Remedial Investigation Work Plan

Glen Cove Former
Manufactured Gas Plant Site
Glen Cove, New York

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1. Introduction

In May 1999, Dvirka and Bartilucci Consulting Engineers (D&B) submitted a draft Investigation Work Plan (1999 Work Plan) to the New York State Department of Environmental Conservation (NYSDEC) and the New York State Department of Health (NYSDOH) for investigation of the Glen Cove former Manufactured Gas Plant (MGP) (site). The 1999 Work Plan was subsequently approved by the NYSDEC in January 2000. However, the 1999 Work Plan did not consider the due diligence site investigation work that was completed in 2000 subsequent to its development. Therefore, on behalf of KeySpan Corporation (KeySpan), GEI Consultants, Inc. (GEI) prepared this work plan to:

- Summarize the previous investigation activities
- Present a comprehensive conceptual model of the site based on previous work, and
- Present a scope of work based on all the existing subsurface investigation data.

This Work Plan is submitted to the NYSDEC and the NYSDOH for their review and approval as part of KeySpan's Voluntary Cleanup Application for the site. Implementation of the scope of work described herein is intended to generate sufficient data to complete the Remedial Investigation (RI), thereby defining the nature and extent of soil and/or groundwater impacts associated with the former MGP operations. GEI developed this Work Plan based upon the following previous investigation reports for the site:

- *Preliminary Assessment Report*, NUS Corporation, June, 1989
- *Phase I Site Investigation Report,* GEI Consultants, Inc., April 1997
- *Limited "Screening" Investigation,* Long Island Lighting Company (LILCO), July 1998
- *Abandoned Utility Investigation and Closure Work Plan,* Foster Wheeler, February 1999
- *Due Diligence Investigation,* Dvirka and Bartilucci, February 16, 2000
- *Investigation Work Plan,* Dvirka and Bartilucci, October 2000

A summary of these previous investigations is included in subsection 1.3 of this Work Plan. This Work Plan has been prepared to be consistent with the NYSDEC draft Guidance for Site Characterization and Remedial Investigations dated December 25, 2002. In addition, this Work

Plan incorporates comments provided by NYSDEC in their September 15, 1999 correspondence regarding the 1999 D&B Work Plan.

1.1 RI Work Plan Objectives and Scope

The purpose of this Work Plan is to describe the methods and procedures to be implemented in performing the RI. This Work Plan includes the following components:

- A brief summary of the site history
- A discussion of the site location and environmental setting
- A discussion of the nature and extent of contamination
- A conceptual site model
- A sampling and analysis plan

The appendices contain an Environmental Data Resources (EDR) Report Executive Summary (Appendix A), Sanborn Fire Insurance Maps (Appendix B), previous site investigation data (Appendix C), a laboratory quality assurance project plan (QAPP) (Appendix D), a community air monitoring program (CAMP) (Appendix E), GEI's standard operating procedures (SOPs) (Appendix F), and the Remedial Investigation Health and Safety Plan, Glen Cove Former Manufactured Gas Plant Site (Appendix G).

1.2 Background

1.2.1 Site Description

The Glen Cove former MGP site is located near the north shore of Long Island, New York, east of Hempstead Harbor, at the intersection of two transportation corridors, Long Island Railroad (LIRR) and Route 107. Figure 1 depicts the site and surrounding community. The site covers a 1.91-acre area and its configuration is roughly L-shaped (Figure 1). A mixed commercial/residential neighborhood is located east and south of the site. The site is currently owned by the Long Island Power Authority (LIPA) and is operated as a LIPA electrical substation. Topographically, the site resides in a depression bounded on the north by an embankment leading up to LIRR tracks. On the east and south sides of the site, residential properties sit above the steep embankments bordering the site. The west side of the site is wooded and slopes toward the culverted Glen Cove Creek. Route 107 is located west of Glen Cove Creek. Site access is via an access road from Grove Street (Stanco Street). The entire substation portion of the site is fenced, as is access to the wooded western portion of the site, and access from Grove Street. Plate 1 presents the current configuration of the site along with topographic contours.

1.2.2 Site Operating History and Ownership

The former Glen Cove MGP began operation in 1904 under the ownership of the Sea Cliff and Glen Cove Gas Company. The site provided gas to customers in Sea Cliff, Glen Cove and the Town of Oyster Bay. Except for the year of 1912, when the site was leased to a company based in New Jersey, it was owned and operated by the Sea Cliff and Glen Cove Gas Company. In 1923, however, that company was purchased or merged with the Long Island Lighting Company (LILCO). In 1929, LILCO closed the plant and the manufacturing facilities were demolished shortly after. In 1998, when Brooklyn Union and LILCO merged and KeySpan Corporation was formed, the ownership of the Glen Cove site was transferred to LIPA. Currently, the site is occupied by a substation that is owned by LIPA and operated under contract by KeySpan. Tables 1 and 2 present a summary of ownership and gas production for the plant, respectively.

The overall plant layout is indicated on Plate 1. The plant originally included a 60,000 cubic foot gasholder that was identified first in a 1908 Sanborn Fire Insurance Map. The plant was augmented with a 40,000-cubic foot high pressure Hortonsphere gas holder in 1925 that was apparently used for distribution purposes. Other MGP structures that may have handled tar or feedstock materials include a tar tank and oil tanks located near the eastern end of the plant. Gas tanks depicted in a 1925 Sanborn map reflect an expansion of pressurized on-site gas storage for the distribution system.

The plant remained within approximately the same small operating footprint as depicted in Plate 1 throughout its history. Gas manufacturing operations ceased at the site in 1929. Gas storage continued through the 1950's with the arrival of pipeline natural gas. The existing electrical substation was constructed in the mid-1960's based on available on 1966 aerial photograph. Appendix B contains copies of Sanborn Maps that illustrate the historic plant layout.

1.2.3 Environmental Database Search

As part of the preparation of this Work Plan, GEI conducted an environmental records review of the site and surrounding properties through Environmental Data Resources (EDR) to evaluate potential up-gradient sources of contamination. The area searched was that stipulated by ASTM search distances. EDR searched available environmental government database records and provided a report that met the requirements of ASTM Standard Practice for Environmental Site Assessments, E 1527-00. A summary of the EDR report is included in Appendix A.

The EDR report revealed that there were no recorded listings for the former MGP site. The current electrical substation (Orchard Substation) was listed as a large quantity generator. Numerous off-site properties were identified as having environmental records. Of those reported, sites that have conditions that could potentially impact groundwater at the former MGP

site were considered. Based upon this review, the following types of sites were found in the vicinity of the former MGP:

- Resource Conservation and Recovery Information System (RCRIS)-Small Quantity Generators (SQG) [includes sites that generate, store, treat or dispose of hazardous waste]: 4 listed sites
- Leaking storage tank incident report (LTANK) [includes sites with aboveground or below ground storage tanks that failed tank tests, failed tanks, overfilled tanks]: 1 listed site
- Underground Storage Tank (UST) [USTs that are listed in the NYSDEC petroleum bulk storage tank program]: 3 listed sites
- New York Spill Incident: 1 listed site

Many of these sites had multiple listings. Summary information for these sites is presented below.

- Rallye Motors, Incorporated (20 Cedar Swamp Road) was listed as a RCRIS-SQG (EPA Identification Number 1000293623); LTANK listing (failed tank test due to mechanical equipment), UST listing (two 2,500-gallon waste oil USTs, one 4,000-gallon gasoline UST indicated as empty, and three empty USTs with 13,000 gallons total capacity)
- Porta Systems Corporation (1 Alexander Place) was listed as an RCRIS-SQG (EPA ID number 1000405968) with historic violations and manifest information in Connecticut and New York.
- Micronics Technology (7 Alexander Place) was listed as a RCRIS-SQG (EPA ID number 1000556204)
- S&G Cleaners (10 Cedar Swamp Road) was listed as a RCRIS-SQG (EPA ID number 1000107347)
- Glen Cove High School/ Schools (Cedar Swamp Road/Desoris Avenue) were listed for LTANK incidents (failed tank tests that occurred because of mechanical equipment failures. Both tanks were reportedly removed)
- Transformer leak (Grove Street and Hazel Street) was listed for leaking approximately 4 gallons of transformer oil that was subsequently washed into the storm sewer.

These sites were located upgradient of the subject site. Historic releases of petroleum products and other chemicals from these sites could potentially impact the groundwater under the site.

Detailed database information regarding for these site and site locations are contained within the EDR summary report contained within Appendix A.

1.2.4 Sanborn Map Evaluation

Sanborn Fire Insurance maps were reviewed for selected years from the early 1900s until the early 1970s. A review of historic Sanborn maps was completed for surrounding land use activities that were located topographically upgradient of the site and could potentially impact groundwater beneath the site. Available Sanborn Maps from 1908, 1915, 1925, 1931, 1947, and 1972 are located in Appendix B. These maps summarize the adjacent land-use for the area surrounding the former MGP site. Three operations historically located upgradient from the site that stored and/or handled petroleum (gasoline and fuel oil) or have had historic operations that could potentially impact site groundwater.

- Standard Oil Company (22 Cedar Swamp Road [formerly 1222-1224 Cedar Swamp Road]) previously stored bulk petroleum in aboveground storage tanks from approximately 1908 through 1925. Gasoline underground storage tanks were depicted at the parcel from circa 1931 through 1947. This site was subsequently developed as an automobile sales and service facility circa 1972. The activities and waste handling activities of these historic facilities are unknown at this time.
- Residential gasoline UST is depicted at 28 Cedar Swamp Road from circa 1931 through 1945. The status of this tank is unknown
- Residential gasoline UST is depicted at 20 Grove Street from circa1925 through 1931.

