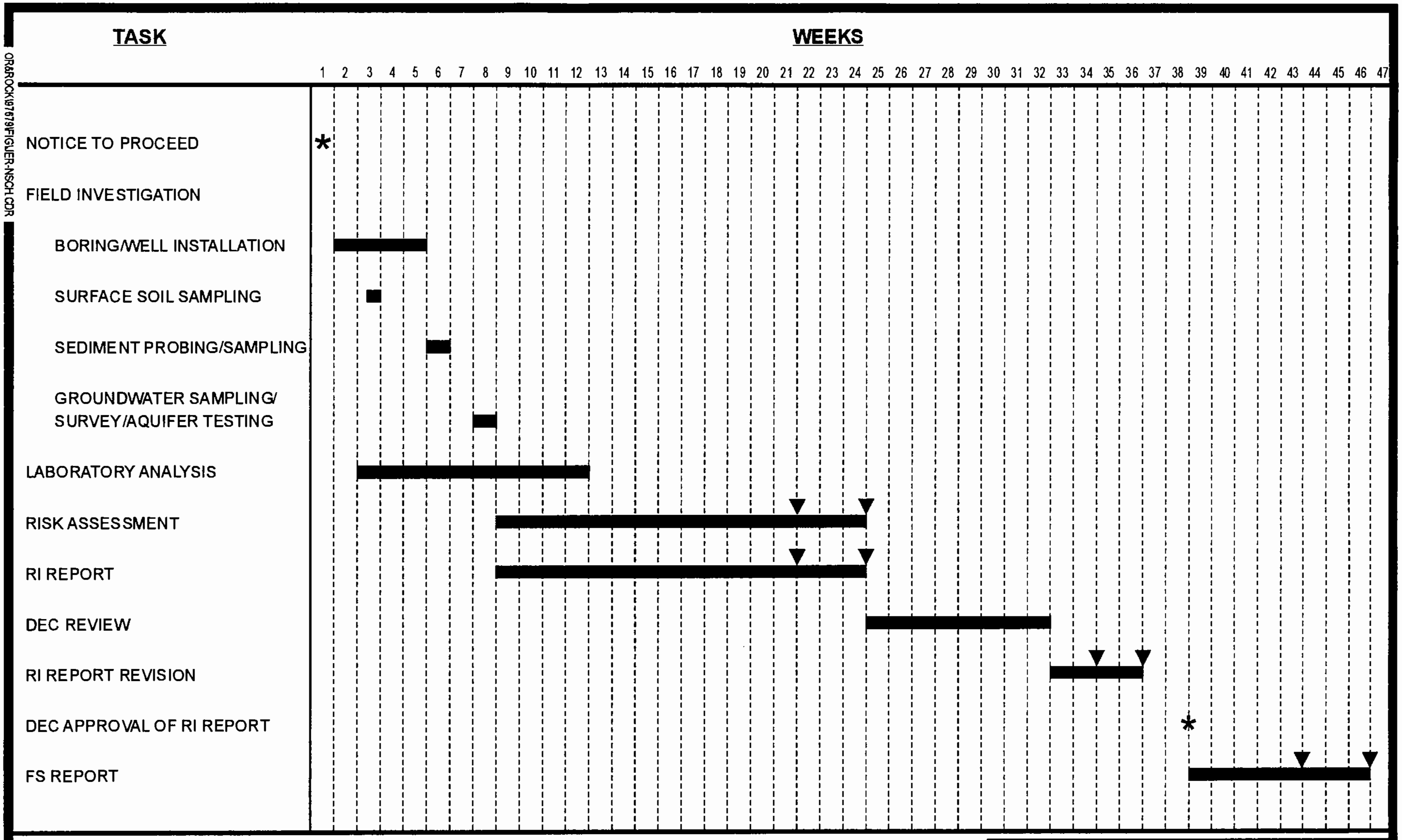


GEI Consultants, Inc.

FIGURE 14
PROJECT ORGANIZATION

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIG\JER-NORG.PRE



OR&ROCK\97679\FIGUER-NSCH.CDR

LEGEND

* AUTHORIZATION

▼ PROJECT DELIVERABLE

GEI Consultants, Inc.

FIGURE 15
PROJECT SCHEDULE

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEWYORK

ATLANTIC PROCEDURE NO. 1020

FIELD PROCEDURES FOR COLLECTING SURFACE-SOIL SAMPLES

Prepared By: John Ripp — 9/2/94
JOHN RIPP — TITLE

Reviewed By: Alan Cornell — 9/2/94
ALAN CORNELL, Ph.D. — TITLE

Approved By: Paul Burgess — 9/2/94
PAUL BURGESS, P.E. — TITLE

REVISIONS

No.	Date	Prepared By	Reviewed By	Approved By
1	5/17/94	Jerry Zak		
2	7/7/94	Jerry Zak		
3				
4				

Procedure No. 1020
Revision No. 3
Date September 2, 1994
Page 1 of 6

TABLE OF CONTENTS

1.0 PURPOSE

To impose a standard procedure for collecting surface-soil samples for the identification of chemical parameters.

2.0 SCOPE

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

3.0 RESPONSIBILITY

- Project Manager — First
- Field Team Leader/Task Manager — Second
- Field Sampling Technicians — Third

4.0 SUPPORTING PROCEDURES

- Atlantic Procedure No. 1060: *Cleaning Procedure for Sampling Devices Used in Environmental Site Investigations*
- Atlantic Procedure No. 1041: *Sample Chain-of-Custody Procedure*

5.0 REQUIRED FORMS

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

6.0 PROCEDURE

6.1 Selection of Sampling Locations

The selection of sampling locations in and around a project site will be based on a review of existing site data: site topography and surface features; results of preliminary site surveys using portable geophysical and air-monitoring equipment; and initial estimates on the extent of contamination and surface migration pathways of the waste present. Only after initial field reconnaissance are the final locations selected. At a minimum, the following general areas should be included as sampling points:

- upgradient soil surfaces to determine background levels;
- soil surfaces within known area(s) of contamination; and
- downgradient soil surfaces to determine any spread of contamination resulting from storm-water runoff.

Specific sampling locations may be selected in:

- areas where chemicals may have been stored, handled, or disposed;
- areas where motor vehicles hauling chemicals may have traveled on the site; and
- areas where water may have ponded during storm events.

6.2 Equipment List

The following items are to be considered a minimum listing of required field equipment for collecting soil samples. Other tools required for accessing soils beneath paved area, etc. should be included, when necessary.

- boots, latex gloves, chemical-resistant gloves, appropriate level of protection;
- appropriate sample containers (supplied by the analytical laboratory, depending on analyses to be performed);
- Teflon®-coated or stainless-steel sample spoons;

- wooden stakes and marking paint and/or ribbons;
- a field notebook and indelible pen;
- sample bottle labels; and
- chain-of-custody forms.

6.3 Order of Samples

Surface-soil samples should be collected *prior to* all other site-sampling events. The reason for this recommended priority is to prevent the possibility of cross-contamination among sampling points by site personnel or equipment (backhoe, drill rigs, equipment vehicles, etc.). For consistency with other sampling programs, the upgradient samples should be collected first.

6.4 Location and Collection of Samples

Surface soils, depending upon the contaminants of interest, can be either discrete or composite samples. Certain state agencies discourage the use of composite samples when looking for aromatic volatile and halogenated volatile organic compounds because of dilution and the difficulty of forming a ''true'' composite. Prior to sampling, approval of composites should be secured from the appropriate regulatory agency.

If statistical techniques are to be employed in collecting surface-soil samples using a random grid, the procedure provided in the following two sources should be followed: Chapter 5 of *Methods of Soil Analysis, Part I*, by C.A. Black, et al; American Society of Agronomy, Academic Press, NY, 1965, and Section I of EPA-SW 846 *Test Methods for Evaluating Solid Waste*.

Once the locations have been chosen, sampling can begin. Remove the upper 2 inches of surface soil using an appropriately decontaminated or dedicated stainless steel or Teflon® spoon.

Normally, surface sampling begins by collecting soil from the 3-inch to 6-inch interval. However, we will be collecting samples from side walls of an excavation, which will be executed by sampling the representative soil along the wall within a 3-inch to 5-inch radius. If volatile organic analysis is planned, place the soil directly in the volatiles sample jar, filling it completely. Concentrate on collecting finer grains. Avoid leaves, twigs, and gravel. When the sample jar is full, wipe excess soil from the threads using a clean paper towel. Secure the cap firmly.

To collect soil for other analyses (semivolatile organics, metals, cyanide, grain size, etc.) use an appropriately decontaminated stainless steel bowl or tray to facilitate homogenization. Place an ample volume of soil in the tray. Separate and discard leaves, twigs, and gravel. Mix each quarter; combine the quarters and mix again. Fill the sample jars with homogenized soil.

If the microsolvent extraction method (simultaneous analysis of monocyclic aromatic hydrocarbons and polycyclic aromatic hydrocarbons) is planned, fill sample jars as previously described for volatile organic samples. Immediate filling of jars will prevent excess stripping of volatile compounds.

Latex or rubber gloves should be worn and changed after each location to protect sampling personnel and to avoid cross contamination through handling.

All filled jars must be labelled with the following information, as a minimum:

- project number;
- sampling time and date;
- sample number;
- analysis; and
- collector's initials.

The sample chain-of-custody form is then immediately filled out and kept with the sample. The sample is subsequently stored in a cooled container (wet ice or refrigeration) until delivery to the analytical laboratory.

The location, depth of sample, sample type, time of sample, and other associated data (i.e., organic vapor readings, color of the ground, odors, texture, etc.) will be documented in the field notebook when the sample is taken. If sampling is performed under a paved area or in fill, a description of these unique areas will also be included.

6.5 Sample Verification

After each soil sample is collected, mark the location to facilitate surveying activities at a later time. Once all the surface-soil samples are collected, the sample numbers and locations should be reviewed before leaving the site or progressing to other tasks in a program. All used sampling devices will be kept together, separate from clean tools for appropriate decontamination. No sample collection device (i.e., a spoon or tray) will be used more than once without proper decontamination previous to the next use.

7.0 REFERENCES

Field Methods Compendium (FMC), Draft, United States Environmental Protection Agency, OERR #9285.2-11, Washington, D.C., November, 1993.

ATLANTIC PROCEDURE NO. 1021

FIELD PROCEDURES FOR COLLECTION OF SUBSURFACE SOILS

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

Procedure No. 1021
Revision No.
Date July 1, 1986
Page 1 of 7

TABLE OF CONTENTS

SECTION PAGE

SECTION 1.0: PURPOSE

To insure a standard procedure for collection of subsurface soil samples during site contamination studies for the determination of chemical parameters.

SECTION 2.0: SCOPE

The following procedure describes the method, materials and documentation requirements for collection of subsurface soils from test pits and split spoon samplers for eventual analysis by a chemical laboratory.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Staff - 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 Introduction

During a site investigation where test pits, exploratory borings, monitoring wells, test trenches and other forms of excavation are performed it is often planned that soils or buried waste materials are to be collected. For most drilling operations split spoon samples are used to collect discrete samples from known depths using samplers ranging in length from 2 feet to 5 feet. Usually not all samples from these split spoons are designated for analysis, therefore the containerization and handling of samples from split spoons may be different depending on their ultimate purpose.

Samples from test pits and test trenches may also be collected for chemical analysis. These samples can only be taken using a remote sampler from the side walls of each pit. Samples taken from the bucket of the backhoe are harder to identify especially regarding their actual vertical position beneath the ground surface.

The following is to be used as a general guide in collecting samples from either test pits or split spoons.

6.2 Split Spoon Sampling

After logging a split spoon sample following Atlantic Procedure No. 1030 the sample is then identified for either analysis by a laboratory or storage until further decisions are made. If the sample is to be stored, a clean glass jar, preferably new one liter size, will be used to store the sample. In many cases the driller will provide these to the field team. However in no case shall used or dirty soils jars be used to hold samples. If the driller does not have the proper jars, new clean "Mason type" jars may be used. A label must be affixed to these storage jars identifying the boring number, sample depth, date of sample and project number on it for future reference. If soil samples are to be sent for analysis then only properly cleaned or laboratory supplied sample containers are to be used.

The collector must take the following steps when preparing the samples:

1. Always follow designated safety precautions in terms of level of protection. At a minimum samples must always be handled using latex or chemical resistant gloves. This protects the collector and prevents cross-contamination between samples.

2. Do not use the top one to two inches of recovered sample in the split spoon. This usually consists of washings and cave-in soils from higher in the boring that fell into the bottom of the augers.
3. Use a properly cleaned stainless steel spoon (tablespoon size) to remove the soils from the split spoon.
4. When possible, try to fill each sample container so that no air space is allowed. This will prevent volatiles from escaping. If a number of containers are to be used then evenly divide the sample between containers.
5. Avoid getting soils on the threads of the soils containers. Use a clean paper towel to wipe off the threads to insure a good seal.
6. Fill out the sample labels on each jar including the following:

   - sample number
   - sample depth
   - date and time of sample
   - analysis
   - preservation
   - initials of the sample collector

7. Fill in the chain-of-custody form (Atlantic Form No. 1041) for each sample. If a confining layer is to be sampled to determine whether contamination from a shallower zone is migrating down, care should be exercised in collecting these samples. In many instances ground water will fill the auger and the split spoon will travel through the water before being pushed into a deeper zone, there is no guarantee that soils in the split spoon haven't been contaminated with standing water in the auger. To insure a "pure" sample, the drilling procedure may have to be modified to seal off the upper zone from the lower zone using casing and washing the interior of the casing clean. These operations must be detailed in the site sampling plan.

After each spilt spoon sample is collected Atlantic personnel will maintain custody and keep it refrigerated (when necessary) until shipment to the laboratory. The stainless steel sampling spoon is then decontaminated in accordance with Atlantic Procedure No. 1060 before the next sample is taken.

6.3 Sampling Soils from Test Pits

As mentioned before, soils designated for analysis must be collected directly from the side walls of the test pits. A remote sampler is basically a stainless steel scoop that can swivel so that it can be pushed against the side wall and hold soils in a trap at its base. The scoop is attached to a light weight telescoping aluminum rod which will have a maximum 10 foot reach.

The depth of sample must be noted in the field notebook. The sample is then handled the same as the split spoon samples following the same safety precautions. After the sample is taken, the remote sampling tool will be decontaminated before obtaining the next sample.

ATLANTIC PROCEDURE NO. 1022

FIELD PROCEDURES FOR COLLECTING SURFACE WATER AND SEDIMENT SAMPLES FOR HAZARDOUS WASTE DETERMINATION

Prepared By:	John Ripp JOHN RIPP	PRINCIPAL TITLE
Reviewed By:	Alan Cornell ALAN CORNELL	QA Officer TITLE
Approved By:	Paul Burgess PAUL BURGESS, P.E.	Principal TITLE

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.	5/17/94	JERRY-ZAE	AC	
2.				
3.				
4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
P.O. BOX 297 • 188 NORWICH AVENUE
COLCHESTER, CONNECTICUT

TABLE OF CONTENTS

SECTION **PAGE**

1.0 PURPOSE

To ensure a standard procedure for collecting surface water (streams, ponds, lakes, impoundments) and sediment samples for the identification of chemical composition.

2.0 SCOPE

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

3.0 RESPONSIBILITY

Project Manager — First
Field Supervisor — Second
Field Sampling Technicians — Third

4.0 SUPPORTING PROCEDURES

Atlantic Procedure No. 1060 - Decontamination Procedure for Sampling Devices
Atlantic Procedure No. 1041 - Sample Chain-of-Custody Procedure

5.0 REQUIRED FORMS

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

6.0 PROCEDURE

6.1 Selection of Sampling Locations

The selection of sampling locations in and around a project site will be based on a review of existing site data: the site topography and surface features; results of preliminary site surveys, using portable geophysical and air monitoring equipment; and the initial estimates as to the extent of the waste. At the start of the investigation, a number of surface water and sediment samples are usually allocated. Only after initial field reconnaissance are the final locations selected. At a minimum, the following aspects should be included as sampling points:

- upstream and upgradient of the waste site to determine background levels of pollutants;
- in leachate, runoff, or intermittent flow paths passing through or from the site; and
- in downgradient streams, swales, runoff channels, or sewers draining the site, to determine limits of surficial deposition.

6.2 Equipment List

The following lists are examples of equipment to be used for sampling. Site-specific checklists of equipment should be based on the characteristics of each sample and location.

6.2.1 Surface-Water Sampling

For surface water sampling, the following items are to be considered a minimum listing of required field equipment:

- boots, latex gloves, chemical-resistant gloves, appropriate level of protection;
- sample containers (depending on sample requirements of the analytical laboratory) may include for each location:

  - four each: 1-liter glass jars with Teflon-lined caps;
  - eight each: 40-ml glass vials with Teflon-lined septas;
  - one each: 500-ml plastic containers for metals analysis;
  - one each: 500-ml plastic containers for mercury analysis;

- wooden stakes and spray paint;

- stainless-steel Kemmerer bottle, Van Dorn bottle, or sterile glass samplers (if required);
- remote samplers;
- field notebook;
- sample bottle labels; and
- chain-of-custody forms.

6.2.2 Sediment Sampling

For sediment sampling, the following items are to be considered a minimum listing of required field equipment:

- boots, latex gloves, chemical-resistant gloves, appropriate level of protection;
- dedicated stainless-steel spoons (tablespoon size);
- dedicated Teflon spoons (if required);
- sample containers for each sample;
  - one each: 1-liter glass jars with Teflon-lined caps;
- wooden stakes and spray paint;
- field notebook;
- sample bottle labels; and
- chain-of-custody forms.

6.3 Order of Samples

If both stream sediment and water samples are to be collected concurrently, the water samples should be taken first in order to avoid introducing pollutants in the water column from sediment-collection activities.

In flowing streams or runoff channels, samples should be collected from the furthest downstream point first. The remaining samples will be taken progressing upstream.

6.4 Sample Collection

6.4.1 Surface-Water Samples

Surface-water samples are collected in a manner to be representative of the water column from which the samples are taken. A two-man team is required for the collection, as a safety precaution. The person collecting the samples in most cases will have entered the water body. For flowing streams, this activity will necessitate the donning of boots or waders and wearing latex inner gloves and chemical-resistant outer gloves. All samples in flowing water bodies will be taken facing upstream. Samples taken from small lakes or ponds should be taken from a small boat, using a Kemmerer or Teflon-lined Van Dorn bottle. Samples taken from standing puddles, pools, and drainage ditches should be taken without disturbing the sediments. This may be accomplished by the use of a remote sampler, e.g., a sample bottle held on a long pole with a gimballed yoke.

For prepreserved sample containers, the following procedure will be followed.

- Prior to collecting any water samples, place a waterproof sample label on each container, which specifies the following:
  - sample number;
  - date;

- time;
- analysis;
- preservative;
- project number; and
- initials of the collector.

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

- Face upstream. Wearing gloves, take a 1-liter glass container with no preservative and submerge it, closed, to mid-depth.

- Open the jar. With the mouth facing upstream, fill it and close it while the jar is submerged.

- Take the filled jar and use it to fill the 40-ml vials, making sure no air is trapped in the vials.

- Repeat steps 1 and 2 with the same container and fill those containers having preservative, avoiding any overflow since this will dilute the preservative.

- Repeat steps 1 and 2 with the same container and fill the remaining sample containers. The last container filler will be the original container used to fill the other jars.

- If dissolved metals analyses are required, an extra bottle (no preservative) will be filled, and the metals container (preserved with nitric acid) will remain empty. Only after the water sample is field-filtered will it be poured into the prepreserved metals container.

- Place all sample containers into a sample shipping container, cool with ice packs, and fill in the chain-of-custody form.

- Detail in the field notebook the following information:

  - sample identification number;
  - location of the sample (sketch of the sample point);
  - time and date sample was taken;

- personnel performing the task;
- visual or sensory description of the sample (color, odor, turbidity, etc.);
- weather conditions during sampling;
- runoff conditions; and
- other pertinent observations.

- Place a wooden stake at the edge of the stream or near the sample point, with sample number on it. The stake may be located by survey for inclusion on a site map.

NOTE:

- It is understood that all sample containers and collection devices will be cleaned prior to field use following the appropriate cleaning procedures, depending on the type of analysis to be performed.

- 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. _____."

6.4.2 Sediment Samples

Stream sediment samples are collected in a manner to be representative of deposits of sediment carried off of a site. Again, the use of protective boots and gloves will be necessary. All priority pollutant and organic analysis of sediments can be performed on a 1-liter sample. The following procedure will be followed.

- Select a sample location that is representative of sediment depositional areas. This location might be a sandbar in the middle of a stream, the inside corner of a stream bed in a meander, or a deep pool where water velocities are reduced.

- Place a waterproof sample label on the glass container, which specifies the following:

- sample number;
- date
- time;
- preservative,;
- project number; and
- initials of the collector.

Fill in the information with a waterproof ink pen prior to collecting the sample.

