



Geotechnical
Environmental and
Water Resources
Engineering

Remedial Investigation Work Plan

**Williamsburg Works
Former Manufactured Gas Plant Site**

Brooklyn, New York
AOC Index No. A2-0552-0606
Site #: 224055

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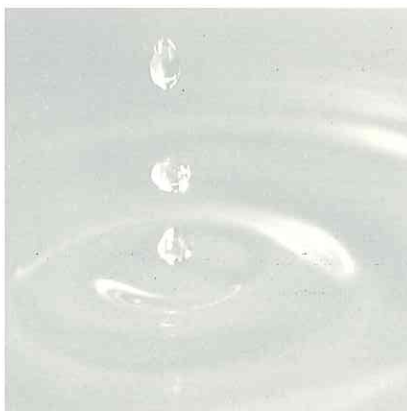


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Abbreviations and Acronyms

ACGIH	American Conference of Government Industrial Hygienists
ACO	Administrative Order on Consent
ASTM	American Society for Testing and Materials
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
BUG	Brooklyn Union Gas Company
CAMP	Community Air-Monitoring Plan
CHSS	Corporate Health and Safety Specialist
cm	Centimeter
DER	Division of Environmental Remediation
DNAPL	Dense Non-Aqueous Phase Liquid
EDR	Environmental Data Resources
ELAP	New York State Environmental Laboratory Approval Program
EPA	United States Environmental Protection Agency
FOIA	Freedom of Information Act
FSP	Field Sampling Plan
FWRIA	Fish and Wildlife Resources Impacts Analysis
GEI	GEI Consultants, Inc.
GPS	Global Positioning System
HASP	Health and Safety Plan
ID	Inner Diameter
IDW	Investigation derived waste
KeySpan	KeySpan Corporation
mcg/m ³	Micrograms per cubic meter
MGP	Manufactured Gas Plant
MS/MSD	Matrix Spike/ Matrix Spike Duplicate
MTBE	Methyl tert-butyl ether
NAPL	Non-Aqueous Phase Liquid
NAVD	North American Vertical Datum
NGRID	National Grid USA
NGVD	National Geodetic Vertical Datum
NTU	Nephelometric Turbidity Units
NYSASP	New York State Analytical Services Protocols
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OSHA	Occupational Health & Safety Administration
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
PID	Photoionization detector
PM-10	Respirable Particulates
ppm	Parts Per Million

PPE	Personal protective equipment
PRP	Potential responsible party
PVC	Polyvinyl chloride
QAPP	Quality Assurance Project Plan
QA/QC	Quality Assurance/Quality Control
QHHEA	Qualitative Human Health Exposure Assessment
Sanborn	Sanborn Fire Insurance Map
RI	Remedial Investigation
SSO	Site Safety Officer
SVOC	Semivolatile Organic Compound
TAL	Target Analyte List
USDOT	United States Department of Transportaion
UST	Underground Storage Tank
VCP	Voluntary Cleanup Program
VOC	Volatile Organic Compound

1. Introduction

On behalf of National Grid USA (NGRID), formerly KeySpan Corporation, GEI Consultants, Inc. (GEI) has prepared this Remedial Investigation (RI) Work Plan for the Williamsburg Works (Williamsburg) former Manufactured Gas Plant (MGP) site. The site consists of four parcels located along North 12th and North 11th Streets, Kent Avenue and the East River in the Williamsburg Neighborhood of Brooklyn, New York. Figure 1 shows the location of the Williamsburg former MGP site.

NGRID is conducting this RI because a predecessor company, the Brooklyn Union Gas Company (BUG), operated the former MGP to produce manufactured gas for use in the surrounding community from 1850 to the 1930s. The Williamsburg MGP was dismantled prior to 1941, and the site was subsequently subdivided, sold to third parties and redeveloped for industrial uses. Currently the site is developed with warehouses, a service garage/gas station, and an industrial-factory building.

In February 2007, KeySpan and the New York State Department of Environmental Conservation (NYSDEC) entered into an administrative order on consent (ACO) and administrative settlement #A2-0552-0606 to evaluate environmental conditions at a number of sites in New York City and on Long Island. The Williamsburg former MGP site was identified in Table 3 of the ACO; however, the site was not covered under the order. In August of 2007, KeySpan and the NYSDEC completed a modification to the ACO in administrative settlement #A2-0552-0606 which added the Williamsburg Works former MGP site to the order.

The scope of work described in this RI Work Plan is intended to collect sufficient data to evaluate the nature and extent of compounds within soils, soil vapor and groundwater that may be associated with the Williamsburg former MGP site.

The scope of work described in this work plan also benefited from a site visit conducted by NGRID and NYSDEC staff on April 29, 2008. The site visit revealed that access to the two parcels closest to the East River (Block 2287, Lots 16 and 30; currently occupied by Citistorage) was not possible and the building located at 50 North Kent Avenue (Block 2287, Lot 1) was scheduled for imminent demolition (Plate 1). Based on these findings, the NYSDEC and NGRID agreed that investigation within these structures would not be conducted at this time. At such time that access to the Citistorage-occupied building can be obtained, evaluation of potential soil vapor intrusion and/or evaluation of soil and groundwater conditions may be warranted. Following demolition of the building at 50 North Kent Avenue, evaluation of subsurface conditions at that parcel would also be warranted.

The objectives of the RI scope are as follows:

- Defining the location of holder foundations and any other subsurface MGP structures that remain at the site
- Identifying and defining the extent of coal tar contamination at the site
- Defining the potential for non-aqueous phase liquid (NAPL) migration into the East River
- Defining MGP-related impacts to groundwater
- Investigating the potential for soil vapor intrusion
- Assessing whether potential pathways exist through which people, flora, or fauna could be exposed to the contaminants

This work plan has been prepared in general accordance with the ACO, the NYSDEC *Draft DER-10 Technical Guidance for Site Characterization and Remedial Investigation*, dated December 25, 2002, and the New York State Department of Health (NYSDOH) *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, dated October 2006. As such, this work plan includes a brief site description, site history, and a proposed scope of work for the RI of the Williamsburg former MGP site. The RI scope of work includes the following tasks:

- Records Review
- Field Investigation Sampling, Analysis and Survey
- Quality Assurance / Quality Control (QA/QC) and Data Validation
- Step 1 Fish and Wildlife Resource Impact Analysis (FWRIA)
- Qualitative Human Health Exposure Assessment (QHHEA)
- RI Report Preparation

Detailed descriptions of each proposed work activity are provided in Section 5 of this work plan.

The RI appendices contain historical documents (Appendix A), environmental records information (Appendix B), a Community Air-Monitoring Plan (CAMP) (Appendix C), a Field Sampling Plan (FSP) (Appendix D), a Health and Safety Plan (HASP) (Appendix E) and a Quality Assurance Project Plan (QAPP) (Appendix F).

2. Site Background

2.1 Site Location and Description

The Williamsburg former MGP site was subdivided and sold to third parties in the years following decommissioning and is now comprised of four properties that encompass approximately 5.7 acres in the Williamsburg neighborhood of Brooklyn, New York. Three of the four parcels are contiguous and bordered by the East River, North 11th and North 12th Streets and Kent Avenue. A holder was located on the fourth parcel, which is located on the southeast side of Kent Avenue between North 11th and North 12th Streets. The site location is depicted on Figure 1. The addresses and parcel information for the properties of the Williamsburg former MGP site are listed below.

Williamsburg Former MGP Site

Address	Block	Lot
2 North 11 th Street, Brooklyn, NY 11211	2287	30
20 North 12 th Street, Brooklyn, NY 11211	2287	16
21 North 12 th Street (50 Kent Avenue), Brooklyn, NY 11211	2287	1
35 Kent Avenue, Brooklyn, NY 11211	2288	1

The current site conditions are shown on Plate 1 and are discussed in Section 2.2.3.

2.2 Site History

The site history of the Williamsburg former MGP site and surrounding area was developed through the review of available Sanborn Fire Insurance (Sanborn) Maps and historical newspaper articles. A brief summary of the history of the Williamsburg former MGP site is provided below. The Sanborn Maps are included in Appendix A. A comprehensive illustration of historical features during the span of MGP operations is shown on Plate 1.

2.2.1 MGP History

The Williamsburgh Gas Light Company was incorporated in 1850 (Murphy, 1995) and is the first known operator of the Williamsburg MGP. The Williamsburg MGP is first shown on the 1887 Sanborn Map. The MGP gas production facilities were isolated to the 2 North 11th Street and 20 and 21 North 12th Street properties and consisted of coal gas production facilities including a retort house, an engine room, a meter house, and a condenser house. Gas storage and purification facilities included three gas holders, a governor house, a purifying house, two tar tanks, scrubbers and lime houses. These structures are shown on Plate 1.