1.3 Previous Investigations

1.3.1 Preliminary Assessment Report, NUS Corporation, June 1989

The NUS Corporation, representing the United States Environmental Protection Agency (EPA), completed a Preliminary Assessment (PA) of the former Glen Cove MGP in 1989. The PA included the review of historical documents, agency records and a site reconnaissance. NUS concluded in the June 1987 Final PA report that activities related to the storage and disposal of wastes generated during the MGP operations or during facility demolitions were unknown, but that there may be a potential for polychlorinated biphenyls (PCBs) to be present at the site because of the electrical substation. The former MGP is not an NPL- or State-listed site.

1.3.2 Phase I Site Investigation Report, GEI Consultants, Inc., April 1997

- A Phase I Site Investigation Report was prepared by GEI for the Glen Cove former MGP site.

The Phase I field investigation consisted of surface soil sampling, shallow subsurface-soil sampling using hand tools, test borings with subsurface soil sampling, monitoring well installations and groundwater sampling. The Phase I report concluded the following:

- NAPL was observed in soils on the northwestern portion of the site in the vicinity of the former 60,000 cubic feet gas holder. Fill material below 7 feet was stained and contained concentrations of polycyclic aromatic hydrocarbons (PAHs). Isolated tar seams and odors were found in native soil between 15 and 21 feet below ground surface (bgs) until a tight sand and gravel layer was encountered that appeared to inhibit downward migration of contaminant. Elevated benzene, toluene, ethylbenzene, and xylene (BTEX) and PAH concentrations and sheens in groundwater co-occurred with the presence of observed tar in soils.
- No visible evidence of MGP residues was encountered during an inspection of Glen Cove Creek.
- No former MGP structures were encountered. Borings in the vicinity of the former oil tanks and tar tank did not encounter impacts.
- No imminent risk to on-site workers or the public was identified by the Phase I.

1.3.3 Limited "Screening" Investigation, LILCO, July 1998

In June 1998, LILCO conducted a limited "screening" investigation at the site in preparation for improvements planned for the site. Ten soil borings were advanced to a depth of 18 feet bgs. With the exception of one boring, each of the ten borings had one composite sample collected for laboratory analysis. One of the borings in the location of a proposed utility pole had three composite samples collected across three separate intervals. Samples were analyzed for PAHs and volatile organic compounds (VOCs) (BTEX and MTBE). Additionally, samples were submitted for PCB and metals (lead and arsenic) analysis.

MGP process residuals were not observed during completion of these borings. Total PAHs were identified in the laboratory results ranging from 0 to 1,596 milligrams per kilogram (mg/kg) with the highest concentrations identified along the northern portion of the substation). VOCs, PCBs, and metals were not observed in significant concentrations.

1.3.4 Abandoned Utility Investigation and Closure Work Plan, Foster Wheeler, February 1999

Foster Wheeler Environmental Corporation (Foster Wheeler) prepared an "Abandoned Utility Investigation and Closure Work Plan" in February 1999. The work plan identified procedures to identify, cut, fill, and plug abandoned inactive utility pipelines. The work was implemented by Dvirka and Bartilucci in May of 1999.

A drawing entitled "Cut And Plug Program Excavation And Soil Sample Location Map" produced by Dvirka and Bartilucci depicts the location of excavations and soil samples. Analytical results from these activities were not formally presented in a report, and are presented as part of this document (Section 3.1). Analytical results are contained within Appendix C.

1.3.5 Due Diligence Investigation, Dvirka and Bartilucci, February 16, 2000

A Due Diligence Investigation was completed by D&B for KeySpan and it was reported and submitted to the NYSDEC on February 16, 2000. This investigation focused on the area of steep embankments directly to the north and south of the substation. Three borings (GCSB-25 through GCSB-27) with subsurface samples, three surface samples (GCSS-16 through GCSS-18) and three "ash" samples (GCAS-01 through GCAS-03) were collected adjacent to the retaining wall on the south side of the substation. Four borings (GCSB-28 through GCSB-31) were completed on the top of the steep embankment along the northern property line adjacent to the ROW for the LIRR.

Analytical results of soil borings completed in the area revealed trace BTEX and total cyanide concentrations and concentrations of total PAHs ranging from non detect to 45.3 mg/kg. PCBs were not detected in any of the analytical samples collected. Observed metals concentrations were consistent with those found in historic fill material at the site. Analytical results of surface soil samples collected in this area (GCSS-16 through GCSS-18) contained total PAH concentrations of ranging from 12.2 to 22.9 mg/kg.

Soil borings GCSB-28 through GCSB-31 were completed to a total depth of 36 to 47 feet bgs on the top of the embankment on the northern side of the substation. Fill material (black soils with coal fragments, wood fragments, clinkers with odors) was encountered within each of the borings from the ground surface to approximately 32 feet bgs and was characterized by trace detections of BTEX and total cyanide and PAH concentrations. Oily soils with odors were noted within GCSB-29 and soils with sheen and odor within GCSB-30. Concentrations of total PAHs ranged from non detect to 1,595 mg/kg with the highest concentrations observed in GCSB-29 at a depth of 34 to36 feet bgs. Total BTEX concentrations from these samples were all below 1 mg/kg. Metals concentrations were in the range of background concentrations and no PCBs were detected.

1.3.6 Investigation Work Plan, Dvirka and Bartilucci, October, 2000

In May 1999, D&B prepared a Draft Investigation Work Plan for KeySpan to complete a remedial investigation at the site. Based on KeySpan's January 18, 2000 response to NYSDEC/NYSDOH comments of the DRAFT D&B Work Plan, final approval was received by NYSDEC in January 25, 2000. Based on this approval the Work Plan was finalized in October 2000. The field work was scheduled; however, work has not yet commenced. Since that time, a comprehensive assessment of all available information has been made and is presented in Section 3.0 of this document. Based on this assessment, this work plan presents a revised scope of work (Section 4.0) from that approved in 2000.

2. Physical and Environmental Setting

2.1 Physical Setting

2.1.1 Topography

The site is located in a U-shaped topographic depression that is oriented to the west (Plate 1). The substation was built on a relatively flat bench that was created by historic fill placed within the topographic depression. A natural hillside forms the eastern side of the site where the elevation rises about 30 feet. Also, to the north, there is an artificial embankment created for the railroad right-of-way. There is a gentle slope to the west of the substation (former MGP) down to the Glen Cove Creek valley.

2.2 Geology

Information on the site geology was developed through previous site investigation information and published regional geological information.

2.2.1 Site Geology

The shallow stratigraphy beneath the site consists of marsh and alluvial deposits, which are both overlain by artificial fill. Cross Sections A-A′ through C-C′, depicted on Figure 5 through Figure 7, were developed to illustrate the shallow surficial geology at the site. Plate 1 illustrates the locations of the cross-sections and the boring locations. A general description of these three stratigraphic units is presented below.

Artificial Fill

Artificial fill is present across most of the site (Figures 6 and 7) and ranges in thickness from 11 to 28 feet. The artificial fill appears as two subgroups, which have been labeled “fill” and “black-stained fill with odors”. The fill subgroup overlays the black-stained fill and most likely represents a more recent fill than the unit found beneath. The artificial fill is thicker near the eastern hillside.

The railroad embankment is artificial fill and ranges in thickness at the center from between 25 and 30 feet.

Alluvial Deposits (Former Glen Cove Creek)

Alluvial deposits are present in the central portion of the site (Figures 6 and 7). As discussed in Section 2.3 Glen Cove Creek flowed just to the west of the MGP before it was channelized. The alluvial deposits consist of isolated sand and gravelly sand layers, which were likely associated with the historic Glen Cove Creek stream channel or an ancient stream channel. The top of this unit was encountered from approximately 14 feet bgs on the central portion of the former MGP site to approximately 32 feet bgs below the top of the railroad embankment. The alluvial deposits were encountered at similar elevations across the site and vicinity. Most of the previous borings drilled for the MGP site did not encounter the base of the alluvial deposits.

Marsh Deposits

Marsh deposits, where they have been observed, are generally found beneath the alluvial deposits. They have been observed in areas where deeper borings were drilled (Figures 5 and Figure 7). Marsh deposits consist of a dense clay to sandy-clay unit. As discussed in Section 2, historic topographic maps indicated that Glen Cove Creek previously flowed through the site and its course has been somewhat altered. The former Glen Cove Creek or ancient creek most likely deposited these marsh deposits. They were encountered from approximately 28 feet to 38 feet bgs.

2.3 Hydrogeology

The hydrogeology beneath the site is likely controlled by Glen Cove Creek, which is located on the western boundary of the site and flows in a northerly direction. The creek empties into Hempstead Harbor located approximately one mile from the site at which point the creek is tidally influenced. Glen Cove Creek is culverted under Route 107 (Glen Cove Arterial Highway) and is contained within a concrete channel adjacent to the site and the Long Island Railroad on the northern boundary of the site.

Based upon historic topographic maps, the path of Glen Cove Creek appears to have been altered several times over the last 60 years. USGS topographic maps for 1900, 1943, and 1979 depict different alignments for the creek next to the site. Figure 8 provides an interpretation of the relative locations for each of these creek alterations. Most recently, the Creek has been re-directed to flow underneath the Glen Cove Highway through an on-site culvert. This channelization of Glen Cove Creek is evident in the current culvert construction on the western boundary of the site. Based upon a previous inspection of the Glen Cove Creek culvert completed by GEI in 1997, the culvert flows west to east for approximately 90 feet before turning north near the site boundary for 140 feet. The culvert is of concrete construction in the southern portion and stone masonry construction in the northern portion.

