KeySpan Corporation
Environmental Asset Management
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June 8, 2005

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Environmental Engineer
New York State Department of Environmental Conservation
MGP Remedial Section, Division of Environmental Remediation
Bureau of Western Remedial Action, 11th Floor
Albany, New York 12233-7017

Re: Carroll Gardens/Public Place Site
Former Citizens Gas Works Manufactured Gas Plant (MGP) Site
Site No. V00360-2
Gowanus Canal Sediment Sampling Work Plan

Dear Mr. Moloughney:

This letter presents the work plan for sediment sampling within the Gowanus Canal in association with the on-going characterization of the Carroll Gardens/Public Place site [Former Citizens Gas Works MGP site]. This work plan was prepared in response to requests made by the New York State Department of Environmental Conservation (NYSDEC) in their March 8, 2004 letter providing comment on the Draft Remedial Investigation (RI) Report dated December 23, 2003 for the Carroll Gardens/Public Place site; the February 4, 2005 NYSDEC letter to KeySpan Corporation (KeySpan) to investigate the Gowanus Canal adjacent to the Carroll Gardens/Public Place site; and discussions between KeySpan and the NYSDEC to investigate potential contributions from other KeySpan MGP sites as well as other industrial sites that may have impacted sediments within the Canal. These requests are provided below.

- March 8, 2004 NYSDEC comment letter to the draft RI report:

  "Sediment coring is appropriate within the Gowanus Canal. The goal of this sampling will not be to define the extent of impacts within the canal, but to identify site-related "hot spots." The Department is aware of the U.S. Army Corps of Engineers (USACE) plans to environmentally dredge the canal and does not currently expect KeySpan to conduct remedial dredging in the canal. The identification of sediment "hot spots" as part of the RI will be used by the Department to evaluate the potential migration pathways of NAPL from the site into the canal. KeySpan should identify the sediment cores recently collected by the USACE and use them for comparison with the additional cores to be collected."

- February 4, 2005 NYSDEC letter to KeySpan:

  "The Gowanus Canal investigation is to be designed in accordance with the most recent comments received from the Department; specifically the investigation must identify potential coal tar migration pathways from the site through the floor of the canal and laterally beneath the canal. To accomplish this, sediment cores must be collected along several transects of the canal with multiple cores collected from each transect. Additionally, the transects should include on-shore borings at each end of the transect, originating in areas where contamination has been observed near the canal on the Carroll Gardens site. This is not intended to be a full delineation of the extent of sediment impacts, but is intended to identify if subsurface discharges of coal tar from the site to the canal are ongoing."

In addition to these requests, the proposed work scope presented in this letter is based upon:

- Discussions between NYSDEC and KeySpan and decisions made by the NYSDEC during the April 7, 2004 meeting in Albany, New York. Specifically, the NYSDEC indicated that KeySpan must investigate the potential impacts from other KeySpan MGP sites located along the Gowanus Canal.

- Discussions and decisions between KeySpan and NYSDEC during the May 25-26, 2005 Brooklyn and Queens site visits. Specifically, KeySpan agreed to investigate the entire length of the Gowanus Canal.

- Review of the USACE Site Investigation Gowanus Bay and Gowanus Canal (October 2003) (USACE Investigation) sediment core information adjacent to the Carroll Gardens/Public Place site.

- Review of existing remedial investigation data.

This work plan provides a brief land use history adjacent to the Carroll Gardens/Public Place site, a summary of the USACE investigation adjacent to the site, and the Gowanus Canal sediment investigation work plan.

Background

The Gowanus Canal, built in the 1860s, was constructed in the channel of the former Gowanus Creek. The construction of the canal consisted of the channelization of Gowanus Creek and filling of the adjacent wetlands complex. The Gowanus Canal was built as a conveyance channel to facilitate industrial development of Brooklyn. Reflecting this use and the related subsequent industrial development, there are other current and former land uses that have contributed to the

contamination of the canal sediments. A historic review of land use in the site vicinity shows other uses that could have impacted the sediment quality of the canal, including a creosoting works, fertilizer manufacturing, coal yards, asphalt plants, and major oil storage facilities. In addition, the canal also received sanitary sewage and stormwater discharges for more than 100 years. These industrial land uses and discharges have likely contributed petroleum (including volatile organic compounds [VOCs] and semivolatile organic compounds [SVOCs]), heavy metals, pesticides, herbicides, and/or other chemicals to the sediments. Many of these compounds are the same as or chemically indistinguishable from compounds also associated with former MGP operations.

Because of this long history of industrial use, the Gowanus Canal is currently classified as an SD waterway, indicating that because of natural or man-made conditions, the canal cannot meet the requirements for primary and secondary contact recreation and fish propagation. Figure 1 shows the location of the Gowanus Canal, the Carroll Gardens/Public Place site, the Former Metropolitan MGP site, and the former Fulton MGP site. While the reason for conducting this work is investigating the potential impacts to the Gowanus Canal of these three sites for which KeySpan is responsible, it is clear that the investigation will also identify many of the other industrial, commercial and municipal operations that have also impacted, and may continue to be impacting, the sediments and water quality in the canal.

USACE Site Investigation Gowanus Bay and Gowanus Canal, October 2003

As requested in the February 4, 2005 NYSDEC letter, KeySpan has obtained the USACE investigation. The USACE investigation was conducted in April through May 2003. The objective of the investigation was to characterize the physical conditions of the sediments within the Gowanus Canal. Geotechnical, chemical, and biological samples were collected and analyzed to provide information regarding physical and engineering properties as well as the contaminant distribution within the sediments within the canal. The following is a summary of the findings from the USACE investigation.