- Use either a precleaned, dedicated stainless-steel spoon or Teflon-coated spoon that will fit inside the sample jar to collect a sample.
- All samples should be taken within the top 3 inches of the stream bed. Remove any vegetation debris (leaves, roots, bark), along with any large stones from the sample, so that only the finer soil material is collected.
- Allow excess water to drain from sampling implement.
- Place sample in appropriate sample jar.
- Fill out the chain-of-custody form and place the sediment sample into the shipping container. Cool as required.
- Detail in the field notebook the following information:

  - sample identification number;
  - location of the sample (sketch of the sample point);
  - time and date sample was taken;
  - personnel performing the task;
  - visual or sensory description of the sample;
  - brief sediment descriptions (color, texture, appearance);
  - weather conditions during sampling; and
  - other pertinent observations.

- Place a wooden stake at the edge of the stream or near the sample point, with the sample number on it. This stake will be located by survey for inclusion on a site map.

6.4.3 General Site Rules

Surface-water and sediment samples, depending on the particular site, can be collected from a variety of locations. Instead of having a procedure for each type of location, the following general rules should be used for any site.

- The sample must be representative of the water body or sediments deposited in an area.
- Avoidance of cross contamination among sampling points can be accomplished by the use of dedicated sampling devices.
- Care must be taken not to disturb the sample location conditions or chemistry, e.g., facing upstream in a river, collecting sediments from areas not stepped on by the collectors.
- In lakes or ponds, samples of the water column, at a minimum, will be a composite of surface, mid-depth, and bottom (1 foot above floor) samples. Sediments need only be sampled by grab method.
- Only precleaned sampling devices and sample containers are to be used.
- Proper field documentation and chain-of-custody procedures must be followed.

ATLANTIC PROCEDURE NO. 1023

FIELD PROCEDURES FOR COLLECTING GROUNDWATER SAMPLES FOR HAZARDOUS WASTE DETERMINATION

Prepared By: John Ripp — PRINCIPAL
JOHN RIPP — TITLE

Reviewed By: Alan Cornell — QA Officer
ALAN CORNELL — TITLE

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.	5/17/94		AC	John Ripp
2.				
3.				
4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
P.O. BOX 297 • 188 NORWICH AVENUE

Procedure No. 1023
Revision No. 2
Date May 19, 1994
Page 1 of 7

TABLE OF CONTENTS

SECTION **PAGE**

1.0 PURPOSE

To ensure a standard procedure for collecting groundwater samples for the identification of chemical constituents.

2.0 SCOPE

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

3.0 RESPONSIBILITY

Project Manager — First
Field Supervisor — Second
Field Sampling Technicians — Third

4.0 SUPPORTING PROCEDURES

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

5.0 REQUIRED FORMS

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

6.0 PROCEDURE

6.1 Selection of Sampling Locations

Groundwater sampling locations in and around a project site typically are obtained from existing domestic, production, and monitoring wells, and newly installed groundwater monitoring wells which were part of the site hydrogeological investigation. The location of new groundwater 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 groundwater 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 items are to be considered as a guide for groundwater sampling preparation activities:

- latex gloves and any other personal safety equipment specified in the site health and safety plan;
- sample containers (depending on sample requirements of the analytical laboratory) may include for each location;
    - four each: 1-liter glass jars with Teflon-lined caps;
    - eight each: 40 ml glass vials with Teflon-lined septas;
    - one each: 500-ml plastic containers for metals analysis; and
    - one each: 500-ml plastic containers for mercury analysis.
- a device to measure water levels in wells to within 0.01 feet. Typically, a cloth tape with a ''plopper'' or an electronic water level indicator is used;
- Field Notebook No. 351;
- chain-of-custody forms;
- a large volume bailer or pump to evacuate the wells; and
- a 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 groundwater, the depth to water shall be measured to the nearest 0.01 feet. A cloth tap 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 typically is 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 stickup above the ground surface. If both an inner and outer casing are present, the one used as the measurement reference point (normally the inner) shall be identified, with 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.

Groundwater samples are to be collected in a manner to be representative of the formation from which the samples were taken. To ensure against sampling stagnant water in a well, a minimum of three 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 allow 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 two to three 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 three 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 ensured 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 prepreserved sample containers, the following procedure will be followed.

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

    - sample number;
    - date;
    - time;
    - analysis;
    - preservative;
    - project number; and
    - initials of the collector.

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

- Extract the groundwater sample, using either a dedicated Teflon bailer or a peristaltic pump with dedicated Teflon tubing. Latex gloves shall be worn during this procedure.

- 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.

- Fill all the remaining jars directly from the pump discharge or bailer. With the containers containing preservative, avoid overflow since overflow will dilute the preservative.

- If dissolved metals analyses are required, an extra bottle (no preservative) will be filled, and the metals container (preserved with nitric acid) will remain empty. Only after the water sample is field-filtered will it be poured into the prepreserved metals container. This method will constitute a sample for dissolved metals.

- Place all sample containers into a sample shipping container, cool with ice pack(s), and fill in the chain-of-custody form.

- Detail in the field notebook the following information:

    - sample identification number;
    - location of the sample;
    - time and date sample was taken;
    - personnel performing the task;
    - depth to water table, reference mark, casing(s) stickup, 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; and
    - other pertinent observations.

- Make sure the well is secured after sampling.

NOTE:

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

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

  DEDICATED TO PROJECT NO. ___
  SAMPLE LOCATION NO. _____

ATLANTIC PROCEDURE NO. 1030

FIELD PROCEDURE FOR LOGGING SUB-SURFACE CONDITIONS DURING TEST BORINGS AND WELL LOGGING

Prepared By: John A. Ripp
JOHN A. RIPP
PRINCIPAL
TITLE

Reviewed By: Edmund J. Burke
EDMUND J. BURKE, P.E.
QA MANAGER
TITLE

Approved By: Paul Burgess
PAUL BURGESS, P.E.
CHIEF ENGINEER
TITLE

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

Procedure No.	1030
Revision No.	
Date	July 1, 1986
Page	1 of 10

TABLE OF CONTENTS

SECTION PAGE

FIGURE

SECTION 1.0: PURPOSE

To insure a standard procedure for the documentation of sub-surface conditions encountered during test borings and well drilling.

SECTION 2.0: SCOPE

The following procedure details a method for recording sub-surface conditions in test borings and well drill holes during site contamination, hydrogeological, and geotechnical investigations. An optional procedure for photographing samples is included.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Supervising Field Geologist/Engineer - Second

SECTION 4.0: SUPPORTING PROCEDURES

ASTM Designation D 1586 - Standard method for Penetration Test and Split-Barrel Sampling of Soils.

ASTM Designation D 2488 - Standard practice for Description and Identification of Soils (Visual-Manual Procedure)

SECTION 5.0: REQUIRED FORMS

Field Notebook No. 351 (published by J.L. Darling Corp., Tacoma, Wash.)

Atlantic Boring Log Form

SECTION 6.0: PROCEDURE

6.1 Predrilling Requirements

When conducting borings at any location, local or on-site buried utilities must be cleared through the appropriate engineering departments of each utility serving the area. At least a 48 hour notification shall be made to the utilities prior to drilling. The ticket number or call number given by the utility must be logged in the field notebook. This will protect the drilling supervisor from any liability associated with damaging a public utility.

The supervising geologist/engineer shall record the name of the drilling firm and the names of the driller and his assistant. The date, project location, project number, and weather conditions shall also be recorded.

An accurate time log of drilling activities shall be kept. This log shall be kept in the field notebook and shall include, at least the following:

- Time driller and rig on-site
- Time drilling begins
- Any delays in the drilling activities, and the cause of such delays.
- Time drillers leave the site.

6.2 Test Borings and Well Drilling Subsurface Sampling Methods

Test borings and monitoring well drilling can be conducted by a variety of drilling methods. The drilling method is not as critical to the documentation of the subsurface conditions as the soil and rock sampling techniques. However, the drilling method and type of drill rig shall be documented.

Where details of subsurface conditions are necessary, soil sampling shall be conducted using a split spoon penetration sampler driven with a 140 pound hammer at a height of 30 inches. The standard method of soil sampling as described in ASTM Designation D 1586 shall be used as a guide.

The supervising geologist/engineer shall record, at a minimum, the weight of the hammer, the length of the split spoon sampler, and the number of hammer blows on the spoon per 6 inches of penetration. Upon removal of the sampler the earth materials shall be logged in accordance with Section 6.3 of this document.

Rock sampling will be conducted using a double barrel core sampler. The supervising geologist/engineer shall record the length of the core barrel, the diameter of the barrel, the rate of penetration, and the down pressure torque and rotation of the sampler.

6.3 Logging of Unconsolidated Deposits

Vertical measurements in a boring shall be made from the original ground surface. Split spoon samples are typically taken in 2-foot intervals, or at changes in lithology through unconsolidated materials. The supervising geologist/engineer shall monitor drill cuttings and maintain communication with the driller (Re: down pressures, drilling rates, resistance, etc.) to determine where changes in lithology occur.

During the sampling, the hammer blows per 6 inches of sampler penetration, and the depth at which the sample was taken shall be recorded. Blow counts over 50 per 6 inches of penetration shall constitute sampler refusal. Upon extraction of the sampler moisture conditions on the drill rods shall be noted. Upon opening the sampler the percent recovery shall be recorded as the length of sample retained over the length of sampler penetration. Changes in lithology, color, or moisture conditions in the spoon are measured and recorded prior to emptying the spoon. If the sample is to be retained, a sample number is assigned and recorded in the field log and on the sample container. The sample container will also include the project name, boring number, location, depth, date, and person collecting the sample.

The supervising geologist/engineer will log the soil sample in the field notebook. The soil description shall include, at a minimum, the following information:

o Color

o Mineral or rock content

o Grain size, in order from most predominant to least predominate using the proportions;

- Trace = 0 to 10%
- Little = 10 to 20%
- Some = 20 to 35%
- And = 35 to 50%

o Density, descriptions based upon blow counts as follows:

- Cohesionless Soils (primarily sand and gravel)

0 - 10 blows = Loose
10 - 30 blows = Medium Compact
30 - 50 blows = Dense
50 plus blows = Very Dense

- Cohesive Soils (primarily silt and clay)

0 - 2 blows = Very soft
2 - 4 blows = Soft
4 - 8 blows = Medium
8 - 15 blows = Stiff
15 - 30 blows - Very stiff
30 plus blows = Hard

o Moisture Content

o Structure

o Other (mottling, odor, instrument readings, etc.)

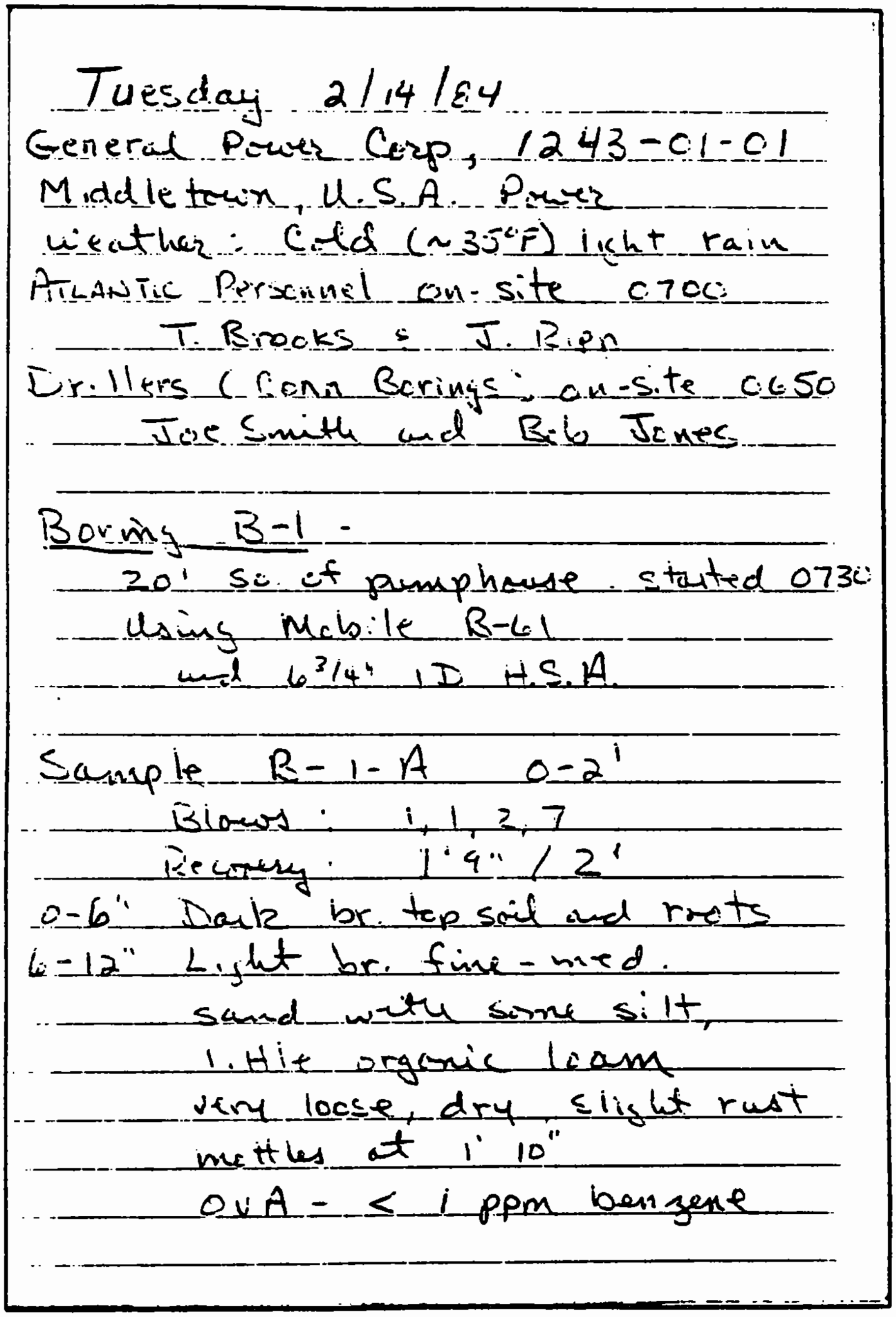
A sample soil log is shown in Figure 6-1.

When the technical specifications of a soil sampling program require soil descriptions to conform to the "Unified Soils Classification" the soils shall also be classified according to ASTM Standard Designation D 2488. Figure 6-2 shows this classification.

6.4 Logging Bedrock Cores

The supervising geologist/engineer on a drilling program is responsible for logging and recording geologic and geotechnical information from rock cores. The following information shall be included in a rock core run log:

- o The depth and length of the core run.
- o The coring rate, down pressure, torque and rotation speed. This information can be obtained from the driller.
- o The color of the core wash water. Any changes or loss of return water will be noted.
- o The recovery of the core run recorded as length of rock recovered over the length of the core run.
- o The Rock Quality Designation (RQD) of the run. RQD is reported as the sum of inches of all rock core pieces larger than four inches over the total number of inches in the run.
- o The rock type(s) and their location in the core run, rotating color, minerology, texture, fossil content, effervescence in HCL and any other data of geologic significance.
- o Any structure in the core, including fractures, clay seams, vuggs, bedding, fissility and any other data of geologic or geotechnical significance.



Tuesday 2/14/84
General Power Corp, 1243-01-01
Middletown, U.S.A. Power
weather: Cold (~35°F) light rain
ATLANTIC Personnel on-site 0700
T. Brooks & J. Rien
Drillers (Conn Borings) on-site 0650
Joe Smith and Bob Jones

Boring B-1 -
20' SE of pumphouse started 0730
Using Mobile B-61
and 6 3/4" ID H.S.A.

Sample B-1-A 0-2'
Blows: 1, 1, 2, 7
Recovery: 1'9" / 2'
0-6" Dark br. top soil and roots
6-12" Light br. fine-med.
sand with some silt,
little organic loam
very loose, dry, slight rust
mottles at 1' 10"
OVA - < 1 ppm benzene

Figure 6-1
Example Boring Log

MAJOR DIVISIONS			GROUP SYMBOLS	TYPICAL NAMES
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS	GW	Well-graded gravels and gravel-sand mixtures, little or no fines
			GP	Poorly graded gravels and gravel-sand mixtures, little or no fines
		GRAVELS WITH FINES	GM	Silty gravels, gravel-sand-silt mixtures
			GC	Clayey gravels, gravel-sand-clay mixtures
	SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS	SW	Well-graded sands and gravelly sands, little or no fines
			SP	Poorly graded sands and gravelly sands, little or no fines
		SANDS WITH FINES	SM	Silty sands, sand-silt mixtures
			SC	Clayey sands, sand-clay mixtures
FINE-GRAINED SOILS 50% or more passes No. 200 sieve*	SILTS AND CLAYS Liquid limit 50% or less		ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands
			CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays
			OL	Organic silts and organic silty clays of low plasticity
	SILTS AND CLAYS Liquid limit greater than 50%		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
			CH	Inorganic clays of high plasticity, fat clays
			OH	Organic clays of medium to high plasticity
Highly Organic Soils			PT	Peat, muck and other highly organic soils

* Based on the material passing the 3-in. (75-mm) sieve.

Figure 6-2
Unified Soils Classification

Rock cores shall be stored in a core box in the exact sequence they were removed from the ground. Core runs will be separated by wooden blocks clearly marked with the depth of the run. The core box shall be marked with the project name, location, project number, boring number, data and the depths of the core runs in that box.

6.5 Photographing Rock and Soil Samples from Borings

Soil samples should be photographed while still in the split spoon sampler. If smearing of the sample has occurred a fresh exposure can be made by scrapping with a pen knife or other similar object. The spoon and sample should be placed in a good light preferable against a solid colored background. A ruler for scale, and a tag identifying the sample number, depth and project name or number written so as to be legible in the photograph. Any photographs taken must be recorded in the field notebook.

Rock core samples are photographed in the wooden core box. The rock should be wetted to enhance the color and textual changes in the rock. Due to the relatively large size of most core boxes the photographer (when possible) should stand up on a chair, tail gate, car bumper or other perch in order to photograph the box from directly above, and get the entire box in the camera's field view. Somewhere in the photograph must be an identifier tag indicating the project name or number, the boring number, the date, and the depths of the various core runs.

ATLANTIC PROCEDURE NO. 1031

FIELD PROCEDURES FOR LOGGING SUBSURFACE CONDITIONS IN TEST PIT EXCAVATIONS

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

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

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

Procedure No. 1031
Revision No. ______
Date July 1, 1986
Page 1 of 7

TABLE OF CONTENTS

SECTION PAGE

SECTION 1.0: PURPOSE

To insure a standard procedure for the documentation of subsurface conditions encountered during test pit excavations.

SECTION 2.0: SCOPE

The following procedure details a method for conducting and recording subsurface conditions in test pits during site contamination, hydrogeological, and geotechnical investigations. A standard procedure for photographing samples and excavations is also included.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Operations Manager - Second

Field Geologist/Soil Scientist - Third

SECTION 4.0: SUPPORTING PROCEDURES

None

SECTION 5.0: REQUIRED FORMS

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

Procedure No. 1031
Revision No.
Date July 1, 1986

SECTION 6.0: PROCEDURE

6.1 Safety Considerations

Test pit excavations are used to evaluate subsurface conditions of soils, groundwater and buried materials during certain types of field investigations. Since they are normally dug using heavy equipment (backhoe, Gradall etc.) and result in a deep pit in the ground the following safety rules will be applied.

1. All buried utilities will be cleared by calling and scheduling at least 48 hours in advance the local "DIG SAFE" service. Also Atlantic will confirm clearance of utilities by contacting the property owner and those people most familiar with the site. At the discretion of the Atlantic project manager Atlantic will use its cable location tool to verify the presence or absence of buried utilities.
2. The backhoe operator will take directions directly from the Atlantic supervisor. Hand signals will be used to communicate instructions mainly because background noise is often very loud.
3. No one will be allowed to enter a test pit greater than three feet in depth.
4. All spoils removed will be placed far enough away from the sides of the pit to prevent slumping into the pit.
5. Test pits will be terminated either at refusal, at the water table or when a buried utility line is uncovered.

6. In no case will an open excavation be left unattended. After logging the soil borings the test pit will be immediately backfilled.
7. During all excavation work the supervisor will make all attempts to stand in front of the operator and away from the bucket arm.

6.2 Logging of Soils

Vertical measurements in the excavation shall be made from the top of the test pit at a spot representative of the original grade. If ground water levels are to be measured over time, a reference point (wooden stake, nail, etc.) shall be established at the original grade. If the test pit is to be surveyed after backfilling, a flagged stake shall be established at the pit on ground representative or the original grade.

A fresh exposure of soil is made at the side of the pit (preferably facing the sun) in an area most representative of the overall soil profile. This exposure is made by having the backhoe take a smooth clean scrapping off the entire side wall.

The soil profile log is recorded in the field notebook. Each test pit log shall be preceded by the following general information.