The shallow unconfined water table aquifer was encountered at the site during the previous field investigations. Groundwater monitoring wells were installed to evaluate the groundwater quality and flow at the site. Seven monitoring wells (PZ-01 through PZ-07) were installed as part of the Phase I assessment. One round of groundwater monitoring data was collected as part of the investigation. Groundwater elevation measurements indicated that groundwater flow is to the west across the majority of the site toward Glen Cove Creek. Given that the current channel is culverted, it is unlikely that groundwater actually discharges to the current channel. However, the stream valley containing the current and former paths of Glen Cove Creek likely acts as the groundwater discharge point for the site and likely is also the drainage divide for the area.

3. Nature and Extent of Contamination

This section discusses the degree and extent of observed tar, staining, sheen, odors, and chemical constituents detected during the field investigations at the site from 1989 to the present. This section has been developed by GEI as a compilation of past field investigations completed by GEI, D&B, LILCO, and KeySpan. The sample locations from past investigations are presented on Plate 1.

GEI evaluated soil-boring logs contained in previous reports and investigation documents. In some cases the D & B soil impact descriptions on previous boring logs were not specific to the nature (e.g., MGP or non-MGP) of the impact. For example, where an "odor" or "oily appearance" was noted on the boring logs, the interpretation on the cross-section was described in terms of the more appropriate of one of the following terms describing the nature of the visual and olfactory soil impacts.

- **Saturated:** the entirety of the pore space of the soil matrix for a given soil sample was filled with a NAPL. The characteristics of the observed NAPL were used in the description (i.e., tar-saturated or petroleum-saturated).

- **Blebs:** observed discrete spherical or pockets of NAPL within a soil sample. The majority of the soil matrix did not exhibit the presence of NAPL beyond these discrete blebs. The characteristics of the observed NAPL were used in the description (i.e., tar blebs or petroleum blebs).

- **Stained:** the soil sample exhibited a discoloration not associated with natural processes. The color of the observed stain was used and if the characteristics of the staining material were discernible, they were also noted (i.e., tar-stained or petroleum-stained).

- **Sheen:** iridescence was observed within a soil sample. Sheens are typically noted in moist to wet soils.

- **Odor:** if an odor was observed, it was described based on its relative intensity and characteristics. Modifier terms such as strong, moderate, and faint were used to describe relative odor intensity. Descriptive terms such as tar-like or petroleum-like odors were also used.

Subsurface observations are depicted on cross sections presented in Figures 5, 6, and 7. Figure 9 presents a lateral extent map of the observed subsurface impacts. Plate 2 presents a summary of

the analytical results for total BTEX, PAHs, and total cyanide in surface-soil samples. Plate 3 presents a summary of the analytical results for BTEX, PAHs, total cyanide, and PCBs in surface soil samples. Plate 4 presents a summary of the groundwater analytical results and groundwater aquifer contours at the site.

Site data for investigations discussed herein have been previously submitted to NYSDEC and have been consolidated in this document. PAHs include the compounds listed below.

2-Methylnaphthalene	Anthracene
Benzo(b)fluoranthene	Chrysene
Fluorene	Phenanthrene
Acenaphthene	Benz(a)anthracene
Benzo(g,h,i)perylene	Dibenz(a,h)anthracene
Indeno(1,2,3-cd)pyrene	Pyrene
Acenaphthylene	Benzo(a)pyrene
Benzo(k)fluoranthene	Fluoranthene
Naphthalene	

The analytical results of the RI and previous investigations are discussed relative to the total BTEX, total PAHs (PAH), and total cyanide (TCN).

3.1 Soils

Soil samples have been collected from areas associated with former MGP structures and historic fill. The sections below address each area based on the results of past site investigations.

Tar-saturated soil, blebs, sheens, staining, and odors were observed in site soils. Tar-saturated soils at the site were generally limited to impacts from the former 60,000 cubic foot gas holder located in the center of the property.

Generally the site is underlain by a 15- to 29-foot-thick layer of mostly sandy artificial fill. The fill is underlain by intermittent sand and gravely-sand layers. Below these courser-grained deposits, a dense clay and sandy-clay unit has been observed. Soil impacts observed in the courser sand and gravel layers indicate a migration pathway on top of the confining layer formed by the historic creek bed. The orientation of the confining layer appears to prevent potential migration of dissolved groundwater impacts to the west.

3.1.1 Surface Soil

PAHs, VOCs (BTEX), and total cyanide were identified in the twelve (12) surface soil samples previously collected on the site. The sample results were previously presented to NYSDEC and

are summarized on Plate 3. Six samples, identified as SS-01 through SS-06, were collected by GEI as part of the Phase I Site Investigation, and six samples, identified as GCAS-01, GCAS-02, GCAS-03, GCSS-16, GCSS-17, and GCSS-18 were collected by D&B as part of the Due Diligence Investigation. VOCs were only detected in sample SS-04 with a total BTEX concentration of 0.002 mg/kg. PAHs were detected in all of the samples with total PAH concentrations ranging from 2.17 mg/kg in sample GCAS-03 to 639 mg/kg in sample SS-04. Sample SS-04 was the only sample with total PAH concentrations above 100 mg/kg. Total cyanide was detected in samples GCSS-18 and GCSS-17 at concentrations of 0.12 mg/kg and 0.17 mg/kg respectively.

Other compounds (pesticides, metals, and PCBs) were also detected in surface-soil samples collected on the property that are not typically associated with MGP sites. These compounds may be associated with historic fill.

It should be noted that the borings prefixed by "ORCH" were borings conducted by KeySpan. Individual logs for these borings were not available. However, a general description of the borings indicates no visual or olfactory impacts to the depth of boring completion. These borings were generally less than 15 feet bgs.

3.1.2 Former Gas Works Area

This area of the site contains the footprint of the former MGP. Former structures associated with this area included a gas holder, Hortonsphere, tar tank, and a purifier building. Past investigations of these structures consisted of hand borings and soil borings completed by GEI in the Phase I Site Investigation Report. A summary of these investigations is included as follows:

Tar Tank. HB-02, SB-06, and ORCH-DCB-12W were located in the vicinity of the former tar tank in the northeastern corner of the site. No physical observations of tar were observed in these borings. BTEX was not detected and PAH concentrations ranged from non-detect within SB-06 to 128 mg/kg within ORCH-DCB-12W. No samples were collected from HB-02.

Hortonsphere. SB–02 and HB-10B were placed in the area of the former Hortonsphere. No physical observations of tar were observed in these borings. Sample HB-10B (4.75 feet) contained total PAH concentrations of 56.16 mg/kg. The lab findings from SB-02 (18 feet) support the lack of observed tar, with only 2.36 mg/kg total BTEX and no PAHs being detected.

60,000-Cubic Foot Gas Holder. Borings (ORCH-FL-W and ORCH-GCB640) and hand auger boring (HB-05) were placed near the northern edge of the former gasholder. No evidence of the former structure was indicated in the previous reports and boring logs. Black-fill material (black-stained sand with coal/coke and a slight odor) was encountered at about 7.25 feet. Analytical results from subsurface soils collected in the vicinity of the holder BTEX

concentrations ranging from non-detect to 0.037 mg/kg and PAH concentrations ranging from 2.68 mg/kg to a maximum Soil boring (GCSB-25) was completed approximately 15 feet south of the former gas holder along a retaining wall to a depth of 11 feet bgs. No visual evidence of tar was observed in this boring. Odors were observed at approximately 8 to 11 feet bgs. Soil samples collected from GCSB-25 identified elevated PAHs in the 4 to 6 foot and 8 to 11 foot interval at concentrations of 45.3 mg/kg and 34.3 mg/kg respectively.

These existing data adjacent to the gasholder show some modest MGP impacts, but would not be indicative of a significant source area. However, these borings were completed at relatively shallow (generally less than 15 feet) depths and may not be suitable to detect a significant release from the gasholder. Accordingly, down gradient, deeper borings may provide evidence to confirm whether or not a significant source area exists at or near the gasholder.

Soil borings SB-03 (PZ-03) and SB-01 (PZ-01) were completed to the north and west of the former 60,000 cubic foot holder within the current substation. Coarse-grained soils with tar seams and moderate odors were observed from approximately 15 feet to 19 feet bgs within SB-01 at the northwest corner of the site and SB-03 on the northern portion of the site. Laboratory analysis of this interval within SB-01 indicated a BTEX concentration ranging from 0.015 mg/kg (estimated) to 0.033 mg/kg (estimated) and PAH concentrations ranging from 31.06 mg/kg to 5,532 mg/kg. No observation of tar was encountered below 19 feet in either boring. Analytical samples collected from below this interval reveal non-detectable levels of BTEX (SB-03) to a maximum concentration of 0.001 mg/kg (estimated) within SB-01 and PAH concentrations ranging from 0.038 mg/kg (estimated) within SB-01 to 0.724 mg/kg within SB-03.

Additional borings completed on the steep embankment further north of the current substation revealed coarse-grained soils with “oily appearance” staining and odors were encountered within GCSB-29 from 34 to 36 feet bgs and soils with sheen and slight odor were observed within GCSB-28 which was located above a sandy-clay layer. No observations of tar were observed below this interval. Analytical samples collected from this area revealed non-detected levels of BTEX to a maximum concentration of 0.002 mg/kg and PAH concentrations ranging from 16.95 mg /kg to a maximum of 1,595 mg/kg within CGSB-29. These coarse grained layers are at similar elevations to those encountered within SB-01 and SB-03 within the substation.