In 1895, the Williamsburgh Gas Light Company and others merged to form the Brooklyn Union Gas Company (BUG), a predecessor to NGRID. The 1905 Sanborn Map indicates that the MGP was referred to as the BUG Williamsburg Branch and a gas holder is now shown at 35 Kent Avenue. Based upon the age of construction, the holder was likely a pit style holder with a sub-grade foundation.

According to the 1905 Sanborn Maps, the gas production facilities at 2 North 11th Street remained relatively unchanged with the exception of the addition of iron tanks and a pump house. One circular gas tank, a generator house, a condenser house, and exhauster houses were noted at 20 North 11th Street. Purifying houses were noted at 21 North 12th Street.

By 1916, the Williamsburg MGP appears to have converted to water gas production as evidenced by the addition of generators and conversion of the retort house to a generator house at 20 North 11th Street. Two additional oil tanks and a tar slop tank were noted at 2 North 11th Street. An additional gas holder was noted on the 35 Kent Avenue property (Plate 1).

The Williamsburg MGP ceased operation and the MGP structures dismantled prior to 1941, as evidenced by the vacant lots shown in the 1941 Sanborn Map.

2.2.2 Post-MGP History

Subsequent to dismantlement, the Williamsburg former MGP site was subdivided and redeveloped for commercial, industrial and manufacturing uses. A brief history of the post-MGP use was developed from available Sanborn Maps and is presented below by current parcel address and tax lot. All of these parcels are owned by third parties.

- 2 North 11th Street [Block 2287 Lot 30]: The property was used for oil truck parking from approximately 1978 until 1982. The current warehouse building was constructed in 1985 and used for lumber storage from 1988 until 1995 according to Sanborn Maps.
- 20 North 12th Street [Block 2287 Lot 16]: In 1965 a repair shop, office and scrap metal storage were on the property. By 1978, the property and buildings were vacant except for the office. In 1983, the buildings had been demolished and the property was used for parking. The current warehouse building was constructed in 1985 and used for lumber storage from 1988 until 1995 according to Sanborn Maps.
- 21 North 12th Street (50 Kent Avenue) [Block 2287 Lot 1]: A warehouse/industrial building was constructed by 1951 and was occupied by the Ferro-Co. Corp. for sheet metal product manufacturing. By 1965, the building was occupied by Commercial Corrugated Container Corp. By 1978, the property was occupied by a New York City sanitation garage, which currently occupies the site according to Sanborn Map information.

- 35 Kent Avenue [Block 2288 Lot 1]: According to Sanborn Maps, the property was developed as a garage in 1949 and utilized a gasoline storage tank as part of the operations. Colonial Tempered Glass currently operates the garage.

2.2.3 Current Site Conditions

The current site conditions and the surrounding area are shown on the aerial photograph in Plate 1. As discussed above in the site history, the site was subdivided into four parcels following dismantlement of the MGP. As shown in the aerial photograph, the majority of the Williamsburg former MGP site is either paved or developed with buildings. The current site conditions of each parcel are summarized below.

Williamsburg Former MGP

Address	Current Owner	Block	Lot	Land Use Description
2 North 11 th Street Brooklyn, NY 11211	10 th Street, LLC.	2287	30	Warehouse
20 North 12 th Street Brooklyn, NY 11211	10 th Street, LLC.	2287	16	Warehouse
21 North 12 th Street (50 Kent Avenue) Brooklyn, NY 11211	Fifty Kent Avenue Associates	2287	1	Garage/Gas Station
35 Kent Avenue Brooklyn, NY 11211	Fourth Avenue Associates	2288	1	Industrial-Factory Building

The Williamsburg former MGP site and surrounding area are zoned for manufacturing (M3-1); as a result, the site is surrounded by commercial and manufacturing businesses. The Williamsburg former MGP site is bordered by the East River to the northwest, North 12th Street and a Bayside Oil terminal to the northeast, and by North 11th Street and warehouses to the southeast and southwest. Kent Avenue bisects the Williamsburg former MGP.

The Williamsburg former MGP site is developed with buildings that are secured with locked entrances or brick walls with gates.

3. Summary of Records Search

GEI completed a search of environmental records for the Williamsburg former MGP site as part of the preparation of the RI Work Plan. The purpose of this review was to determine:

- Environmental data and information currently available for the site
- History and description of the site including nature of operations
- Types, quantities, physical states, locations, methods and dates of hazardous waste disposal at the site
- Identity of other potential responsible parties (PRPs) for releases of hazardous waste at the site

3.1 Records Search

The record search report for the Williamsburg former MGP site included the review or evaluation of the following:

- For potential releases on site, GEI reviewed the NYSDEC's on-line Spills Incidents Database Search and the Environmental Remediation Database Search
<http://www.dec.ny.gov/chemical/8437.html>
- For environmental data, potential hazardous waste storage, and PRPs, GEI relied upon information from Environmental Data Resources (EDR), a commercially available environmental database, searches dated May 11, 2004 and January 15, 2008, and available Sanborn Maps dated 1887 through 1996. EDR environmental database searches and Sanborn Maps are attached in Appendices A and B.

The site history, current site conditions and site security are discussed above within Section 2.2.

A Freedom of Information Act (FOIA) request letter was submitted to the NYSDEC to obtain information for the subject property and abutting properties with environmental records. NYSDEC provided correspondence and spill report information pertaining to the adjacent Bayside Fuel Oil Depot (Site V00587) in response to the FOIA request. No information pertaining to the Williamsburg Former MGP was provided in response to the FOIA request. This Bayside information will be evaluated and incorporated into the site conceptual model as the RI Work Plan for the former MGP is implemented. Relevant data and findings from the FOIA request information will be incorporated into the RI Report for the former MGP.

3.2 Environmental Records Information Summary

A search of the NYSDEC spill incidents and environmental site remediation databases was conducted by GEI on February 4, 2007. The following environmental records were encountered for the site when GEI accessed the databases.

3.2.1 NYSDEC Environmental Site Remediation Database Search

The NYSDEC website contained a record for the adjacent former Bayside Fuel Oil Depot located to the north of the site. No record was found for the Williamsburg Works MGP.

The Bayside Fuel Oil Depot (Site V00587) is located at 1-65 North 12th Street to the north of the site. The Bayside site is listed as a Class A site within the State Voluntary Cleanup Program (VCP), which indicates that a remedial program is underway but not yet currently complete. There is an existing oil spill stipulation (Spill No. 9804544) that has resulted in ongoing recovery of free-product and contaminated groundwater. A Phase II assessment was completed in 2003, and a FOIA request has been submitted to the NYSDEC for the Phase II report. Fuel oil contamination and MGP impacts have been reported at the Bayside site. Impacts, allegedly from the MGP, were observed from 20 feet below ground surface (bgs) to the top of clay encountered at 60 feet bgs. Concentrations of volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), methyl tert-butyl ether (MTBE) and lead exceeded applicable soil cleanup objectives and groundwater standards. The RI phase is reportedly on-going.

3.2.2 NYSDEC Spill Incident Database Search

Multiple spill incidents were encountered for the Williamsburg former MGP site at 50 Kent Avenue (a/k/a 21 North 12th Street). The spill incidents indicate that diesel was spilled at the site multiple times due to equipment failure and housekeeping. Quarterly Monitoring Reports indicate persistently high levels of soil and groundwater contamination potentially due to MGP impacts. Multiple spill reports remain open for this property. No other spill incident records were found during the GEI search for the parcels comprising the Williamsburg former MGP site.

Multiple spill incidents were encountered for streets and properties adjacent to and within one block of the Williamsburg former MGP site, including multiple spills at the Bayside Fuel Oil Depot which is located to the north of the site across North 12th Street. Three of the spill reports for the Bayside Fuel Oil Depot report alleged MGP impacts.

3.2.3 Commercial Environmental Records Review

A number of current/historic activities of potential environmental concern were identified on site and at adjacent and nearby properties, based on the EDR database search report and on Sanborn Maps. A summary of findings is presented in Table 1 and illustrated on Figure 2.

3.3 Possible Subsurface Structures

A review of Sanborn Maps revealed that a number of historic subsurface structures may be potentially located within the footprint of the Williamsburg former MGP site. Sanborn Maps depict the following possible subsurface structures were present during the operation of the MGP:

- Seven circular tar/oil tanks were located at 2 North 11th Street
- One gas tank was located at 20 North 12th Street
- Three gasholders were located at 21 North 12th Street
- Two gas holders were located at 35 Kent Avenue

The locations of these former MGP structures are shown on Plate 1.

A review of Sanborn Maps and the EDR environmental records report document post-MGP subsurface structures within the footprint of the former MGP. EDR environmental database searches and Sanborn Maps are attached in Appendices A and B. The structures are summarized below by property:

2 North 11th Street [Block 2287 Lot 30]

- One gasoline tank is shown on the 1965 Sanborn Map.

20 North 12th Street [Block 2287 Lot 16]

- Subsurface structures were not shown on the Sanborn Maps or indicated by the EDR report.