- Geotechnical testing and sampling revealed that a layer of very soft, highly plastic clay extends over the entire Gowanus Bay and Canal with the exception of two locations: within and near the 6th Street Basin and to the south of the site near 20th Street. Weak hydrocarbon sheen and "decaying organic odors" were noted within some of the clay samples collected.
- Sands and silty-sands are located beneath the clay unit. Weak to strong "hydrocarbon sheens and odors" were noted within some of these materials.
- Chemical testing of canal sediments revealed concentrations of VOCs [including benzene, toluene, ethylbenzene, xylenes (BTEX)], SVOCs [including polycyclic aromatic hydrocarbons (PAHs)], priority pollutant metals, pesticides, polychlorinated biphenyls (PCBs), and total petroleum hydrocarbons within canal sediments.

- Concentrations of VOCs, SVOCs; pesticides; PCBs and priority pollutant metals were detected 1.5 to 24 feet below the floor of the Gowanus Canal. Detections of BTEX ranged from not detected to 2702.6 ppm in GC-03-24 (13 feet below MLW). Detections of PAHs ranged from 0.15 ppm in GC-03-22 (22.4 to 24 feet below MLW) to 20613.7 ppm in GC-03-21 (23 to 24.5 feet below MLW). A summary of the BTEX and PAHs concentrations within Gowanus Canal sediments is summarized on Plate 1.
- Bacteriological testing revealed elevated concentrations of bacteria within sediment samples throughout the canal.

The USACE findings were based upon a limited subset of sediment data. Analytical sample information from GC-03-15, GC-03-16, and GC-03-19, which were located adjacent to the Carroll Gardens/Public Place site within the canal and the 6th and 7th Street Basins, were not available because of sample breakage and improper preservation temperatures.

The USACE report recommended the assessment of the nature and extent of impacted sediments, an evaluation of restoration measures to mitigate impacted sediments, and preparation of remedial action plan that would include the decontamination, disposal and re-use of canal sediments. The USACE also recommended the completion of additional investigations to evaluate the nature and extent of bacteriological contamination and the completion of an updated bathymetric survey within the Gowanus Canal and Gowanus Bay.

Gowanus Canal Sediment Sampling Objectives

As stated in the February 4, 2005 NYSDEC letter to KeySpan, the March 8, 2004 comment letter, and in discussions between the NYSDEC and KeySpan, the purpose of the Gowanus Canal sediment sampling is to identify potential coal tar (dense non-aqueous phase liquid [DNAPL]) migration pathways from the former MGP sites through the floor of the canal and laterally beneath the canal. The objectives of the Gowanus Canal Sediment investigation include:

- Evaluate whether contaminant discharges can be observed entering the canal at and near the former MGP sites, through a physical reconnaissance of the canal extending the length of the canal, including all basins.
- Evaluate sediment quality adjacent to the former MGP sites and throughout the canal.
- Collect data confirming the USACE conclusion that the shallow clay layer is continuous beneath the canal.
- Evaluate the nature of contaminants in the Gowanus Canal surface water and sediments adjacent to the MGP sites and throughout the canal and basins.

- Compare sediment contaminant chemistry upstream, adjacent to, and downstream of the sites.

- Evaluate the origin of PAHs in sediments by utilizing chemical forensic techniques.

- Estimate the relative and approximate chronological age of the sediments at different depths and locations by utilizing sediment age dating methods.

- Evaluate the water column chemistry adjacent to, upstream, and downstream of the former MGP sites.

- Evaluate the subsurface soil conditions adjacent to the proposed sediment sample transects.

Gowanus Canal Sediment Investigation Work Plan

The Gowanus Canal sediment investigation will be completed in general accordance with the NYSDEC approved *Remedial Investigation Work Plan, Citizens Gas Works Former MGP Site* dated February 11, 2003. The sediment investigation will include the following activities:

- Bulkhead and Outfall Reconnaissance
- Bathymetry Data Collection
- Sediment Coring and Sample Collection
- Surface Water Sample Collection
- Subsurface Borings and Soil Sample Collection

Gowanus Canal Bulkhead and Outfall Reconnaissance

There are numerous current and former industrial and commercial land uses surrounding the canal that may contribute contaminants to the canal and canal sediments. To thoroughly assess the potential for on-going discharges of contaminants to the canal in the vicinity of the Carroll Gardens/Public Place site, the Metropolitan site, and the Fulton site, KeySpan proposes conducting a bulkhead and outfall reconnaissance of the canal in the vicinity of the sites and throughout the canal.

There are two objectives of the canal reconnaissance:

- To document whether tar seeps or sheens can be observed at low tide along the seawall of the canal adjacent to the former MGP sites.
- To document whether other potential on-going sources of contaminants to the canal are present in the vicinity of the former MGP sites.

KeySpan will conduct a visual reconnaissance from a boat to inspect and photo document the seawall along each side of the canal at low tide. The reconnaissance will also include an inspection of the canal basins.

During the reconnaissance, KeySpan will specifically document the occurrence of any surface drainage ditches, culverts, pipes, seepages through the seawall, or any additional observation that indicates an on-going discharge to the canal. Based upon available information, a number of combined sewer overflow and permitted discharges exists along the canal. Available information regarding these outfalls will be obtained prior to mobilization and their locations verified as part of the reconnaissance. The location and elevation of any potential discharge will be established using global positioning system (GPS) methods correlated to the site datum (National Astronomic Vertical Datum [NAVD]). In addition, the size (diameter) of any conduit, state of discharge (active or inactive), type of discharge (if active), odor, and staining will be documented. The weather conditions will also be noted at the time of the inspection to correlate any potential discharges to combined sewer outfalls and/or other drainage features located adjacent to the canal.

