REVISED REMEDIAL INVESTIGATION WORK PLAN
FORMER GATEWAY FRENCH CLEANERS
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK 11224
NYSDEC SITE NO. C224151

PREPARED FOR:
Bay Park One Company
70 East 55th Street – 7th Floor
New York, NY 10022

PREPARED BY:
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September 2013
File No. 41.0161826.60

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PE CERTIFICATION

I Kathleen Cyr certify[1] that that I am a Professional Engineer licensed in the State of New York as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan (RIWP), for 3375 Neptune Avenue, Brooklyn NYSDEC Site No. C224151, was prepared in accordance with applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

Kathleen A. Cyr
Name

067143
NYS PE License Number

Signature

07-31-2013
Date

STATE OF NEW YORK
KATHLEEN A. CYR
Stamp
No. 067143
LICENSED PROFESSIONAL ENGINEER

[1] - Certify is not intended to mean or imply a guarantee or warranty; rather it is defined as a statement of a professional opinion based on the information, data and/or facts gathered and reviewed as part of the investigation.

QEP CERTIFICATION

I David Winslow certify[1] that that I am a Qualified Environmental Professional as defined in 6 NYCRR Part 375 and that this Remedial Investigation Work Plan (RIWP), for 3375 Neptune Avenue, Brooklyn NYSDEC Site No. C224151, was prepared in accordance with applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

David M. Winslow
QEP Name

QEP Signature

07-31-2013
Date

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1.00 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) was prepared by Goldberg Zoino Associates of New York, P.C. d/b/a GZA GeoEnvironmental of New York (GZA) on behalf of Bay Park One Company (Bay Park One) for submittal to the New York State Department of Environmental Conservation (NYSDEC), Division of Environmental Remediation (DER) Brownfield Cleanup Program (BCP). The subject of this RIWP is the Former Gateway French [Dry] Cleaner located at 3375-3377 Neptune Avenue, in Brooklyn, New York. Please refer to **Figure 1** for a Site location map.

The Former Gateway French Cleaner is identified on the Tax Map as Block 6979 and a portion of Lot 100. Please Refer to **Figure 2** for an aerial photograph depicting the location of the Former Gateway French Cleaner and the boundary of the NYSDEC accepted Brownfield Area (Site). The Former Gateway French Cleaners (aka Charles French Cleaners) operated within the western portion of commercial-retail space, located at the above address, between 1975 and 1996. The United Stated Environmental Protection Agency (USEPA) Facility Identification Number (ID No.) is NYD981080799. Previous Site investigation activities, at the Former Gateway French Cleaners, documented the presence of volatile organic compounds (VOCs), particularly tetrachlorethene (PCE), in soil vapor beneath the concrete floor slab of the retail tenant spaces at the Site.

This RIWP presents the proposed work required to delineate the vertical and horizontal extent of the potentially impacted soils, groundwater, and soil vapor. This work plan has been prepared in accordance with the limitations presented in **Appendix A.**

During historic research to develop the BCP Application, it was noted that a historic dry cleaner operated immediately adjacent to and south of the Site prior to condemnation of the city blocks that were redeveloped in the early 1970s to the present day Bay Park One residential complex. The rear of the historic dry cleaner coincides with an area where 3 parts per million (ppm) of PCE was detected in soils at the soil/water interface, discussed further in **Section 2.3**, below. Bay Park One filed a separate BCP application for the historic dry cleaner, which was not accepted by the NYSDEC.

1.10 PROJECT OBJECTIVES

The objectives of this RIWP are to present an approach to:

- Delineate the horizontal and vertical extent of impacted soils, groundwater, and soil vapor in the Site vicinity.
- Evaluate the potential contaminant fate and transport as it currently exists in the subsurface, and
- Collect sufficient data to evaluate potential remedial alternatives for exposure mitigation.

GZA prepared this RIWP for review by the NYSDEC. It is based on our current understanding of Site conditions and may need to be altered as additional information becomes available.

1.20 SCOPE OF SERVICES

This RIWP was prepared by GZA, in general accordance with the NYSDEC Division of Environmental Remediation *Draft Technical Guidance for Site Investigation and* Remediation (DER-10), dated May 2010. GZA's scope of services consists of the following activities:

- Development of a work plan to delineate the horizontal and vertical extent of impacted soil, groundwater, and soil vapor;
- Development of a site specific health and safety plan (HASP) for the personnel undertaking the work;
- Preparation of a community air monitoring plan (CAMP);
- Preparation of a quality assurance/quality control plan (QAPP) for the acquisition, handling and analysis of the samples taken;
- Implementation of this RIWP; and,
- Preparation of a Remedial Investigation and Remedial Alternatives Feasibility Study report.