Purifier Building. Soil borings ORCH – DCB-133, ORCH-PT02(B) and ORCH-DCB-TC(B) and hand auger boring (HB-04) were also completed in the area of the former purifier building. The soil borings within this area were relatively shallow, ranging in depth from 2 to 6 feet. Analytical results from these soil borings revealed BTEX concentrations that were less than 11 mg/kg and total PAH concentrations ranging from 2.48 mg/ kg to 21.56 mg/kg. No observations of tar or odors were recorded for the borings.

No evidence of the former MGP plant structures was observed in any of the previous investigations completed on the site.

3.1.3 Historic Fill Area

Fill material was placed across the site in a series of land area expansions over time. The Phase I report identified the site as being underlain by fill material consisting of sands, clinker, asphalt, and coal debris to a depth of 15 feet. A review of boring logs from GEI's and D&B's investigations revealed the presence of fill material as deep as 29 feet as it thickens toward the northern portion of the property. Some of the fill was reported to have black staining with some odors, but it is not clear what type of odors were detected. Analytical results of samples collected within the fill material did reveal PAHs and BTEX that could be associated with MGP-derived residuals or industrial fill used to develop the site. However, pesticides were detected in 6 out of 11 subsurface soil samples, which may indicate that fill material was brought in from an off-site location and could have been previously impacted. No former MGP structures were identified during the investigation, however a 2 to 6 foot layer of fill material was documented in soil borings in the area of the former MGP works. The extent of fill material is depicted in Cross Section C-C′ included as Figure 7.

3.2 Groundwater Analytical Results

The groundwater analytical data available for the site was derived from the April 1997 Phase I Site Investigation, which included the installation of seven groundwater-monitoring wells (GW-1 through GW-7) and one round of analytical data. Groundwater was encountered in the groundwater aquifer between the depths of 10 and 14 feet bgs. Groundwater flow is generally toward Glen Cove Creek and the former creek bed with a northwesterly component in the northern portion of the site (Plate 4).

Groundwater samples collected from GW-1 and GW-2 located northwest and southwest of the former 60,000 cu ft gasholder exhibited total BTEX at concentrations of 245 µg/l and 416 µg/l, respectively. Water from both wells exhibited a noticeable odor and sheen. Only trace detections of BTEX and PAHs were detected across the remainder of the site. Groundwater from GW-1 and GW-2 had the highest concentrations of total PAHs on the site with concentrations of 7,390 µg/l and 6,730 µg/l respectively. Naphthalene accounted for over 70 percent of the PAHs with concentrations of 6,100 µg/l and 5,100 µg/l in GW-1 and GW-2 respectively. All remaining monitoring wells had very low to non-detected concentrations of PAHs. Groundwater samples from each of the installed wells were also analyzed for PCBs, RCRA metals, and pesticides. No other compounds were detected with the exception of the pesticide Endosulfan II that was only detected in a duplicate sample collected from GW-1 and was therefore discounted.

3.3 Conceptual Site Model

This section discusses the conceptual site model as it pertains to the history of the site and vicinity, the local geology, the nature of the physical observations of MGP impact and contaminant, migration pathways and potential receptors. The conceptual model was used as a basis for determining the scope of additional investigations.

The former Glen Cove MGP operated from 1904 through approximately 1929 after which the site was utilized for gas storage. The MGP was subsequently decommissioned and the site was redeveloped for its current use as a substation in the late 1960s. Based on observations taken during previous borings, fill material was added to the site and vicinity during the era of the MGP and just before the substation was built. In addition to topographic changes, the course of Glen Cove Creek, which is located adjacent to the site, has been realigned in conjunction with the construction of Route 107. Historic topographic maps depict the course of Glen Cove Creek has historically flowed northward across the western portion of the site.

The site is situated in a topographic depression created by a railroad embankment to the north and a hillside to the east. Surface water flows down the hillsides toward the substation and into the culverted Glen Cove Creek, which flows from south to north along the western boundary of the site. Groundwater flows toward the culverted creek, but it is unlikely that groundwater actually discharges into the creek itself due to the presence of the concrete culvert. The former MGP was built on a relatively small flat bend between the hillside and the historic creek channel.

The soils underlying the site consist of a sequence of artificial fill over alluvium (sands, gravelly-sands) over marsh deposits (clay to sandy-clay). The marsh deposits may be serving as a horizontal barrier to vertical contaminant migration. In addition, the apparent northwestern slope of the marsh deposits may be controlling lateral contaminant migration. However, previous investigation did not confirm the extent and continuity of the marsh deposits.

Likely sources of MGP contamination (tars) were investigated during the Phase I site investigation. Limited information was developed; however, no large pockets of tar (considered source areas) were uncovered. Subsurface soils exhibited tar impacts in seams between 15 and 21 feet in the northwestern corner of the site.

Inferred alluvial sand and gravel associated with the former Glen Cove Creek channel is located adjacent to the area of the former 60,000 cubic foot gas holder. These layers may have been impacted by the seepage of tar from the former 60,000 cubic foot gas holder (however, this needs to be confirmed). Once released, it is hypothesized that minor amounts of tar have preferentially collected and migrated into these coarser-grained material at the site. Tar-stained soils, minor seams of tar, sheens, and odors were primarily encountered within this coarser-grained unit. The sand/gravelly-sand layers may have allowed minor amounts (tar seams) to migrate northward as

encountered within GCSB-29 (34 to 36 feet bgs) to the north of the site. Dense gravelly sand unit and clay/sandy-clay units have been encountered and potentially act as a confining unit for the tar under the site. Based upon site topography, the tar impacts were primarily below 15 feet bgs. No tar was observed in the vicinity of other tar handling structures, gas storage, or gas production facility at the site. Based primarily on topography and groundwater flow directions, the most likely route of any tar migration would be to the northwest under the railroad embankment along the course of the historic Glen Cove Creek channels.

Groundwater exhibits concentrations of BTEX and PAHs primarily down gradient from the former 60,000 cubic foot gas holder. Dissolved tar-related constituents (BTEX and PAHs) are primarily limited to monitoring wells PZ-01, PZ-02, and PZ-03 which are located generally downgradient from the 60,000 cubic foot holder. Only trace concentrations of BTEX and PAHs were detected within groundwater in monitoring wells upgradient of the former 60,000 cubic foot holder. The groundwater flow at the site appears to be controlled by the topography. Groundwater generally flows westward across the site but abruptly flows northward in the vicinity of the former Glen Cove Creek channel which is located on the northwestern portion of the site. This valley that Glen Cove Creek occupies serves as a local groundwater divide and likely limits the distribution of dissolved MGP constituents to the west.

The conceptual site model provides a general idea of the site's physical setting, areas of MGP impact, and the controlling features of contaminant migration. Previous investigations have been limited to shallow delineation. Based on this conceptual site model, a number of data gaps are apparent.

The following lists the data gaps that have been identified, which will be addressed in the remedial investigation work plan. They include:

- Determine the elevation and continuity of the potential confining layer beneath the site.
- Assess the nature of a potential source area associated with a former 60,000 cubic foot gas holder.
- Develop a better understanding of groundwater flow toward the northwestern corner of the site and Glen Cove Creek.
- Assess the interaction between Glen Cove Creek and the culverted channel.
- Assess the extent of the deeper MGP impacts under the railroad embankment and to the north.
- Assess the relative human health and ecological risks at the site.

4. Scope of Work

Based upon the review of information from previous investigations in conjunction with analysis of historic topographic and Sanborn maps and site, a conceptual site model for the former Glen Cove MGP site has been developed. This scope of work is based on the conceptual site model and is meant to fill data gaps regarding the nature and extent of MGP-related impacts.

The following tasks are identified in the scope of work.

- Preliminary site visit
- Field investigation activities including soil borings, installation of monitoring wells, and surface-soil sampling
- Background surface soil investigation
- Video inspection of Glen Cove Creek and sediment sampling of open channel
- Air monitoring
- Groundwater sampling, hydraulic conductivity testing, and water level measurement
- Private well survey
- Step I fish and wildlife impact analysis (FWIA)
- Qualitative human exposure assessment (QHEA)
- Data reduction and data summary
- RI report preparation
- Presentation of findings

Descriptions of each activity are provided below.

4.1 Field Investigation Preparation and Mobilization Activities

Upon approval of this Work Plan by the NYSDEC and authorization from KeySpan, mobilization to the site will begin. The initial field mobilization will include the following:

- Identify proposed sample locations
- Identify underground and overhead utilities
- Establish a decontamination area
- Establish a waste storage area

4.1.1 Establish Decontamination Area and Waste Storage Area

Equipment decontamination will take place on a plastic lined, bermed decontamination area or will be completed in a mobile decontamination container. The location of the decontamination area will be chosen during the preliminary site visit. During the investigation, drilling equipment (e.g., drill rods and auger flights) will be steam cleaned within the decontamination area before and after the completion of each sampling location. Investigation derived wastes (IDW), including soil cuttings and wastewaters produced during decontamination activities, will be collected and placed into USDOT/UN-approved 55-gallon drums, labeled, and stored at the established waste storage area at the site.

Sampling equipment used for sample collection (e.g., split spoons, sample spoons, and hand trowels) will be decontaminated prior to use and reuse, or disposable sampling equipment will be used. Sampling equipment will be cleaned according to SOP No. SA-007 (Appendix F), as outlined below:

- Non-phosphate detergent and tap water wash
- Tap water rinse
- 10% nitric acid solution rinse
- Distilled water rinse
- Methanol rinse
- Distilled water rinse

All drums will be subsequently characterized and disposed of by KeySpan.