- o Date
- o Client, and Atlantic Project Number
- o Location of Project Site
- o Weather Conditions

- o Time Excavation Started
- o Test Pit ID Number and Specific Location
- o Person Logging Pit

The soil profile is logged from the top down starting with the 'A' horizon (top soil). A metal or fiberglass tape or surveyors stadiarod should be used to measure all the soil horizons. The description of each horizon shall include the following information:

- o Textual description of grains (i.e., fine to medium). This is used mostly when describing sands and gravels.
- o The predominant grain size (clay, silt, sand, or gravel).
- o The secondary grain size using the proportions "trace" (0-10 percent), "little" (10-20 percent), "some" (20-35 percent", and "and" (35-50 percent).
- o The relative density and consistency of the soil using the descriptions for cohesionless soils (sands and gravels) of very loose, loose, medium, dense, and very dense. For cohesive soils (silts and clays) the consistency descriptions of very soft, soft, medium, stiff, very stiff, and hard shall be used.

- The moisture content of the soil using the relative descriptions dry, damp, wet, and saturated. A saturated soil will yield free water when squeezed.
- The structure of the soil, (i.e., blocky, granular, prismatic) if no structure is evident, make a note of it.
- Note the presence of absence of any mottling and the depth at which it starts and ends.
- Record the depth of seepage into the pit.
- Record the total depth of the pit and note if this was a refusal point where farther excavation was limited by rock, concrete or other tough surfaces.
- Describe any bedrock encountered in the excavation.

The above listed requirements for a test pit log are considered as a minimum. Any additional observations that are pertinent to the interpretation of the subsurface conditions should be recorded. Certain projects may require that specific data be recorded. Certain projects may require that specific data analysis be conducted in the test pit. These requirements shall be detailed in the site sampling plan and presented to the field personnel, in writing, prior to the commencement of the field operations.

6.3 Photographing Test Pit Excavations and Samples

Whenever possible, the subsurface conditions shall be documented with a photograph. Photographs should be taken with a 35mm camera on color slide film. The field personnel taking photographs shall log all photos in the field notebook.

Photographs of test pits should be taken in good light, preferable during mid-day when the sun is high. A flash attachment should be made available if ambient light is too weak. The photo should be taken of the side of the pit most exposed to sunlight. Prior to taking the photo, some sort of identification must be placed in the photo. This is best done by writing the test pit ID in bold letters on a clipboard and placing it within the field of view of the camera. Other forms of identification can be used (i.e., building in background, etc.) but must be documented in the test pit log. In all photos, an object must be placed in the photo for scale.

A scale is particularly useful in close-up photos.

ATLANTIC PROCEDURE NO. 1040-NY

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

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

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

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

Procedure No. 1040-NY
Revision No.
Date February 28, 1990
Page 1 of 16

TABLE OF CONTENTS

SECTION PAGE

TABLE

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°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 <u>Basic Laboratory Skills</u> 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^oC 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. 1041

SAMPLE CHAIN-OF-CUSTODY PROCEDURE

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

Procedure No.	1041
Revision No.	
Date	July 1, 1986
Page	1 of 5

TABLE OF CONTENTS

SECTION PAGE

FIGURE

SECTION 1.0: PURPOSE

To provide the project manager with a record of the custody of any environmental field sample from time of collection to final analysis. Once a sample has been submitted to the laboratory, internal laboratory chain-of-custody will take over in the form of "Request for Analysis" forms, analytical notebooks, and "Reports of Analysis" forms.

SECTION 2.0: SCOPE

This procedure details how a sample is traced through the Chain-of-Custody-Form.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Supervisor - Second

Field Technician - Third

SECTION 4.0: SUPPORTING PROCEDURES

None

SECTION 5.0: REQUIRED FORMS

Atlantic Chain-of-Custody Form No. 1041

SECTION 6.0: PROCEDURE

This procedure describes the use of a Chain-of-Custody Form to accompany all sample containers from the time of collection to submission to the analytical laboratory.

For sampling programs where a large number of samples are to collected or where various laboratories will be receiving the samples, a Chain-of-Custody Form is to accompany each group of samples (see attached form). This form presents general sample information in tabular form listing sample number, date and time of sampling, whether the sample was a composite or grab and information regarding the number of containers, size of container and preservative used for each. If for instance a sample consisted of two 40 ml. vials with no preservation and one 500 ml vial preserved with nitric acid, the number of containers box would designate three while the first diagonal box would list 40 ml vial/PRSV.-NONE and the box beneath listing two and the second diagonal box listing 500 ml glass jar/PRSV.-HNO_3 and the box beneath listing one.

ATLANTIC PROCEDURE NO. 1042

SHIPPING PROCEDURES FOR ENVIRONMENTAL FIELD SAMPLES

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

ATLANTIC ENVIRONMENTAL SERVICES, INC.
COLCHESTER, CONNECTICUT

Procedure No. 1042
Revision No.
Date July 1, 1986
Page 1 of 5

TABLE OF CONTENTS

SECTION 1.0: PURPOSE

To insure a standard procedure for shipment of water, soil and other environmental samples that are controlled by chain-of-custody and strict analytical starting times.

SECTION 2.0: SCOPE

The following procedure is established to avoid mishandling, delays and mislabeling of samples normally collected and shipped from a field site to a designated analytical laboratory.

SECTION 3.0: RESPONSIBILITY

Project Manager - First

Field Supervisor - Second

Field Technicians - Third

SECTION 4.0: SUPPORTING PROCEDURES

Atlantic Procedure No. 1040 Sample Preservation for Solid and Liquid Matrices

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

SECTION 5.0: REQUIRED FORMS

Receipt of Airweigh Bill or Weighbill Forms

Chain-of-Custody Form Standard Form No. 1041

SECTION 6.0: PROCEDURE

6.1 Prior to mobilization to a field site, the field operations manager or his designee will select a shipper based on proximity to the site and ability to ship overnight.

6.2 Upon selection of a shipper the following information will be gathered before any samples are shipped. This can be done over the phone or by correspondence.

1. Location of the shipping depot or local pickup office in case samples are to be delivered directly to the depot by the field team.
2. Name and phone number of a contact at the shipper.
3. Rates of shipping per package size and weight
4. Special instructions as to container sizes and weights.
5. A set of weighbills for the field team.
6. A copy of the shipper's brochure which will provide information on the format for the various types of weigh bills.
7. Times for calling in a pickup from the job site and normal pickup times.

6.3 The Atlantic field manager will give the shipper a street address where samples can be picked up by the courier near the job site.

6.4 Once all samples have been collected, preserved and containerized for shipment, the field supervisor will call the shipper to arrange for pick up.

6.5 All samples, unless so designated for ground transportation, will be shipped by air express for overnight delivery. This is the standard method since samples collected for Method 625 organics have only a 72-hour holding time between collection and the start of analysis.

6.6 The following steps will be followed in the field to prepare the sample shipping containers for pick up.

1. A standard chain-of-custody form will be filled-out, signed by the courier as a custodian, and placed inside each shipping container before final sealing.
2. The Atlantic field supervisor or his designee will insure that all weighbills have been filled-in properly for air express. If the contract laboratory is within ground transportation distance for overnight delivery, then the weighbills should reflect guaranteed overnight delivery.
3. A copy of all weighbills must be kept by the field supervisor and the weighbill number associated with each group of samples logged into the Master Sample Log. The name of courier must be written in this log also in case there is a problem in tracing samples.
4. If possible, to save shipping fees, the sample shipping containers can be strapped together.

5. An estimated time of delivery for the samples will be logged in the Master Sample Log, (e.g., ETA 12 noon 3/14/83).

6.7 Once the samples have been shipped, the field supervisor will call the analytical laboratory and provide a listing of samples to be delivered, the shipping company's name, and the weighbill numbers. As soon as the samples are delivered, the contract laboratory will inform Atlantic of their arrival and report, any damage associated with the samples or whether any sample containers are missing.

ATLANTIC PROCEDURE NO. 1050

OPERATION AND CALIBRATION OF THE CENTURY ORGANIC VAPOR ANALYZER

MODEL OVA-128

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

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

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

Procedure No. 1050
Revision No.
Date July 1, 1986
Page 1 of 7

TABLE OF CONTENTS

SECTION 1.0: PURPOSE

To insure a standard procedure for the calibration and operation of the Century Organic Vapor Analyzer Model OVA - 128.

SECTION 2.0: SCOPE

The following procedure details those steps necessary for the calibration and operation in the survey mode the Century OVA. 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.

OVA-128 Operators Manual

SECTION 6.0: PROCEDURE

6.1 Safety Considerations

The Operators Manual will always accompany the OVA-128. The OVA-128 is a flame ionization detector (FID) and as such is potentially hazardous since it burns hydrogen gas in the detector cell. Different models of the OVA are certified for use in hazardous atmospheres. To maintain the designed safety integrity of this unit, carefully follow all operating and servicing procedures as outlined here and as described in detail in the Operator's Manual. Refer to Section 5 of the Operator's Manual for detailed safety considerations, especially with regard to refilling the hydrogen supply cylinder. Refilling procedures are presented in Section 2.6 of the Manual.

6.2 Initial Preparation

6.2.1 Normal Survey

- Connect the adjustable probe to the Read-out Assembly (RA) with the locking nut. Ensure that the probe is seated firmly in the RA. (Note: The probe is sealed against the RA by holding it firmly against the rubber washer on the RA while tightening the plastic nut. The plastic nut does not provide the air seal. Rather the rubber washer serves as a gasket to prevent air leaks).
- Select a pick-up fixture, install a particle filter, and connect the pick-up fixture to the probe with the locking nut.

o Connect the umbilical cord and sample hose to the side pack assembly.

o Ensure that the sample inject valve is out and that the backflush valve is either fully in or fully out.

6.2.2 Close Area Survey

o Install a particle filter on the close area sampler, and connect sampler directly to the RA.

o Connect the umbilical cord and sample hose to the side pack assembly.

6.2.3 Battery Check

o Move INST/BATT switch to BATT and verify that the read-out meter reads in the "battery OK" area.

o If the meter reads low, plug the charger into the connector on the battery cover and insert the AC plug into a 115 VAC outlet. Then move the battery charger switch to ON. Do not charge in a hazardous atmosphere.

o Approximately one hour charging time is required for each hour of operation. When fully charged, the meter on the charger will point to "charged".

o When charged, move the battery charge switch to OFF, and disconnect the charger.

o Refer to Section 2.7 of the Manual for battery charging details.

6.3 Instrument Start-Up

1. Move the INST switch to ON and allow the instrument to warm up for five minutes.

2. If desired, set the audible alarm to a predetermined level. Refer to Section 2.3.2 of Manual for this adjustment.
3. Move the CALIBRATE switch to X10 and adjust the meter to zero with the CAL ADJUST knob.
4. Move the PUMP switch to ON and verify that the SAMPLE FLOW RATE is at least two liters per minute.
5. Open the H2 TANK VALVE one turn and observe the H2 TANK PRESSURE. About 150 psig is required for each hour of operation.
6. Open the H2 SUPPLY VALVE one turn and observe the H2 SUPPLY PRESSURE. (Note: Do not leave this valve open when the pump is not running, otherwise hydrogen will accumulate in the detector chamber.)
7. Readjust the meter zero if necessary.
8. Depress the igniter button for at most 6 seconds until the hydrogen ignites. Usually a 1 to 2 second push on the ignition is all that is necessary. Immediately release the button. The needle on the RA should quickly deflect as the flame is ignited. If the deflection is not obvious, ignition can be checked by holding the sample probe near an obvious source (butane lighter, alcohol base pen etc.). In a clean area, adjust the CALIBRATE ADJUST knob so that the meter reads one ppm at X 1. This allows for minor fluctuations and drift. If the meter goes below 0 the flame-out alarm will sound.

6.4 Instrument Operation

1. Set the CALIBRATE switch to the desired range and monitor the meter reading.
2. Refer to Section 7.2 of the Manual for details on use of a recorder supplied by Foxboro, if so chosen. For other recorders, the OVA output is 0-5 VDC.
3. Check the safety considerations in Section 7.2.7 of the Manual whenever a recorder is used.
4. Document all instrument and recorder operating conditions.

6.5 Instrument Shut-Down

1. Close the H2 SUPPLY VALVE and the H2 TANK VALVE.
2. Move the INST switch to OFF.
3. Wait five seconds until the hydrogen supply into the ignition chamber has been depleted, then turn the PUMP switch to OFF.
4. Disconnect the RA and pack in the shipping case.

6.6 Calibration

1. Refer to Section 4 of the Manual for detailed calibration information.
2. After the instrument is operating, draw a sample of calibration gas into the instrument. Adjust the GAS SELECT knob to move the meter read-out to the desired position.
3. Lock the GAS SELECT knob in position.

4. When using a recorder, adjust the recorder offset to 5-10% of full scale to allow for drift.
5. When using pressurized zero and span gases for calibration they should be introduced through a tee to prevent excessive pressure in the instrument. Connect a rotameter to the tee vent. Set cylinder output pressure to 10-15 psig. Adjust the vent rotameter to a low but steady flow.
6. Prepare bag standards following EPA Method 110: "Determination of Benzene from Stationary Sources."
7. Always calibrate the instrument under the same conditions that sampling will take place. For example, the amount of oxygen supplied to the instrument may affect instrument response.

6.7 Documentation

In the field notebook record the calibration of the OVA by first listing the date, project location, meter model and serial number. Note the calibration gas used and its concentration along with and "zero" air calibration gas. Record the gas select reading established during calibration, the scale factor (1x, 10x or 100x) and any obvious problems associated during the calibration. The battery should be fully charged during calibration or the FID may not ignite. The person performing the calibration should indicate so by initializing the field notebook. If the gas select is set so that the survey readings are not direct then the calibration factor should be noted next to each reading.

ATLANTIC PROCEDURE NO. 1051

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

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.				
2.				
3.				
4.				

TABLE OF CONTENTS

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. 1060

CLEANING PROCEDURE FOR SAMPLING DEVICES USED IN ENVIRONMENTAL SITE INVESTIGATIONS

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

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

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

REVISIONS

NO.	DATE	PREPARED BY	REVIEWED BY	APPROVED BY
1.	2-28-90	John Ripp	James E Gould	Paul Burgess
2.				
3.				
4.				

Procedure No. 1060
Revision No. 1
Date February 28, 1990
Page 1 of 4

TABLE OF CONTENTS

SECTION PAGE

REVISIONS

1. Revision 1 was incorporated to delete the use of acetone from field cleaning operations.

SECTION 1.0: PURPOSE

To insure a standard procedure for cleaning sampling devices for use on site investigations.

SECTION 2.0: SCOPE

This procedure is to be used during site investigations for the cleaning of split spoons, sampling spoons, well bailers, remote samplers, sampling dredges and all devices used to collect a sample or transfer a sample of soil or liquid into its shipping container. Following this general procedure will prevent the likelihood of cross-contamination between samples.

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

None

SECTION 6.0: PROCEDURE

6.1 Materials Selection

All field sampling equipment that contacts the solid or liquid media being collected for eventual chemical analysis should be made of stainless steel or teflon. These materials are easily cleaned and relatively inert when containing the sample. Materials such as neoprene fittings, tygon tubing, silicon rubber bladders, PVC, polyethylene and viton are not acceptable. Also, stainless steel aircraft cable should be used for raising and lowering bailers into monitoring wells. Sampling equipment should be cleaned beforehand and dedicated to individual samples taken in the field. If this is not possible, a cleaning procedure must be followed between each sample. The following presents the procedures for the sampling of organic and inorganic constituents:

6.2 Procedure for Materials in Contact with Media to be Analyzed for Organics

1. Scrub the device with nonphosphate/low sudsing detergent in a stainless steel basin. This type of basin is easily cleaned and thus prevents the buildup of organic contaminants.
2. Rinse it thoroughly with tap water to remove all suds.
3. Rinse it three times with distilled water using a plastic squeeze bottle.

4. Finally rinse it three times with chromatograph grade methanol using a teflon squeeze bottle to remove nonpolar compounds. Allow to air dry and wrap in aluminum foil until use.

Note: Solvent resistant gloves should be worn when rinsing with organic solvents to prevent contamination of the equipment and for personal safety. Use aluminum foil to provide a clean surface if the equipment is set down during the cleaning procedure.

6.3 Procedure for Materials in Contact with Media to be Analyzed for Inorganics

1. Scrub the device with nonphosphate/low sudsing detergent in a HDPE (high density polyethylene) basin using a plastic brush.
2. Rinse it thoroughly with tap water to remove all suds.
3. Rinse it with dilute (0.1N) HCl and/or HNO3 using prerinsed plastic squeeze bottles.
4. Rinse three times with deionized distilled water. Air dry and wrap in plastic. Note: Any acid resistant disposable gloves can be used in this cleaning procedure. Plastic sheeting should be available to provide a clean surface if the equipment is set down during the cleaning procedure.

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN
PORT JERVIS, NEW YORK FORMER MGP SITE
PORT JERVIS, NEW YORK

NYSDEC CONSENT ORDER #D03-0001-99-01

Submitted to:

Orange & Rockland Utilities, Inc.
Pearl River, New York

188 Norwich Avenue
Colchester, CT 06415
(860) 537-0751

July 8, 1999
Project 97679-1001

J:\WPROC\SBO\O&R\PORTJERV\QAPP\QAPP-rev.NEW.wpd

QUALITY ASSURANCE PROJECT PLAN

PORT JERVIS FORMER MGP SITE

PORT JERVIS, NEW YORK

NYSDEC CONSENT ORDER #D03-0001-99-01

July 8, 1999

Submitted to:

Orange & Rockland Utilities, Inc.
One Blue Hill Plaza
Pearl River, NY 10965

Prepared by:

GEI Consultants, Inc.
Atlantic Environmental Division
188 Norwich Avenue
Colchester, CT 06415
(860) 537-0751

Project 97679-1001

Jerry Zak
Project Manager

CONTENTS

SECTION **PAGE**

CONTENTS (continued)

CONTENTS (continued)

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

Attachment A: Severn-Trent Laboratories Quality Assurance Program
Attachment B: Chain of Custody Form

1.0 PURPOSE AND SCOPE

This Quality Assurance Project Plan (QAPP) details the protocols and procedures to be followed during the remedial investigation that GEI Consultants, Inc., Atlantic Environmental Division (GEI/Atlantic), will conduct on the Port Jervis former MGP site. The purpose of the protocols and procedures is to ensure that all investigatory activities will be performed in a manner consistent with the data quality objectives (DQOs) established for the project.

Furthermore, this QAPP identifies project responsibilities and prescribes guidance and specifications to make certain that:

- samples are identified and controlled through sample tracking systems and chain-of-custody protocols;
- field and laboratory analytical results are valid and useable by adherence to proper protocols and procedures;
- calculations and evaluations are accurate and appropriate;
- generated data are validated so they can be applied directly to gaining a complete understanding of the subsurface at the site to determine the extent of any contamination resulting from hydrocarbon impact, whether any waste attributed to former operations is present at the site, and whether or not there are any other off-site or on-site sources of contamination; and
- all aspects of the measurement process, from field through laboratory, are documented to provide data that are technically sound and legally defensible.

The requirements prescribed in this QAPP apply to all contractor and subcontractor activities, as appropriate, for their respective tasks.

The prime responsibilities detailed in Section 3.0, Project Organization, extend to all quality-related controls and activities. The quality control (QC) and quality assurance (QA) elements address essential project-specific components. The project-specific QA/QC requirements are aimed at preventing substandard or erroneous actions from occurring in these essential areas.

The following documents have been used to prepare this QAPP:

- *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,* U.S. EPA 1983;

- *Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring,* U.S. EPA 1984;

- *U.S. EPA Contract Laboratory Program, Statement of Work for Organic Analyses,* Doc. No. 0LM01.0 including revisions through 0LM01.8, August 1991; and

- U.S. EPA *Contract Laboratory Program Statement of Work for Inorganic Analysis Multi-Media, Multi-Concentration, Documentation* No. ILM03.0.

2.0 PROJECT DESCRIPTION

2.1 Site Location

The Port Jervis former MGP site is located in the western portion of Port Jervis, New York, 400 feet northeast of the Delaware River. The site consists of a 1.2±-acre commercial/industrial parcel. The property is currently occupied by an O&R service center. The site is bounded by Brown Street (north), King Street (east), Pike Street (south), and Water Street (west).

2.2 Site History

The Port Jervis former MGP site was an active gas manufacturing facility from as early as 1880 to at least 1945. The site history is presented in detail in the attached work plan.

2.3 Project Goals and Objectives

The PSA will address each of the following.

- Physical Setting and Site Description
- Surrounding Land Use and Demographics
- Site Operational History
- Site Geology and Hydrogeology
- Nature and Extent of Chemical Constituents
- On-Site and Off-Site Impacts
- Potential Receptors
- Preliminary Risk Evaluation
- Interim Remedial Measure Identification, as appropriate
- Applicable Remedial Strategies

The work plan details the methods and practices to be utilized during field sampling. For further details, see the project scope of work and the project work plan.

2.4 Project Schedule

The schedule for the field investigation is given in the following table.

FIELD INVESTIGATION SCHEDULE	
Activity	**Time Frame/Date**
Mobilization, Site Set Up	TBD
Boring Installation, Well Installation	
Well Development	
Groundwater Sampling	
Well Surveying	
River Sampling	

3.0 PROJECT ORGANIZATION

GEI/Atlantic is responsible for the implementation of this project, including supervision of subcontractor activities, field activities, and the evaluation and interpretation of data.