21 North 12th Street (50 Kent Avenue) [Block 2287 Lot 1]

- EDR indicates two, 2,000-gallon diesel underground storage tanks (USTs) were closed and removed in 1997 and one, 2,000-gasoline UST was closed in place in 1995.

35 Kent Avenue [Block 2288 Lot 1]

- One gasoline tank is shown on the 1951 Sanborn Map.

4. Local Environment

The following section provides a brief summary of the local environmental setting of the Williamsburg former MGP site and vicinity.

4.1 Surficial Geology

The Williamsburg former MGP site is underlain by artificial fill and glacial deposits (outwash sands and glacial till) according to published information. According to the 1989 *Surficial Geologic Map of New York, Lower Hudson Street* (Cadwell, 1989), the glacial till beneath the site is of variable texture (i.e., clay, silt-clay, boulder-clay) and typically poorly sorted, with variable clast contents that are well rounded and of varying lithologies. The glacial till deposits are stated to be approximately 100 feet thick in the vicinity of the site. Crystalline bedrock underlies the till, the contact of which is located at approximately elevation -100 feet (National Geodetic Vertical Datum [NGVD]) 1929 according to Buxton et. al. (1981).

4.2 Hydrogeology

The hydrogeology beneath the Williamsburg former MGP site is discussed in terms of the available groundwater data and the nearest water body, the East River. Based upon the surrounding topography, the anticipated depth to groundwater is approximately 10 feet bgs and the anticipated groundwater flow direction is northwest, towards the East River.

The East River is located at the northwestern boundary of the Williamsburg former MGP site. The East River is a saline Class I water body. The best use for saline Class I water bodies is for fishing and boating.

5. Scope of Work

The RI scope of work addresses field investigation tasks that will evaluate the nature and extent of soil and groundwater impacts related to the operation of the Williamsburg former MGP site. The type, number and depth of samples were developed based on a preliminary review of historic sources of information such as historic topographic maps and Sanborn Maps. Accordingly, the proposed sampling program includes sampling of soils, soil vapor and groundwater.

The RI scope of work includes the following tasks:

- Pre-Investigation Tasks
- Field Investigation Sampling and Analysis
- Sample Location Survey
- QA/QC and Data Validation
- Qualitative Human Health Exposure Assessment
- Step I Fish and Wildlife Resources Impact Analysis
- RI Report Preparation

A description of each proposed work activity is provided separately below, with the exception of the RI Report. Preparation of the RI Report is addressed in Section 6.

5.1 Pre-Investigation Tasks

Upon receipt of authorization from NGRID, and the necessary access agreements, the consultant will mobilize to the site to implement the sampling program. The initial field mobilization will include the following items to be completed prior to the commencement of the field RI activities:

- Establish a temporary decontamination area
- Establish a temporary waste storage area and make arrangements with NGRID for the removal of investigation-derived wastes (IDW)
- Identify underground utilities

5.1.1 Site Access

NGRID and its consultant/contractors will need site access granted by private property owners to complete the proposed RI scope of work. NGRID will negotiate access with the private property owners. If access to any site parcels can not be obtained, NGRID will work with the NYSDEC to gain access to complete the RI activities.

5.2 Field Investigation Sampling and Analysis

This section of the RI Work Plan describes the proposed surface soil, test pit, soil boring, groundwater monitoring well and soil vapor point installation, sampling and analysis activities. Table 2 presents the general rationale and proposed sampling and analysis for each of the RI sampling locations and media, and Plate 1 depicts all proposed sampling locations. In addition, procedures for ancillary tasks such as utility clearance, hydraulic conductivity testing, well development, air monitoring, and waste containerization and characterization are discussed in this section as well.

Sampling procedures and methods are detailed within the FSP in Appendix D. The proposed analyses, analytical methods, and QA/QC samples are discussed under each of the following subsections for surface soil, test pit, soil boring, monitoring well, sediment, soil vapor, and ambient air sampling procedures. Laboratory data deliverables and data validation procedures are discussed below in Section 5.5, and QA/QC procedures are detailed within the QAPP in Appendix F.

5.2.1 Utility Clearance

The general location of the proposed RI sample locations were identified during a preliminary site visit. Each actual proposed boring and subsurface investigation location will be marked with white paint by the consultant. The drilling subcontractor will provide the boring locations to the utility clearance organization (New York City and Long Island One Call) to identify potential utility conflicts at the site and within the street right of ways adjacent to the site. Prior to installation, each proposed RI sample location will also be cleared by a private utility mark-out company. A request will be submitted to the private property owner for on-site utility plans prior to completing intrusive activities.

Each test pit, soil boring, soil vapor point and monitoring well location will first be cleared utilizing manual or vacuum extraction methods to a depth of 5 feet bgs, or 1 foot below the estimated depth of any adjacent known utility.

5.2.2 Surface Soil Sample Collection

Nine surface soil samples (WW-SS-01 through WW-SS-09) will be collected from unpaved areas where surface soils are exposed around the exterior of the buildings, adjacent to the footprint of the Williamsburg former MGP. The sample locations are shown on Plate 1. Sample descriptions, rationale and analysis are shown in Table 2.

Stainless-steel sampling implements (including spoons or trowels) and stainless steel bowls will be used to collect each surface soil sample from the upper 2 inches beneath any turf, vegetative or gravel layers. The exposed soil will be screened for VOCs using a photoionization detector

(PID). A discrete VOC soil sample will be collected from the area of the highest PID reading. Each surface soil sample will be sampled for VOCs by the United States Environmental Protection Agency (EPA) SW-846 Method 8260B, semivolatile organic compounds (SVOCs) by EPA Method 8270C; Target Analyte List (TAL) metals by EPA Method 6000/ 7000 series; herbicides by EPA Method 8151A; polychlorinated biphenyls (PCBs) by EPA Method 8082; pesticides by EPA Method 8081A; and free cyanide [extraction by EPA Method 9013A and analysis by Microdiffusion American Society for Testing and Materials (ASTM) Method D4282-02]. No compositing or mixing of the VOC sample aliquot will occur. Sample aliquots for analysis of SVOCs, metals, herbicides, PCBs, pesticides and free cyanide will be homogenized in a stainless steel bowl using a stainless steel spoon prior to being placed in laboratory-provided sample containers.

Each sampling implement will be decontaminated in accordance with decontamination procedures described in the FSP (Appendix D). QA/QC samples will include blind duplicate soil samples, MS/MSD samples, and equipment rinsate blank samples. The quality control samples will be completed at a frequency of 1/20 or once per week of sampling. An approved NYSDOH Environmental Laboratory Approval Program (ELAP) laboratory will perform the analyses. One trip blank will be included per shipment of soil samples to the laboratory.

5.2.3 Test Pit Excavation and Sample Collection

A total of six test pits (WW-TP-01 through WW-TP-06) are proposed to be excavated at the Williamsburg former MGP site. The proposed test pit excavation locations are shown on Plate 1, and the descriptions, rationale, and analysis are presented in Table 2. The test pits are proposed to assess the configuration and contents of former MGP structures which may be present in the site subsurface.

Each test pit will be photographed and logged by the field representative during the intrusive utility clearance (Section 5.1.2) and excavation. All material removed from the test pit will be placed on polyethylene sheeting. Odor-suppressing foam and/or other appropriate means to mitigate odor (e.g. plastic sheeting) will be provided by the consultant/contractor to control odor emissions that may result from excavating potentially impacted soils. Test pits will be terminated at the approximate groundwater table or practical extent of the equipment which is approximately 15 feet bgs. Field screening of soils for total organic vapors will be conducted with a PID from the ground surface to the entire depth of the excavation. A minimum of one soil sample will be selected for analysis per each test pit. Samples will be selected from the area exhibiting the most prominent signs of apparent contamination. If no impacts or structures are observed a sample will be collected from the bottom of the test pit. Each sample will be analyzed for VOCs by EPA Method 8260B; SVOCs by EPA Method 8270C; TAL metals by EPA Method 6000/7000 series; herbicides by EPA Method 8151A; PCBs by EPA Method 8082; pesticides by EPA Method 8081A, and free cyanide [extraction by EPA Method 9013A and analysis by Microdiffusion ASTM Method D4282-02].

After the completion of each test pit, the test pit will be backfilled in reverse sequence in which it was excavated, so that materials removed from the bottom of the test pit are placed back at the bottom and materials removed from the top of the test pit are placed back at the top. The test pits will be backfilled in lifts and compacted. Excess soils will be containerized in a lined roll-off which will be characterized by the consultant and disposed of by NGRID. If test pits are excavated in paved areas, the pavement will be restored following completion of RI activities.

QA/QC samples will include blind duplicate soil samples, MS/MSD samples, and equipment rinsate blank samples. The quality control samples will be completed at a frequency of 1/20 or once per week of sampling. A laboratory certified in the NYSDOH ELAP will perform the analyses. One trip blank will be included per shipment of soil samples to the laboratory.