2.00 SITE INFORMATION

The following section summarizes information provided in previous Site assessment and Site investigation reports. These documents should be consulted for additional information and details not presented here. Previous documents include:

Phase I Environmental Site Assessment. Velocity Consulting Inc, June 2008.

Phase II Environmental Site Assessment Report – Bay Park, 13325 Neptune Avenue, 3750-2770 West 33rd Street, Brooklyn, NY. GZA, September 10, 2009.

Vapor Intrusion Assessment Letter Report. GZA, July 2, 2010.

Vapor Delineation and Mitigation Design Interim Report. GZA, March 30, 2012.

Brownfield Cleanup Application. GZA, August 28, 2012.

2.10 SITE LOCATION, DESCRIPTION AND USE

As stated above, the Site is located at 3375-3377 Neptune Avenue, in Brooklyn, New York and is a portion of the Tax Block 6979, Lot 100. The Site is centrally located on the west end of the Coney Island neighborhood of Brooklyn (**Figure 1)**. Coney Island is a sand spit peninsula along the southern Atlantic Ocean coast line of Brooklyn and extends southwest into the outer New York Harbor.

The Site is located approximately 1,000 feet south of Gravesend Bay and Coney Island Creek and 2,000 feet north of the Atlantic Coast line. The Site is also located approximately 3,000 feet from the western tip of Coney Island. This area of Brooklyn is relatively low lying and at one time was sand dunes and scrub brush prior to development. Urban development of Coney Island began in the 1800's.

The Site and vicinity area is a mixed-use development with residential apartments and retail space. The building complex consists of several residential towers spread over approximately three city blocks. The development is north of Neptune Avenue, west of 33rd Street, east of 37th Street and south of Canal Avenue. 35th Street and 36th Street were eliminated within the Site footprint during the Site development in 1973; 34th Street appears to have not previously existed in the vicinity of the Site. The current commercial-retail space is located along a promenade in ground floor units, with an approximate 40-foot setback from the historic store fronts and sidewalk line. In addition, the grade has been increased by approximately four vertical feet, through the placement of fill material, from pre-redevelopment elevations to the current elevation. The promenade is approximately 4 feet above street level.

2.20 SITE HISTORY

As stated above, the Site is part of a development covering three city blocks. Prior to development in 1973-1974, there were three separate and individual city blocks containing residential and commercial buildings. Commercial businesses primarily were located along the northern side of Neptune Avenue. Based on review of historical Sanborn Fire Insurance Maps (Sanborns) and a City directory search, prior to 1973, the historic addresses in the immediate Site vicinity were 3501 through 3505 Neptune Avenue. Between 1973 and after development the addresses ranged between 3300 and 3600 along Neptune Avenue between 33rd and 37th Streets. After Site development, the businesses and buildings are listed as having addresses in the 3300s.

Referring to the Sanborn maps (**Appendix B**), there were no buildings in the Site vicinity in 1906. The next available Sanborn, 1930, depicts significant urban development in the area. Both the 1930 and the 1950 maps are primarily devoid of property use descriptions in the Site area. The 1966 and 1968 Sanborn maps depict a historical dry cleaning businesses located at 3503 to 3505 Neptune Avenue; which lies directly south of the Site. All other available Sanborn Maps are post redevelopment and none indicate the type of operator in the retail spaces.

A *Phase I Environmental Site Assessment of 3325 Neptune Avenue, 2750 West 33rd Street, and 2770 West 33rd Street Brooklyn, New York* (Phase I ESA) was completed in June 2008 by Velocity Consulting Incorporated (Velocity). The Phase I ESA indicated that a dry cleaner, known as the Gateway French Cleaners (the "Gateway Cleaners"), formerly operated on-site at 3375-3377 Neptune Avenue. A City Directory Search of 3375-3377 Neptune Avenue lists Charles French Cleaners as the former occupant. Reportedly, Gateway Cleaners operated from about 1984 to 1995. After 1995, the retail space was occupied by Neptune Dental and AFAM Medical until approximately 2009. A new tenant, operating the space as a dental practice, has occupied the retail space since early 2012.