An organization chart showing positions and reporting relationships is presented in Figure 1. Key GEI/Atlantic personnel assigned to this project are:

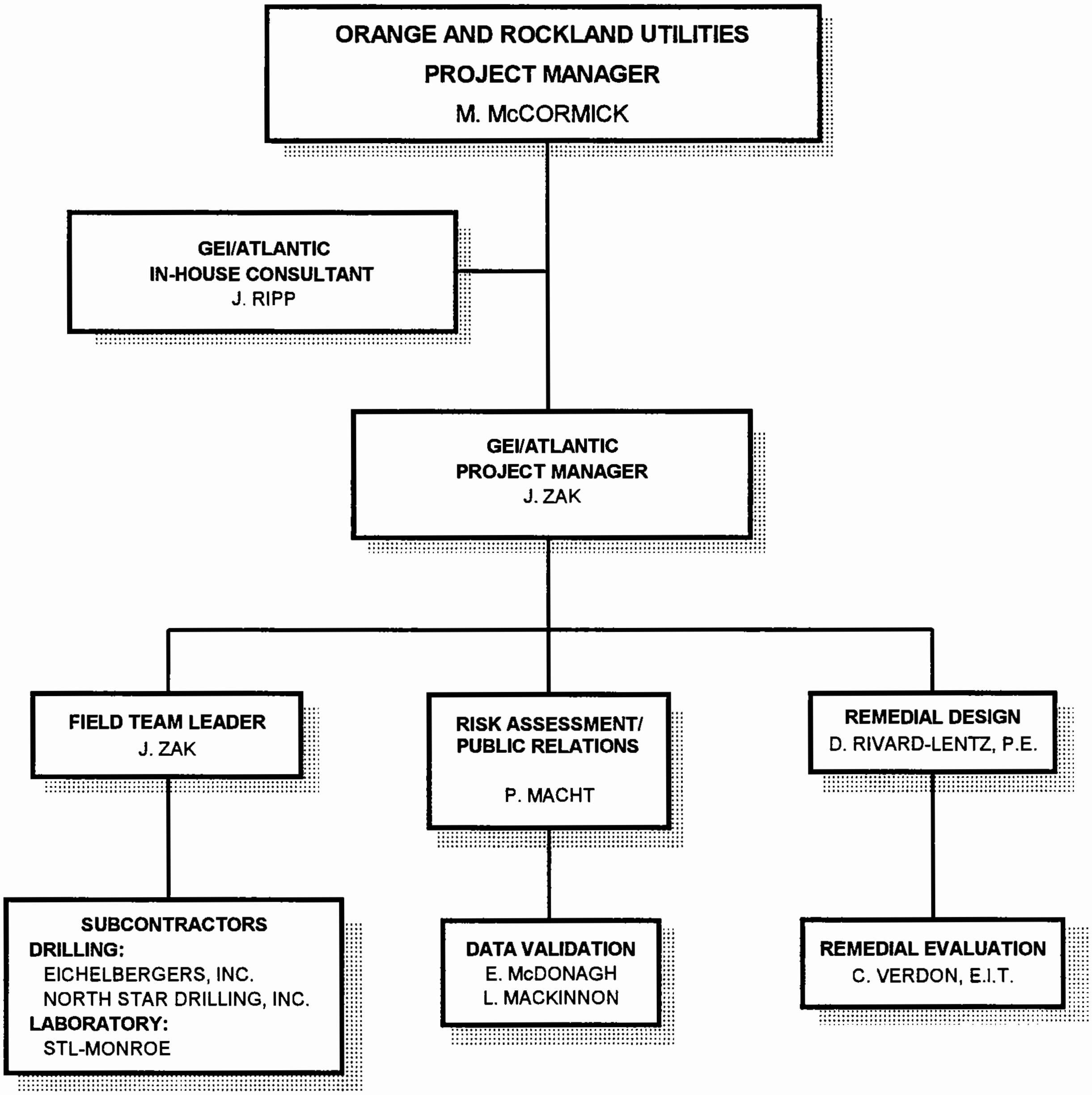
In-House Consultant:	John Ripp
Project Manager:	Jerry Zak
Quality Assurance Officer:	Lorie MacKinnon
Health and Safety Officer:	Robert Breeding, C.H.M.M., R.E.P.
Field Team Leader:	Jerry Zak
Project Engineer:	David Rivard-Lentz, P.E.
Project Risk Assessor:	Penny Macht

The primary responsibilities of key personnel positions are described in Table 1.

Analytical services will be provided by Nytest Environmental. Certifications under the New York State Environmental Laboratory Approval Program are summarized in Table 2.

Subcontractors participating in this project are:

• Prime Contract Laboratory	Severn-Trent Laboratories 200 Monroe Turnpike Monroe, CT 06468
• Driller	Eichelbergers, Inc. Pocono Test Boring & Drilling Company



GEI Consultants, Inc.
ATLANTIC ENVIRONMENTAL DIVISION

FIGURE 1
PROJECT ORGANIZATION

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIG\JER-ORG.PRE

Table 1
Key Project Personnel and Responsibilities

Position	GEI/Atlantic Key Personnel	Areas of Responsibility
In-House Consultant	John Ripp	• will ensure that the required resources are made available to accomplish the project objectives • overall program oversight • senior technical review • client contact on strategic issues
Project Manager	Jerry Zak	• project management and client contact • technical review and schedule • personnel and resource management
Quality Assurance Officer	Lorie MacKinnon	• data validation
Health and Safety Officer	Robert Breeding	• review of subcontractor Health and Safety Plan and procedures • assignment of site-specific Health and Safety Officers
Field Team Leader	Jerry Zak	• coordination of subcontractors • technical project and status report preparation
Environmental Engineer	David Rivard-Lentz	• characterization of site subsurface
Project Risk Assessor	Penny Macht	• perform preliminary risk evaluation

Table 2
Laboratory Certification

State	Responsible Agency	Analyses	Environmental Laboratory Approval Program Certification Number
Severn Trent Laboratories			
New York	Department of Health	CLP Drinking Water Non-Potable Water Solid/Hazardous Waste Air and Emissions	

4.0 QUALITY ASSURANCE OBJECTIVES

This section establishes the QA objectives for measurements that are critical to the project. The QA objectives are developed for relevant data quality indicators. The data quality indicators include method detection limit, precision, accuracy, completeness, representativeness, and comparability. The data quality objectives (DQOs) are based on project requirements and ensure: (1) that the data generated during the project are of known quality, and (2) that the quality is acceptable to achieve the project's technical objectives. Analytical options available to support the DQOs are defined in five general analytical levels, as presented in Table 3. The analytical support level is chosen to ensure that the established DQOs can be attained.

Table 3
Analytical Support Levels

These levels are distinguished by the types of technology, documentation used, and degree of sophistication, as follows.

- Level I: Field Screening. This level is characterized by the use of portable instruments to provide real-time data to assist in the optimization of sampling point locations and for health and safety support. Data can be generated regarding the presence or absence of certain contaminants (especially volatiles) at sampling locations. Air monitoring.
- Level II: Field Analysis. This level is characterized by the use of portable analytical instruments which can be used on site or in mobile laboratories stationed near a site (close-support laboratories). Depending upon the types of contaminants, sample matrix, and personnel skills, qualitative and quantitative data can be obtained. Headspace analyses.
- Level III: Laboratory Analysis. Using methods other than the CLP RAS, this level primarily supports engineering studies using standard EPA-approved procedures. **Note:** *Some procedures may be equivalent to CLP RAS without the CLP requirements for documentation.* MSE, PAC.
- Level IV: CLP Routine Analytical Services (RAS). This level is characterized by rigorous QA/QC protocols and documentation and provides qualitative and quantitative analytical data. Some regions have obtained similar support via their own regional laboratories, university laboratories, or other commercial laboratories. Confirmation Analyses, TCLP, TCL, TAL, total CN.
- Level V: Non-standard methods. Analyses which may require method modification and/or development. *CLP Special Analytical Services (SAS) are considered Level V.*

Procedures to assess the data quality indicators are given in Section 14.0.

4.1 Required Quantification Limit

The required quantification limit is the quantitative analytical level for individual analytes needed to make decisions relative to the objectives of the project. Quantitative limits may be expressed as the method detection limit or some quantitative level defined in terms relative to the program. It should be noted that there is some ambiguity in the definitions and use of terms that define quantification limits. The method detection limit (MDL) presented herein is a well-defined and accepted entity, although attainable only under ideal laboratory conditions.

Method Detection Limit. The MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDL is determined from analysis of a sample in a given matrix type containing the analyte.

Practical Quantitation Limit. The practical quantitation limit (PQL) is the concentration in the sample that corresponds to the lowest concentration standard of the calibration curve.

4.2 Precision

Precision is an assessment of the variability of measurements under a given set of identical conditions. In environmental sampling, precision is the result of field sampling and analytical factors. Precision in the laboratory is easier to measure and control than precision in the field. Replicate laboratory analyses of the same sample provide information on analytical precision; replicate field samples provide data on overall measurement precision. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision.

Laboratory analytical precision will be estimated by analyzing samples in duplicate: either the unspiked sample and its duplicate(s) or the matrix spike and matrix spike duplicate samples. Duplicate field samples will be analyzed to estimate variability caused by both field and laboratory procedures.

Duplicate field samples will be taken as indicated in the work plan.

4.3 Accuracy

The complete train of events involved in the measurement system, from sampling to analysis, affects the accuracy of the data generated.

Laboratory accuracy will be determined by using standard reference materials of known and traceable purity and quality, system monitoring compounds, compound spikes, matrix spike samples, and duplicate laboratory control samples. The Nytest Environmental QAP discusses the QA/QC procedures to be used in the analytical testing for this project (Attachment A), including a check for system accuracy in the absence of matrix effects. This will be accomplished by the preparation and analysis of spiked method blanks or laboratory control samples (LCS).

Accuracy will be expressed as a percentage of the true value [(X-T)100/T].

For field analytical measurements, equipment and instruments will be calibrated by using known standards as follows:

- GEI/Atlantic Technical Procedure No. 1050 - *Operation and Calibration of the Century Organic Vapor Analyzer Model OVA - 128* (calibrated using methane, 100 ppm).

- GEI/Atlantic Technical Procedure No. 1051 - *Operation and Calibration of the HNu System Photoionizer Model PI-101* (Ionizable Volatile Organics) (below 10.2 ev) (calibrated using isobutylene, 100 ppm).

Calibration gases are supplied by:

- Hazco Services
  Liquid Carbonic
  Chicago, IL 60603

4.4 Representativeness

Representativeness is a measure of how closely the data collected portray the conditions of the site under investigation. Standard operating procedures (SOPs) will be used in sample collection to ensure that the sample is truly representative of the condition of the site for the matrix being sampled.

The sampling plan and sampling procedures to be used are discussed in Section 5.0.

4.5 Comparability

Comparability is a qualitative parameter expressing confidence that one set of data can be compared with another. Standardized sampling and analytical procedures will be used to ensure that the reported data can be used in comparison with any future site investigations. To facilitate data comparison, the data-reporting format as presented below will be used:

- Conventions (units reported as): for solids - weight/unit weight (i.e., mg/kg)
  for liquids - weight/unit volume (i.e., μg/liter)

- Use common chemical name with corresponding CAS code.
- Report all data for soils on a dry-weight basis.

4.6 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was anticipated. The objective for completeness is a sufficient amount of valid data to achieve a predetermined statistical level of confidence. Critical samples must be identified and plans must be formulated to secure requisite valid data for these samples.

GEI/Atlantic anticipates that 90 percent of the data will be complete. The following precautions have been taken to ensure that this percentage will be met: materials for critical parameters will be retained, if resampling is required; strict adherence to holding times will be required.

5.0 SAMPLING PROCEDURES

5.1 Sample Types, Location and Frequency

The subsurface-soil sampling program will be implemented through the placement of 11 soil borings. The boring locations and analytical rationales are given in the work plan. Soil borings will be advanced by a hollow-stem auger drill rig. Drilling and sampling operations will be conducted in accordance with GEI/Atlantic Technical Procedure No. 1021, *Field Procedures for Collection of Subsurface Soils,* July 1, 1986.

Logging and screening of soils will be conducted in accordance with GEI/Atlantic Technical Procedure No. 1030, *Field Procedures for Logging Subsurface Conditions During Test Borings and Well Logging,* July 1, 1986.

GEI/Atlantic will collect up to two subsurface-soil samples per boring to chemically characterize obvious wastes and to determine if MGP wastes are present. Soil samples for laboratory analysis will be collected based on field observations and field instrument readings in accordance with GEI/Atlantic Technical Procedure No. 1021, *Field Procedures for Collection of Subsurface Soils,* July 1, 1986.

GEI/Atlantic will collect three sediment samples. This sample will be taken in accordance with GEI/Atlantic Technical Procedure No. 1022, *Field Procedures for Collection of Surface Water and Sediment Samples for Hazardous Waste Determination.*

Sample collection equipment and QC procedures during sampling will be in accordance with those described in GEI/Atlantic Technical Procedure No. 1021, *Field Procedures for Collection of Subsurface Soils*, July 1, 1986.

Up to 11 groundwater monitoring wells will be installed as shown in the work plan. The specific location of each well screen will be determined in the field based on depth to water table. The wells will be developed in accordance with GEI/Atlantic Technical Procedure No. 1023. Water level measurements will be taken before and after well development.

Groundwater samples will be collected from wells installed during the drilling program according to the rationales and analytical summaries in the work plan. Prior to obtaining a sample from each well, the groundwater level will be measured to the nearest 0.1 foot with an electronic water level meter.

Following the measurement of the water levels and prior to collection of samples, an amount of water equal to approximately three well volumes will be purged. Purging will be accomplished with a peristaltic pump, at a flow rate of 500 millimeters/minute (ml/min). Purging of wells will be conducted in accordance with GEI/Atlantic Technical Procedure No. 1023.

Containers with appropriate preservatives will be supplied by the appropriate laboratory. A list of containers, preservatives, and sample holding times is presented as Table 4.

All-weather bound field notebooks will be used to record all field information relevant to sampling, such as sampling history, sampling conditions, and analyses to be performed.

All referenced GEI/Atlantic Technical Procedures are presented in Appendix A of the work plan.

5.2 Sample Identification

Each sample will be identified using an alpha numeric code to be used in all field notes, chain-of-custody forms, and laboratory reports. The sample identification system will consist of the letters RP for site identification, sample type, and number.

Example: PTGW0501 = Port Jervis Groundwater Sample One from Monitoring Well Number 5.

Waterproof labels marked with indelible ink, or equivalent, will be used on all sample containers.

5.3 Equipment Needed for Sampling, Preservation, and Decontamination

Equipment needed for sampling, preservation, and decontamination is presented in Table 5.

Table 4
Solids and Liquids
Sample Quantities, Containers, Preservatives, and NYSASP[a] Analyses

Analysis	Container	Preservative	Holding Time
Solid Phase			
VOC	(2) 40-ml glass vials with Teflon septums	4°C	7 days
SVOC	16 oz. wide-mouth glass with Teflon-lined cap	4°C	7 days
TAL Metals Cyanide	16 oz. wide-mouth glass with Teflon-lined cap	4°C	6 months 12 days
Liquid Phase			
VOC	(2) 40-ml glass vials with Teflon septums	4°C 0.008% $Na_2S_2O_3^5$ HCL pH <2	7 days @ 4°C 10 days with HCL
SVOC	(2) 1-liter glass with Teflon-lined cap	4°C	5 days from VTSR
TAL Metals (filtered)	1-liter plastic with Teflon-lined cap	HNO^3 pH <2	6 months
Cyanide	1-liter plastic with Teflon-lined cap	NaOH pH >12	12 days
Total Phenols	1-liter glass with Teflon-lined cap	H_2SO_4 pH <2	26 days

a. New York State Analytical Services Protocols (12/91)
VTSR - verified time of sample receipt
HCL - hydrochloric acid
HNO^3 - nitric acid
H_2SO_4 - sulfuric acid
NaOH - sodium hydroxide

Table 5
Equipment Needs

Item	Comments
Camera (35 mm) and Film	Record site conditions
Camera (videotape)	Videotape test pit operations
OVA, PI-101	Real time measurement, volatile organic compounds
Pumps, Peristaltic, ISCO	Groundwater sampling
Bailer	Groundwater sampling for volatiles
Water Level Meter	Depth to water measurements
pH Meter, Reference Electrode Filling Solutions	Groundwater measurement
Conductivity Meter, Calibration Solutions	Groundwater measurement
Temperature Probe	Groundwater measurement
Turbidity Meter	Groundwater measurement
Magnetic Locator	Screening boring and excavation areas for metallic objects
Nalgon Tubing	Groundwater sampling
Field Notebooks	Recordkeeping
Write-in-Rain Pens	Recordkeeping
Low Sudsing Detergent (Alconox)	Decontamination
Bootwash Basin (plastic)	Decontamination
Nitric Acid (0.1N)	Decontamination
Methanol (0.1)	Decontamination
Deionized/Distilled Water	Decontamination
Squeeze bottles (polyethylene)	Decontamination
Sprayers (large)	Decontamination
Plastic Bucket	Decontamination
Scrub Brushes (large)	Decontamination
Folding Tables	Decontamination, sampling
Paper Towels	Cleaning
Aluminum Foil	Protect clean equipment
Hand Auger	Soil sampling
Split Spoons	Subsurface sampling
Latex Gloves	Sampling
Folding Ruler	Sampling
Measuring Tape	Sampling
Stainless-Steel Bowls	Sampling
Stainless-Steel Spoons	Sampling

Table 5 (continued) Equipment Needs	
Item	**Comments**
Stainless-Steel Spatulas	Sampling
Sample Jars	Sampling
Ice	Sample cooling
Sample Coolers	Sample shipping
Shipping Labels	Sample shipping
Sampler Labels	Sampling
GEI/Atlantic Technical Procedures	
Chain-of-Custody Forms	Sample control
Airbill Shipping Forms	Sample shipping
Polyethylene Sheeting	Separation of excavated material
General Purpose Tools	
Traffic Cones	Safety
Caution Tape	Safety
Five-Gallon Buckets With Lids	
Plastic Trash Bags	
DOT-Certified Drums for Cuttings	
Air Horn	Safety
First Aid Kit	Safety
Respirators, Cartridges	Personal safety
Tyvek Suits	Personal safety
Hard Hats	Personal safety
Hearing Protection	Personal safety
Safety Shoes	Personal safety
Boot Covers	Personal safety

6.0 SAMPLE CUSTODY

Sample custody and control procedures are an integral part of any field operation. Sample custody is often implemented through chain-of-custody procedures.

The objective of the chain-of-custody procedure is to document the history of each sample and its handling, from collection through final disposition after analysis has been performed. Chain-of-custody procedures may be mandated for certain investigations, especially if the data being generated will be used in any legal proceedings. Whether mandated or not, chain-of-custody procedures should be standard operating procedures for site investigations.

Chain-of-custody procedures will be used for all samples collected during this investigation. A sample chain-of-custody form is given as Attachment B.

Samples, until shipped, will be retained at all times in the field crew's custody. Samples will be shipped to the appropriate laboratory at the end of each day or every other day by an overnight courier. The scheduling of sample shipping to the laboratory will be timed to ensure meeting sample holding times. All samples will be kept on ice or refrigerated and protected from the sunlight until shipped.

Accountability for samples collected will be the responsibility of John Bogdanski, the Field Team Leader. Sample custody seals will be placed over each sample shipping container lid so that any tampering can be detected.

After accepting custody of the shipping containers, the laboratory will document the receipt of the shipping containers by signing the chain-of-custody record. The laboratory will record the date and time of receipt, assess the condition of the shipping containers and sample bottles, and look for other potential discrepancies.

The laboratory sample custodian will bring discrepancies to the attention of the laboratory program administrator for reconciliation with the appropriate field investigators. After all discrepancies are resolved, the laboratory will acknowledge receipt of the samples and return a signed copy of the chain-of-custody form.

The laboratory procedures for sample receipt and sample security are detailed in the Nytest Quality Assurance Plan.

7.0 DECONTAMINATION

7.1 Decontamination Sequence and Procedure

Decontamination procedures will be followed as specified in GEI/Atlantic Technical Procedure No. 1060, *Cleaning Procedure for Sampling Devices Used In Environmental Site Investigations, February 28, 1990*. Specifically, heavy equipment such as augers, drill rods, and the backhoe will be steam-cleaned in the decontamination area over a portable trough to collect wastewater. Immediately adjacent to the equipment decontamination area there will be facilities for boot and glove washing, disposable coverall removal, and hand washing. Wastewater from equipment and personnel decontamination activities will be consolidated in 55-gallon drums for proper disposal.

7.2 Decontamination Location

The decontamination location will be determined at the time of site mobilization.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

All analytical equipment will be calibrated according to known standards to maintain QA/QC objectives.

Field equipment will be calibrated by GEI/Atlantic personnel according to the manufacturer's instructions and GEI/Atlantic's Technical Procedures.

The following field instruments will be used during this investigation.

- Century Organic Vapor Analyzer Model OVA-128 - calibrate each day before use using GEI/Atlantic Technical Procedures, QA Procedure No. 1050, *Operation and Calibration of the Century Organic Vapor Analyzer Model OVA-128, July 1, 1986.*

Calibration procedures for laboratory equipment will be performed as written in the Nytest Environmental QAP.