5.2.4 Soil Boring Advancement and Sample Collection

A total of thirty-two (32) soil borings are proposed at the Williamsburg former MGP site. One soil boring (WW-SB-12) and one boring intended to be completed as a monitoring well (WW-MW-09) cannot be installed at this time due to access restrictions to the properties occupied by Citistorage (20 North 12th St and 2 North 11th St). If access can be obtained in the future, these proposed borings could be completed as originally intended. The proposed soil boring and monitoring well locations are shown on Plate 1. Table 2 provides sample description, rationale, and analysis. Each soil boring location will first be cleared utilizing manual methods or vacuum extraction methods to a depth of 5 feet bgs, or 1 foot below the estimated depth of any nearby known utility. NYSDEC requested that this RI Work Plan incorporate contingency “step out” soil boring locations at 20 ft intervals. Plate 1 includes potential step out locations depicted by red hatch marks moving radially away from the proposed borings at the periphery of the former MGP footprint. If MGP impacted materials are encountered in a borehole, then the consultant will clear utilities at the proposed step out location and dynamically delineate the lateral extent of apparent MGP impacts. Potential step out locations are not depicted where fixed structures are present.

Soil samples will be collected and logged continuously from each boring location. It is anticipated that drilling will proceed approximately 10 feet into soils that appear to be un-impacted according to visual and PID assessment in the field. If no impacts are observed at a particular on-site boring location, the boring will terminate at the top of the clay layer, which is anticipated at approximately 60 feet bgs. Any deep drilling through impacted zones will ensure that there is no vertical communication of DNAPL caused by the drilling. Specifically, the upper potentially-impacted units would be cased and sealed into a lower, more confining unit. Drilling methods and procedures will be consistent with the FSP included as Appendix D.

Drilling equipment (i.e., drilling rods, auger, casing, and/or macro-core sampler) will be decontaminated between each sample location. Soil cuttings and decontamination fluids will be

collected in 55-gallon United States Department of Transportation (USDOT) drums, lined roll-off or frac tank and will be disposed of by NGRID following characterization.

Up to three soil samples per boring will be selected for chemical analysis. The first soil sample will be collected from the depth interval indicating the greatest apparent degree of contamination, from beneath the pavement and road base to approximately 5 feet bgs during utility clearance activities, to evaluate shallow subsurface soil conditions for determination of potential exposure pathways at the site. A sample will also be collected during boring advancement at the depth interval indicating the greatest degree of impacts to evaluate the magnitude of the observed impacts at each boring. The greatest degree of contamination will be identified by field screening of the borings with a PID, and by visual and olfactory observations. If soils within a particular boring appear un-impacted then a sample will be collected from the observed groundwater table. A sample will be collected beneath MGP impacts, if present, at the completion of the boring.

Each sample will be analyzed for VOCs by EPA Method 8260B, SVOCs by EPA Method 8270C, TAL metals by EPA Method 6000/7000 series, and free cyanide [extraction by EPA Method 9013A and analysis by Microdiffusion ASTM Method D4282-02]. One sample from within the fill in each soil boring will be analyzed for herbicides by EPA Method 8151A, PCBs by EPA Method 8082 and pesticides by EPA Method 8081A. Environmental forensic analysis of PAHs may be used to evaluate co-mingled or non-MGP related impacts.

Geotechnical parameters will also be evaluated during the RI. Three samples of the clay layer will be analyzed for permeability and Atterberg limits. The fill and glacial outwash layers will also be analyzed for grain size by ASTM method D421/422, moisture content by ASTM method D-2216, and total organic carbon by ASTM method D2974 at 10 to 20 representative sample locations.

Following the collection of subsurface soil samples, each subsurface soil boring not completed as a well (Section 5.3.4) will be abandoned by tremmie grouting the boring from the bottom of the boring to the top in accordance with the FSP (Appendix D).

Each sampling implement will be decontaminated in accordance with decontamination procedures described in the FSP. QA/QC procedures are detailed within the QAPP located in Appendix F. QA/QC samples will include blind duplicate soil samples, MS/MSD samples, and equipment rinsate blank samples. The quality control samples will be completed at a frequency of 1/20. An approved NYSDOH ELAP registered laboratory will perform the analyses. One trip blank will be included per shipment of samples to the laboratory.

5.2.5 Monitoring Well Installation

Fifteen (15) of the proposed soil borings (WW-MW-01 through WW-MW-08 and WW-MW-10 through WW-MW-16) will be completed as permanent monitoring wells. As noted in Section 5.2.4, proposed monitoring well WW-MW-09 cannot be completed at this time due to access restrictions at 20 North 12th Street. Soils at each of the monitoring well locations will be continuously logged as described in Section 5.2.4. Temporary groundwater points will be installed and sampled at three locations (WW-SB-03, WW-SB-05 and WW-SB-07). The locations of the borings and the proposed analysis are shown on Plate 1 and Table 2, respectively. The permanent monitoring wells are proposed to evaluate the groundwater conditions at and immediately adjacent to the Williamsburg former MGP. Two of these monitoring wells will be placed downgradient of the Site, adjacent to the East River. Temporary groundwater points are proposed to evaluate the conditions immediately within the footprint of former MGP structures. Each monitoring well/ point will be installed in general accordance with procedures described below and within the FSP (Appendix D).

Each proposed monitoring well will be screened in the uppermost portion of the water table aquifer. Each well screen will extend approximately two feet above the water table. If DNAPL is encountered in the soil boring, the well screen bottom will be installed on top of any observed confining layer that may be retarding the migration of DNAPL. The screen lengths will not exceed 10 feet. Based upon the vertical extent of DNAPL tar, deep groundwater monitoring wells may be considered. The installation method selected for the deep wells will depend on the depth of contamination, the number of anticipated deep wells, and on the physical drilling conditions.

The monitoring wells will be constructed of 2-inch inside diameter (ID), flush-threaded polyvinyl chloride (PVC) screen and solid casing with a 2-foot sump. 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. Each monitoring well will be fitted with a lockable cap and finished with a flush-mounted curb box secured with cement.

Temporary points will be constructed of a PVC screen and riser or collected through a stainless steel groundwater sampler. Each temporary groundwater point will be abandoned by tremmie grouting the boring from the bottom of the boring to the top in accordance with the FSP (Appendix D).

Soil cuttings and decontamination fluids generated during the installation of monitoring wells will be collected in 55-gallon USDOT drums, lined roll-off or frac tank and will be disposed of by NGRID subsequent to characterization.

5.2.6 Well Development

Each newly installed monitoring well will be developed by alternatively surging and pumping until the turbidity is less than 50 nephelometric turbidity units (NTUs) or until a maximum of 10 well volumes of water have been removed. A field turbidity meter will be used to monitor the NTU levels. Well development will be completed in general accordance with the FSP in Appendix D. Purged groundwater will be containerized in 55-gallon USDOT drums or frac tank and will be disposed of by NGRID at an approved facility.

5.2.7 Groundwater Sample Collection

The fifteen (15) proposed RI monitoring wells will be gauged and sampled. Each of the newly installed monitoring wells will be sampled after a minimum of two weeks following completion of well development. Prior to sampling, two synoptic rounds of groundwater level measurements will be recorded for the monitoring wells and an established surface water measuring point in the East River; the groundwater will be gauged at both the low tide and high tidal levels.

Monitoring wells will be purged and sampled utilizing low flow groundwater sampling procedures and in accordance with the FSP (Appendix D). Each groundwater sample will be analyzed for VOCs by EPA Method 8260B, SVOCs by EPA Method 8270C, TAL metals by EPA Method 6000/7000 series, herbicides by EPA Method 8151A, pesticides by EPA Method 8081A, PCBs by EPA Method 8082 and cyanide by EPA Method 9012.

If 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 or pumped from the well and the volume of bailed DNAPL tar will be recorded. The DNAPL recovered from each well will be examined and described by the consultant's field representative. All DNAPL removed from a well will be containerized for disposal. The recovery rate of the DNAPL will be assessed through periodic measurements of DNAPL levels with an oil/water interface probe. DNAPL levels in each monitoring well will be measured and recorded with the time of the measurement after the DNAPL tar has been removed. If present a sample of the accumulated tar may be analyzed for disposal characteristics.

QA/QC procedures are detailed within the QAPP located in Appendix F. QA/QC samples will include blind duplicate soil samples, MS/MSD samples, and equipment rinsate blank samples. The quality control samples will be completed on a frequency of 1/20. An approved ELAP laboratory will perform the analyses. One trip blank will be included per shipment of samples to the laboratory.

5.2.8 Hydraulic Conductivity Testing

In-situ hydraulic conductivity tests (slug tests) will be completed at three (3) selected monitoring wells. The location of the slug tests will be determined after evaluation of the site lithology.

5.2.9 Sediment Sample Collection

A total of seven (7) sediment core locations (WW-SED-01 through WW-SED-07) are proposed for installation in the East River adjacent to the Williamsburg former MGP site. The proposed sediment core locations are shown on Plate 1. Table 2 provides sample description, rationale, and analysis.

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. 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.