At each location, a sample of the discharge from the outfall will be collected. In the event that no discharge from the outfall is present, a sample of the surface water at the outfall will be collected. Each of the discharge or surface water samples will be analyzed for the following analysis:

- VOCs according to EPA Method 8260B
- SVOCs according to EPA Method 8270C
- PCBs according to EPA Method 8082A
- Pesticides according to EPA Method 8081A
- Herbicides according to EPA Method 8151A
- TAL metals according to EPA Method 6000/7000 series
- Total cyanide according to EPA Method 9012
- Nitrate/nitrite according to EPA Method 300.0
- Sulfate according to EPA Method 300.0
- Fecal Coliform

The flow rate of each outfall will be estimated and recorded. Each of the discharge or surface water samples will also be field measured for pH, specific conductance, temperature, turbidity, dissolved oxygen, and oxidation-reduction potential.

A sample of the sediment within the outfall, if present, will be collected. Each sample will be analyzed for:

- VOCs according to EPA Method 8260B
- SVOCs according to EPA Method 8270C
- PCBs according to EPA Method 8082A
- Pesticides according to EPA Method 8081A
- Herbicides according to EPA Method 8151A
- Target Analyte List (TAL) metals according to EPA Method 6000/7000 series
- Total cyanide according to EPA Method 9012
- Total organic carbon (TOC) according to EPA Method 9060
- Nitrate/nitrite according to EPA Method 300.0
- Sulfate according to EPA Method 300.0
- Fecal Coliform

In addition to these laboratory analyses, the sediment samples may be tested in the field for pH.

Bathymetry Data Collection

To evaluate the relief of the canal floor surface, KeySpan will perform a bathymetric survey of the canal and basins. Bathymetry will be obtained through a sonar survey performed by KeySpan or a subcontractor. The survey will utilize GPS equipment for location and elevation measurements and will be tied in to the NAVD datum used for the survey of on-site borings and monitoring wells. In addition, KeySpan will attempt to obtain previous bathymetric data that was collected by others within the canal.

Sediment Coring and Sample Collection

The objective of this part of the investigation is to collect sediment samples within the Gowanus Canal for chemical and physical characterization. The project team will utilize sediment cores, sediment sampling, and chemical analysis to meet this objective.

Twenty-seven transects (Transect A through AA) located perpendicular to the canal will be established for sampling. Plate 1 provides a summary of the proposed transect locations. Plates 2, 3, and 4 identify the Upper, Middle, and Lower Reaches of the Gowanus Canal and provide the sample locations along each transect and in the basins. However, the exact location may be established based on the canal reconnaissance, subsurface utilities, and the results from the bathymetric survey proposed by KeySpan as part of this work plan. Transect A will be located at the head of the canal near the flushing tunnel (Plate 2). Transect AA will be located at the terminus of the canal as it enters Gowanus Bay (Plate 4). Additional sediment samples will be collected from the canal basins as depicted on Plates 2, 3 and 4. Where practical, transects will be located to replicate the USACE borings completed along the canal and in the basins.

Each transect will include three core locations for the collection of sediment samples. One core location will be established in the middle of the canal with the other two core locations located

approximately 5 to 10 feet from the canal bulkhead. In addition, three sediment cores will be collected from the canal basins to evaluate the sediment conditions. Table 1 provides a summary of transects and associated samples identification numbers. Core locations will be surveyed using GPS equipment and referenced to the site datum for the Carroll Gardens/Public Place site.

Sediment core samples will be collected from a barge using an electric or pneumatically driven vibracore. The sediment cores will be collected in general accordance with the standard operating procedure for sediment sampling using vibratory equipment that is provided as Attachment 1. The barge will be equipped with oil absorbent boom and other spill control materials in the event that any oily residue is generated during the sampling process.

If the upper sediment is too loose for vibracore sampling, then a clamshell grab sampler will be used to collect the sediment sample.

Based upon the USACE report, the depth to the sediments ranges from 1 foot at the end of the canal to a maximum of 30.5 feet within the canal near the Gowanus Bay. The depth to the sediment water interface within the barge basins ranged from 0 feet to 5.5 feet. The United States Geological Survey (USGS) estimates sedimentation rates in the New York Harbor area range from 2 centimeters (cm) to 5 cm per year. Assuming an average constant sediment rate of 2 cm/year, with no dredging, the sediment column would be approximately 10 feet thick since 1850. To fully evaluate the profile of accumulated sediments and to assess the nature of the geologic materials beneath the sediments, KeySpan proposes that each core sample target a maximum 20-foot core length or vibracore refusal.

At each proposed core location, sediment samples will be collected and submitted for laboratory chemical and physical analysis. Upon retrieval, each vibracore will be split, logged, and screened by an organic vapor analyzer equipped with a photoionization detector (PID). The physical characteristics of the core will be noted and will include:

- Type and thickness of stratigraphic layers
- Sediment texture
- Identification of visual impacts
- Odor
- Color
- Identification of anthropogenic material

Analytical samples from each core will be collected from sediments within each core that exhibit impacts. If no impacts are observed analytical sample locations will be chosen as follows: one sample will be collected from the shallow sediments near the sediment water interface; one sample will be collected from the sediments at the interface of the sediment deposits and the native material; and one sample will be collected from the native materials at the terminus of the boring.

Eight to ten additional sediment cores will be collected for age dating analysis at the end of the sediment coring program. These duplicate cores will be located next to completed cores and will be weighted towards sediment cores with greater accumulations of sediments (i.e., longer sediment records). Upon collection, the core will be sectioned in the field, capped, and stored upright to minimize sample disturbance.

Laboratory Analysis and Age Dating of Sediment

The objective of this part of the investigation is to generate chemical characterization to establish the lateral and vertical extent, genesis, and age of contaminated sediments. To meet this objective, KeySpan will utilize standard analytical methods as well as forensic and geochronology analytical methods.

A maximum of three samples will be collected from each core and analyzed for:

- VOCs according to EPA Method 8260B
- SVOCs according to EPA Method 8270C
- PCBs according to EPA Method 8082A
- Pesticides according to EPA Method 8081A
- Herbicides according to EPA Method 8151A
- Target Analyte List (TAL) metals according to EPA Method 6000/7000 series
- Total cyanide according to EPA Method 9012
- Total organic carbon (TOC) according to EPA Method 9060
- Nitrate/nitrite according to EPA Method 300.0
- Sulfate according to EPA Method 300.0
- Fecal Coliform
- Bulk density, grain size and percent water content (ASTM Methods)

In addition to these laboratory analyses, the sediment samples may be tested in the field for pH.