The focus of prior investigations (discussed below) has been the retail space formerly occupied by the Gateway Cleaners; bordered to the east by a Stationary Store and to the north by a residential building. A Site Plan is attached as **Figure 3.**

2.30 PREVIOUS INVESTIGATIONS

Based upon the conclusions of the Phase I ESA, the Gateway Cleaners was identified as a Recognized Environmental Condition (REC). Gateway Cleaners was identified as a REC due to the lack of information regarding the tenant's operations and management practices as it pertains to the handling, storage, and the use of solvents typically used in dry cleaning operations. Reportedly, due to renovations that occurred after Gateway Cleaners vacated the space (subsequently occupied by Neptune Dental and AFAM Medical) Velocity was unable to perform a thorough inspection during the Phase I ESA.

In May 2009, GZA performed a limited subsurface investigation in the vicinity of the former dry cleaner. The results of the investigation were summarized in the Phase II Environmental Site Assessment Report (Phase II ESA) and submitted to the NYSDEC. Soil borings, GZA-1 through GZA-4, were advanced and temporary groundwater well points were installed. Please refer to **Figure 3** for these locations relative to Site features. The soil encountered directly below ground surface was fill material consisting of a heterogeneous mix of fine to medium sand and gravel. Fill material was observed to a depth between 5 and 6 feet below ground surface (bgs). The fill material is underlain by brown fine to medium sand with silt.

Petroleum constituents were detected in the soil sample from boring GZA-3 (**Figure 4**). No VOCs or SVOCs were detected above Soil Cleanup Objectives (SCOs) as defined by NYSDEC in Technical Administrative Guidance Memorandum (TAGM) 4046. Please refer to **Appendix C** for previous analytical laboratory results summary tables. Groundwater was encountered at approximately 8-9 feet bgs. Tetrachloroethene (PCE) was detected in samples collected of shallow groundwater at GZA-3 and GZA-4 (**Figure 5**). The PCE concentration in groundwater sample GZA-4 (5.8 ppb) was above the NYSDEC Technical and Operational Guidance Standards (TOGS) Ambient Water Quality Standard (AWQS) of 5 ppb.

After discovery of groundwater and soils contaminated with fuel compounds and PCE in May 2009, a supplemental subsurface investigation of the Gateway Cleaners operating space was performed in July 2009. Six soil borings, designated GZA-5 through GZA-10, were advanced with a direct push drilling rig. Three permanent groundwater monitoring wells, designated MW-1 through MW-3, were also installed approximately 15 to 30-feet below the water table. One soil gas probe (SG-1) was installed to collect a sub-slab soil vapor sample in the rear of the former dry cleaning tenant space. Monitoring well MW-4 was installed northeast of the Site during an unrelated study. Please Refer to **Table 1** for monitoring well construction details.

Relatively low levels of semi-volatile organic compounds (SVOCs), below SCOs, were detected in Site soils at these locations. PCE was detected in shallow groundwater samples collected at GZA-5 and GZA-10 but at concentrations below the PCE AWQS. Several additional VOCs (methyl-tert-butyl-ether, aka MTBE) and SVOCs (naphthalene) were also detected in groundwater samples. Among deep monitoring wells MW-1, MW-2, and MW-3, only MTBE was identified in the MW-2 sample, at a concentration less than the AWQS, suggesting the impact to groundwater has been vertically delineated. Sub-slab soil vapor sample results indicated that four VOCs were detected at concentrations above the EPA's Office of Solid Waste and Emergency Response

(OSWER)[1] including 1,2,4-trimethylbenzene, 1,3,5- trimethylbenzene, benzene, and ethyl benzene and five VOCs exceeded NYSDOH[2] background values; including 1,2,4-trimethylbenzene, benzene, ethyl benzene, toluene, and m/p-xylene.

Due to observations of petroleum impacts to soil and groundwater, the NYSDEC Region 2 was notified of a petroleum release on September 1, 2009. Bay Park One subsequently received a letter, on September 11, 2009, from Jeffrey Vought of the NYSDEC Division of Environmental Remediation (DER) requiring a summary letter outlining the cause and remedial activities. GZA submitted the Phase II EAS report to the DER on October 9, 2009.