4.1.2 Identify Sample Locations and Underground Utilities

During the preliminary site visit, the sample locations will be determined and marked out with stakes and/or white paint. Once marked, the drilling subcontractor will provide the boring locations to the One-Call utility clearance service to identify potential utility conflicts. Because of the current use as an active substation, KeySpan will obtain available utility plans for the substation from LIPA and will provide on-site mark-outs of existing buried electrical cables. Soil boring, groundwater monitoring wells, and temporary groundwater monitoring point locations will be hand-cleared or cleared through the use of a vacuum excavation machine. KeySpan will attempt to gain information on potential utility conflicts on adjacent private parcels. Also, KeySpan will obtain the necessary permits and written access agreements to complete RI activities on the privately owned parcels.

4.2 Field Investigation Sampling and Analysis

This section of the RI Work Plan discusses the proposed surface soil samples, soil borings, temporary groundwater monitoring points and groundwater monitoring well installation activities. Table 3 presents the sampling rationale, proposed sampling and sample analysis for the soil and groundwater samples. The proposed sample locations are shown on Plate 5. In addition, air monitoring, well development, and hydraulic conductivity testing procedures to be implemented are discussed in the following section.

The proposed analyses, analytical methods, and Quality Assurance/Quality Control (QA/QC) samples are discussed under each of the following subsections for surface soil, soil boring, and monitoring well sampling procedures. Appendix F includes GEI's standard operating procedures (SOPs) that will be implemented for this scope of work during the collection of samples for analysis. Subsection 4.6 discusses laboratory data deliverables and data validation procedures. H2M Labs, Inc. (H2M) of Melville, New York will perform the investigation sample analyses. H2M is a New York State ELAP approved laboratory H2M's QAPP is provided as Appendix D.

4.2.1 Surface Soil Sampling

Nine surface-soil samples (GCSS-19 through GCSS-27) will be collected from areas associated with the former MGP structures as depicted on Plate 5. Stainless-steel sampling implements (including spoons or trowels) and stainless steel bowls will be used to collect each surface soil sample from the upper two inches beneath any turf or vegetative layer. The soil will be screened for VOCs using a photo-ionization detector organic vapor analyzer (PID-OVM). During collection, surface soils will not be mixed or composited for the VOC analysis. Each surface soil sample will be sampled for a semivolatile organic compounds (SVOCs) EPA Method 8270 for the PAH fraction only; the eight Resource Conservation Recovery Act (RCRA-8) metals; total cyanide (TCN). Two surface soil samples (GCSS-22 and GCSS-26) will be analyzed for Polychlorinated Biphenyls (PCBs) to screen for PCB impacts associated with the electrical transformers in the substation. One surface soil sample will be collected and analyzed for TAL SVOCs, TAL VOCs, and TAL Metals. In addition, five of the nine proposed surface soil samples will be analyzed for pH and two of the nine surface soils will be analyzed for grain size distribution in support of the Qualitative Human Exposure Assessment (QHEA).

Each sampling implement will be decontaminated in accordance with decontamination procedures described in GEI's SOP's (Appendix F). Quality Assurance/Quality Control (QA/QC) samples for the entire investigation will include blind duplicate surface soil samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment rinsate blank samples. The quality control samples will be completed at on a frequency of 1/20 or once per week of sampling. One trip blank will be included per shipment of samples to the laboratory.

4.2.2 Background Surface Soil Investigation

A background investigation of surface soils will be completed to evaluate the quality of surface soils surrounding the site. The established background soil concentrations may be used in the determination of the soil cleanup objectives for the site. Fifteen (15) surface soil samples will be collected from properties surrounding the former MGP site and will include at least one sample at the City Stadium Ballfields. Locations will be selected that are unaffected by current and former site operations. The proposed sample locations will be depicted on an aerial photograph of the surrounding area and submitted to NYSDEC and NYSDOH for review and approval under a separate cover letter.

Fifteen (15) samples are suggested as the minimum number of samples required to provide a statistically valid data set per EPA's risk assessment guidance for establishing background concentrations in soil. Stainless-steel sampling implements (including spoons or trowels) and stainless steel bowls will be used to collect each background soil sample from the upper two inches beneath any turf or vegetative layer. Samples will be analyzed for SVOCs using EPA Method 8270 for the PAH fraction only. Data collected during this investigation will be statistically analyzed to eliminate outliers and provide an assessment of the background concentrations of PAHs in the soils surrounding the site.

Each sampling implement will be decontaminated in accordance with decontamination procedures described in GEI's SOP's (Appendix F). Quality Assurance/Quality Control (QA/QC) samples for the entire investigation will include blind duplicate surface soil samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment rinsate blank samples. The quality control samples will be completed at on a frequency of 1/20 or once per week of sampling. One trip blank will be included per shipment of samples to the laboratory.

4.2.3 Creek Channel Inspection and Sediment Sampling

A video inspection of the Glen Cove Creek channel will be completed to document the integrity of the channel and determine if any open pathways exist for MGP site related contaminants to impact the channel. The video inspection will evaluate the sections of the culverted creek that are adjacent to the former MGP site. Any drainage features that empty into the open channel from the site will be closely examined for signs of MGP related impacts. A determination of the discharge point of the downstream box culvert will also be made.

Three sediment samples (GCSED-01 through GCSED-03) will be collected from the open channel portion of Glen Cove Creek as depicted on Plate 5. A properly decontaminated hand driven open coring device will be used to collect up to a two-foot of undisturbed sediments from the creek bed. The sediment core will be screened for VOCs using a PID-OVM. A sample will be collected from each core at the interval that exhibits the highest PID-OVM reading for VOC

analysis. A sample will also be collected from each core for SVOCs analysis by EPA Method 8270 for the PAH fraction only and TCN.

Each sampling implement will be decontaminated in accordance with decontamination procedures described in GEI's SOP's (Appendix F). Quality Assurance/Quality Control (QA/QC) samples for the entire investigation will include blind duplicate surface soil samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment rinsate blank samples. The quality control samples will be completed at on a frequency of 1/20 or once per week of sampling. One trip blank will be included per shipment of samples to the laboratory.

4.2.4 Soil Borings and Monitoring Wells

GEI will mobilize to the site and conduct 12 soil borings (GCSB-32 through GCSB-43), six monitoring wells (GCMW-08S/D, GCMW-09, GCMW-10, GCMW-11, GCMW-12), and seven temporary Geoprobe® groundwater monitoring points (GCCWP-01 through GCCWP-06, and GCSB/GCGWP-37). In addition, the previously installed monitoring wells/piezometers (PZ-01 through PZ-07) will be re-installed if the wells are unable to be located or damaged beyond repair. All soil borings and groundwater monitoring wells will be drilled with either hollow-stem auger drilling methods using split-spoon sampling methods or direct push sampling with a Geoprobe® drilling rig drilling methods as described below.

The number and location of the borings and wells are based on the NYSDEC approved technical scope of work proposed by D&B, and the conceptual site model and analytical summary developed in this report. However, GEI has departed from the methodology in the D&B proposed scope that specified the use of direct push technology for soil borings and groundwater probes throughout the site. GEI proposes to conduct temporary borings and groundwater sampling points along the northwest corner of the property to aid in the placement of off-site borings and monitoring wells. These temporary borings will better assess the extent and continuity of the confining layer identified in this area, provide higher resolution piezometric data, and higher resolution shallow-dissolved plume configuration.

Soil samples will be collected continuously through split-spoon sampling methods at each boring location. If HSA drilling is conducted, split spoon samples will be collected ahead of the lead auger flight. Upon collection of each split spoon sample, the lead auger will be advanced over the sampled interval prior to collection of the next split spoon sample. This method will ensure that "double-spooning" ahead of the augers does not occur. In addition, while the augers are being advanced a temporary plug will be placed at the bottom of the lead auger to minimize or eliminate the potential for formation materials to run up into the augers. The use of an auger plug will help assure that split spoon samples are representative of in-situ formation materials.

Each boring completed with a Geoprobe® drill rig will utilize the closed piston-Macro-core configuration for each sample collected after the first 4-foot interval. Following the collection of each Macro-core sample, the Macro-core sampler will be advanced to the bottom of the last Macro-core interval and the next sample will be collected. Soil samples will not be collected by utilizing a Macro-core sampler in an "open hole". The Macro-core shoe and point will be decontaminated according to GEI's SOPs after the collection of each sample. The Macro-core sampler core barrel will be decontaminated with non-phosphate soap and water and tap water rinse at the completion of each soil boring.

If a boring exhibits the visual presence of tar-impacted soils, drilling will proceed until signs of the tar and residual tar product are no longer visible for a maximum of 10 feet. Deep drilling through impacted zones will ensure that vertical communication caused by the drilling does not occur. Specifically, the upper impacted units would be cased and grouted into a lower, more confining unit.

Three soil samples will be selected for analysis from each boring. Two separate depth intervals exhibiting the greatest degree of contamination will be sampled to evaluate the magnitude of the observed impacts at each boring. In addition, a sample from beneath the observed impacted intervals will also be analyzed to assess the vertical extent of the impacts. It is anticipated that drilling will proceed approximately 10 feet into a visually un-impacted zone. Each sample will be analyzed for BTEX, PAHs, RCRA metals, and total cyanide with 10% of the samples collected analyzed for TAL SVOCs, TAL VOCs, and TAL Metals. In addition, five subsurface soil samples will be analyzed for bulk density, total organic carbon (TOC), grain size, and moisture content analysis.