9.0 ANALYTICAL PROCEDURES

The analytical methods listed in Table 6 will be used for analysis of samples for this investigation. These methods have been chosen to meet the data quality objectives outlined in Section 4.0.

Table 6
Analytical Methods

Method	Matrix	Analytes
NYSASP Method 95-1	Subsurface Soils, Water	Volatile Organics,
NYSASP Method 95-2	Soil, Water	Semivolatile Organics
NYSASP Method CLP-M	Soil, Water	TAL Metals
NYSASP Method CLP-M	Soil, Water	Cyanide

10.0 DATA REDUCTION, VALIDATION, AND REPORTING

10.1 Data Verification

Critical functions for determining the validity of generated data are: (1) strict adherence to the analytical methods, (2) assurance that the instrumentation employed was operated in accordance with defined operating procedures, (3) assurance that quality parameters built into the analytical procedures have been adhered to, and (4) confirmation that the data quality objectives have been met.

10.2 Data Reduction

Raw field data will be summarized by using a format that will facilitate interpretation, analysis, and evaluation. The data will be presented as tables, well logs, maps, charts, and graphs, as considered appropriate by the project manager.

10.3 Data Reporting

10.3.1 Laboratory Deliverables

Laboratory deliverables will consist of a hard-copy New York ASP Category B data package containing:

- a summary of laboratory activities performed for this project;
- a list of laboratory identifications, project identification numbers, and field descriptions for all samples, blanks, and QA samples;
- a summary of exceeded holding times with explanations;
- a table showing sample identification, analytical parameter, date of laboratory receipt, extraction date, date analyzed, and re-extraction and reanalysis dates;
- QA discussion for each parameter, including analytical anomalies, corrective actions, and samples lost;
- copies of field chain-of-custody records;

- detection limits for all parameters; and
- summary data sheets for all analyses with the corresponding instrument calibration and QA test forms.

10.3.2 Field Data

Field data will be reviewed by the technical supervisory staff for completeness and representativeness.

10.3.3 Technical Report

The verified field and analytical data will be used to prepare the RI Report. In addition to descriptions of project methods, materials, and findings, the technical report will include: (1) changes to the original QAPP and the rationale for these changes, and (2) a summary of any limitations to the use of the data with conclusions on how these limitations affect the project objectives.

11.0 INTERNAL QUALITY-CONTROL CHECKS

Field and laboratory quality-control checks will be used to ensure project data quality objectives. QC checks will include replicates, split samples, spiked samples, blanks, laboratory control samples, internal standards, surrogate samples, calibration standards, and reagent checks.

11.1 Internal Checks for Laboratory Activities

Internal quality-control checks for laboratory activities will be performed as specified in the Severn-Trent QAP.

11.2 Internal Checks for Field Activities

QA/QC procedures for field activities will include the collection of field blanks, field replicates, trip blanks, matrix spikes, and matrix spike duplicates. Duplicates will be collected as scheduled in the work plan.

12.0 PERFORMANCE AND SYSTEM AUDITS

Audits are an independent means of: (1) evaluating the operation or capability of a measurement system, and (2) documenting the use of QC procedures designed to generate data of known and acceptable quality.

12.1 Field Audits

Field audits will assess sample collection protocols, determine the integrity of chain-of-custody procedures, and evaluate sample documentation and data-handling procedures. Field audits will be scheduled by the project QA officer, project manager, or principal-in-charge, at their discretion. Written records of audits and any recommendations for corrective action will be submitted to the project manager.

12.2 Contract Laboratory Audit

Severn-Trent has been audited by GEI/Atlantic previously. The laboratory in Monroe, Connecticut provides considerable support for various GEI/Atlantic MGP projects.

13.0 PREVENTIVE MAINTENANCE

Preventive maintenance will be performed on field equipment in accordance with the manufacturer's recommendations.

- Century OVA-128 - as detailed in GEI/Atlantic Technical Procedures, QA Procedure No. 1050, *Operation and Calibration of the Century Organic Vapor Analyzer Model OVA-128, July 1, 1986.*

- YSI Model 3580 Water Quality Monitor (pH, Oxid./Red. potential, conductivity, temperature). Manufacturers' instructions for YSI Model 3530 pH Electrode, YSI 3550 Sample Chamber, YSI 3510 Temperature Probe, YSI 3540 — ORP Electrode, and YSI 3520 Conductivity Cell.

14.0 SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA QUALITY INDICATORS

QC analyses conducted as a part of the testing program will provide a quantitative quality assessment of the data generated and their adherence to the data quality indicators. The data quality indicators ensure that the quality assurance objectives for the project are met.

14.1 Method Detection Limit

The MDL is defined as follows for all measurements:

$$MDL = (t_{[n-1,1-a=0.99]}) \text{ x } (s)$$

where: s = standard deviation of the replicate analysis;

$t_{(n-1,\ 1-a=0.99)}$ = student's t-value for a one-sided, 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom.

The MDLs calculated by the laboratory are determined under "ideal" conditions. MDLs for environmental samples are dependent on the sample aliquot, the matrix, the concentration of analyte, and any interferences present in the matrix, the percent of moisture, dilution factor, etc. The MDL for each sample analysis will be adjusted accordingly.

Practical Quantitation Limit. The PQL is the concentration of an analyte in the sample that corresponds to the lowest concentration standard of the calibration curve. As with the MDLs, the PQLs are dependent on the sample aliquot, the final sample volume, the percent of moisture, dilution factor, etc.

The PQL is determined as follows:

$$PQL = \frac{\text{Lowest conc. std } (ng)}{\text{Volume injected } (uL)} \times \frac{\text{Sample aliquot } (mL \text{ or } g)}{\text{Final volume } (mL)} \times DF \times \frac{100}{(100-PM)}$$

where: DF = dilution factor, including all dilutions or lost samples not accounted for in "sample aliquot/final volume" ratio;

PM = percent moisture for solid samples.

Analytes that are not detected in the sample analysis are reported on the data reporting form with the quantitation limits and a nondetect designation. Analytes identified above the MDL but below the quantitation limits are reported with the calculated concentration and an estimate designation. The estimate designation indicates that the concentration is estimated based on the assumption that the system is still linear below the calibration curve.

14.2 Precision

Variability will be expressed in terms of the relative percent difference or deviation (RPD).

When only two data points exist, the RPD is calculated as:

$$RPD = \frac{(Larger\ Value - Smaller\ Value)}{[(Larger\ Value + Smaller\ Value)/2]} \ x\ 100\%$$

For data sets greater than two points, the percent relative standard deviation (percent RSD) is used as the precision measurement. It is defined by the equation:

$$Percent\ RSD = \frac{Standard\ Deviation}{Mean} \ x\ 100\%$$

Standard deviation (SD) is calculated as follows:

$$SD = \sqrt{\sum_{i=1}^{n} \frac{(y_i - y)^2}{n-1}}$$

where:
SD = standard deviation
y_i = measured value of the *i*th replicate
y = mean of replicate measurements
n = number of replicates

For measurements such as pH, where the absolute variation is more appropriate, precision is usually reported as the absolute range (D) of duplicate measurements:

$$D = |\text{first measurement - second measurement}|$$

or as the absolute standard deviation previously given.

RPD, %RSD, and D are independent of the error of the analyses and reflect only the degree to which the measurements agree with each another, not the degree to which they agree with the "true" value for the parameter measured.

14.3 Accuracy

Accuracy is related to the bias in a measurement system. Accuracy describes the degree of agreement of a measurement with a true value. Accuracy will be expressed as percent recovery for each matrix spike analyte by using the following equation:

$$\%\ Recovery = \frac{Css - Cus}{Csa}\ X\ 100\%$$

where:
Css = measured concentration in spiked sample;
Cus = measured concentration in unspiked sample;
Csa = known concentration added to the sample.

Accuracy for a measurement such as pH is expressed as bias in the analysis of standard reference sample according to the equation:

$$\text{Bias} = pH_m - pH_t$$

where:
pH_m = measured pH;
pH_t = the true pH of the standard reference sample.

14.4 Representativeness

Representativeness is a qualitative statement that expresses the extent to which the sample accurately and precisely represents the characteristics of interest of the study. Representativeness is primarily concerned with the proper design of the sampling program and is best ensured by proper selection of sampling locations and the taking of a sufficient number of samples. It is addressed by describing the sampling techniques, the matrices sampled, and the rationale for the selection of sampling locations.

14.5 Comparability

Comparability is a qualitative parameter expressing the confidence that one set of data can be compared to another. Comparability is possible only when standardized sampling and analytical procedures are used.

14.6 Completeness

Data completeness is a measure of the amount of useable data resulting from a measurement effort. For this program, completeness will be defined as the percentage of valid data obtained compared to the total number of measurements necessary to achieve our required statistical level of confidence for each test.

15.0 CORRECTIVE ACTION

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the QA officer and the project leader will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

A corrective action memorandum will be prepared, documenting the problem and detailing the corrective action to be initiated.

Corrective actions may include, but are not limited to, the corrective action matrix presented below.

Corrective Action Matrix

Problem	Corrective Action
Sample exceeded holding time criteria.	Resample and reanalyze.
Field instruments are not within calibration limits.	Calibrate instrument and retest once an acceptable calibration has been obtained.
Procedures are observed that are not in accordance with the QAPP.	QA officer is notified and involved personnel are retrained.

The efficacy of any corrective action will be assessed by project management to ensure that the deficiency or problem has been adequately addressed.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Effective management of environmental investigations requires timely assessment and review of field and laboratory activities. The QA officer will be the interface between management and project activities in matters of project quality.

The QA officer will review the implementation of this QAPP. Reviews will be conducted at the completion of field activities and will include the results of any audits and an evaluation of data quality.

The contract laboratory will submit QA reports as part of their deliverable analytical data packages.

REFERENCES

U.S. Environmental Protection Agency. 1980. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80. Prepared by the Office of Monitoring Systems and Quality Assurance, Office of Research and Development, United States Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency, *Data Quality Objectives for Remedial Response Activities*, Development Press, Office of Solid Waste and Emergency Response Directive 9355,0-7B, March 1987.

U.S. Environmental Protection Agency. 1986 Revision 1990. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, Third Edition. Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. EPA Contract Laboratory Program, *Statement of Work for Inorganic Analysis Multi-Media, Multi-Concentration*, Document No. ILM03.0.

U.S. EPA Contract Laboratory Program, *Statement of Work of Organics Analysis Multi-Media Multi-Concentration*, Document No. OLM01.0, including revisions through OLM01.8 (August 1991).

ATTACHMENT A

SEVERN-TRENT LABORATORIES
QUALITY ASSURANCE
PROGRAM

Severn Trent Laboratories-Connecticut Quality Assurance Program

prepared by

Marsha K. Culik
Quality Assurance Manager

for

Severn Trent Laboratories
Monroe, Connecticut

This document has been prepared by STL-CT and will be updated annually. The material contained herein is not to be disclosed to, or made available to any third party without the prior expressed written approval of the Laboratory Management.

TABLE OF CONTENTS

TABLE OF CONTENTS-Continued...

LIST OF FIGURES

LIST OF TABLES

APPENDIX

1.0 QUALITY ASSURANCE PROGRAM-IDENTIFICATION FORM

Document Title: STL-CONNECTICUT QUALITY ASSURANCE PROGRAM PLAN

Company Address:
Severn Trent Laboratories - Connecticut
200 Monroe Turnpike
Monroe, Connecticut 06468

Company Official: Mr. Jeffrey C. Curran
Title: Laboratory Director

Company Official: Ms. Marsha K. Culik
Title: Quality Assurance Manager

Plan Coverage: STL-Connecticut Laboratory including the following functions:

- Administration
- Sample Receipt
- GC Laboratories
- Quality Assurance
- Data Entry
- Report Production
- Computer Systems
- Inorganics Laboratories
- GC/MS Laboratories
- Facilities and Safety
- Sample Preparation Laboratories

Concurrences:

Name: Mr. Michael Bonomo
Title: General Manager
Signature:
Date: Dec 2, 1998

Name: Mr. Jeffrey Curran
Title: Laboratory Director
Signature: Jeffrey C. Cu
Date: Dec 1, 1998

Name: Ms. Marsha Culik
Title: Quality Assurance Manager
Signature: Marsha K. Culik
Date: Dec 1, 1998

ATTACHMENT B

CHAIN OF CUSTODY FORM

Nº 3128

GEI CONSULTANTS, INC., ATLANTIC ENVIRONMENTAL DIVISION
188 Norwich Avenue, P.O. Box 297, Colchester, CT 06415
PHONE: (860) 537-0751 FAX: (860) 537-6347

CHAIN OF CUSTODY RECORD

PROJECT NAME: ______

PROJECT NUMBER: ______

SAMPLE NO.	DATE	TIME	GRAB	COMP	NO. OF CONT.	SAMPLE MATRIX	ANALYSIS										
							PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	COMMENTS

Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received for Laboratory by:

Method of Shipment:

Shipping Waybill No.:

Remarks:

SAMPLED BY:

______ (Print Name) ______ Signature

______ (Print Name) ______ Signature

PT 1:ORIGINAL PT 2:Laboratory Project Manager-yellow PT 3:Field Copy-pink

SP-3479 8/97

FINAL WORK PLAN
PORT JERVIS FORMER MGP SITE
NYSDEC CONSENT ORDER # D03-0002-9412
PORT JERVIS, NEW YORK

Submitted to:

Orange & Rockland Utilities, Inc.
Pearl River, New York

188 Norwich Avenue
Colchester, CT 06415
(860) 537-0751

March 9, 1998
Project 97679-1001

PRELIMINARY SITE ASSESSMENT

PORT JERVIS FORMER MGP SITE

NYSDEC CONSENT ORDER # D3-0002-9412

PORT JERVIS, NEW YORK

March 9, 1998

Submitted to:

Orange & Rockland Utilities, Inc.
One Blue Hill Plaza
Pearl River, NY 10965

Prepared by:

GEI Consultants, Inc.
Atlantic Environmental Division
188 Norwich Avenue
Colchester, CT 06415
(781) 721-4000

Project 97679-1001

Martha M. Mayer
Project Manager

CONTENTS

SECTION **PAGE**

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

GEI Consultants, Inc., Atlantic Environmental Division (GEI/Atlantic), has been retained by Orange and Rockland Utilities, Inc. (O&R) to perform a preliminary site assessment (PSA) at the Port Jervis former manufactured gas plant (MGP) site. This former MGP site is managed under a Consent Order with the New York State Department of Environmental Conservation (NYSDEC) [Index # D3-0002-9412, January 8, 1996]. This introductory section presents GEI/Atlantic's understanding of the project (subsection 1.1)

1.1 Understanding the Project

In view of the New York state regulatory program to investigate and remediate MGP sites throughout the state, and O&R's interest in determining whether contamination exists on sites owned by predecessor companies, O&R is actively addressing potential environmental issues at the former Port Jervis MGP site, which it owns. The site is currently used on a small scale as an O&R service center.

O&R's objectives for the PSA are to determine the following:

- whether contamination from previous MGP operations exists;
- the nature and extent of contamination;
- the associated risk to public health and the environment; and
- possible options for remediation, if necessary.

A PSA is the first element in a series of activities necessary for regulatory compliance and site closure, O&R's goal is to characterize the site and minimize the need for additional characterization. The field program has been designed to achieve this goal while complying with the regulations. The PSA will address each of the following.

- Physical Setting and Site Description
- Surrounding Land Use and Regional Demographics
- Site Operational History
- Site Geology and Hydrogeology
- Nature and Extent of Chemical Constituents
- On-site and Off-site Impacts
- Potential Receptors
- Preliminary Risk Evaluation
- Interim Remedial Measure Identification, as appropriate
- Applicable Remedial Strategies

Using all of the information from the PSA, a preliminary evaluation of risks to potential receptors will be completed. Applicable site remedial strategies will be described, based on PSA findings. Conditions warranting remedial action on an interim basis will be identified with appropriate remedies.

2.0 SITE BACKGROUND

The following subsection provides detailed historic and environmental information relevant to the field investigation. Subsection 2.1 presents the physical setting and site description. Subsection 2.2 describes the surrounding land use and regional demographics. Subsection 2.3 presents the site operational history, and subsection 2.4 lists previous site investigations. Subsection 2.5 summarizes the findings and an environmental records review. Subsection 2.6 reports the regional climatology and regional geology. Subsection 2.7 presents the regional hydrogeology.

2.1 Physical Setting and Site Description

The Port Jervis former MGP site is located in the western portion of the city of Port Jervis, New York, 400 feet northeast of the Delaware River. The site vicinity is urban. The site consists of a 1.2(+/-)-acre commercial/industrial parcel. The property is currently occupied by an O&R service center. A site location map is provided as Figure 1. Current site conditions are depicted in Figure 2.

2.2 Surrounding Land Use/Regional Demographics

As previously stated, the Port Jervis former MGP site is located in an urbanized area. Features of note include the nearby Delaware River (400 feet southwest of the site), a large railyard facility (less than 1,000 feet northwest of the site), and nearby railroad tracks (less than 1,000 feet northeast of the site, running in a southeast/northwesterly direction.

Port Jervis Demographics. The total population of Port Jervis is 15,181 persons and 5,515 households. Forty-nine percent of the population is male, while 51 percent is female. The ethnic breakdown is as follows.

White:	95 percent
Black:	2.5 percent
Other:	2.5 percent

2.3 Site Operational History

The development of the manufactured gas industry in this country typically started with small, local enterprises that joined/evolved into larger network operations involved with the manufacture and distribution of gas from hub facilities, as occurred in Orange and Rockland counties. Site uses were variable following the decline of gas manufacturing and the increase in use of natural gas.

The operational history for the Port Jervis MGP site was generated using the following resources.

- Production records from *Brown's Directory of American Gas Companies (Brown's Directory).* Site-specific records were available from 1887 to 1917; thereafter, the annual data were combined with records for production at the Middletown MGP site. Table 1 summarizes these records.

- Sanborn Fire Insurance (Sanborn) Maps from 1888, 1900, 1912, 1921, 1931, 1945, and 1961.

- NYSPSC Case 94-M-1016 file information.

- Current and Historic Topographic Maps from 1906, 1936, 1969 photorevised 1983, and 1992

- 1995 Site Map.

The Port Jervis MGP site originated as a coal gas plant sometime before 1880, and had a long service life. A change in manufacturing technology occurred in 1880 when the Lowe water gas process was adopted (*Water Gas Journal,* 1883). The site continued in gas production as a water gas plant until sometime between 1946 and 1961. A brief summary of the site history from 1888 follows.

- **Prior to 1880.** The site was an active coal gas manufacturing plant.

- **1880.** The site adopted the Lowe water gas process.

- **1888.** *Brown's Directory* indicates that gas production continued with the use of the Lowe water gas process, Granger variation. This variation placed the generator in a pit. Sanborn maps show that the site was split by a canal raceway perpendicular to the Delaware River. The canal extended into the adjacent block. Naphtha feed stock was piped underground to storage tanks on the northern side of the site from the railroad a block away. From storage, naphtha was piped across the canal raceway to the generator room. Lime purifiers were on the northern side of the site. Two gas holders were present on each side of the canal, 8,000 cubic feet (cf) to the south and 37,000 cf to the north. A tar well was adjacent to the canal to the south. Coal was stored east of the generator room. (Site features depicted on the 1888 Sanborn map are shown in Figure 3.)

- **1892.** *Brown's Directory* indicates that the gasification method used was modified to the Granger-Collins method.
- **1900.** *Brown's Directory* indicates that the site adopted the Lowe water gas process. Sanborn maps show that the canal was partially filled under Water Street, in the vicinity of the river, and identified as a brook. An additional naphtha tank was located in the generator room. Gas purifying was accomplished in the same location with a combination of sawdust and bog iron. A slight increase in gas holder capacities was noted, 9,000 cf and 39,000 cf. (Site features depicted on the 1900 Sanborn map are shown in Figure 4.)

- **1906.** A historic topographic map shows that the brook was completely filled.

- **1912.** Sanborn maps show that the small gas holder was removed. One naphtha tank on the northern side of the site was relocated in the same vicinity, as was piping to the generator room. The tar well south of the former canal/brook was relocated near the eastern site boundary; still south of the former water course. Added structures included a large (75,000 cf) gas holder in the northeast corner of the site, a tar extractor next to the purifier room, and additional generator and purifier buildings. (Site features depicted on the 1912 Sanborn map are shown in Figure 5.)

- **1921.** Sanborn maps show that one naphtha tank near the northern site boundary was removed and the capacity of the 39,000 cf gas holder was reduced to 25,000 cf. The underground naphtha pipe from the railroad was not identified. Coal storage was shifted to the northern side of the original generator room which was converted to storage. Added structures included gas oil tanks near the northwestern corner and in a pit in the vicinity of the former 8,000 cf gas holder. (Site features depicted on the 1921 Sanborn map are shown in Figure 6.)

- **1931.** Sanborn maps show that the site property extended westward to Water Street. A larger gas holder of unknown capacity was located in the northwestern corner. The original purifier house was relocated to the west. (Site features depicted on the 1931 Sanborn map are shown in Figure 7.)