On December 30, 2009, a letter was received from Jeffrey Vought indicating that the Phase II EAS report had been reviewed in conjunction with the NYSDOH. The December 30th letter required that additional assessment be conducted at the Site, including indoor and outdoor air ambient air and sub-slab soil vapor samples in accordance with the NYSDOH guidance[2]. The requested additional assessment was completed and a *Vapor Intrusion Assessment Letter Report* was issued to the NYSDEC and the NYSDOH on July 2, 2010.

As part of that assessment, two sub-slab soil gas samples, designated SS-2 and SS-3, were collected on February 4, 2010, from beneath the former dry cleaning tenant space. PCE and trichloroethene (TCE) were detected at concentrations in both sub-slab vapor samples above the respective Table C-2 Indoor Air BASE median values[2], Helen Dawson USEPA Region 8 background values, and the NYSDOH Table 3.1 2006 Air Guideline Values. Concentrations of PCE and TCE were 2,180 $\mu g/m^3$ and 25.8 µg/m3, respectively in sample SS-2 and 25,000 $\mu g/m^3$ and 289 $\mu g/m^3$ in sample SS-3. In general, PCE concentrations are much greater than TCE concentrations at the Site, therefore PCE is considered to be the regulatory driver. The report identified the occurrence of VOCs above NYSDOH guidance and USEPA criteria. However, the absence of PCE and TCE in the indoor sample results suggests that vapors are not concentrating within the building interior and/or there is not a direct pathway from beneath the slab into the active indoor space.

On August 27, 2010 GZA prepared a *Vapor Intrusion Response Alternatives Report*. GZA assessed potential remedial alternatives to address the identified sub-slab VOCs in soil vapor, including PCE at concentrations as high as 25,000 $\mu g/m^3$.

GZA also reviewed alternative building mitigation and remedial action measures to address the vapor condition. On December 29, 2010 GZA received a phone call and email with templates from Mr. Vought regarding a possible Site Characterization Consent Order to address vapor intrusion. A formal order was never received from the NYSDEC.

However, in October, 2011 Bay Park One retained GZA to perform additional assessment at the former dry cleaner space. GZA subcontracted Viridian Field Services, Inc, (Viridian) of Montclair, New Jersey, with the capability of an on-site mobile SRI 8610

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[1] USEPA OSWER Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), EPA 530-D-02-004, Table 2C; November 2002.

[2] Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York, NYSDOH Bureau of Environmental Exposure Investigation, October 2006.

gas chromatograph (GC) laboratory using EPA Method 8021 to expedite delineation and screen vapor samples for the presence of PCE and TCE. The objective was to delineate the vapor condition to the NYSDOH GESVI mitigation action level of 250 micrograms per cubic meter (ug/m^3) of PCE.

GZA performed a soil vapor survey using Viridian's mobile laboratory in the commercial space where accessible, and obtained confirmation and correlation summa canister samples for fixed-laboratory analysis. The results indicated the vapor plume concentrations were highest at the southern side of the former dry cleaning space and tapered off to the north or rear of the former dry cleaner space (**Figure 6**). The concentrations increased again to the north on the opposite side of the common-wall with the apartment space. During Site reconnaissance, GZA observed a seam in the concrete floor suggesting the possible presence of a grade beam separating the front one-story retail space from the rear 5 story apartment building. This seam in the concrete slab was visible in the rear of the stationary store and is demarcated on **Figure 3.**

GZA also conducted a soil boring investigation beneath the building floor slab, during which soil samples were screened with a photoionization detector (PID) for the presence of volatile vapors. GZA did not encounter any olfactory, visual or PID evidence of residual soil contamination immediately beneath the slab. However, evidence of soil staining, odors and elevated PID readings were noted in soils slightly above the water table and extending to a depth of at least 12 feet below the building slab. Soil samples from two borings, P-3 and P-4 (8.5-9.0 ft) contained VOC concentrations that exceeded the New York State Protection of Ground Water Soil clean-up objectives (NYSPGW SCOs) (samples obtained from just above the water table). Sample P-3 contained PCE, at a concentration of 2.9 ppm as compared to the New York State Protection of Groundwater (NYSPGW) Soil Cleanup Objective (SCO) of 1.3 ppm.