Quality Assurance/Quality Control (QA/QC) samples for the subsurface soil investigation will include blind duplicate subsurface soil samples, matrix spike/matrix spike duplicate (MS/MSD) samples, and equipment rinsate blank samples. The quality control samples will be completed at on a frequency of 1/20 or once per week of sampling. One trip blank will be included per shipment of samples to the laboratory. Subsurface soil analysis will be conducted according to the schedule outlined in Table 3. Sample locations are shown on Plate 5.

The monitoring wells will be drilled with either standard 4.25-inch-hollow-stem augers or Geoprobe augers/casing. The shallow wells will be screened in the uppermost portion of the water table aquifer. If signs of light non-aqueous phase liquids (LNAPL) are encountered in the borings, the well screen will extend approximately two feet above the water table. If signs of DNAPL (e.g., blebs or saturated soil) are encountered, the well screen bottom will be installed on top of any observed confining layer that may be retarding the migration of DNAPL. A 2-foot section of unscreened casing will be installed below the screen as a sump. The screen lengths will not exceed 10 feet. Deep groundwater wells (screened below the water table) will be installed at four locations on the site and adjacent parcel

The monitoring wells will be constructed of 2-inch inside diameter (ID), flush-threaded polyvinyl chloride (PVC) 0.020-inch screen and solid casing with a two-foot sump for DNAPL collection if a confining layer is present. The annular space between the well screen and 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 seal 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. Each monitoring well will be fitted with a stick-up or flush-mounted curb box secured with cement.

Groundwater monitoring wells were installed as part of a previous site assessment. GEI will attempt to locate these wells and assess their construction and condition. If these wells can't be located they will be re-installed as part of this mobilization.

4.2.5 Soil Vapor Survey

Following completion of the soil boring and surface soil sampling programs, GEI will assess the BTEX soil concentrations to evaluate whether soil vapor sampling in the vicinity of adjacent properties and/or structures is warranted. If, based on the analysis of the soil data, potential vapor intrusion into adjacent structures is a concern, then a soil gas survey will be performed. The work plan to complete the soil gas survey will be provided to NYSDEC and NYSDOH as an addendum to this report, if required.

4.2.6 Air Monitoring

In accordance with NYSDEC and NYSDOH requirements, a Community Air Monitoring Plan (CAMP) will be implemented at the site during each phase of the intrusive field activities. The objective of the CAMP is to provide a measure of protection for the downwind community (i.e., off-site receptors, including residences and businesses and on-site workers not involved with site RI activities) from potential airborne contaminant releases as a direct result of intrusive RI activities. Air monitoring stations will be located up-wind and downwind of each intrusive work area (i.e., boring locations). Volatile organic compounds (VOCs) and respirable particulates (PM-10) will be monitored at the stations on a continuous basis. Wind direction will be determined using a wind sock(s) and/or flagging poles installed on site. Hand-held equipment will be used to monitor VOCs, particulates, and cyanide in the work zone. VOCs, particulates, and cyanide will also be monitored around the perimeter of the work zone on a regular basis (hourly) by the field personnel. The VOC monitoring, response levels, and actions are presented in CAMP, which is located in Appendix E.

VOC vapors will be monitored using a photoionization detector (PID). Particulate dust will be monitored using a Miniram particulate meter. The Drager MiniWarn monitoring equipment for cyanide and will be verified by the use of Drager® tubes for cyanide. The PID and Miniram monitoring equipment will be calibrated at least daily.

4.2.7 Well Development

Development of the newly installed monitoring wells will be performed by alternately surging and pumping, utilizing either a centrifugal or piston pump, for a maximum of 1 hour or until the turbidity of the development water is less than 50 nephelometric turbidity units (NTUs). A field turbidity meter will be used to monitor NTU levels.

4.2.8 Waste Disposal Sampling

One composite soil sample will be collected from the drums holding soil cuttings and analyzed for Toxicity Characteristic Leaching Procedure (TCLP) VOCs, SVOCs, and metals along with reactivity (cyanide, sulfide), ignitability, corrosivity, and paint filter tests. These analyses are intended to characterize the wastes to determine the appropriate disposal options available.

4.2.9 Groundwater Sampling

After a minimum of two weeks following the completion and development of all the planned new monitoring wells, groundwater samples will be collected from each newly installed well and each existing well, if present.

If a substantial dense non-aqueous phase liquid (DNAPL) accumulation is present in any well, then no groundwater sample will be collected for laboratory analysis. If DNAPL is found to accumulate in a well, then the DNAPL will be bailed from the well and the recovery rate of the DNAPL will be assessed.

Groundwater purging and sampling of the monitoring wells will be conducted according to the procedures set forth in *Low Stress (low flow) Purging and Sampling Procedure for the Collection of Ground Water Samples From Monitoring Wells,* published July 30, 1996 by the United States Environmental Protection Agency (EPA). The wells will be purged and sampled at rates that minimize or eliminate significant draw down. Dedicated polyethylene tubing will be used at each well. Water quality will be monitored for pH, temperature, specific conductivity, oxidation-reduction potential (Eh), dissolved oxygen, and turbidity. The tubing volume will be calculated and, upon removal of one tubing volume of groundwater, parameters will be recorded at five-minute intervals to determine well stability. Stability is achieved when pH is within 0.1 standard unit, temperature is within 0.5ºC, Eh is within 10% and specific conductivity is within 10% for three consecutive readings.

When stability is attained, samples will be collected from the well. Samples for VOC analysis will be collected using a disposable polyethylene bailer. Samples for all other analyses will be collected directly from the tubing. Groundwater samples will be placed directly into pre-cleaned and appropriately preserved sample containers provided by the laboratory.

Each sample will be analyzed for BTEX, PAHs, RCRA metals, and total cyanide with 10% of the samples collected analyzed for TAL SVOCs, TAL VOCs, and TAL Metals. Groundwater analysis will be conducted according to the schedule outlined in Table 3.

In addition to the primary groundwater samples, the following QA/QC samples will be collected.

- One trip blank sample per day of sampling
- One duplicate sample per 20 groundwater samples
- One equipment rinse sample per 20 groundwater samples

Each QA/QC sample will be analyzed for VOCs, SVOCs, RCRA metals, and total cyanide except the trip blank samples, which will be analyzed only for VOCs.

Groundwater elevations will be measured in all monitoring wells and within Glen Cove Creek.

4.2.10 Hydraulic Conductivity Testing

GEI proposes conducting in-situ hydraulic conductivity tests (slug tests) at three selected wells. The location of the slug tests will be determined after evaluation of the site lithology. A Standard Operating Procedure (SOP) for in-situ hydraulic conductivity testing is provided in Appendix F. In addition, Shelby tube samples from any suspected confining layers (e.g., the clayey till) will be collected and sent to GEI's geotechnical laboratory for permeability analysis.

4.3 Survey and Sample Point Location

Following completion of the planned soil borings, monitoring wells, and collection of the surface-soil samples, a New York State Licensed Land Surveyor will survey each of these points. The elevation of each new monitoring well will be determined to ±0.01 foot. In addition, a permanent surveyed benchmark will be established to measure the Glen Cove Creek elevation. All locations and elevations will be tied to the New York State Plane Coordinate System.

4.4 Private Well Survey

GEI proposes to complete a private well search for all private wells within the area depicted on Figure 10 – Private Well Search Area. This search will include a file search of state, county,

and local records for information on wells identified within the established search area. Information about each identified well including construction details and current status (active, inactive, or properly abandoned) will be collected. If insufficient well records are available, then individual property owners will be contacted through a door-to-door survey within the specified search area. Wells identified in the survey will be evaluated to determine if they could potentially be affected by site conditions. If findings from the RI indicate potential off-site migration of a groundwater plume in the direction of identified private wells, then GEI will prepare and submit for approval a work plan to appropriately delineate the off site extent.

4.5 Step I Fish and Wildlife Impact Analysis

GEI will retain an ecological risk assessor experienced in New York to conduct a Step I Fish and Wildlife Analysis (FWIA) for the site. The Step I analysis will be conducted in accordance with the current version of NYSDEC's *Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites* (*FWIA*). The general objectives of the Step I assessment are:

- Identify the fish and wildlife resources, habitats, cover type, wetland and stream classifications at the site and in the vicinity
- Identify the fauna expected within each cover type and aquatic habitat
- Document observations of stress to the site soils and vegetation
- Describe the value of habitat to expected fauna
- Describe the value of the fish and wildlife resources to humans
- Determine whether contaminants are present that potentially could affect the expected fish and wildlife resources
- Recommend whether a Step II FWIA is warranted

The findings of the Step I FWIA will be included in the final RI Report.

4.6 Qualitative Human Health Exposure Assessment

In accordance with direction provided by NYSDEC, a qualitative human health exposure assessment will be prepared. This assessment will generally follow the guidelines provided in the November 9, 2000 document, titled *New York State Department of Health Qualitative Human Health Exposure Assessment* (Appendix 1B to NYSDEC's Draft Site Characterization and Remedial Investigation Guidance document). In general, the assessment will identify the exposure setting, identify exposure pathways, and will evaluate the fate and transport of the contaminants. The assessment will include text discussions, tables, and graphics depicting the potential exposure pathways. The characterization will include all environmental data gathered pertaining to the RI. The qualitative assessment will identify potential risks for specific potential

receptors based on complete pathways of exposure to contaminant levels exceeding default "screening criteria," such as the NYSDEC-recommended soil cleanup objectives (RSCOs) and drinking water standards. The qualitative health exposure assessment will not quantitatively evaluate the potential carcinogenic and non-carcinogenic risks to potential receptors. In addition, the qualitative assessment will not evaluate potential alternative risk-based exposure criteria or risk-based cleanup criteria.