- **1945.** No changes were evident. (Site features depicted on the 1945 Sanborn map are shown in Figure 8.)

- **1961.** Sanborn maps show that the largest gas holder and governor room remained, but the rest of the site was modified to function as an office and service center. No gas production structures were evident. The largest gas holder was removed some time before 1970. (Site features depicted on the 1961 Sanborn map are shown in Figure 9.)

Figure 10 reflects the substantial modifications made to the MGP operations at the site over the years. One notable feature at this site is the former canal that traversed the site and discharged to the Delaware River. The canal was filled in between 1900 and 1906. The only visible remaining MGP structure on site is a small brick building that was formerly the governor house. A composite map of historical site structures is shown in Figure 10.

2.4 Previous Investigations

No previous investigations have been conducted at this site.

2.5 Environmental Records Review

Federal and state environmental lists were reviewed for potential impacts to the site. Table 2 summarizes the lists reviewed and the number of environmentally significant sites in the vicinity.

A brief summary of each site is provided below.

Orange & Rockland Utilities, Inc.; 16 Pike Street (the subject site). This site is currently a Hazardous Substance Waste Disposal site and a bulk petroleum storage facility. The site has been delisted from the CERCLIS database. Currently, a 1,000-gallon gasoline underground storage tank (UST) is located on the east side of the site. The tank was last pressure tested in 1995. An 8,000-gallon diesel tank was removed in 1996. The reason for removal is currently unknown. The ERNS database indicates that 20 gallons of transformer oil was spilled at the site. According to this database, 10 gallons of transformer oil were released to water.

Calligo Residence; 43 King Street (413 feet east/southeast of the site). On May 29, 1992 NYSDEC was informed of deliberate oil dumping. This case was found to be a neighbor dispute. This case was closed.

Mile Post 87; Pike Street (Distance from site is unknown). Ten gallons of sulfuric acid was spilled at the site.

Conrail; 75 Pike Street/1 Bell Crossing Road (867 feet northeast of the site). This site is a listed hazardous waste generator/transporter. The status is unknown.

US Post Office; 20 Sussex Street (1,306 feet east/northeast of the site). On August 14, 1989, a tank containing No. 2 fuel oil failed tank tightness testing. A noticeable leak was identified in the manway. A 3,000-gallon fuel tank was removed from this property in 1990. This site is also listed as an air discharge facility (potential uncontrolled emissions, less than 100 tons per year).

Port Jervis Solid Waste Landfill;1 Franklin Street (1,740 feet to the east/northeast). This is a mixed solid waste landfill.

Monroe Residence; 15 Franklin Street (1,894 feet east of the site). On August 29, 1984, an odor was detected in well water at this residence. The site is in close proximity to an earlier spill. The site water was tested.

Williams Candle Shop; 17 Delaware Street (2,122 feet northeast of the site). On September 15, 1993, a 275-gallon outdoor oil tank was overfilled. Oil leaked into the basement. The quantity of oil was estimated to be 1 gallon.

Tank Site; Pike and East Main Street (2,567 feet northeast of the site)). On April 4, 1997, three 2,000-gallon gasoline tanks failed tank tightness testing.

Barrier Industries; 200 East Main Street (4,532 feet southeast of the site). This site is listed as a CERCLA site and a Hazardous Substance Waste Disposal Site. This is na industrial site. Contamination sources include leaking tanks, drums, lagoons, and other containers.

2.6 Regional Climatology

Climatological data recorded at West Point, New York are a good representation of the climatology of Orange County. Data collected from 1951 to 1971 are summarized in Table 3.

2.7 Regional Geology

According to the Soil Survey of Orange County, New York, US Department of Agriculture, Soil Conservation Service, in cooperation with Cornell University Agricultural Experiment Station (1981), the Port Jervis site is underlain by soil classified as Tioga silt loam. These soils are generally deep (greater than 60 inches) and consist of well drained, nearly level soils. These soils formed in alluvial deposits on floodplains and low terraces along streams and rivers. Tioga soils are characterized by three soil horizons. The first horizon is a silt loam and ranges in depth from 0 to 3 inches below grade. The second horizon is classified as a silt loam, loam, gravelly fine sandy loam and ranges in depth from 3 to 40 inches below grade. The third horizon is from 40 to 60 inches below grade and is classified as a silt loam, gravelly loam, very gravelly loamy sand.

2.8 Hydrogeology

The physical and chemical properties of the three Tioga soil horizons are summarized in Table 4. Brief flooding from November through May is common in areas underlain by Tioga soils. The high water table is generally 3 to 6 feet below ground surface (bgs), and occurs from February to April. Little information is available regarding aquifers in the site vicinity. Depth to bedrock is unknown.

3.0 SCOPE OF WORK

To address the requirements of the Consent Order, the scope consists of three main tasks.

- Task 1: Field Investigation
- Task 2: Risk Evaluation/IRM Evaluation/Report Preparation
- Task 3: Project Management

These tasks are explained in detail in this section. The activities associated with the field investigation are described in subsection 3.1. The Risk Evaluation approach is discussed in subsection 3.2. The basis for evaluation of IRMs is presented in subsection 3.3. The project management approach and report preparation are presented in subsection 3.4. Standard Operating Procedures (SOPs) to be followed during field work are provided in Appendix A. The Quality Assurance Project Plan (QAPP), intended to maintain and document the quality of developed data, is provided in Appendix B.

3.1 Field Investigation

The field investigation will characterize the nature and extent of contamination through subsurface exploration (installation of soil borings and test pits), groundwater monitoring well installation, and the collection of surface-soil, subsurface-soil, groundwater, and sediment samples for chemical analyses. A backhoe will be used to excavate test pits. A hollow-stem auger drill rig will be used to drill the borings and install polyvinyl chloride (PVC) monitoring wells. Subsurface-soil samples will be monitored for organic vapors, using a photoionization detector (PID) and organic vapor readings will be recorded in the field notes. The instrument will be calibrated daily. Groundwater will be sampled using low-flow peristaltic pumps except for samples submitted for volatile organic compound (VOC) and semivolatile organic compound (SVOC) analyses, which will be sampled using disposable bailers. The field investigation tasks have been targeted to obtain sufficient data to characterize both the nature and potential risks of contaminants at the site. Based on the previous and current site uses, there is potential for the site to be impacted by MGP residuals and polychlorinated biphenyls (PCBs). MGP residuals typically include VOCs, SVOCs, metals, and cyanide. The scope of work includes the following analytical methods for the compounds of concern.

- VOCs by SW-846 Method 8260
- SVOCs by SW-846 Method 8270
- PCBs by SW-846 Method 8082

- TAL Metals by 6000/7000 Series
- Total Cyanide by United States Environmental Protection Agency (EPA) Method 9012

Quality assurance/quality control samples will be collected to assess the sampling and analytical protocols. QA/QC samples will include duplicates, field blanks, rinsate blanks, trip blanks, matrix spikes, and matrix spike duplicates.

Investigation-derived waste (IDW) generated during the field program will include drill cuttings to be containerized, labeled, and staged on site for disposal by O&R. Personal protective equipment (PPE), and other solid IDW will be segregated in trash bags to facilitate disposal. Well development water, purge-water, and decontamination liquid will be contained in an agricultural tank, labeled, and staged on site for disposal by O&R.

3.1.1 Surface-Soil Sampling

Surface-soil samples will not be collected because the site is paved.

3.1.2 Test Pit Excavation

Approximately ten test pits will be excavated at the Port Jervis site. The objective is to locate former MGP structures and other relevant features, such as a former canal that traversed the site before 1912. Test pit locations were selected based on historic site information, including the review of Sanborn maps, topographic maps, and available site plans, and are presented in Figure 11. Rationale for placement of the test pits is listed in Table 5.

A backhoe operated by Mr. Robert Prentiss, a licensed operator and GEI/Atlantic employee, will be used to excavate test pits. Details on the excavation and logging practices are contained in SOP No. 1031 in Appendix A. Additional locations may be excavated based on findings, field conditions, and time availability. Test pits will be logged to include dimensions, soil lithology, and visual and olfactory evidence of contamination will be noted. Soils excavated from each test pit will be screened in the field for organic vapors, using a PID. All observations will be recorded in the field notes for future reference regarding odors and air emissions during potential hot spot removal activities. Excavation activities will be videotaped for further reference. Soil samples will be collected for laboratory analyses from the most contaminated area (based on visual, odor, and PID observations). If no contamination is evident, no sample will be collected.

Following excavation and observation, the test pits will be backfilled with the excavated material, in reverse order of removal (i.e., first out, first in). Replaced backfill will be tamped into place. Paved locations will be restored with cold patch bituminous concrete. Vegetation will be removed and replaced with care in order to enhance regrowth.

In addition to the test pits proposed by GEI/Atlantic in January 1998, O&R removed a 1,000-gallon gasoline UST located on the east side of the site. The UST excavation was documented as required by NYSDEC. An additional soil sample was collected (from the eastern wall) and analyzed for SVOCs, PCBs, and cyanide. The geological observations and analytical results associated with the removal will be incorporated in the report on the site investigation.

A second UST (8,000 gallons) was removed from the eastern side of the site in 1996. No evidence of MGP tar contamination was noted during that removal. Geological observations and analytical results noted during the removal will be incorporated in the site investigation report.

3.1.3 Subsurface-Soil Borings/Well Installation

Subsurface-Soil Borings. Four shallow subsurface borings will be installed and completed as shallow monitoring wells. The borings will be advanced to approximately 30 feet bgs or until an aquitard of 5 feet or greater thickness is encountered. The objectives of these borings are to evaluate shallow subsurface soils (those soils encountered from the ground surface to the uppermost portion of the underlying aquifer) and to identify the groundwater flow direction. The wells will be screened through the water table in an effort to assess light nonaqueous phase liquid (LNAPL) contamination. If NAPL is observed beneath the screened interval, a second, deeper well will be installed adjacent to the shallow well.

An additional boring will be installed and extended to bedrock or other confining layer. The location of this boring will be determined in the field so that the boring is placed in an impacted area. The objective of this deep boring is to evaluate the potential presence of dense nonaqueous phase liquid (DNAPL) above the confining layer. If DNAPL is encountered just above the confining layer, it will be sampled and a deep well will be installed. If DNAPL is not encountered just above the confining layer, a soil sample will be collected for laboratory analyses from above the confining layer, and the boring will be grouted with cement/bentonite grout from the base of the boring to the ground surface. The proposed locations of the five borings are illustrated in Figure 11.

A hollow-stem auger drill rig with a 4.25-inch auger will be used to install the borings. Plywood will protect the ground surface in the vicinity of the boring. Continuous split-spoon samples will be collected from the ground surface to the end of each boring. Samples will be collected using either a 2- or 3-inch split spoon, 2 feet in length and will be collected in advance of the auger. A down-hole hammer will be used for driving the split-spoon sampler, if possible.

The lithology of each subsurface sample will be logged. Each sample will be screened with a PID for organic vapors. Soil samples from each split spoon will be collected for archive purposes. One soil sample per shallow boring will be collected from the most contaminated interval (based on field observations) for laboratory analysis. If no contamination is evident, the sample will be taken from the groundwater interface. As previously mentioned, one soil sample will also be collected for laboratory analyses from above the confining layer from the deep boring.

Drill cuttings will be containerized in labeled 55-gallon drums and staged on site for disposal.

Monitoring Well Installation. The three shallow subsurface borings will be completed as monitoring wells. The monitoring wells will be constructed of 2-inch inside diameter, flush-threaded polyvinyl chloride (PVC) screen and solid casing (Figure 12). The annular space between the well screen and the borehole wall will be backfilled with chemically inert sand to promote sufficient groundwater flow to the well and to minimize the passage of any fine-grained formational material into the well. A bentonite clay seal will be placed above the sand pack. The remaining annular space will be filled to grade with cement-bentonite grout. The bentonite seals will prevent the migration of contaminants to the sampling zone (i.e., screened interval) from the surface and overlying material and will prevent cross-contamination between strata. A concrete pad will surround each well at the ground surface. Each monitoring well will be fitted with a flush-mounted curb box, secured with cement. The monitoring wells will be screened at the uppermost portion of the water table, and screen lengths will be no more than 10 feet. If contamination is evident during field screening in soil samples collected from just above the confining layer in the deep boring, a monitoring well will be installed. The deep well will be constructed in the same way as the shallow monitoring wells. The deep well will be screened at the confining layer and the screen interval will be no more than 10 feet.

Well Development. Subsequent to drilling operations, all monitoring wells will be developed to restore the natural permeability of the formation in the vicinity of the well and to remove silt and clay. Development will be performed by alternately surging and pumping, utilizing either a centrifugal or piston pump for a minimum of 30 minutes. Pumping will then continue until the turbidity of the development water is less than five nephelometric turbidity units (NTUs). A field turbidity meter will be used to monitor these levels. Wells screened in fine-grained material (e.g., silt and clay) may not develop to a turbidity less than 50 NTUs. In these cases, well development will continue until a minimum volume of groundwater equal to 10 well volumes is removed. Wells will not be developed until 24 hours after construction, or their recovery is completed (whichever is later). Development water will be contained, labeled, and staged for appropriate disposal.

Surveying. A site survey will be performed by Mr. Douglas Bonoff, a surveyor licensed to operate in New York (license number 050146). Information will be obtained for production of a composite map that accurately illustrates the locations and elevations of surface-soil samples, test pits, test borings, monitoring wells, and other pertinent features. Monitoring well head elevations will be determined with a vertical accuracy of ±0.01 foot. Locations and elevations will be referenced to a known benchmark.

3.1.4 Groundwater Sampling

The newly installed monitoring wells will be sampled for MGP constituents as presented in Table 7. These wells will be sampled a minimum of two weeks after installation and development have been completed. Groundwater sampling will be conducted in accordance with SOP No. 1023 (Appendix A).

Purging. Prior to groundwater sampling, three to five well volumes will be purged from each well to ensure that all stagnant water is replaced by representative formation water. A peristaltic pump with dedicated disposable nalgene and silicone tubing will be used to purge each well at a pumping rate of approximately 1,000 milliliters/minute (ml/min). While the monitoring well is being purged, pH, temperature, Eh, and conductivity will be monitored and recorded. When at least three well volumes have been purged and the pH, temperature, and conductivity values remain within 10 percent over several consecutive readings, the monitoring well will be sampled. At a maximum, five well volumes will be purged prior to sampling. Purge water will be contained, labeled, and staged for appropriate disposal.

Sampling. After each well is purged, groundwater samples will be collected and contained in glassware provided by the laboratory. Samples will be collected using a dedicated disposable polypropylene bailer and a peristaltic pump (pumping rate: 100 milliliters per minute). Samples will be collected for analysis in the following order: VOCs, SVOCs, PCBs, cyanide, and TAL metals. An in-line 0.4 micron disposable filter will be used when collecting the TAL metals sample. If turbidity of well development water is >50 NTU, an unfiltered sample will be collected also for TAL metals analyses. All samples will be kept on ice before and during shipment to the laboratory.

3.1.5 Equipment Decontamination

To prevent cross-contamination of samples by sampling devices, all equipment used for sample collection will be decontaminated before each use. At a location acceptable to O&R, a temporary decontamination pad with sides will be constructed during site mobilization. Decontamination waste fluids produced during the field program will be pumped into 55-gallon drums, labeled, and staged for appropriate disposal. Sampling equipment decontamination will be conducted according to Atlantic Technical Procedure No. 1060, included in Appendix A and outlined as follows:

- nonphosphate detergent and tap-water wash;
- tap-water rinse;
- 10 percent nitric acid rinse;
- triple distilled/deionized water rinse;
- methanol rinse;
- distilled/deionized water rinse; and
- air dry.

Upon drying, the decontaminated object will be wrapped in aluminum foil until used again.

This decontamination procedure will be used for any hand equipment, as well as the driller's down-hole tools. A pressurized steam cleaner and brushes will be used for decontamination of the backhoe and drill rig at the decontamination pad. All wash and rinse liquids will be consolidated during decontamination and transferred to the waste storage area following the completion of each boring and sediment sample. Two rinsate samples will be collected for each medium sampled.

3.1.6 Delaware Riverbank Inspection

GEI/Atlantic will perform an inspection of the Delaware River near the entrance of the former canal and will collect a sediment sample from this area.

3.2 Analytical Summary

The following table summarizes the planned sampling and analysis program. Analytical procedures will be in accordance with New York State Analytical Services Protocols. Category B deliverables will be provided by the laboratory.

Analyses per Round	No. of Sediment Samples	No. of Sub-Surface Soil Samples	No. of Ground-water Samples	No. Of Test Pit Samples	No. of Duplicates		No. of Rinsate Blanks		No. of Trip Blanks		No. of MS/MSD Samples		Total No. of Samples
					Soil	GW	Soil	GW	Soil	GW	Soil	GW	
VOC (8260)	1	5	4	TBD	1	1	1	1	0	1	1	1	17
SVOC (8270)	1	5	4	TBD	1	1	1	1	0	1	1	1	17
PCBs (8080)	1	5	4	TBD	1	1	1	1	0	1	1	1	17
Total Cyanide				TBD									
(9012)	1	5	4	TBD	1	1	1	1	0	1	1	1	17
TAL Metals				TBD									
(6000/7000)	1	5	4	TBD	1	1	1	1	0	1	1	1	17

Note:
TBD = to be determined based on field observations.

3.3 Risk Evaluation

The preliminary risk evaluation will be performed based on applicable NYSDEC and EPA risk assessment guidance. The evaluation will follow the approach outlined below.

Step 1: Problem Formulation. Historical, current, and expected future uses will be identified in order to define the site's context. Using this information, and the collected physical and chemical data, the most likely operable risk system at the site will be described. The conceptual risk system model will include a description of:

- chemicals of potential concern (COPCs);
- sources;

- environmental transport pathways;
- environmental fates; and
- exposure scenarios (which are made up of people, exposure pathways, and exposure routes).

Step 2: Development of Risk-Based Target Concentration. In this step, target concentrations for the COPCs will be developed based on the potential exposures and populations identified in Step 1. A range of targets will be developed because a range of acceptable individual chemical risk levels will be used (namely, a probability of 10^{-6} to 10^{-4} for carcinogens, and a Hazard Index of unity or 1.0 for non-carcinogens). The calculations will be parameterized using the collected site-specific physical data, reasonable maximum exposure (RME) values, and EPA-approved toxicological values from either the Integrated Risk Information System (IRIS) or the Health Effects Assessment Summary Tables (HEAST).

Step 3: Evaluate Potential Health Risks. Observed environmental concentrations of the different COPCs will be compared with the target values calculated in Step 2, as well as any applicable state or federal standards or guidance values. This comparison will provide information regarding whether the individual chemical concentrations exceed applicable health risk bright-lines (for example, *de minimis* risk), and will provide estimates of the risk levels contributed by each COPC. In addition, estimates of cumulative risk will be tabulated and considered in providing a preliminary characterization of the risk to potentially exposed populations.

Step 4: Evaluation of Potential Environmental Impacts. Potential environmental impacts will be considered qualitatively by identifying general conditions, cover types, trends, and critical habitat, as well as considering the potential for rare/endangered/threatened (R/E/T) species on or near the sites. The general natural resources of the area and their value will be described. Applicable environmental regulatory criteria will be identified. Potential contaminant-biota exposure pathways will be identified, as will exceedances of any applicable criteria.

3.4 Report Preparation

An investigation report will be prepared. The primary body of the report will include, at a minimum, the following information.

1.0 Introduction
2.0 Site Background
2.1 Site Physical Setting and Description
2.2 Surrounding Site Use and Demographics
2.3 Site Operational History
2.4 Regional Geology and Hydrogeology
3.0 Scope of Work
3.1 Description of Field Methods
4.0 Findings
4.1 Site Geology and Hydrology
4.2 Nature and Extent of Chemical Constituents
4.3 On-Site Impacts
4.4 Potential Off-Site Impacts
5.0 Risk Evaluation
5.1 Identification of Potential Receptors
5.2 Potential Off-Site Impacts
6.0 Potential Remediation Strategies for the Site
7.0 IRM Evaluation (If Appropriate)
8.0 Conclusions and Recommendations
9.0 References

4.0 PROJECT ORGANIZATION

The project team is shown in Figure 12 and briefly discussed as follows. The proposed project staff have the requisite health and safety training specified by OSHA regulations (29 CFR 1910.120 and 29CFR1926).

- **Mr. John Ripp** will be the In-House Consultant. He has over 15 years of MGP experience in New York and will ensure that O&R will receive high-quality and timely support throughout the project.

- **Ms. Martha Mayer** will be the Project Manager, responsible for completion of technically appropriate work on schedule and within budget. She has more than five years of MGP experience and has directed concurrent PSAs at New York MGP sites.

- **Mr. John Bogdanski, P.G.,** will be the Field Team Leader, responsible for sampling and analysis of environmental media in conformance with the approved Work Plan. He will coordinate support from the proposed drilling subcontractor, Aquifer Drilling and Testing (ADT), and laboratory subcontractor, NYTEST.

- **Dr. Kurt Frantzen** will complete risk evaluations based on documented, reasonable exposure scenarios. He has extensive New York State experience and has completed MGP risk analyses for sites throughout the United States. Dr. Frantzen will also provide risk communications public relations support to O&R as required.