Sediment cores will be advanced to a depth of 20 feet below the sediment water interface or to vibracore refusal. Sediment samples will be collected and logged continuously from each core location. Sediment sampling methods and procedures will be consistent with the FSP in Appendix D. Core locations will be surveyed using Global Positioning System (GPS) equipment and referenced to New York State Plane Coordinate System and North American Vertical Datum (NAVD).

Up to three sediment samples per core location will be selected for chemical analysis. The first sediment sample will be collected from 0 to 6 inches to evaluate the bioactive zone. A sample will also be collected at the depth interval indicating the greatest degree of impacts to evaluate the magnitude of the observed impacts at each sediment core location. The greatest degree of contamination will be identified by field screening of the cores with a PID, and by visual and olfactory observations. If no impacts are observed, analytical samples will be collected from the sediments at the interface of the sediment deposits and the native material. A sample will also be collected beneath the DNAPL impacts, if present, or at the completion of the coring run.

Each sample will be analyzed for VOCs by EPA Method 8260B, SVOCs by EPA Method 8270C, TAL metals by EPA Method 6000/7000 series, and free cyanide [extraction by EPA Method 9013A and analysis by Microdiffusion ASTM Method D4282-02], herbicides by EPA Method 8151A, PCBs by EPA Method 8082 and pesticides by EPA Method 8081A. Environmental forensic analysis of PAHs may be used to evaluate co-mingled or non-MGP related impacts.

Each sampling implement will be decontaminated in accordance with decontamination procedures described in the FSP in Appendix D. QA/QC procedures are detailed within the QAPP located in Appendix F. QA/QC samples will include blind duplicate sediment samples, MS/MSD samples, and equipment rinsate blank samples. The quality control samples will be completed at a frequency of 1/20. An approved NYSDOH ELAP registered laboratory will perform the analyses. One trip blank will be included per shipment of samples to the laboratory.

5.2.10 Soil Vapor Sample Collection

Soil vapor sampling is proposed for the building located at 35 Kent Avenue. Two (2) soil vapor samples (WW-SV-01, WW-SV-02) are proposed for collection to assess the soil vapor conditions beneath this building. Soil vapor sampling cannot be conducted at this time at the buildings occupied by Citistorage on 2 North 11th Street and 20 North 12th Street because of access restrictions. In addition the structure occupying 50 Kent Avenue is slated for demolition; therefore, soil vapor sampling will not be conducted at this time either.

Each soil vapor point will be installed and samples will be collected in general accordance with the New York State Department of Health's *"Guidance for Evaluating Soil Vapor Intrusion in the State of New York"* and National Grid's *"Draft Standard Operating Procedures for Soil Vapor Intrusion Evaluations at National Grid MGP Sites in New York State."*

Soil vapor points installed within building interiors will be installed and completed as permanent sub-slab soil vapor points. Sub-slab soil vapor points will be installed by drilling a hole through the concrete floor slab and then fitting the point with Teflon or stainless steel tubing secured with stainless steel fittings and cap. Each sub-slab soil sample port will be sealed with non-shrinking grout or beeswax and completed with flush-mount manhole covers.

Temporary soil vapor sample points installed outside of buildings will be advanced approximately 5 feet bgs, or 1 foot above the water table. Temporary points will be constructed utilizing a stainless steel screen that is fitted to Teflon or stainless steel tubing secured with stainless steel fittings and caps to the ground surface. The annular space around the screen will be backfilled with inert silica to a minimum of 6 inches above the screen. A bentonite seal will be placed above the sand and the remainder of the annulus will be filled with soil cuttings. The sampling port will be sealed with a 2-inch layer of bentonite paste at the surface.

To ensure that the sampling tube is sealed from the ambient air aboveground, the consultant will utilize helium as a tracer gas as described in the NYSDOH Soil Vapor Intrusion Guidance document. Each sample will be collected utilizing a SUMMA[®] canister with a laboratory-calibrated flow controller that will not exceed 0.2 liters/minute. Each SUMMA[®] canister will be shipped to an approved-NYSDOH ELAP registered laboratory for analysis. The sample will be analyzed for VOCs and naphthalene by the EPA Method TO-15 (including naphthalene). The

soil vapor sampling will target the winter heating season between November 15 and March 30 in accordance with NYSDOH Soil Vapor Guidance.

QA/QC procedures are detailed within the QAPP located in Appendix F. QA/QC samples will include one blind duplicate sample collected during each sampling event. An approved NYSDOH ELAP registered laboratory will perform the analyses.

5.2.11 Indoor and Outdoor Air Sample Collection

Two (2) indoor air samples (WW-IA-01, WW-IA-02) and one (1) outdoor ambient air samples (WW-OA-01) are proposed to be collected as part of the Williamsburg RI. The ambient air samples will be used to assess the potential for soil vapor intrusion into the building at 35 Kent Avenue. Soil vapor intrusion assessment at 2 North 11th Street and 20 North 12th Street cannot be conducted at this time due to access restrictions and the building occupying 50 Kent Avenue is slated to be demolished; therefore soil vapor intrusion assessment will not be conducted there either. The proposed locations are shown in Plate 1 and the rationale and analysis are provided in Table 2.

The proposed air samples will be collected from the approximate breathing height (approximately 3 to 5 feet above ground). Each indoor air and outdoor air samples will be collected utilizing an individually certified 6-Liter SUMMA[®] canister with a laboratory-supplied flow controller that is calibrated to an 8-hour period. The regulator flow rate will not exceed 0.2 liters per minute. Each SUMMA[®] canister will be shipped to an approved-NYSDOH ELAP registered laboratory for analysis. The samples will be analyzed for VOCs and naphthalene by the modified EPA Method TO-15.

QA/QC procedures are detailed within the QAPP located in Appendix F. QA/QC samples will include one blind duplicate air sample (indoor or outdoor air sample) collected during each sampling event. The ambient air sampling will target the winter heating season between November 15 and March 30 in accordance with NYSDOH Soil Vapor Guidance.

Property information will also be collected in general accordance with the NYSDOH Center of Environmental Health's Indoor Air Quality Questionnaire and Building Form that is provided as Appendix B of the New York State Department of Health's "*Guidance for Evaluating Soil Vapor Intrusion in the State of New York*" and NGRID's "*Draft Standard Operating Procedure-Soil Vapor Intrusion for MGP Sites in New York*," which is located in the FSP in Appendix D.

5.2.12 Air Monitoring Implementation

A Community Air-Monitoring Plan (CAMP) will be implemented at the site during intrusive field activities. The CAMP will meet the requirements of the NYSDOH's Generic CAMP contained in Appendix 1 of NYSDEC's *Draft DER-10 Technical Guidance For Site*

Investigation and Remediation, dated December 25, 2002. Air quality will be monitored upwind and downwind of each intrusive work area (i.e., boring, monitoring well and test pit locations). VOCs and respirable particulates (PM-10) will be monitored upwind and downwind on a continuous basis. Wind direction will be determined using a wind sock(s) and/or flagging poles installed on site.

Total volatile organic vapors will be monitored using a PID. Particulate dust will be monitored using a DataRAM particulate meter or equivalent. The equipment will be calibrated at least daily or in accordance with manufacturers' recommendations. The proposed CAMP is presented in Appendix C of this work plan.

5.2.13 Decontamination and Investigation-Derived Wastes

Drilling equipment will be decontaminated at the established decontamination pad between each sample location in accordance with the FSP in Appendix D. Sampling equipment used for sample collection (e.g., stainless steel split spoons, sample spoons, and hand trowels) will be decontaminated prior to use and reuse or disposable sampling equipment will be used.

Soil cuttings and wastewaters produced during decontamination will be collected and contained within 55-gallon USDOT drums, roll-off or frac tank. NGRID will arrange for the disposal of the investigation-derived wastes after they have been characterized at the completion of the field program.

5.2.14 Waste Characterization Sample Collection

As stated above, NGRID will arrange for the disposal of the investigation-derived wastes at the completion of the RI field program.

A waste profile sample of soil and fluid investigation-derived wastes will be collected to characterize the wastes to determine the appropriate disposal options available. Samples will be collected into laboratory-preserved bottles, chilled with ice and submitted to the laboratory under chain of custody as described in the FSP and QAPP. Each disposal sample media will be sampled for parameters to meet the requirements of the approved disposal facilities. A list of potential disposal parameters is provided in the QAPP.

5.3 Survey

Each of the completed RI sample locations including test pits, soil borings, temporary groundwater points, monitoring wells and soil vapor locations will be surveyed by a New York State Licensed Land Surveyor. The elevation of each temporary monitoring well will be determined to ± 0.01 foot and will be tied into the site benchmark. All locations and elevations will be referenced to the New York State Plane Coordinate System and NAVD.

5.4 Quality Assurance/Quality Control and Data Validation

An approved ELAP laboratory will provide New York State Category B data deliverables for all samples analyzed as part of the RI. The data will be validated in accordance with New York State Analytical Service Protocols (NYSASP). A data usability summary report will be prepared documenting 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. QA/QC procedures and data validation requirements for this RI are further addressed in the QAPP located in Appendix F.