4.7 Quality Assurance/Quality Control and Data Validation

H2M Laboratories will provide New York State Category B data deliverables. The data will be validated in accordance with NYSASP protocols. The data validator will prepare a data usability report summarizing the adequacy of the analytical data obtained from the laboratory and discussing any pertinent data excursions or limitations on the use of the data. The data usability report will be used in preparing the RI report, and will be submitted as part of the RI report.

Through the use of standardized sample collection and decontamination procedures (SOPs in Appendix F), the quality of the samples during field collection can be assured.

The data validation process will ensure that the data collected and reported by the laboratory are of sufficient quality that management decisions regarding the degree and extent of potential impacts can be reliably made. The data validation will evaluate whether the required quantitation limit has been achieved for each sample analyzed, and will evaluate the precision, accuracy, and completeness of the data. The data validator will use the blind duplicate samples, the MS/MSD samples, the trip blanks, and the equipment rinsate blank samples, as well as laboratory calibration blanks, spikes, and other standards to assess the quality of the data obtained. Any deviations from the required level of sample quality will be called out in the data usability reports prepared by the data validator and these deviations will be taken into consideration when using the data to explain site conditions.

5. RI Report Preparation

5.1 Data Reduction and Data Summary

Field observations and empirical data collected during the RI will be analyzed to refine the site conceptual model. A composite base map that accurately illustrates the locations and elevations of site features, including all sampling locations, will be developed. Analytical data will be validated to determine if the data meet acceptable criteria for precision, accuracy, and completeness. Validated analytical data will be tabulated and compared to applicable NYSDEC standards. Field observations will be compared and correlated with the validated analytical data to characterize impacted areas.

The conceptual model will be finalized and presented in graphical and tabular form. The impacted areas will be illustrated through boring logs, plan view maps, and cross sections. A groundwater contour map will be generated illustrating groundwater flow direction of the overburden aquifer beneath the site. At least two cross sections will be completed to depict the hydrogeology parallel and perpendicular to groundwater flow.

All site data will be managed in a database so that the physical and chemical data can be easily integrated and compared to NYSDEC standards.

5.2 RI Report

GEI will prepare a RI report for submittal to NYSDEC for the Glen Cove site. The report will incorporate the findings of the RI activities and previous investigations. The information will be used to describe the nature and extent, and fate and transport of all contaminants associated with the former MGP site. The report will identify specific contaminant concentrations throughout each media (e.g., soil, groundwater, etc.), which is necessary to determine whether any media require remediation or further evaluation. The reports will also incorporate the findings of the Step I FWIA and the QHEA.

Key components of the RI report will include:

- Description of RI activities
- Discussion of site geology and groundwater flow patterns
- Distribution of analytical compounds in soil and groundwater
- Distribution of non-aqueous phase liquid (NAPL)
- Identification of historic structures and associated MGP source areas

- Comparison of site soil and groundwater analytical data to NYSDEC standards
- Identification of areas that exceed the soil and groundwater standards
- Boring logs and monitoring well construction details
- Data usability reports
- Validated laboratory Form I reports
- Site photographs

6. Schedule

Mobilization for field activities can be accomplished within ten days of receipt of NYSDEC approval of this Work Plan. However, the commencement of field activities is contingent upon site accessibility and availability of subcontractors.

It is expected that final NYSDEC approval of this RI Work Plan will be given by November 30, 2003. Based on this approval date, the soil boring, monitoring well installation, and surface-soil sampling could begin on December 8, 2003. The submittal of the final draft RI Report is expected by August 1, 2004.

A detailed project schedule using Microsoft® Project will be prepared. This schedule will incorporate critical path items and contingencies of the site access agreement. The final schedule will be delivered upon approval of this work plan. Revisions will be submitted as needed based upon any changes in field conditions or logistics.

7. Project Team

GEI's key project members and their roles are summarized below.

- **David Terry – KeySpan Program Manager.** Mr. Terry will have ultimate responsibility for successful completion of the work scope, will interface with KeySpan as needed, and will be responsible for project quality control.

- **Chris Dailey – Project Manager.** Mr. Dailey will have the day-to-day responsibility for project logistics, coordination with KeySpan and NYSDEC. He will be responsible for the deliverables and quality control

- **Dennis Unites – In-House Consultant.** Mr. Unites will serve as GEI's in-house consultant for the project team. Mr. Unites' extensive MGP experience and understanding of MGP historic operations, and the behavior of MGP contaminants in the environment, are a valuable asset to the project team.

- **Lynn Willey – Lead Geologist.** Under the direction of Mr. Dailey, Mr. Willey will be primarily responsible for implementation of the field program, managing GEI's subcontractors, interpretation of the investigation findings, and preparation of the RI report.

Tables

Table 1 Record of Ownership[1] Glen Cove Manufactured Gas Plant	
Directory Years	**Ownership**
No record 1887 – 1904	
1905 – 1911	Sea Cliff and Glen Cove Gas Company
1912	Leased to Nassau Gas Construction Company Newark, NJ
1913 – 1917	Sea Cliff and Glen Cove Gas Company
1918 – 1929	Sea Cliff and Glen Cove Gas Company (by Long Island Lighting Company)
1930 and following, no site information listed	
[1] Source: "Brown's Directory of American Gas Companies"	

Table 2 Gas Production (ft^3) for the Glen Cove MGP			
Directory Year	**Process Oil Volume (gal)**	**Annual Gas Production**	**Annual Gas Sales**
1906			
1907		5,500,000	
1908		8,000,000	
1909		8,000,000	
1910			12,000,000
1911			12,000,000
1912			13,000,000
1913			14,000,000
1914			14,000,000
1915		15,000,000	15,000,000
1916		15,000,000	15,000,000
1917		15,000,000	15,000,000
1918		19,170,000	15,375,000
1919		21,221,000	16,586,000
1920		24,300,000	19,733,000
1921		31,420,000	24,057,000
1922		31,868,000	25,273,000
1923		33,222,000	26,838,000
1924		36,630,000	31,076,000
1925			
1926		46,568,000	36,530,000
1927		54,070,000	45,394,000
1928		53,922,000	49,063,000
1929			59,585,000
Source: “Brown’s Directory of American Gas Companies”			

Table 3
Proposed Sampling Rationale
Glen Cove Former Manufactured Gas Plant Site
Glen Cove, New York

Sample ID	Sample Location/ Rationale	Sample Type			Analysis[1]						
		Soil	Sediment	Water	VOCs[2]	SVOCs[3]	Metals[4]	PCBs[5]	TCN[6]	Grain Size Bulk Density TOC, Moisture Content[7]	TAL/TCL[8]
Soil Boring Installation											
GCSB-32	Located to the south of the current electrical substation control room. The proposed boring will evaluate potential discharges downgradient of the active cesspool that receives sanitary waste from the LIPA electrical substation and evaluate for the presence/absence of the clay/sandy-clay confining layer beneath the footprint of the former MGP. Boring is anticipated to be completed to approximately 50 feet below ground surface.	X			X	X	X		X		
GCSB-33	Located on the western boundary of the current electrical substation. The proposed boring will evaluate the presence of the bottom of the former 60,000 cubic foot gas holder structure and the presence/absence of the clay/sandy-clay confining layer beneath the footprint of the former MGP. Boring will be advanced to the bottom of the holder to check for the presence of NAPL, if no NAPL is observed the boring will continue through the base of the holder until 10 feet of visually clean material or a confining layer is encountered. If NAPL is observed, the boring will be relocated to the outside of the holder and continued as discussed. Boring is anticipated to be completed to approximately 50 feet below ground surface.	X									X
GCSB-34	Located on the western boundary of the current electrical substation. The proposed boring will evaluate potential impacts from the former 60,000 cubic foot gas holder structure and the presence/absence of the clay/sandy-clay confining layer beneath the footprint of the former MGP. Boring is anticipated to be completed to approximately 50 feet below ground surface.	X			X	X	X		X		
GCSB-35	Located along the northern boundary of the current electrical substation fence to the west of the current substation control house. The proposed boring will evaluate the lateral extent of tar impacts at the site and the presence/absence of the clay/sandy-clay confining layer beneath the footprint of the former MGP. The boring is anticipated to be completed at approximately 50 feet below ground surface.	X			X	X	X		X		

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Sample ID	**Sample Location/ Rationale**	**Soil**	**Sediment**	**Water**	**VOCs[2]**	**SVOCs[3]**	**Metals[4]**	**PCBs[5]**	**TCN[6]**	**Grain Size Bulk Density TOC, Moisture Content[7]**	**TAL/TCL[8]**
GCSB-36	Located on the northern parcel that borders the site within a gravel parking area. The proposed boring will evaluate the lateral extent of tar impacts adjacent to the site and the presence/absence of the clay/sandy-clay confining layer adjacent to the site. The boring is anticipated to be completed to approximately 70 feet below ground surface.	X			X	X	X		X		
GCSB-38	Located along the northwestern corner of the site adjacent to an existing retaining wall. The proposed boring will evaluate the lateral extent of tar impacts and evaluate the presence/absence of the clay/sandy-clay confining layer on the site. The boring is anticipated to be completed at approximately 50 feet below ground surface.	X			X	X	X		X		
Soil Boring/Temporary Groundwater Probe Installation											
GCSB/ GCGWP-37	Located on the northern parcel that borders the site within a gravel parking area. The proposed boring will evaluate the lateral extent of tar impacts adjacent to the site and the presence/absence of the clay/sandy-clay confining layer adjacent to the site. The boring is anticipated to be completed to approximately 70 feet below ground surface. A temporary groundwater probe will be installed at this location to check for groundwater impacts previously observed in GCSB-28.	X		X	X	X	X		X		
Soil Boring/Monitoring Wells											
GCSB-39/ GCMW-08 S, D	Located on the northern parcel that borders the site within a gravel parking area. The proposed boring will evaluate the lateral extent of tar impacts adjacent to the site and the presence/absence of the clay/sandy-clay confining layer adjacent to the site. The boring is anticipated to be completed to approximately 70 feet below ground surface. A nested pair (groundwater table well and deep well) of groundwater wells will be installed at this location to provide information regarding the groundwater aquifer information.	X		X	X	X	X		X	X	