Three samples exhibiting evidence of contamination will be analyzed for full toxicity characteristic leaching procedure (TCLP) analytes: metals, VOCs, SVOCs, pesticides, herbicides and disposal parameters including: paint filter test, ignitability, corrosivity, and reactivity.

Environmental forensics will be used as an aid for the determination of the source and age of the PAHs within the sediments. Three samples from each transect will be collected for forensic analysis. Samples that exhibit a range of contaminant concentration from low to high, based on PID readings and physical observations, will be collected. Chemical analysis from accumulated DNAPL tar from three landside monitoring wells will be used for comparison with hydrocarbon signatures in sediment. Forensic analysis will include high resolution hydrocarbon

fingerprinting, extended PAH profiles and biomarker fingerprints. Environmental forensic samples will be analyzed by Newfields Environmental Forensics Practice located in Rockland, Massachusetts.

Geochronology methods will be used as an aid to the determination of the age of the sediments within the Gowanus Canal. Two radiogenic parameters will be measured to determine the sedimentation rate and dated depth interval between approximately 1850 and present (about 150 years). These parameters include:

- Lead-210
- Cesium-137

These parameters are not byproducts of industrial processes along the Gowanus Canal but are used as indicators of the age of the sediment through their presence and/or absence. According to USGS information, lead (Pb)-210 decays with a half-life of 22.3 years and has a useful range of approximately 150 years before present. Cesium (Cs)-137 is a radioactive isotope that is used as a geochronology marker based on the advent of nuclear testing. Cs-137 first appeared in the atmosphere in 1952 and peaked around 1963, and has since steadily declined.

Geochronology analysis will be competed at a minimum six sediment cores. Samples will be collected at approximately in 2 cm intervals over the entire depth of the sediment core or over the core interval representative of the last 150 years, if known.

Surface Water Quality Sample Collection

The objective of this portion of the investigation is to collect surface water quality data and analytical samples to characterize the surface waters of the Gowanus Canal. Four surface water samples will be collected from each of the 27 sediment sampling transects and within the basins. The samples will be collected at two locations at different depths. In addition, surface water samples will be collected from at least three locations in the lower reach of the canal along the centerline to determine the potential discharge to the Gowanus Bay. The proposed surface water locations are shown on Plate 1. Each of the surface water sample location will be analyzed for:

- VOCs according to EPA Method 8260B
- SVOCs according to EPA Method 8270C
- PCBs according to EPA Method 8082A
- Pesticides according to EPA Method 8081A
- Herbicides according to EPA Method 8151A
- TAL metals according to EPA Method 6000/7000 series
- Total cyanide according to EPA Method 9012
- Nitrate/nitrite according to EPA Method 300.0
- Sulfate according to EPA Method 300.0
- Fecal Coliform

In addition, the following water quality parameters will be tested in the field: pH, specific conductance, temperature, turbidity, dissolved oxygen, and oxidation-reduction potential. Water quality parameters will be collected utilizing the In-situ Troll 9000 multi-parameter water quality meter or equivalent. Water column clarity will also be gauged with a secchi disk at each transect.

Subsurface Soil Boring Investigation

As requested in the February 4, 2005 NYSDEC letter, KeySpan will include on-shore soil borings at the end of each transect where it is feasible. Transects were generally aligned with existing boring/monitoring wells that were completed on the Carroll Gardens/Public Place site. Plates 2, 3, and 4 show the proposed boring locations. Because of physical constraints (building and active gate regulator station), the requested borings on the east end of Transects P and Q will be not able to be completed. Other boring locations may have to be modified or may not be possible due to physical constraints and/or access restrictions to third party properties. Any changes in proposed boring locations will be evaluated prior to the start of the sediment sampling program. Each proposed boring will be continuously sampled to a maximum depth of 40 feet (approximately -27 feet NAVD) to coincide with the approximate terminal depth of the sediment cores. The soil borings will be collected with a Geoprobe® drilling rig. Soil samples will be collected continuously from each boring using 4-foot or 5-foot-long MacroCore® sampler equipped with a discrete sampler device. Each core will be screened with a PID and logged for physical observations including evidence of visual impacts and odors.

Up to two soil samples from each boring will be submitted for laboratory analysis. The two samples that exhibit the greatest evidence of impacts within the boring will be submitted for laboratory analysis. In the absence of visual impacts, soil samples will be collected at depths that coincide with observed impacts within nearby sediment cores. Each subsurface soil sample will be analyzed for:

- VOCs by EPA Method 8260B
- SVOCs by Method 8270C
- PCBs by Method 8082A
- Pesticides by Method 8081A
- Herbicides by Method 8151A
- TAL metals by EPA Method 6000/7000 series
- Total cyanide by EPA Method 9012

In addition, a minimum of one environmental forensics samples will be collected from the proposed subsurface borings if impacted soils are encountered.

Quality Assurance (QA)/Quality Control (QC) Plan

QA/QC samples will be collected as part of the sediment and subsurface soil investigation as described in the approved work plan. One set of QA/QC samples, consisting of blind duplicate samples, matrix spike (MS)/matrix spike duplicate (MSD) samples, and equipment rinsate blank will be collected and analyzed for every 20 sample collected in the field or one week of sampling. The QA/QC sample sets will be analyzed for the same suite of analytes as the environmental samples being submitted. Trip blank samples will be submitted for VOC analysis with every shipment of samples to the laboratory. All sample analysis and data validation will be conducted in accordance with the NYSDEC June 2000 Analytical Services Protocol (ASP).