- **Mr. Jerry Ackerman** will provide public relations support to O&R as needed. He has assisted several other utility clients with their public relations and Brownfields issues.

- **Ms. Sharon Owen, P.E.,** will evaluate candidate IRMs. She has evaluated and designed remedial actions for sites throughout the United States and is familiar with a wide variety of remedial technologies applied to former MGP sites.

- **Mr. Douglas Bonoff, L.S.,** is a New York licensed surveyor with 13 years of surveying experience. He will perform the survey tasks specified in the scope of work.

- **Ms. Lorie MacKinnon and Ms. Elissa McDonagh,** two experienced chemists, will undertake data validation. Both are familiar with New York State and EPA analytical protocols and the analysis of samples with MGP residues.

ADT will conduct boring and monitoring well installations.

Laboratory analyses will be completed by IEA Corporation, which is certified under the New York State Department of Health Environmental Laboratory Approval Program (ELAP).

5.0 SCHEDULE

The proposed project schedule is depicted in Figure 13. In the absence of a stipulated work plan review duration for NYSDEC in the Consent Order, six weeks has been assumed. The field program will be initiated in the spring of 1998 and will be completed by June of 1998.

APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN
PORT JERVIS, NEW YORK FORMER MGP SITE
PORT JERVIS, NEW YORK

NYSDEC CONSENT ORDER # D03-0002-9412

Submitted to:

Orange & Rockland Utilities, Inc.
Pearl River, New York

188 Norwich Avenue
Colchester, CT 06415
(860) 537-0751

March 9, 1998
Project 97679-1001

QUALITY ASSURANCE PROJECT PLAN

PORT JERVIS FORMER MGP SITE

PORT JERVIS, NEW YORK

NYSDEC CONSENT ORDER # D03-0002-9412

March 9, 1998

Submitted to:

Orange & Rockland Utilities, Inc.
One Blue Hill Plaza
Pearl River, NY 10965

Prepared by:

GEI Consultants, Inc.
Atlantic Environmental Division
188 Norwich Avenue
Colchester, CT 06415
(860) 537-0751

Project 97679-1001

Martha M. Mayer
Project Manager

CONTENTS

CONTENTS (continued)

CONTENTS (continued)

SECTION PAGE

LIST OF TABLES

LIST OF FIGURES

LIST OF ATTACHMENTS

1.0 PURPOSE AND SCOPE

This Quality Assurance Project Plan (QAPP) details the protocols and procedures to be followed during the subsurface investigation that GEI Consultants, Inc., Atlantic Environmental Division (GEI/Atlantic), will conduct on the Port Jervis former MGP site. The purpose of the protocols and procedures is to ensure that all investigatory activities will be performed in a manner consistent with the data quality objectives (DQOs) established for the project.

Furthermore, this QAPP identifies project responsibilities and prescribes guidance and specifications to make certain that:

- samples are identified and controlled through sample tracking systems and chain-of-custody protocols;
- field and laboratory analytical results are valid and useable by adherence to proper protocols and procedures;
- calculations and evaluations are accurate and appropriate;
- generated data are validated so they can be applied directly to gaining a complete understanding of the subsurface at the site to determine the extent of any contamination resulting from hydrocarbon impact, whether any waste attributed to former operations is present at the site, and whether or not there are any other off-site or on-site sources of contamination; and
- all aspects of the measurement process, from field through laboratory, are documented to provide data that are technically sound and legally defensible.

The requirements prescribed in this QAPP apply to all contractor and subcontractor activities, as appropriate, for their respective tasks.

The prime responsibilities detailed in Section 3.0, Project Organization, extend to all quality-related controls and activities. The quality control (QC) and quality assurance (QA) elements address essential project-specific components. The project-specific QA/QC requirements are aimed at preventing substandard or erroneous actions from occurring in these essential areas.

The following documents have been used to prepare this QAPP:

- *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans,* U.S. EPA 1983;

- *Guidance for Preparation of Combined Work/Quality Assurance Project Plans for Environmental Monitoring,* U.S. EPA 1984;

- *U.S. EPA Contract Laboratory Program, Statement of Work for Organic Analyses,* Doc. No. 0LM01.0 including revisions through 0LM01.8, August 1991.

- U.S. EPA *Contract Laboratory Program Statement of Work for Inorganic Analysis Multi-Media, Multi-Concentration, Documentation* No. ILM03.0.

2.0 PROJECT DESCRIPTION

2.1 Site Location

The Port Jervis former MGP site is located in the western portion of Port Jervis, New York, 400 feet northeast of the Delaware River. The site consists of a 1.2±-acre commercial/industrial parcel. The property is currently occupied by an O&R service center. The site is bounded by Brown Street (north), King Street (east), Pike Street (south), and Water Street (west).

2.2 Site History

The Port Jervis former MGP site was an active gas manufacturing facility from as early as 1880 to at least 1945. The site history is presented in detail in the attached work plan.

2.3 Project Goals and Objectives

The PSA will address each of the following.

- Physical Setting and Site Description
- Surrounding Land Use and Demographics
- Site Operational History
- Site Geology and Hydrogeology
- Nature and Extent of Chemical Constituents
- On-Site and Off-Site Impacts
- Potential Receptors
- Preliminary Risk Evaluation
- Interim Remedial Measure Identification, as appropriate
- Applicable Remedial Strategies

The work plan details the methods and practices to be utilized during field sampling. For further details, see the project scope of work and the project work plan.

2.4 Project Schedule

The schedule for the field investigation is given in the following table.

Field Investigation Schedule	
Activity	**Time Frame/Date**
Mobilization, Site Set Up	TBD
Surface-Soil Sampling	
Test Pit Excavation	
Boring Installation, Well Installation	
Well Development	
Groundwater Sampling	
Well Surveying	

3.0 PROJECT ORGANIZATION

GEI/Atlantic is responsible for the implementation of this project, including supervision of subcontractor activities, field activities, and the evaluation and interpretation of data.

An organization chart showing positions and reporting relationships is presented in Figure 1. Key GEI/Atlantic personnel assigned to this project are:

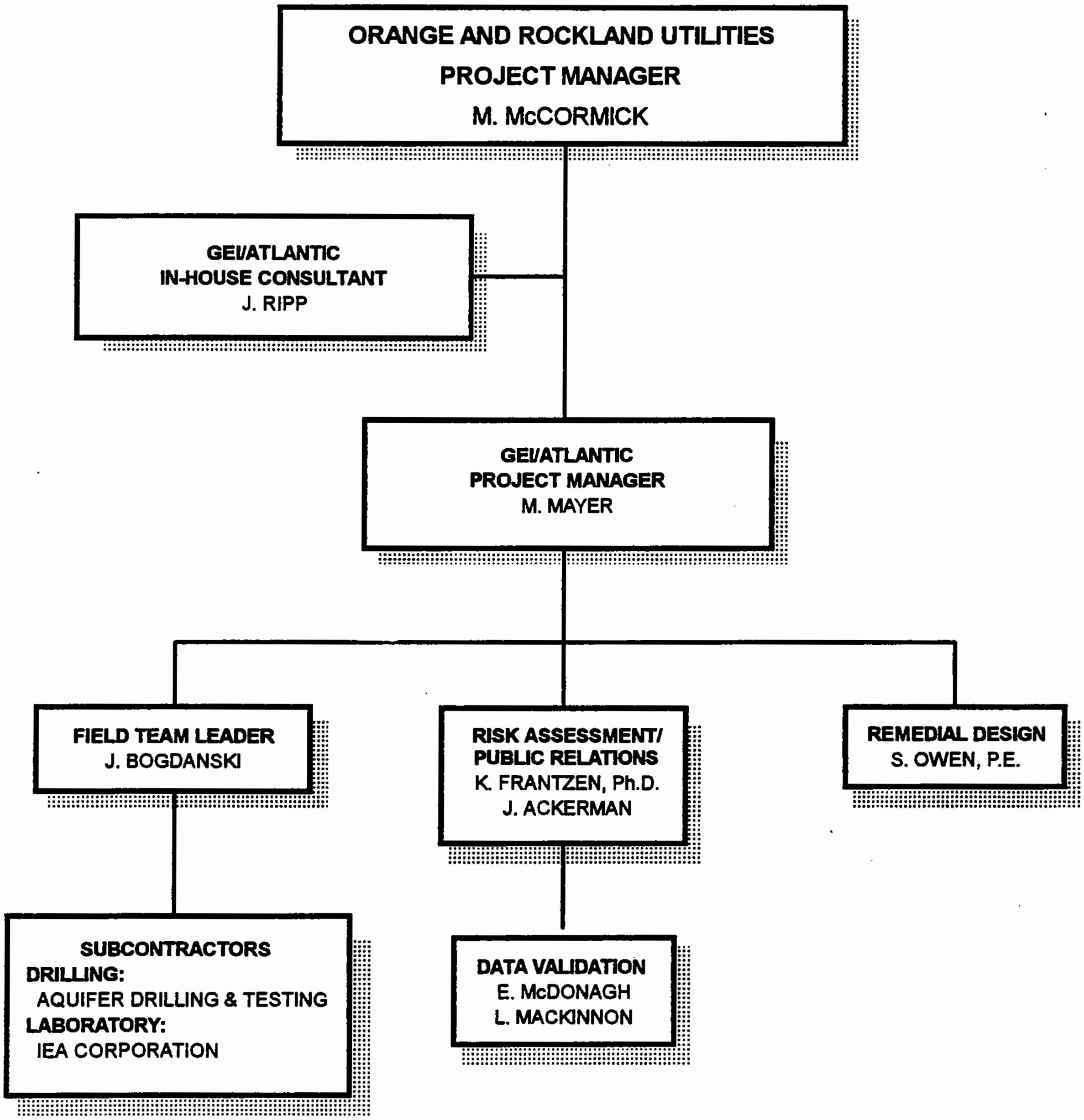
In-House Consultant:	John Ripp
Project Manager:	Martha Mayer
Quality Assurance Officer:	Lorie MacKinnon
Health and Safety Officer:	Robert Breeding, C.H.M.M., R.E.P.
Field Team Leader:	John Bogdanski
Project Engineer:	Sharon Owen, P.E.
Project Risk Assessor:	Kurt Franzen, Ph.D.
Public Relations Representative:	Jerry Ackerman

The primary responsibilities of key personnel positions are described in Table 1.

Analytical services will be provided by Nytest Environmental. Certifications under the New York State Environmental Laboratory Approval Program are summarized in Table 2.

Subcontractors participating in this project are:

• Prime Contract Laboratory	IEA Corporation 200 Monroe Turnpike Monroe, CT 06468
• Driller	Aquifer Drilling and Testing



GEI Consultants, Inc.
ATLANTIC ENVIRONMENTAL DIVISION

FIGURE 1
PROJECT ORGANIZATION

PORT JERVIS FORMER MGP SITE
PORT JERVIS, NEW YORK

OR&ROCK\97679\FIGJER-ORG.PRE

Table 1
Key Project Personnel and Responsibilities

Position	GEI/Atlantic Key Personnel	Areas of Responsibility
In-House Consultant	John Ripp	• will ensure that the required resources are made available to accomplish the project objectives • overall program oversight • senior technical review • client contact on strategic issues
Project Manager	Martha Mayer	• project management and client contact • technical review and schedule • personnel and resource management
Quality Assurance Officer	Lorie MacKinnon	• data validation
Health and Safety Officer	Robert Breeding	• review of subcontractor Health and Safety Plan and procedures • assignment of site-specific Health and Safety Officers
Field Team Leader	John Bogdanski	• coordination of subcontractors • technical project and status report preparation
Environmental Engineer	Sharon Owen	• characterization of site subsurface
Project Risk Assessor	Kurt Franzen	• perform preliminary risk evaluation
Public Relations Representative	Jerry Ackerman	• provide PR services when needed

Table 2
Laboratory Certification

State	Responsible Agency	Analyses	Environmental Laboratory Approval Program Certification Number
IEA Corporation			
New York	Department of Health	CLP	101181
		Drinking Water	101975
		Non-Potable Water	101177
		Solid/Hazardous Waste	101180
		Air and Emissions	101179

4.0 QUALITY ASSURANCE OBJECTIVES

This section establishes the QA objectives for measurements that are critical to the project. The QA objectives are developed for relevant data quality indicators. The data quality indicators include method detection limit, precision, accuracy, completeness, representativeness, and comparability. The data quality objectives (DQOs) are based on project requirements and ensure: (1) that the data generated during the project are of known quality, and (2) that the quality is acceptable to achieve the project's technical objectives. Analytical options available to support the DQOs are defined in five general analytical levels, as presented in Table 3. The analytical support level is chosen to ensure that the established DQOs can be attained.

Table 3
Analytical Support Levels

These levels are distinguished by the types of technology, documentation used, and degree of sophistication, as follows.

- Level I: Field Screening. This level is characterized by the use of portable instruments to provide real-time data to assist in the optimization of sampling point locations and for health and safety support. Data can be generated regarding the presence or absence of certain contaminants (especially volatiles) at sampling locations. Air monitoring.
- Level II: Field Analysis. This level is characterized by the use of portable analytical instruments which can be used on site or in mobile laboratories stationed near a site (close-support laboratories). Depending upon the types of contaminants, sample matrix, and personnel skills, qualitative and quantitative data can be obtained. Headspace analyses.
- Level III: Laboratory Analysis. Using methods other than the CLP RAS, this level primarily supports engineering studies using standard EPA-approved procedures. **Note:** *Some procedures may be equivalent to CLP RAS without the CLP requirements for documentation.* MSE, PAC.
- Level IV: CLP Routine Analytical Services (RAS). This level is characterized by rigorous QA/QC protocols and documentation and provides qualitative and quantitative analytical data. Some regions have obtained similar support via their own regional laboratories, university laboratories, or other commercial laboratories. Confirmation Analyses, TCLP, TCL, TAL, total CN.
- Level V: Non-standard methods. Analyses which may require method modification and/or development. *CLP Special Analytical Services (SAS) are considered Level V.*

Procedures to assess the data quality indicators are given in Section 14.0.

4.1 Required Quantification Limit

The required quantification limit is the quantitative analytical level for individual analytes needed to make decisions relative to the objectives of the project. Quantitative limits may be expressed as the method detection limit or some quantitative level defined in terms relative to the program.

It should be noted that there is some ambiguity in the definitions and use of terms that define quantification limits. The method detection limit (MDL) presented herein is a well-defined and accepted entity, although attainable only under ideal laboratory conditions.

Method Detection Limit. The MDL is the minimum concentration of a substance that can be measured and reported with 99 percent confidence that the analyte concentration is greater than zero. MDL is determined from analysis of a sample in a given matrix type containing the analyte.

Practical Quantitation Limit. The practical quantitation limit (PQL) is the concentration in the sample that corresponds to the lowest concentration standard of the calibration curve.

4.2 Precision

Precision is an assessment of the variability of measurements under a given set of identical conditions. In environmental sampling, precision is the result of field sampling and analytical factors. Precision in the laboratory is easier to measure and control than precision in the field. Replicate laboratory analyses of the same sample provide information on analytical precision; replicate field samples provide data on overall measurement precision. The difference between the overall measurement precision and the analytical precision is attributed to sampling precision.

Laboratory analytical precision will be estimated by analyzing samples in duplicate: either the unspiked sample and its duplicate(s) or the matrix spike and matrix spike duplicate samples. Duplicate field samples will be analyzed to estimate variability caused by both field and laboratory procedures.

Duplicate field samples will be taken as indicated in the work plan.

4.3 Accuracy

The complete train of events involved in the measurement system, from sampling to analysis, affects the accuracy of the data generated.

Laboratory accuracy will be determined by using standard reference materials of known and traceable purity and quality, system monitoring compounds, compound spikes, matrix spike samples, and duplicate laboratory control samples. The Nytest Environmental QAP discusses the QA/QC procedures to be used in the analytical testing for this project (Attachment A), including a check for system accuracy in the absence of matrix effects. This will be accomplished by the preparation and analysis of spiked method blanks or laboratory control samples (LCS).

Accuracy will be expressed as a percentage of the true value [(X-T)100/T].

For field analytical measurements, equipment and instruments will be calibrated by using known standards as follows:

- GEI/Atlantic Technical Procedure No. 1050 - *Operation and Calibration of the Century Organic Vapor Analyzer Model OVA - 128* (calibrated using methane, 100 ppm).
- GEI/Atlantic Technical Procedure No. 1051 - *Operation and Calibration of the HNu System Photoionizer Model PI-101* (Ionizable Volatile Organics) (below 10.2 ev) (calibrated using isobutylene, 100 ppm).

Calibration gases are supplied by:

- Hazco Services
  Liquid Carbonic
  Chicago, IL 60603
- Scott Specialty Gases
  Wakefield, MA
- Calgaz
  Alphagaz/Liquid Air
  Cambridge, MD 21613

4.4 Representativeness

Representativeness is a measure of how closely the data collected portray the conditions of the site under investigation. Standard operating procedures (SOPs) will be used in sample collection to ensure that the sample is truly representative of the condition of the site for the matrix being sampled.

The sampling plan and sampling procedures to be used are discussed in Section 5.0.

4.5 Comparability

Comparability is a qualitative parameter expressing confidence that one set of data can be compared with another. Standardized sampling and analytical procedures will be used to ensure that the reported data can be used in comparison with any future site investigations. To facilitate data comparison, the data-reporting format as presented below will be used:

- Conventions (units reported as): for solids - weight/unit weight (i.e., mg/kg)
  for liquids - weight/unit volume (i.e., µg/liter)

- Use common chemical name with corresponding CAS code.
- Report all data for soils on a dry-weight basis.

4.6 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system compared with the amount that was anticipated. The objective for completeness is a sufficient amount of valid data to achieve a predetermined statistical level of confidence. Critical samples must be identified and plans must be formulated to secure requisite valid data for these samples.

GEI/Atlantic anticipates that 90 percent of the data will be complete. The following precautions have been taken to ensure that this percentage will be met: materials for critical parameters will be retained, if resampling is required; strict adherence to holding times will be required.

5.0 SAMPLING PROCEDURES

5.1 Sample Types, Location and Frequency

The subsurface-soil sampling program will be implemented through the placement of three soil borings. The boring locations and analytical rationales are given in the work plan. Soil borings will be advanced by a hollow-stem auger drill rig. Drilling and sampling operations will be conducted in accordance with GEI/Atlantic Technical Procedure No. 1021, *Field Procedures for Collection of Subsurface Soils,* July 1, 1986.

Logging and screening of soils will be conducted in accordance with GEI/Atlantic Technical Procedure No. 1030, *Field Procedures for Logging Subsurface Conditions During Test Borings and Well Logging,* July 1, 1986.

GEI/Atlantic will collect a maximum of one subsurface-soil sample per boring to chemically characterize obvious wastes and to determine if MGP wastes are present. Soil samples for laboratory analysis will be collected based on field observations and field instrument readings in accordance with GEI/Atlantic Technical Procedure No. 1021, *Field Procedures for Collection of Subsurface Soils,* July 1, 1986.

GEI/Atlantic will collect one sediment sample. This sample will be taken in accordance with GEI/Atlantic Technical Procedure No. 1022, *Field Procedures for Collection of Surface Water and Sediment Samples for Hazardous Waste Determination.*

Sample collection equipment and QC procedures during sampling will be in accordance with those described in GEI/Atlantic Technical Procedure No. 1021, *Field Procedures for Collection of Subsurface Soils*, July 1, 1986.

Three groundwater monitoring wells will be installed as shown in the work plan. The specific location of each well screen will be determined in the field based on depth to water table. The wells will be developed in accordance with GEI/Atlantic Technical Procedure No. 1023. Water level measurements will be taken before and after well development.

Three groundwater samples will be collected from wells installed during the drilling program according to the rationales and analytical summaries in the work plan. Prior to obtaining a sample from each well, the groundwater level will be measured to the nearest 0.1 foot with an electronic water level meter.

Following the measurement of the water levels and prior to collection of samples, an amount of water equal to approximately three well volumes will be purged. Purging will be accomplished with a peristaltic pump, at a flow rate of 500 millimeters/minute (ml/min). Purging of wells will be conducted in accordance with GEI/Atlantic Technical Procedure No. 1023.

Containers with appropriate preservatives will be supplied by the appropriate laboratory. A list of containers, preservatives, and sample holding times is presented as Table 4.

All-weather bound field notebooks will be used to record all field information relevant to sampling, such as sampling history, sampling conditions, and analyses to be performed.

All referenced GEI/Atlantic Technical Procedures are presented in Appendix A of the work plan.

5.2 Sample Identification

Each sample will be identified using an alpha numeric code to be used in all field notes, chain-of-custody forms, and laboratory reports. The sample identification system will consist of the letters RP for site identification, sample type, and number.

Example: PTGW0501 = Port Jervis Groundwater Sample One from Monitoring Well Number 5.

Waterproof labels marked with indelible ink, or equivalent, will be used on all sample containers.

5.3 Equipment Needed for Sampling, Preservation, and Decontamination

Equipment needed for sampling, preservation, and decontamination is presented in Table 5.