5.5 Qualitative Human Health Exposure Assessment

A QHHEA will be prepared for the Williamsburg former MGP site. This assessment will generally follow the guidelines provided in the New York State Department of Health *Qualitative Human Health Exposure Assessment* (Appendix 3B to NYSDEC's December 2002 *Draft DER-10 Technical Guidance for Site Investigation and Remediation*). In general, the assessment will identify the exposure setting, identify exposure pathways, and evaluate the fate and transport of the identified contaminants of concern. The QHHEA 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 Part 375 soil standards and groundwater standards. The assessment will be used to render an opinion as to whether potential complete exposure pathway(s) and/or risk exist for potential receptors.

5.6 Step I Fish and Wildlife Resource Impact Analysis

A Step I FWRIA will be completed 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 FWRIA is warranted

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

6. RI Report Preparation

A RI report will be prepared for submittal to NYSDEC and NYSDOH. The report will present the findings of the RI and will describe the nature and extent and fate and transport of all encountered contaminants associated with the Williamsburg former MGP. The RI report will identify specific contaminant concentrations throughout each media (e.g., soil, groundwater, soil vapor, sediment, etc.) and compare contaminants of concern against appropriate regulatory criteria, which is necessary to assess whether any media require remediation or further evaluation. The RI report will also incorporate the findings of the hydraulic conductivity testing, QHHEA and Step I FWRIA.

7. Schedule

NGRID is actively procuring consultant services to implement this RI scope of work. A detailed schedule will be established upon the approval of this work plan and prior to commencing RI field activities. NGRID will notify NYSDEC five working days prior to the anticipated start date of the remedial investigation program.

8. References

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Tables

Table 1
Summary of Environmental Records Information
Williamsburg Works MGP Site
Brooklyn, New York

On Site				Abutting Properties				Properties within One Block			
Parcel I.D. No.	Company Name	Facility Operations (years)	Ranking	Parcel I.D. No.	Company Name	Facility Operations (years)	Ranking	Parcel I.D. No.	Company Name	Facility Operations (years)	Ranking
1	NYC Department of Sanitation	Service Garage SQG/AST/UST (1970s-present)	Moderate chem-oil use & storage/moderate potential for release/on site >10 yrs.	3	North 12th Street Pro./Bayside Fuel Oil Dept. Corp./Transgas Energy Systems/Paragon Oil Co. Division of Texaco, Inc./Standard Oil Co.	Bulk Fuel Terminal/Refinery SQG (1880s-present)	Large chemical & oil use & storage/ abutting site/high potential for release/>20yrs	7	Hecla Iron Works	Iron Works (1900s-1920s)	Moderate chem-oil use/moderate potential for release/one block fr. site >10 yrs./upgradient fr. site
1	Commercial Corrugated Container Corporation	Manufacturing (1960s-1970s)	Minimal chem-oil use/minimal potential for release/on-site ≤10 yrs.(short duration)	4	Standard Oil Company	Petroleum Refinery (1900s-1920s)	Large chemical & oil use & storage /abutting site/high potential for release/≥20yrs	8	New York Quinine & Chemical Works, Inc.	Chemical Manufacturing (1880s-1950s)	Moderate chem-oil use/moderate potential for release/one block fr. site >10 yrs./upgradient fr. site
1	Ferro-Co. Corporation	Sheet Metal Product Manufacturer (1950s-1960s)	Moderate chem/oil use & storage/moderate potential for release/on site >10 yrs.	5	Hemisphere Steel Products/Parker Steel Products	Steel Product Manufacturer/SQG (1960s-present)	Moderate chem-oil use/moderate potential for release/abutting site >10 yrs.	9	Tuttle & Bailey Manufacturing Co.	Hot Air Ventilation & Register Factory/Foundry (1880s-1930s)	Moderate chem-oil use/moderate potential for release/one block fr. site >10 yrs./upgradient fr. site
2	Unknown	Oil truck parking (1970s-1980s)	Moderate chem/oil use & storage/moderate potential for release/on site >10 yrs.	6	Arkell Safety Bag Co.	Elastic Paper Lining Manufacturer (1900-1940s)	Moderate chem-oil use/moderate potential for release/abutting site >10 yrs.	10	Hecla Iron Works	Mill Works/Foundry (1880s-1930s)	Moderate chem-oil use/moderate potential for release/one block fr. site >10 yrs./upgradient fr. site
13	Unknown	Scrap Metal Yard/Repair Shop (1960s)	Large chem-oil use & storage/on-site/high potential for release	11	Pratt Manufacturing Company/Standard Oil Company of New York	Oil Company (1880s-1940s)	Moderate chem-oil use/moderate potential for release/abutting site >10 yrs.				
13	North 12th Street Transfer Station	SWF/Spills	Large chem-oil storage/on-site/high potential for release/ documented impact	12	Hildreth Varnish Company/C.C. Reed & Company	Varnish Manufacturer (1880s-late 1940s)	Moderate chem-oil use/moderate potential for release/abutting site >10 yrs.				

Notes:
AST - aboveground storage tank
SWF - solid waste facility
SQG - small quantity generator of hazardous waste
UST - underground storage tank

Table 2
Sample Descriptions, Rationale and Analysis
Williamsburg Works MGP Site
Brooklyn, New York

Sample I.D.	Sample Location	Sample Rationale	Sample Depth	Number of Samples			VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Cyanide ²	Herbicides (EPA 8151A)	PCBs (EPA 8082)	Pesticides (EPA 8081A)	VOCs (Expanded) (Modified TO-15)
				Soil	Groundwater	Soil Vapor/ Indoor Air/ Outdoor Air								
Surface Soil Sample Locations														
WW-SS-01	North 12th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-02	North 11th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-03	North 12th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-04	North 11th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-05	North 12th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-06	North 11th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-07	North 12th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-08	North 11th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
WW-SS-09	North 12th Street, adjacent to the site	Soil sample to evaluate surface soil conditions adjacent to the site	0-2"	1	0	0	X	X	X	X	X	X	X	
Test Pit Locations														
WW-TP-01	Block 2287, Lot 1, within the gas holder footprint	Assess the location, depth, configuration and contents of the former gas holder	Depth at greatest suspected impacts	1	0	0	X	X	X	X	X	X	X	
WW-TP-02	Block 2287, Lot 1, within the gas holder footprint	Assess the location, depth, configuration and contents of the former gas holder	Depth at greatest suspected impacts	1	0	0	X	X	X	X	X	X	X	
WW-TP-03	Block 2287, Lot 1, within the gas holder footprint	Assess the location, depth, configuration and contents of the former gas holder	Depth at greatest suspected impacts	1	0	0	X	X	X	X	X	X	X	
WW-TP-04	Block 2287, Lot 1, within the gas holder footprint	Assess the location, depth, configuration and contents of the former gas holder	Depth at greatest suspected impacts	1	0	0	X	X	X	X	X	X	X	
WW-TP-05	Block 2287, Lot 1, within the gas holder footprint	Assess the location, depth, configuration and contents of the former gas holder	Depth at greatest suspected impacts	1	0	0	X	X	X	X	X	X	X	
WW-TP-06	Block 2287, Lot 1, within the gas holder footprint	Assess the location, depth, configuration and contents of the former gas holder	Depth at greatest suspected impacts	1	0	0	X	X	X	X	X	X	X	

Table 2
Sample Descriptions, Rationale and Analysis
Williamsburg Works MGP Site
Brooklyn, New York

Sample I.D.	Sample Location	Sample Rationale	Sample Depth	Number of Samples			VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Cyanide ²	Herbicides (EPA 8151A)	PCBs (EPA 8082)	Pesticides (EPA 8081A)	VOCs (Expanded) (Modified TO-15)
				Soil	Groundwater	Soil Vapor/ Indoor Air/ Outdoor Air								
Subsurface Soil Borings, Monitoring Wells and Temporary Groundwater Monitoring Points														
WW-SB-01	North 11th Street, south of the site	Evaluate soil quality south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-02	North 12th Street, north of the site	Evaluate soil quality adjacent to the former gas holder footprint	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-03	Block 2287, Lot 1, within the gas holder footprint	Evaluate soil and groundwater quality within the former gas holder footprint	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-04	Block 2287, Lot 1, within the gas holder footprint	Evaluate soil quality within the former gas holder footprint	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-05	Block 2287, Lot 1, within the gas holder footprint	Evaluate soil and groundwater quality within the former gas holder footprint	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-06	Block 2287, Lot 1, within the gas holder footprint	Evaluate soil quality within the former gas holder footprint	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-07	Block 2287, Lot 1, within the gas holder footprint	Evaluate soil and groundwater quality within the former gas holder footprint	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-08	Block 2287, Lot 1, within the gas holder footprint	Evaluate soil quality within the former gas holder footprint	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-09	North 12th Street, north of the site	Evaluate soil quality north of the site, adjacent to the former condenser house	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-10	North 11th Street, south of the site	Evaluate soil quality south of the site, adjacent to the former purifying house	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-11	North 12th Street, north of the site	Evaluate soil quality north of the site, adjacent to the former condensers	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	