Health and Safety Plan

All fieldwork will be conducted in a manner consistent with the provisions of the site-specific health and safety plan dated February 28, 2003. An addendum to the approved health and safety plan will be prepared and submitted that specifically addresses sediment sampling from a barge and addresses and health and safety concerns related to sampling material that may contain untreated sanitary sewage.

Equipment Decontamination and Investigation Derived Wastes

Any non-dedicated sampling equipment that contacts the sediments and subsurface soils will be decontaminated according to the approved work plan. Prior to each use by the following procedure:

- Rinse with a tap water and bleach solution (surface water and sediment handling)
- Wash with a tap water and non-phosphate detergent solution
- Tap water rinse
- Distilled water rinse
- 10% nitric acid rinse
- Methanol rinse
- Distilled/deionized water rinse

All decontamination fluids, subsurface soils, sediments and personal protective equipment (PPE) generated will be contained and brought back to the Carroll Gardens/Public Place Parcel I site and stored within 55-gallon United States Department of Transportation (USDOT)-approved drums that will be staged at Carroll Gardens/Public Place Parcel I. The investigation-derived wastes will be characterized and disposed at an approved facility.

Analytical Data Deliverable

The laboratory will provide New York State Category B data deliverables for subsurface soil, sediment, and surface water samples that will be provided in both electronic and printed format. The analytical results will be validated in accordance with New York requirements.

Field Program Schedule

It is anticipated that, pending vendor availability, the Gowanus Canal sediment investigation field program can commence upon review and approval by NYSDEC of this work plan and execution of a consent order specifically for this site. (A copy of a proposed consent order will be forwarded to the Department within one week.) KeySpan anticipates that the sampling program can be completed in approximately three to four weeks of fieldwork, depending on weather, tidal conditions, bridge and barge traffic, and approval of this work plan. KeySpan will notify NYSDEC five working days prior to the anticipated start date of the sediment-sampling investigation program. It is anticipated that the NYSDEC will have a representative on-site during all field work.

Gowanus Canal Investigation Report

The newly obtained data will be incorporated into an electronic database. The Gowanus Canal sediment investigation findings will be summarized in an investigation report that will include lithologic logs of the sediment cores, maps updated with actual sample locations, and all analytical results. Sediments will be evaluated with information provided in the NYSDEC Technical Guidance for Screening Contaminated Sediments. A draft copy of the report will be submitted to NYSDEC for review and comment approximately eight weeks after completion of field activities. A final report will be prepared following KeySpan's receipt of any NYSDEC comments.

If you have any questions, feel free to contact me at (718) 403-3053 or e-mail me at tbell@keyspanenergy.com.

Sincerely,

Tracey L. Bell
Manager
Environmental Asset Management

Attachments
c: L. Liebs (KeySpan; 1 copy)

Attachment 1

Standard Operating Procedure for Sediment Sampling Using Vibracore Equipment

STANDARD OPERATING PROCEDURE FOR SEDIMENT SAMPLING USING VIBRACORE EQUIPMENT

1. INTRODUCTION

Sediment samples can be collected via a number of different methods. The chosen method is dependent upon the nature of the sediments and to what depth the sediments are to be sampled. Fine-grained sediments, such as sands, silts and clays can be collected using Vibracore (VC) equipment for depths of up to 10 feet below the top of sediments. The VC equipment utilizes an air powered piston vibrator to drive the core pipe into the unconsolidated sediments. A disposable lexan liner is placed within the core pipe to collect each sample. A new liner is inserted in the core pipe for each sample. There are a cutting edge and a retainer at the bottom of the core pipe to hold the sample in the barrel.

2. PROCEDURES

VC sampling is conducted as follows.

- Sample from downstream to upstream locations so that disturbed sediment will not affect subsequent sampling locations.
- If sediment samples are being collected for laboratory analysis, the sampling equipment (i.e., cutting shoe, retainer, and sampling barrel) shall be decontaminated prior to the collection of samples at each location. Decontamination shall be conducted according to procedures that are outlined in any work plan(s) associated with the site.
- The drilling contractor shall measure the depth of the water column (depth to top of sediments). The drilling contractor shall also record the latitude, longitude and elevation of the sample location by means of the Global Positioning System (GPS). This information will be recorded by the GEI field representative along with a written description of the location (including sketch if appropriate). If GPS is not available, sampling locations will be marked with a labeled stake, buoy, flagging, or other device. When marking locations in navigable waterways, the appropriate regulatory agencies will be informed and proper precautions will be taken to prevent any navigational hazards before, during, and after sampling.
- Prior to coring at each sampling location, the VC watercraft shall be moored in a multi-point fashion.
- The VC drilling contractor will collect sediment samples using 3-inch diameter steel pipe in lengths of 5-feet or 10-feet. A 2-5/16-inch outer diameter (1/16-inch thick) lexan liner is placed into the core barrel. The apparatus is vibrated into the sediments, where penetration rates will vary depending on the sediment type. When the projected/specified depth is reached, the core will be retrieved.
- If sufficient room on the VC watercraft is available, the GEI field representative will log the core and collect analytical samples from the core

onboard. Otherwise, core samples shall be delivered to the field representative at a shore side landing area as soon as practical after acquisition.