Table 4
Solids and Liquids
Sample Quantities, Containers, Preservatives, and NYSASP[a] Analyses

Analysis	Container	Preservative	Holding Time
Solid Phase			
VOC	(2) 40-ml glass vials with Teflon septums	4°C	7 days
SVOC	16 oz. wide-mouth glass with Teflon-lined cap	4°C	7 days
TAL Metals Cyanide	16 oz. wide-mouth glass with Teflon-lined cap	4°C	6 months 12 days
Liquid Phase			
VOC	(2) 40-ml glass vials with Teflon septums	4°C 0.008% $Na_2S_2O_3{}^5$ HCL pH <2	7 days @ 4°C 10 days with HCL
SVOC	(2) 1-liter glass with Teflon-lined cap	4°C	5 days from VTSR
TAL Metals (filtered)	1-liter plastic with Teflon-lined cap	HNO^3 pH <2	6 months
Cyanide	1-liter plastic with Teflon-lined cap	NaOH pH >12	12 days
Total Phenols	1-liter glass with Teflon-lined cap	H_2SO_4 pH <2	26 days

a. New York State Analytical Services Protocols (12/91)
VTSR - verified time of sample receipt
HCL - hydrochloric acid
HNO^3 - nitric acid
H_2SO_4 - sulfuric acid
NaOH - sodium hydroxide

Table 5
Equipment Needs

Item	Comments
Camera (35 mm) and Film	Record site conditions
Camera (videotape)	Videotape test pit operations
OVA, PI-101	Real time measurement, volatile organic compounds
Pumps, Peristaltic, ISCO	Groundwater sampling
Bailer	Groundwater sampling for volatiles
Water Level Meter	Depth to water measurements
pH Meter, Reference Electrode Filling Solutions	Groundwater measurement
Conductivity Meter, Calibration Solutions	Groundwater measurement
Temperature Probe	Groundwater measurement
Turbidity Meter	Groundwater measurement
Magnetic Locator	Screening boring and excavation areas for metallic objects
Nalgon Tubing	Groundwater sampling
Field Notebooks	Recordkeeping
Write-in-Rain Pens	Recordkeeping
Low Sudsing Detergent (Alconox)	Decontamination
Bootwash Basin (plastic)	Decontamination
Nitric Acid (0.1N)	Decontamination
Methanol (0.1)	Decontamination
Deionized/Distilled Water	Decontamination
Squeeze bottles (polyethylene)	Decontamination
Sprayers (large)	Decontamination
Plastic Bucket	Decontamination
Scrub Brushes (large)	Decontamination
Folding Tables	Decontamination, sampling
Paper Towels	Cleaning
Aluminum Foil	Protect clean equipment
Hand Auger	Soil sampling
Split Spoons	Subsurface sampling
Latex Gloves	Sampling
Folding Ruler	Sampling
Measuring Tape	Sampling
Stainless-Steel Bowls	Sampling
Stainless-Steel Spoons	Sampling

Table 5-6 (continued)
Equipment Needs

Item	Comments
Stainless-Steel Spatulas	Sampling
Sample Jars	Sampling
Ice	Sample cooling
Sample Coolers	Sample shipping
Shipping Labels	Sample shipping
Sampler Labels	Sampling
GEI/Atlantic Technical Procedures	
Chain-of-Custody Forms	Sample control
Airbill Shipping Forms	Sample shipping
Polyethylene Sheeting	Separation of excavated material
General Purpose Tools	
Traffic Cones	Safety
Caution Tape	Safety
Five-Gallon Buckets With Lids	
Plastic Trash Bags	
DOT-Certified Drums for Cuttings	
Air Horn	Safety
First Aid Kit	Safety
Respirators, Cartridges	Personal safety
Tyvek Suits	Personal safety
Hard Hats	Personal safety
Hearing Protection	Personal safety
Safety Shoes	Personal safety
Boot Covers	Personal safety

6.0 SAMPLE CUSTODY

Sample custody and control procedures are an integral part of any field operation. Sample custody is often implemented through chain-of-custody procedures.

The objective of the chain-of-custody procedure is to document the history of each sample and its handling, from collection through final disposition after analysis has been performed. Chain-of-custody procedures may be mandated for certain investigations, especially if the data being generated will be used in any legal proceedings. Whether mandated or not, chain-of-custody procedures should be standard operating procedures for site investigations.

Chain-of-custody procedures will be used for all samples collected during this investigation. A sample chain-of-custody form is given as Attachment B.

Samples, until shipped, will be retained at all times in the field crew's custody. Samples will be shipped to the appropriate laboratory at the end of each day or every other day by an overnight courier. The scheduling of sample shipping to the laboratory will be timed to ensure meeting sample holding times. All samples will be kept on ice or refrigerated and protected from the sunlight until shipped.

Accountability for samples collected will be the responsibility of John Bogdanski, the Field Team Leader. Sample custody seals will be placed over each sample shipping container lid so that any tampering can be detected.

After accepting custody of the shipping containers, the laboratory will document the receipt of the shipping containers by signing the chain-of-custody record. The laboratory will record the date and time of receipt, assess the condition of the shipping containers and sample bottles, and look for other potential discrepancies.

The laboratory sample custodian will bring discrepancies to the attention of the laboratory program administrator for reconciliation with the appropriate field investigators. After all discrepancies are resolved, the laboratory will acknowledge receipt of the samples and return a signed copy of the chain-of-custody form.

The laboratory procedures for sample receipt and sample security are detailed in the Nytest Quality Assurance Plan.

7.0 DECONTAMINATION

7.1 Decontamination Sequence and Procedure

Decontamination procedures will be followed as specified in GEI/Atlantic Technical Procedure No. 1060, *Cleaning Procedure for Sampling Devices Used In Environmental Site Investigations, February 28, 1990*. Specifically, heavy equipment such as augers, drill rods, and the backhoe will be steam-cleaned in the decontamination area over a portable trough to collect wastewater. Immediately adjacent to the equipment decontamination area there will be facilities for boot and glove washing, disposable coverall removal, and hand washing. Wastewater from equipment and personnel decontamination activities will be consolidated in 55-gallon drums for proper disposal.

7.2 Decontamination Location

The decontamination location will be determined at the time of site mobilization.

8.0 CALIBRATION PROCEDURES AND FREQUENCY

All analytical equipment will be calibrated according to known standards to maintain QA/QC objectives.

Field equipment will be calibrated by GEI/Atlantic personnel according to the manufacturer's instructions and GEI/Atlantic's Technical Procedures.

The following field instruments will be used during this investigation.

- Century Organic Vapor Analyzer Model OVA-128 - calibrate each day before use using GEI/Atlantic Technical Procedures, QA Procedure No. 1050, *Operation and Calibration of the Century Organic Vapor Analyzer Model OVA-128, July 1, 1986.*

Calibration procedures for laboratory equipment will be performed as written in the Nytest Environmental QAP.

9.0 ANALYTICAL PROCEDURES

The analytical methods listed in Table 6 will be used for analysis of samples for this investigation. These methods have been chosen to meet the data quality objectives outlined in Section 4.0.

Table 6
Analytical Methods

Method	Matrix	Analytes
EPA Method 8260	Subsurface Soils, Water	Volatile Organics,
EPA Method 8270	Soil, Water	Semivolatile Organics
EPA Method 8082	Soil, Water	PCBs
EPA Method 6000/7000 series	Soil, Water	TAL Metals
EPA Method 9012	Soil, Water	Cyanide

10.0 DATA REDUCTION, VALIDATION, AND REPORTING

10.1 Data Verification

Critical functions for determining the validity of generated data are: (1) strict adherence to the analytical methods, (2) assurance that the instrumentation employed was operated in accordance with defined operating procedures, (3) assurance that quality parameters built into the analytical procedures have been adhered to, and (4) confirmation that the data quality objectives have been met.

10.2 Data Reduction

Raw field data will be summarized by using a format that will facilitate interpretation, analysis, and evaluation. The data will be presented as tables, well logs, maps, charts, and graphs, as considered appropriate by the project manager.

10.3 Data Reporting

10.3.1 Laboratory Deliverables

Laboratory deliverables will consist of a hard-copy New York ASP Category B data package containing:

- a summary of laboratory activities performed for this project;
- a list of laboratory identifications, project identification numbers, and field descriptions for all samples, blanks, and QA samples;
- a summary of exceeded holding times with explanations;
- a table showing sample identification, analytical parameter, date of laboratory receipt, extraction date, date analyzed, and re-extraction and reanalysis dates;
- QA discussion for each parameter, including analytical anomalies, corrective actions, and samples lost;
- copies of field chain-of-custody records;

- detection limits for all parameters; and
- summary data sheets for all analyses with the corresponding instrument calibration and QA test forms.

10.3.2 Field Data

Field data will be reviewed by the technical supervisory staff for completeness and representativeness.

10.3.3 Technical Report

The verified field and analytical data will be used to prepare the PSA Report. In addition to descriptions of project methods, materials, and findings, the technical report will include: (1) changes to the original QAPP and the rationale for these changes, and (2) a summary of any limitations to the use of the data with conclusions on how these limitations affect the project objectives.

11.0 INTERNAL QUALITY-CONTROL CHECKS

Field and laboratory quality-control checks will be used to ensure project data quality objectives. QC checks will include replicates, split samples, spiked samples, blanks, laboratory control samples, internal standards, surrogate samples, calibration standards, and reagent checks.

11.1 Internal Checks for Laboratory Activities

Internal quality-control checks for laboratory activities will be performed as specified in the Nytest QAP.

11.2 Internal Checks for Field Activities

QA/QC procedures for field activities will include the collection of field blanks, field replicates, trip blanks, matrix spikes, and matrix spike duplicates. Duplicates will be collected as scheduled in the work plan.

12.0 PERFORMANCE AND SYSTEM AUDITS

Audits are an independent means of: (1) evaluating the operation or capability of a measurement system, and (2) documenting the use of QC procedures designed to generate data of known and acceptable quality.

12.1 Field Audits

Field audits will assess sample collection protocols, determine the integrity of chain-of-custody procedures, and evaluate sample documentation and data-handling procedures. Field audits will be scheduled by the project QA officer, project manager, or principal-in-charge, at their discretion. Written records of audits and any recommendations for corrective action will be submitted to the project manager.

12.2 Contract Laboratory Audit

Nytest was audited previously by GEI/Atlantic. A repeat review of laboratory operations will be performed.

13.0 PREVENTIVE MAINTENANCE

Preventive maintenance will be performed on field equipment in accordance with the manufacturer's recommendations.

- Century OVA-128 - as detailed in GEI/Atlantic Technical Procedures, QA Procedure No. 1050, *Operation and Calibration of the Century Organic Vapor Analyzer Model OVA-128, July 1, 1986.*

- YSI Model 3580 Water Quality Monitor (pH, Oxid./Red. potential, conductivity, temperature). Manufacturers' instructions for YSI Model 3530 pH Electrode, YSI 3550 Sample Chamber, YSI 3510 Temperature Probe, YSI 3540 — ORP Electrode, and YSI 3520 Conductivity Cell.

14.0 SPECIFIC ROUTINE PROCEDURES TO ASSESS DATA QUALITY INDICATORS

QC analyses conducted as a part of the testing program will provide a quantitative quality assessment of the data generated and their adherence to the data quality indicators. The data quality indicators ensure that the quality assurance objectives for the project are met.

14.1 Method Detection Limit

The MDL is defined as follows for all measurements:

$$\text{MDL} = (t_{[n-1,1-a=0.99]}) \times (s)$$

where: s = standard deviation of the replicate analysis;

$t_{(n-1,\ 1-a=0.99)}$ = student's t-value for a one-sided, 99 percent confidence level and a standard deviation estimate with n-1 degrees of freedom.

The MDLs calculated by the laboratory are determined under “ideal” conditions. MDLs for environmental samples are dependent on the sample aliquot, the matrix, the concentration of analyte, and any interferences present in the matrix, the percent of moisture, dilution factor, etc. The MDL for each sample analysis will be adjusted accordingly.

Practical Quantitation Limit. The PQL is the concentration of an analyte in the sample that corresponds to the lowest concentration standard of the calibration curve. As with the MDLs, the PQLs are dependent on the sample aliquot, the final sample volume, the percent of moisture, dilution factor, etc.

The PQL is determined as follows:

$$PQL = \frac{Lowest\ conc.\ std\ (ng)}{Volume\ injected\ (uL)} \ x\ \frac{Sample\ aliquot\ (mL\ or\ g)}{Final\ volume\ (mL)} \ x\ DF\ x\ \frac{100}{(100-PM)}$$

where: DF = dilution factor, including all dilutions or lost samples not accounted for in “sample aliquot/final volume” ratio;

PM = percent moisture for solid samples.

Analytes that are not detected in the sample analysis are reported on the data reporting form with the quantitation limits and a nondetect designation. Analytes identified above the MDL but below the quantitation limits are reported with the calculated concentration and an estimate designation. The estimate designation indicates that the concentration is estimated based on the assumption that the system is still linear below the calibration curve.

14.2 Precision

Variability will be expressed in terms of the relative percent difference or deviation (RPD).

When only two data points exist, the RPD is calculated as:

$$RPD = \frac{(Larger\ Value\ -\ Smaller\ Value)}{[(Larger\ Value\ +\ Smaller\ Value)/2]}\ x\ 100\%$$

For data sets greater than two points, the percent relative standard deviation (percent RSD) is used as the precision measurement. It is defined by the equation:

$$Percent\ RSD = \frac{Standard\ Deviation}{Mean}\ x\ 100\%$$

Standard deviation (SD) is calculated as follows:

$$SD = \sqrt{\sum_{i=1}^{n} \frac{(y_i - y)^2}{n-1}}$$

where: SD = standard deviation
y_i = measured value of the *i*th replicate
y = mean of replicate measurements
n = number of replicates

For measurements such as pH, where the absolute variation is more appropriate, precision is usually reported as the absolute range (D) of duplicate measurements:

$$D = |\text{first measurement - second measurement}|$$

or as the absolute standard deviation previously given.

RPD, %RSD, and D are independent of the error of the analyses and reflect only the degree to which the measurements agree with each another, not the degree to which they agree with the "true" value for the parameter measured.

14.3 Accuracy

Accuracy is related to the bias in a measurement system. Accuracy describes the degree of agreement of a measurement with a true value. Accuracy will be expressed as percent recovery for each matrix spike analyte by using the following equation:

$$\%\ Recovery = \frac{Css - Cus}{Csa}\ X\ 100\%$$

where: Css = measured concentration in spiked sample;
Cus = measured concentration in unspiked sample;
Csa = known concentration added to the sample.

Accuracy for a measurement such as pH is expressed as bias in the analysis of standard reference sample according to the equation:

$$\text{Bias} = pH_m - pH_t$$

where: pH_m = measured pH;
pH_t = the true pH of the standard reference sample.

14.4 Representativeness

Representativeness is a qualitative statement that expresses the extent to which the sample accurately and precisely represents the characteristics of interest of the study. Representativeness is primarily concerned with the proper design of the sampling program and is best ensured by proper selection of sampling locations and the taking of a sufficient number of samples. It is addressed by describing the sampling techniques, the matrices sampled, and the rationale for the selection of sampling locations.

14.5 Comparability

Comparability is a qualitative parameter expressing the confidence that one set of data can be compared to another. Comparability is possible only when standardized sampling and analytical procedures are used.

14.6 Completeness

Data completeness is a measure of the amount of useable data resulting from a measurement effort. For this program, completeness will be defined as the percentage of valid data obtained compared to the total number of measurements necessary to achieve our required statistical level of confidence for each test.

15.0 CORRECTIVE ACTION

If unacceptable conditions are identified as a result of audits or are observed during field sampling and analysis, the QA officer and the project leader will document the condition and initiate corrective procedures. The specific condition or problem will be identified, its cause will be determined, and appropriate action will be implemented.

A corrective action memorandum will be prepared, documenting the problem and detailing the corrective action to be initiated.

Corrective actions may include, but are not limited to, the corrective action matrix presented below.

Corrective Action Matrix

Problem	Corrective Action
Sample exceeded holding time criteria.	Resample and reanalyze.
Field instruments are not within calibration limits.	Calibrate instrument and retest once an acceptable calibration has been obtained.
Procedures are observed that are not in accordance with the QAPP.	QA officer is notified and involved personnel are retrained.

The efficacy of any corrective action will be assessed by project management to ensure that the deficiency or problem has been adequately addressed.

16.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Effective management of environmental investigations requires timely assessment and review of field and laboratory activities. The QA officer will be the interface between management and project activities in matters of project quality.

The QA officer will review the implementation of this QAPP. Reviews will be conducted at the completion of field activities and will include the results of any audits and an evaluation of data quality.

The contract laboratory will submit QA reports as part of their deliverable analytical data packages.

REFERENCES

U.S. Environmental Protection Agency. 1980. *Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans*, QAMS-005/80. Prepared by the Office of Monitoring Systems and Quality Assurance, Office of Research and Development, United States Environmental Protection Agency, Washington, D.C.

U.S. Environmental Protection Agency, *Data Quality Objectives for Remedial Response Activities*, Development Press, Office of Solid Waste and Emergency Response Directive 9355,0-7B, March 1987.

U.S. Environmental Protection Agency. 1986 Revision 1990. *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846*, Third Edition. Office of Solid Waste and Emergency Response, Washington, D.C.

U.S. EPA Contract Laboratory Program, *Statement of Work for Inorganic Analysis Multi-Media, Multi-Concentration*, Document No. ILM03.0.

U.S. EPA Contract Laboratory Program, *Statement of Work of Organics Analysis Multi-Media Multi-Concentration*, Document No. OLM01.0, including revisions through OLM01.8 (August 1991).

ATTACHMENT A

QUALITY ASSURANCE PROGRAM

IEA Corporation
Quality Assurance Plan

Doc# QAQ00102.CT
Date: 02/14/97
Page 1 of 75

IEA-CT Laboratory Quality Assurance Program

Prepared by:

Marsha K. Culik
QUALITY ASSURANCE MANAGER

for

IEA - Monroe, Connecticut

This document has been prepared by IEA Corporation and will be updated annually. The material contained herein is not to be disclosed to, or made available to any third party without the prior expressed written approval of the Corporate Quality Assurance Director.

TABLE OF CONTENTS

TABLE OF CONTENTS-Continued...

LIST OF FIGURES

LIST OF TABLES

APPENDIX

Section 1	Professional Profiles of Key Personnel
Section 2	IEA Chain-of-Custody Forms
Section 3	Sample Preservation and Holding Time Requirements
Section 4	Floor Plan
Section 5	Organizational Chart
Section 6	Corrective Action Form
Section 7	Example Listing of Laboratory Standard Operating Procedures (SOPs)
Section 8	Analytical Methods and Associated Method Detection Limits

1.0 QUALITY ASSURANCE PROGRAM-IDENTIFICATION FORM

Document Title: **IEA-CONNECTICUT QUALITY ASSURANCE PROGRAM PLAN**

Corporate Address:
IEA Connecticut
200 Monroe Turnpike
Monroe, Connecticut 06468

Company Official: Mr. Michael V. Bonomo
Title: Vice President of Connecticut Operations
Telephone: (203) 261-4458

Company Official: Mr. Jeffrey C. Curran
Title: Laboratory Manager

Company Official: Ms. Marsha K. Culik
Title: Quality Assurance Manager

Plan Coverage: IEA-Connecticut Laboratory including the following functions:

- Administration
- Sample Receipt
- GC Laboratories
- Quality Assurance
- Data Entry
- Report Production
- Computer Systems
- Inorganics Laboratories
- GC/MS Laboratories
- Facilities and Safety
- Sample Preparation Laboratories

Concurrences:

Name: Mr. Michael Bonomo
Title: Vice President of Connecticut Operations
Signature:
Date: 2/20/97

Name: Mr. Jeffrey Curran
Title: Laboratory Manager
Signature: Jeffrey C. Curran
Date: 2/20/97

Name: Ms. Marsha Culik
Title: Quality Assurance Manager
Signature: Marsha K. Culik
Date: 2/20/97

Name: Mr. David Houle
Title: President - IEA
Location: Cary, North Carolina
Signature:
Date: 2/17/97

ATTACHMENT B

CHAIN OF CUSTODY FORM

GEI CONSULTANTS, INC., ATLANTIC ENVIRONMENTAL DIVISION
188 Norwich Avenue, P.O. Box 297, Colchester, CT 06415
PHONE: (860) 537-0751 FAX: (860) 537-6347

№ 3128

CHAIN OF CUSTODY RECORD

PROJECT NAME: ____________________

PROJECT NUMBER: ____________________

							ANALYSIS										
SAMPLE NO.	DATE	TIME	GRAB	COMP	NO. OF CONT.	SAMPLE MATRIX	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	PRSV.	COMMENTS

Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received by:
Relinquished by:	Date/Time	Received by:	Relinquished by:	Date/Time	Received for Laboratory by:

Method of Shipment:

Shipping Waybill No.:

Remarks:

SAMPLED BY:

(Print Name) ____________________ Signature ____________________

(Print Name) ____________________ Signature ____________________

PT 1:ORIGINAL PT 2:Laboratory Project Manager-yellow PT 3:Field Copy-pink

SP-3479 8/97