Table 2
Sample Descriptions, Rationale and Analysis
Williamsburg Works MGP Site
Brooklyn, New York

Sample I.D.	Sample Location	Sample Rationale	Sample Depth	Number of Samples			VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Cyanide ²	Herbicides (EPA 8151A)	PCBs (EPA 8082)	Pesticides (EPA 8081A)	VOCs (Expanded) (Modified TO-15)
				Soil	Groundwater	Soil Vapor/ Indoor Air/ Outdoor Air								
WW-SB-13	North 11th Street, south of the site	Evaluate soil quality south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-14	North 12th Street, north of the site	Evaluate soil quality north of the site, adjacent to the former retort house and generator house	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-15	North 12th Street, north of the site	Evaluate soil quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-16	North 12th Street, north of the site	Evaluate soil quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-17	North 11th Street, south of the site	Evaluate soil quality south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-SB-18	Kent Avenue, north of the site	Evaluate soil quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-01	Wythe Avenue, east and upgradient of the site	Evaluate soil and groundwater quality upgradient of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-02	North 11th Street, south of the site	Evaluate soil and groundwater quality south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-03	North 12th Street, north of the site	Evaluate soil and groundwater quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-04	Block 2287, Lot 1, downgradient of the gas holder	Evaluate soil and groundwater quality downgradient of the former gas holder	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-05	Block 2287, Lot 1, adjacent to the gas holders	Evaluate soil and groundwater quality adjacent to the former gas holders	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	

Table 2
Sample Descriptions, Rationale and Analysis
Williamsburg Works MGP Site
Brooklyn, New York

Sample I.D.	Sample Location	Sample Rationale	Sample Depth	Number of Samples			VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Cyanide ²	Herbicides (EPA 8151A)	PCBs (EPA 8082)	Pesticides (EPA 8081A)	VOCs (Expanded) (Modified TO-15)
				Soil	Groundwater	Soil Vapor/ Indoor Air/ Outdoor Air								
WW-MW-06	North 11th Street, south of the site	Evaluate soil and groundwater quality south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-07	North 12th Street, north of the site	Evaluate soil and groundwater quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-08	North 11th Street, south of the site	Evaluate soil and groundwater quality south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-10	North 12th Street, north of the site	Evaluate soil and groundwater quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-11	North 11th Street, south of the site	Evaluate soil and groundwater quality south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-12	North 11th Street, south of the site	Evaluate soil and groundwater quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-13	North 12th Street, north of the site	Evaluate soil and groundwater quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-14	North 11th Street, downgradient of and south of the site	Evaluate soil and groundwater quality downgradient of and south of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-15	North 12th Street, downgradient of and north of the site	Evaluate soil and groundwater quality downgradient of and north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	
WW-MW-16	Kent Avenue, north of the site	Evaluate soil and groundwater quality north of the site	Between 0&5', depth at greatest suspected impact and beneath impacts	3	1	0	X	X	X	X	X ¹	X ¹	X ¹	

Table 2
Sample Descriptions, Rationale and Analysis
Williamsburg Works MGP Site
Brooklyn, New York

Sample I.D.	Sample Location	Sample Rationale	Sample Depth	Number of Samples			VOCs (EPA 8260B)	SVOCs (EPA 8270C)	TAL Metals (6000/7000)	Cyanide ²	Herbicides (EPA 8151A)	PCBs (EPA 8082)	Pesticides (EPA 8081A)	VOCs (Expanded) (Modified TO-15)
				Soil	Groundwater	Soil Vapor/ Indoor Air/ Outdoor Air								
Sediment Sample Locations														
WW-SED-01	East River, adjacent to the site	Evaluate sediment quality adjacent to the site	0-6", depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X	X	X	
WW-SED-02	East River, adjacent to the site	Evaluate sediment quality adjacent to the site	0-6", depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X	X	X	
WW-SED-03	East River, adjacent to the site	Evaluate sediment quality adjacent to the site	0-6", depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X	X	X	
WW-SED-04	East River, adjacent to the site	Evaluate sediment quality adjacent to the site	0-6", depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X	X	X	
WW-SED-05	East River	Evaluate sediment quality in the East River	0-6", depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X	X	X	
WW-SED-06	East River	Evaluate sediment quality in the East River	0-6", depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X	X	X	
WW-SED-07	East River	Evaluate sediment quality in the East River	0-6", depth at greatest suspected impact and beneath impacts	3	0	0	X	X	X	X	X	X	X	
Soil Vapor Sample Locations														
WW-SV-01	Block 2288, Lot 1, within the footprint of the former gas holder	Soil vapor sample to screen the soil conditions within the footprint of the former gas holder	Beneath the building slab	0	0	1								X
WW-SV-02	Block 2288, Lot 1, within the footprint of the former gas holder	Soil vapor sample to screen the soil conditions within the footprint of the former gas holder	Beneath the building slab	0	0	1								X
Indoor Air Sample Locations														
WW-IA-01	Block 2288, Lot 1	Sample to evaluate indoor air quality at the building located at Block 2288, Lot 1	At the height of the breathing zone	0	0	1								X
WW-IA-02	Block 2288, Lot 1	Sample to evaluate indoor air quality at the building located at Block 2288, Lot 1	At the height of the breathing zone	0	0	1								X
Outdoor Air Sample Locations														
WW-OA-01	North 12th Street, adjacent to Block 2288, Lot 1	Sample to evaluate ambient air quality outside of the building located at Block 2288, Lot 1	At the height of the breathing zone	0	0	1								X

Notes:

Chemical analysis test methods specified are from U.S. EPA SW-846 test methods

EPA TO-15 analysis will include VOCs and naphthalene

EPA - Environmental Protection Agency

VOC - volatile organic compounds

SVOC - semivolatile organic compounds

TAL - target analyte list

PCBs - polychlorinated biphenyls

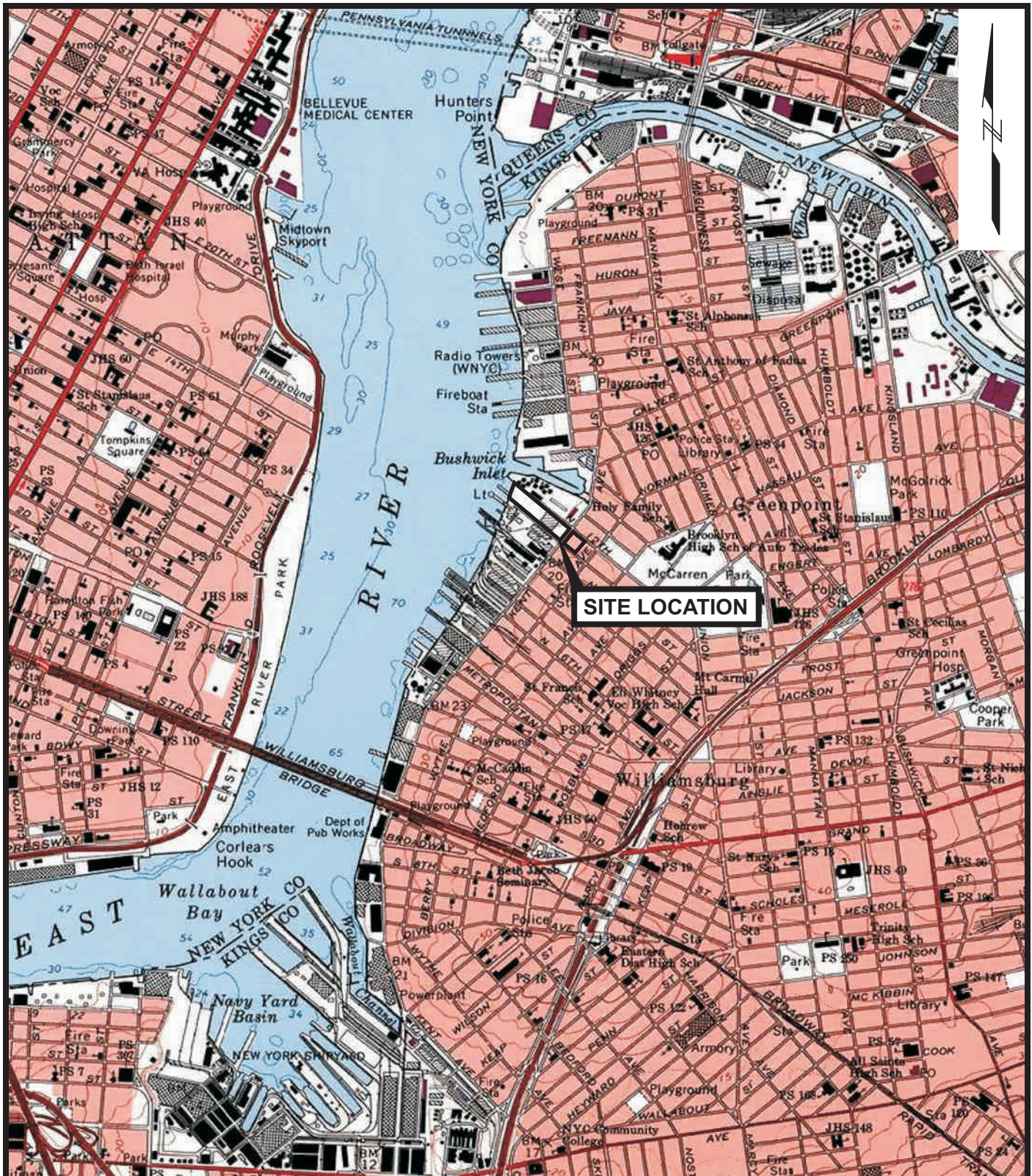
bgs - below ground surface

¹-One sample from within the fill in each soil boring

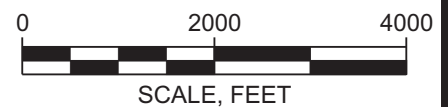
²-Soils will be analyzed by Free Cyanide [extraction by EPA Method 9013A and analysis by Microdiffusion American Society for Testing and Materials (ASTM)]

Prepared by: MJF

Figures



SOURCE: MAP CREATED WITH TOPO!™ 2000 WILDFLOWER PRODUCTIONS (www.topo.com)



**REMEDIAL INVESTIGATION WORK PLAN
WILLIAMSBURG WORKS FORMER MGP SITE
BOROUGH OF BROOKLYN, NEW YORK**

nationalgrid



Project 080090-1002

SITE LOCATION MAP

May 2008

Figure 1

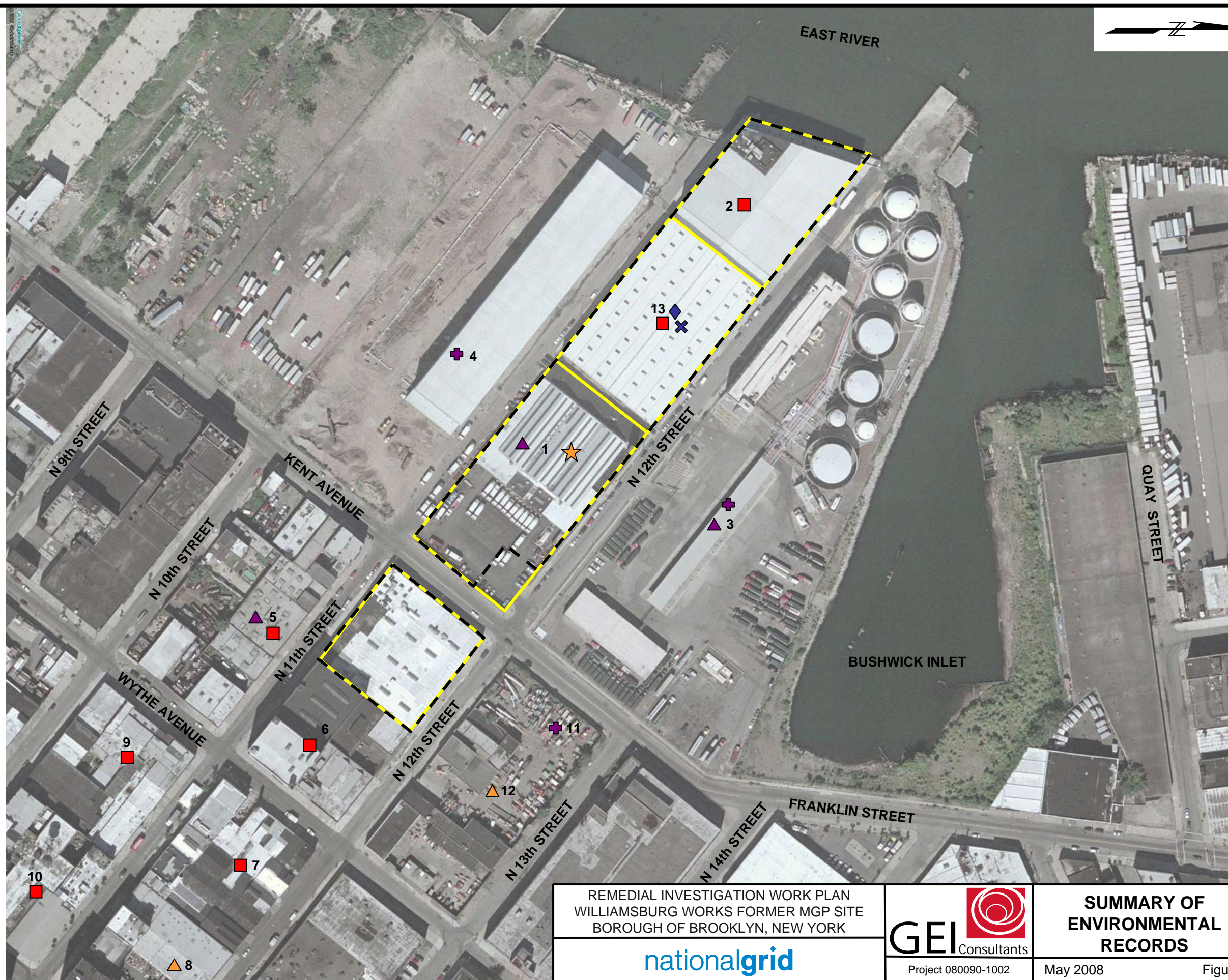
LEGEND

- APPROXIMATE FORMER MGP BOUNDARY
- APPROXIMATE CURRENT PROPERTY BOUNDARY
- RECENT REGULATORY RECORDS**
- ◆ RCRA (TSDF, CORRACTS), CERCLIS, VCP, LANDFILL, DISPOSAL SITE
 - ▲ RCRA (LQG, SQG)
 - MAJOR OIL OR CHEMICAL STORAGE
 - ★ MINOR OIL STORAGE
 - ✕ SPILLS, TRIS
- HISTORIC LAND USE**
- MANUFACTURING AND COMMERCIAL
 - ✚ OIL, PETROCHEMICAL
 - ▲ CHEMICAL, PAINT, FERTILIZER, PLASTIC

NOTE:
SEE TABLE 1 FOR INFORMATION ABOUT THESE SITES.

SOURCE:
Copyright 2005. GlobeXplorer and Partners.
All rights reserved. Image date: 7/2/01.

NOTE: NOT TO SCALE



REMEDIAL INVESTIGATION WORK PLAN
WILLIAMSBURG WORKS FORMER MGP SITE
BOROUGH OF BROOKLYN, NEW YORK

nationalgrid

GEI Consultants

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**SUMMARY OF
ENVIRONMENTAL
RECORDS**

May 2008

Figure 2

Plate



LEGEND

APPROXIMATE CURRENT PROPERTY BOUNDARY

APPROXIMATE BOUNDARY OF FORMER MANUFACTURED GAS PLANT (MGP) SITE

HISTORIC STRUCTURE

PROPOSED SAMPLES

PROPOSED REMEDIAL INVESTIGATION (RI) MONITORING WELL LOCATION

PROPOSED RI SOIL BORING LOCATION

PROPOSED SOIL BORING WITH TEMPORARY GROUNDWATER SAMPLE LOCATION

PROPOSED SURFACE SOIL SAMPLE LOCATION

PROPOSED SOIL VAPOR POINT

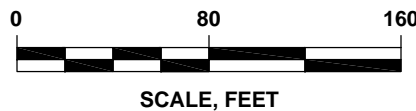
PROPOSED TEST PIT LOCATION

PROPOSED INDOOR AIR SAMPLE LOCATION

PROPOSED OUTDOOR AIR SAMPLE LOCATION

PROPOSED SEDIMENT SAMPLE LOCATION

POTENTIAL SAMPLE OFFSET LOCATION



- SOURCES:**
1. PHOTOGRAPH OBTAINED FROM GOOGLE EARTH, IMAGE © DIGITALGLOBE 2008.
 2. SANBORN FIRE INSURANCE MAPS (1887 THROUGH 1996).
 3. NEW YORK CITY OPEN ACCESSIBLE SPACE INFORMATION SYSTEM <http://www.oasisnyc.net>, ACCESSED JANUARY 2008.

DRAFT

REMEDIAL INVESTIGATION WORK PLAN
WILLIAMSBURG WORKS FORMER MGP SITE
BOROUGH OF BROOKLYN, NEW YORK

KEYSPAN CORPORATION

PROJECT 080090-1002

GEI

Consultants

455 WINDING BROOK DRIVE
SUITE 201
GLASTONBURY, CONNECTICUT 06033

PROPOSED SAMPLE LOCATIONS

May 2008

Plate 1