- The GEI field representative will identify and record the recovery and the type of sediment in terms of the major and minor constituents (i.e., sand, gravel, silt, and clay) and choose the proper group name and Unified Soil Classification Symbol. Soil samples shall be described according to the American Society for Testing and Materials (ASTM) Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) D2488-90. Estimates of the percentage of each constituent will be recorded and listed in order of predominance.
- The sample structure shall be recorded (i.e., laminated, stratified, homogenous). Note attributes such as cementation, color and mineralogy (if it can be determined).
- Screening for Volatile Organic Compounds (VOCs) will be conducted on sediments throughout the core. A photoionization detector will be used for this process. Only relatively undisturbed portions of the core will be screened. The results of the screening will be recorded.
- The presence of iron-staining or other staining, presence of organic matter, shells, debris or detritus will be recorded. Any odors (i.e., tar-like vs. gasoline-like vs. fuel oil-like, etc.) will be recorded. Any visual impacts will be recorded (i.e., sheens vs. DNAPL vs. staining vs. oil blebs).
- Analytical samples will be selected based on any criteria stipulated in the associated site-specific work plan. Analytical samples shall be collected with stainless steel spatulas (or similar) that have been decontaminated according to procedures that are outlined in any work plan(s) associated with the site. The samples shall be contained in laboratory provided jars or glassware and kept cool. The sample identification, date, time and associated details will be recorded. Pertinent information regarding the samples will be recorded on a chain-of-custody form.

3. REFERENCES

1. Annual Book of ASTM Standards (1993), Section 4, v. 4.08 Soil and Rock; Building Stones; Geosynthetics, D2488-90, Standard Practice for Description and Indentification of Soils (Visual-Manual Procedure), American Society for Testing and Materials (ASTM).

Table 1

Sample Descriptions and Analytical Summary

Table 1
Sample Descriptions and Analytical Summary
KeySpan Corporation
Carroll Gardens/Public Place
Gowanus Canal Sediment Sampling

Transect I.D.	Sample I.D.	Sample Location	Sample Type and Number			Analysis (Method[1])												
			Sediment	Subsurface Soil	Surface Water	VOCs (8260B)	SVOCs (8270C)	PCBs (8082A)	Pesticides (8081A)	Herbicides (8151A)	TAL Metals (6000/7000)	Total Cyanide (9012)	TOC (9060)	Nitrate/ Nitrite (300.0)	Sulfate (300.0)	Fecal Coliform	Bulk Density/ % Water Content/ Grain Size[3]	Environmental Forensics[2]
A	GC-SED-01	Gowanus Canal/Upper Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-02		3															
	GC-SED-03		3															
	GC-SW-01				2	X	X	X	X	X	X	X		X		X		
	GC-SW-02				2													
	GC-GP-01	Block 411, Lot 14		2		X	X	X	X	X	X	X						
	GC-GP-02	Block 411, Lot 24		2														
B	GC-SED-04	Gowanus Canal/Upper Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-05		3															
	GC-SED-06		3															
	GC-SW-03				2	X	X	X	X	X	X	X		X		X		
	GC-SW-04				2													
	GC-GP-03	Block 417, Lot 21		2		X	X	X	X	X	X	X						
	GC-GP-04	Block 418, Lot 1		2														
C	GC-SED-07	Gowanus Canal/Upper Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-08		3															
	GC-SED-09		3															
	GC-SW-05				2	X	X	X	X	X	X	X		X		X		
	GC-SW-06				2													
	GC-GP-05	Block 424, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-06	Block 425, Lot 1		2														
D	GC-SED-10	Gowanus Canal/Upper Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-11		3															
	GC-SED-12		3															
	GC-SW-07				2	X	X	X	X	X	X	X		X		X		
	GC-SW-08				2													
	GC-GP-07	Block 431, Lot 17		2		X	X	X	X	X	X	X						
	GC-GP-08	Block 432, Lot 15		2														
E	GC-SED-13	Gowanus Canal/Upper Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-14		3															
	GC-SED-15		3															
	GC-SW-09				2	X	X	X	X	X	X	X		X		X		
	GC-SW-10				2													
	GC-GP-09	Block 438, Lot 17		2		X	X	X	X	X	X	X						
	GC-GP-10	Block 439, Lot 1		2														
F	GC-SED-16	Gowanus Canal/Upper Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-17		3															
	GC-SED-18		3															
	GC-SW-11				2	X	X	X	X	X	X	X		X		X		
	GC-SW-12				2													
	GC-GP-11	Block 445, Lot 11		2		X	X	X	X	X	X	X						
	GC-GP-12	Block 439, Lot 1		2														
G	GC-SED-19	Gowanus Canal/Upper Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-20		3															
	GC-SED-21		3															
	GC-SW-13				2	X	X	X	X	X	X	X		X		X		
	GC-SW-14				2													
	GC-GP-13	1st St, adjacent to Block 452, Lot 15		2		X	X	X	X	X	X	X						
	GC-GP-14	Block 453, Lot 1		2														
H	GC-SED-22	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-23		3															
	GC-SED-24		3															
	GC-SW-15				2	X	X	X	X	X	X	X		X		X		
	GC-SW-16				2													
	GC-GP-15	Block 458, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-16	Block 967, Lot 1		2														
I	GC-SED-25	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-26		3															
	GC-SED-27		3															
	GC-SW-17				2	X	X	X	X	X	X	X		X		X		
	GC-SW-18				2													
	GC-GP-17	Block 466, Lot 19		2		X	X	X	X	X	X	X						
	GC-GP-18	Block 978, Lot 32		2														