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		Sample Type			Analysis[1]						
Sample ID	**Sample Location/ Rationale**	**Soil**	**Sediment**	**Water**	**VOCs[2]**	**SVOCs[3]**	**Metals[4]**	**PCBs[5]**	**TCN[6]**	**Grain Size Bulk Density TOC, Moisture Content[7]**	**TAL/TCL[8]**
GCSB-40/ GCMW-09	Located within the access road adjacent to PZ-01. The proposed boring will evaluate the lateral extent of tar impacts adjacent to the site and the presence/absence of the clay/sandy-clay confining layer adjacent to the site. The boring is anticipated to be completed to approximately 70 feet below ground surface. A deep groundwater monitoring well will be installed to screen deep groundwater beneath observed impacts. Additionally, PZ-01 will be re-installed (PZ-01A) adjacent to the former location because the well was damaged. PZ-01 will be abandoned at this time.	X		X						X	X
GCSB-41/ GCMW-10	Located on the western boundary of the site adjacent to the culverted Glen Cove Creek. The proposed boring will evaluate soils for the tar impacts and the presence absence of the clay/sandy-clay confining unit at the site. The boring is anticipated to be completed to approximately 60 feet below ground surface. A deep monitoring well will be installed to screen the deep groundwater aquifer and provide hydrologic information for groundwater flow.	X		X	X	X	X		X	X	X
GCSB-42/ GCMW-11	Located on the northern boundary of the current substation. The proposed boring will evaluate soils for the vertical extent of tar impacts within the inferred former Glen Cove Creek channel and evaluated the thickness of the clay/sandy-clay confining unit at the site. The boring is anticipated to be completed to approximately 60 feet below ground surface. A deep groundwater monitoring well will be installed to screen deep groundwater aquifer and provide hydrologic information for groundwater flow. Groundwater aquifer monitoring well (PZ-03) will be re-installed if unable to be located during the field investigation.	X		X	X	X	X		X	X	

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		Sample Type			Analysis[1]						
Sample ID	**Sample Location/ Rationale**	**Soil**	**Sediment**	**Water**	**VOCs[2]**	**SVOCs[3]**	**Metals[4]**	**PCBs[5]**	**TCN[6]**	**Grain Size Bulk Density TOC, Moisture Content[7]**	**TAL/TCL[8]**
GCSB-43/ GCMW-12	Located upgradient of the former MGP site within the Hazel Avenue. This boring will evaluate soils for potential impacts from current and historic sources of contamination. The boring is anticipated to be completed to approximately 70 feet below ground surface. A groundwater table monitoring well will be installed to screen the groundwater table aquifer for potential impacts and provide hydrologic information.	X		X	X[9]	X	X		X	X	
Monitoring Well Re-Installation											
PZ-02A	Located in the southwestern portion of the site. PZ-02 will be re-installed with a replacement well PZ-02A to provide shallow groundwater information and hydrologic information.			X	X	X	X		X		
PZ-03A	Located along the northern boundary of the current electrical substation fence. PZ-03 will be re-installed with a replacement well PZ-03A to provide groundwater information within the substation.			X	X	X	X		X		
PZ-04A	Located in the southern portion of the current electric substation. PZ-04 will be re-installed with a replacement well PZ-04A to provide shallow groundwater hydrologic information and chemical information.			X	X[9]	X	X		X		
PZ-05A	Located in the eastern corner of the site. If PZ-05 can not be located, then it will be re-installed to obtain shallow groundwater, hydrologic information, and chemical information.			X	X[9]	X	X		X		
PZ-06A	Located in the northeastern corner of the site. PZ-06 will be reinstalled to obtain shallow groundwater hydrologic information.			X	X	X	X		X		
PZ-07A	Located in the southwestern portion of the site. If PZ-07 can not be located, then it will be re-installed to obtain groundwater chemistry and hydrologic information at the site adjacent to Glen Cove Creek.			X	X	X	X		X		

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Sample ID	**Sample Location/ Rationale**	**Soil**	**Sediment**	**Water**	**VOCs[2]**	**SVOCs[3]**	**Metals[4]**	**PCBs[5]**	**TCN[6]**	**Grain Size Bulk Density TOC, Moisture Content[7]**	**TAL/TCL[8]**
Temporary Geoprobe Groundwater Probe Installation											
GCGWP-01 through GCGWP-06	Located in the northwestern corner of the site. These temporary groundwater probes will be installed into the groundwater table to evaluate potential migration of MGP constituents along the former Glen Cove Creek channel.			X	X	X					
Surficial Soil Samples											
GCSS-19	Located in the southwestern portion of the site to evaluated surface soil conditions within the first two inches of mineral soil.	X			X	X	X		X	X[10]	
GCSS-20	Located in the western portion of the site to evaluate surface soil conditions within the footprint of the former 40,000 cubic foot gas holder (Hortonsphere). Surficial sample will be collected within the first two inches of mineral soils beneath the vegetative mat.	X			X	X	X		X	X[10]	
GCSS-21	Located in the western portion of the site to evaluate surficial soil conditions within the footprint of the former aboveground storage tanks. Surficial sample will be collected within the first two inches of mineral soils beneath the vegetative mat.	X			X	X	X		X		
GCSS-22	Located in the central portion of the site to evaluate surficial soil conditions within the footprint of the former 60,000 cubic foot gas holder. Surficial sample will be collected within the first two inches of mineral soils.	X						X		X[10]	X
GCSS-23	Located in the eastern portion of the site to evaluate the surficial soil conditions within the active transformer substation. Surficial soil sample will be collected within the first two inches of mineral soils.	X			X	X	X		X		
GCSS-24	Located in the northwestern corner of the site to evaluate the surficial soil conditions within the footprint of the potential impact zone. Surficial soil sample will be collected within the first two inches of mineral soils.	X			X	X	X		X	X[10]	
GCSS-25	Located in the northwestern portion of the site adjacent to the former 60,000 cubic foot gas holder within the active transformer station. Soil sample will be collected to evaluate the surficial soil conditions within the footprint of the potential impact zone. Surficial soil sample will be collected within the first two inches of mineral soils.	X			X	X	X		X		
GCSS-26	Located on the northern portion of the site within the active transformer station. Soil sample will be collected to evaluate the surficial soil conditions within the footprint of the potential impact zone. Surficial soil sample will be collected within the first two inches of mineral soils.	X			X	X	X	X	X		

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Sample ID	**Sample Location/ Rationale**	**Soil**	**Sediment**	**Water**	**VOCs[2]**	**SVOCs[3]**	**Metals[4]**	**PCBs[5]**	**TCN[6]**	**Grain Size Bulk Density TOC, Moisture Content[7]**	**TAL/TCL[8]**
GCSS-27	Located in the eastern portion of the site to evaluate the surficial soil conditions at the former SS-4 sampling location. Surficial soil sample will be collected within the first two inches of mineral soils.	X			X	X	X		X	X[10]	
Glen Cove Creek Sediment Samples											
GCSED-01	Located on the upstream side of open channel of Glen Cove Creek where the box culvert that crosses Rout 107 empties into the channel. This sample will be collected to check for the presence of upstream impacts in the channel.		X		X	X			X		
GCSED-02	Located midway down the open channel of Glen Cove Creek adjacent to the former hortonsphere location. This sample will be collected to check for the presence of impacts in the channel from MGP related sources.		X		X	X			X		
GCSED-03	Located on the downstream side of open channel of Glen Cove Creek just upstream of the closed box culvert that crosses the LIRR and continues downstream of the site. This sample will be collected to check for the presence of impacts in the channel from MGP related sources.		X		X	X			X		

Notes:

1. All test methods specified are from EPA SW-846.
2. VOCs refer to volatile organic compounds (Benzene, Toluene, Ethylbenzene, Xylene [BTEX]) fraction only by EPA Method 8021.
3. SVOCs refer to semivolatile organic compounds (Polycyclic Aromatic Hydrocarbons [PAHs]) by EPA Method 8270.
4. RCRA 8 Metals analyzed are as follows: arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver by EPA Method 6010/7471.
5. PCBs refer to Polychlorinated Biphenyls by EPA Method 8082.
6. TCN stands for total cyanide EPA Method 9012.
7. Grain size was analyzed by ASTM Method D-422, TOC stands for total organic compound analyzed by EPA Method 9060, bulk density was analyzed by ASTM Method D2937-94. Moisture Content by ASTM D2937-94.
8. TCL/TAL stands for target compound list/target analyte list, which includes VOCs analysis by EPA Method 8260, SVOCs by EPA Method 8270, and RCRA-8 metals plus TCL/TAL metals by EPA Method 6010/7471, and total cyanide by EPA Method 9012.
9. A full VOC scan will be completed for the upgradient groundwater samples to evaluate off-site impacts entering the site.
10. Grain size will be analyzed on two surficial soil samples. pH analysis will be completed by EPA method 150.1 for five surficial soils samples collected.