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			Sediment	Subsurface Soil	Surface Water	VOCs (8260B)	SVOCs (8270C)	PCBs (8082A)	Pesticides (8081A)	Herbicides (8151A)	TAL Metals (6000/7000)	Total Cyanide (9012)	TOC (9060)	Nitrate/ Nitrite (300.0)	Sulfate (300.0)	Fecal Coliform	Bulk Density/ % Water Content/ Grain Size[3]	Environmental Forensics[2]
J	GC-SED-28	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-29		3															
	GC-SED-30		3															
	GC-SW-19				2	X	X	X	X	X	X	X		X		X		
	GC-SW-20				2													
	GC-GP-19	Block 466, Lot 19		2		X	X	X	X	X	X	X						
	GC-GP-20	Block 977, Lot 3		2														
K	GC-SED-31	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-32		3															
	GC-SED-33		3															
	GC-SW-21				2	X	X	X	X	X	X	X		X		X		
	GC-SW-22				2													
	GC-GP-21	Block 466, Lot 17		2		X	X	X	X	X	X	X						
	GC-GP-22	Block 977, Lot 3		2		X	X	X	X	X	X	X						
L	GC-SED-34	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-35		3															
	GC-SED-36		3															
	GC-SW-23				2	X	X	X	X	X	X	X		X		X		
	GC-SW-24				2													
	GC-GP-23	5th St. adjacent to Block 990, Lot 21		2		X	X	X	X	X	X	X						
M	GC-SED-37	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-38		3															
	GC-SED-39		3															
	GC-SW-25				2	X	X	X	X	X	X	X		X		X		
	GC-SW-26				2													
	GC-GP-24	Block 990, Lot 21		2		X	X	X	X	X	X	X						
N	GC-SED-40	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-41		3															
	GC-SED-42		3															
	GC-SW-27				2	X	X	X	X	X	X	X		X		X		
	GC-SW-28				2													
	GC-GP-25	Block 990, Lot 25		2		X	X	X	X	X	X	X						
O	GC-SED-43	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-44		3															
	GC-SED-45		3															
	GC-SW-29				2	X	X	X	X	X	X	X		X		X		
	GC-SW-30				2													
P	GC-SED-46	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-47		3															
	GC-SED-48		3															
	GC-SW-31				2	X	X	X	X	X	X	X		X		X		
	GC-SW-32				2													
Q	GC-SED-49	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-50		3															
	GC-SED-51		3															
	GC-SW-33				2	X	X	X	X	X	X	X		X		X		
	GC-SW-34				2													
R	GC-SED-52	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-53		3															
	GC-SED-54		3															
	GC-SW-35				2	X	X	X	X	X	X	X		X		X		
	GC-SW-36				2													
	GC-GP-26	Block 990, Lot 50		2		X	X	X	X	X	X	X						
S	GC-SED-55	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-56		3															
	GC-SED-57		3															
	GC-SW-37				2	X	X	X	X	X	X	X		X		X		
	GC-SW-38				2													
T	GC-SED-58	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-59		3															
	GC-SED-60		3															
	GC-SW-39				2	X	X	X	X	X	X	X		X		X		
	GC-SW-40				2													
	GC-GP-27	Block 480, Lot 8		2		X	X	X	X	X	X	X						
	GC-GP-28	Block 1007, Lot 1		2														

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			Sediment	Subsurface Soil	Surface Water	VOCs (8260B)	SVOCs (8270C)	PCBs (8082A)	Pesticides (8081A)	Herbicides (8151A)	TAL Metals (6000/7000)	Total Cyanide (9012)	TOC (9060)	Nitrate/ Nitrite (300.0)	Sulfate (300.0)	Fecal Coliform	Bulk Density/ % Water Content/ Grain Size[3]	Environmental Forensics[2]
U	GC-SED-61	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-62		3															
	GC-SED-63		3															
	GC-SW-41				2	X	X	X	X	X	X	X		X		X		
	GC-SW-42				2													
	GC-GP-29	Block 480, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-30	Block 1007, Lot 1		2														
V	GC-SED-64	Gowanus Canal/Middle Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-65		3															
	GC-SED-66		3															
	GC-SW-43				2	X	X	X	X	X	X	X		X		X		
	GC-SW-44				2													
	GC-GP-31	Block 483, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-32	Block 1025, Lot 1		2														
W	GC-SED-67	Gowanus Canal/Lower Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-68		3															
	GC-SED-69		3															
	GC-SW-45				2	X	X	X	X	X	X	X		X		X		
	GC-SW-46				2													
	GC-GP-33	Block 489, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-34	Block 625, Lot 2		2														
X	GC-SED-70	Gowanus Canal/Lower Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-71		3															
	GC-SED-72		3															
	GC-SW-47				2	X	X	X	X	X	X	X		X		X		
	GC-SW-48				2													
	GC-GP-35	Block 491, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-36	Block 625, Lot 2		2														
Y	GC-SED-73	Gowanus Canal/Lower Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-74		3															
	GC-SED-75		3															
	GC-SW-49				2	X	X	X	X	X	X	X		X		X		
	GC-SW-50				2													
	GC-GP-37	Block 493, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-38	Block 625, Lot 2		2														
Z	GC-SED-76	Gowanus Canal/Lower Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-77		3															
	GC-SED-78		3															
	GC-SW-51				2	X	X	X	X	X	X	X		X		X		
	GC-SW-52				2													
	GC-GP-39	Block 495, Lot 1		2		X	X	X	X	X	X	X						
	GC-GP-40	Block 625, Lot 250		2														
AA	GC-SED-79	Gowanus Canal/Lower Reach	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-80		3															
	GC-SED-81		3															
	GC-SED-82		3															
	GC-SED-83		3															
	GC-SW-53				2	X	X	X	X	X	X	X		X		X		
	GC-SW-54				2													
	GC-GP-41	Block 496, Lot 1		2		X	X	X	X	X	X	X						
N/A	GC-SW-55	Gowanus Canal/Lower Reach			2	X	X	X	X	X	X	X		X		X		
	GC-SW-56				2													
	GC-SW-57				2													
N/A	GC-SED-84	4th Street Basin	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-85		3															
	GC-SED-86		3															
	GC-SED-87		3															
	GC-SW-58				2	X	X	X	X	X	X	X		X		X		
	GC-SW-59				2													
	GC-SW-60				2													
	GC-SW-61				2													

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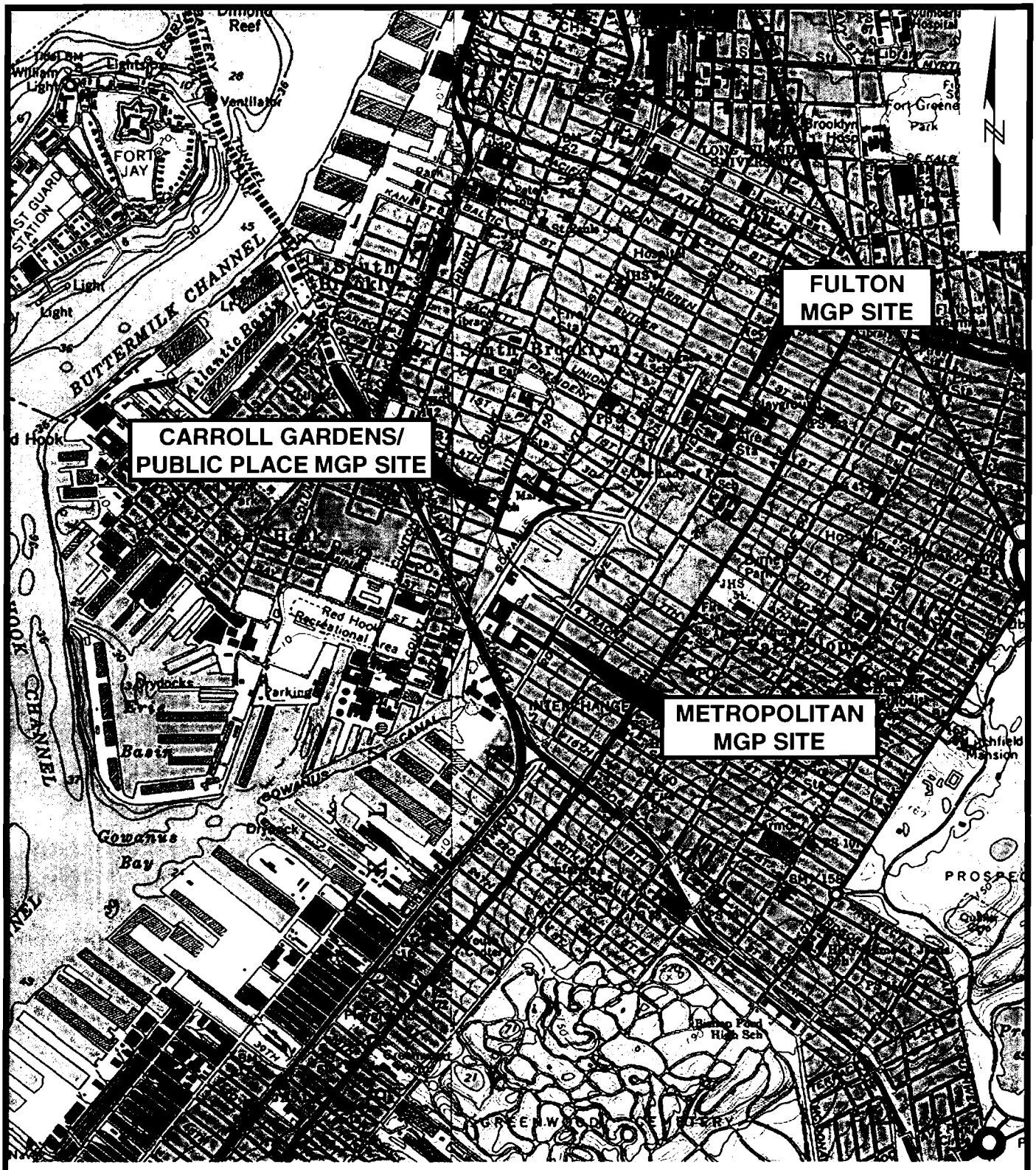
			Sediment	Subsurface Soil	Surface Water	VOCs (8260B)	SVOCs (8270C)	PCBs (8082A)	Pesticides (8081A)	Herbicides (8151A)	TAL Metals (6009/7000)	Total Cyanide (9012)	TOC (9060)	Nitrate/ Nitrite (300.0)	Sulfate (300.0)	Fecal Coliform	Bulk Density/ % Water Content/ Grain Size[3]	Environmental Forensics[2]
N/A	GC-SED-88	6th Street Basin	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-89		3															
	GC-SED-90		3															
	GC-SW-62				2	X	X	X	X	X	X	X		X		X		
	GC-SW-63				2													
	GC-SW-64				2													
N/A	GC-SED-91	7th Street Basin	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SED-92		3															
	GC-SED-93		3															
	GC-SW-65				2	X	X	X	X	X	X	X		X		X		
	GC-SW-66				2													
	GC-SW-67				2													
N/A	GC-SED-94	11th Street Basin	3			X	X	X	X	X	X	X	X	X	X	X	X	X
	GC-SW-68				1	X	X	X	X	X	X	X		X		X		
N/A	GC-OFS[4]	Gowanus Canal/All Outfalls	1			X	X	X	X	X	X	X	X	X	X	X		
	GC-OFW[5]				2	X	X	X	X	X	X	X		X		X		
	GC-SW[5]				2	X	X	X	X	X	X	X		X		X		

N/A - Not applicable
1. Chemical analysis test methods specified are from U.S. EPA SW-846 test methods.
2. One sediment sample per core will be analyzed for environmental forensics.
3. Physical analysis test methods are ASTM D2937, D2216, and D422, respectively.
4. If present, a sediment sample will be collected from each outfall on the Gowanus Canal.
5. A water sample will be collected from each outfall on the Gowanus Canal.
6. A surface water sample will be collected at each outfall on the Gowanus Canal if there is no water flowing from the outfall.

Figure 1

Site Location Map



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

0 2000 4000

SCALE, FEET

KEYSPAN CORPORATION GOWANUS CANAL BROOKLYN, NEW YORK, NEW YORK	GEI Consultants	**SITE LOCATION MAP**
KEYSPAN CORPORATION BROOKLYN, NEW YORK	PROJECT 982482-8-1905	JUNE 2005 FIGURE 1

KEYSPAN\GOWANUS CANAL\SEDIMENT\GOWANUS SEDIMENT-LOC.PPT

Plates