Hurricane Sandy impacted the New York City Metropolitan Area, and inundated large areas of Coney Island, on October 29, 2012. Approximately three to four feet of water covered the ground level residential apartments and the commercial spaces at the Bay Park One complex; including the Site. All ground floor residential spaces were gut-renovated during the latter part of 2012 and early 2013. During that time GZA installed several sub-slab vapor delineation/monitoring points. Three laboratory samples were submitted for analysis of VOCs by Method TO-15. This work was coordinated with the NYSDEC via e-mails and telephone conversations on December 13, 2012. A January 7, 2013 summary letter report was prepared by GZA, provided to Bay Park One, and is included here.

The displacement of the first floor tenants provided an unparalleled opportunity to install a sub-slab depressurization system (SSDS) system for the protection of Human Health within the residential apartments immediately north of the Site. The NYSDEC approved the installation of the SSDS system during December 13, 2012 e-mails and telephone conversations. A SSDS system was installed between December 2012 and February 2013. The SSDS system consists of seven suction pits below the concrete floor slab and is currently operating. Results of the additional delineation and installation of the SSDS will be included in the Remedial Investigation Report.

3.00 ENVIRONMENTAL SETTING

The following subsections provide information regarding the general physiographic, hydrologic, and soil conditions in the area of the Site.

3.10 REGIONAL PHYSIOGRAPHY

The Site and the surrounding area are relatively flat. Based on a review of the U.S. Geological Survey (USGS) Topographic Map for the Coney Island Quadrangle dated 1979 and The Narrows dated 1981, the Site has a ground surface elevation of approximately 7 feet above the Mean Sea Level (MSL) based on the National Geodetic Vertical Datum (NGVD). A survey, performed by Rogers Surveying, PLLC, of Staten Island, New York on July 30, 2009 confirmed the elevation above. Based on the 1906 Sanborn map, the street level is approximately 4 feet above MSL.

As mentioned above, Coney Island is a sand spit peninsula along the southern Atlantic Ocean coast line of Brooklyn and extends southwest into the outer New York Harbor. This area of Brooklyn is relatively low lying and at one time was sand dunes and scrub brush. The Site is located approximately 1000 feet south of Gravesend Bay and Coney Island Creek and 2000 feet north of the Atlantic Coast line. The Site is also located approximately 300 feet from the western tip of Coney Island.

3.20 SOIL AND ROCK CONDITIONS

According to the USGS *Reconnaissance of the Groundwater Resources of Kings and Queens Counties, New York*, dated 1981, native Site overburden soils were deposited during the Pleistocene epoch. The overburden is composed of glacial outwash sands, which are expected to extend to a depth of approximately 100 feet below MSL. Beneath this layer, the Cretaceous period Gardiners Clay and Jamaico Gravel are expected to be present. The Magothy Formation occurs beneath theses formations; which is in turn, underlain by the Raritan Clay and the Lloyd Sand. The bedrock underlying the Cretaceous deposits is expected to be the schist, gneiss and amphibolite with pegmatite intrusions typical of the Cambro-Ordovician Hartland Formation at a depth greater than 800 feet below ground surface.

3.30 GROUNDWATER CONDITIONS

According to the USGS *Reconnaissance of the Groundwater Resources of Kings and Queens Counties, New York*, dated 1981, the water table in the area of the Site is expected to be about 10 feet below ground surface. Based on the previous Site investigations, groundwater was encountered between 9 and 10 feet bgs. Groundwater levels were measured at permanent groundwater monitoring wells on June 30, 2009 and November 13, 2010. An on-site stormwater manhole located approximately 40 feet north of monitoring well MW-3 with a surveyed elevation of 7.00 ft above mean sea level was used as a site datum. Based on the two rounds of groundwater levels, the calculated groundwater flow path is approximately to the east (**Figure 7**). Localized groundwater gradients in the Site vicinity may vary due to subsurface utilities, irrigation and infiltration, seasonal variations, precipitation events, local pumping wells or sump pumps, and heterogeneous subsurface conditions.

Regional groundwater flow direction is generally controlled by regional topography with groundwater flow from higher to lower elevations. Based on the southeasterly down-sloping topography, the groundwater in the area is inferred to flow in a southeasterly direction. Manmade structures also have effects on groundwater flow. Along the Coney Island-Gravesend Bay shore line is the United States Pierhead and Bulkhead Line. Timber and steel bulkheads act as land erosion control but also act as groundwater flow barriers (**Appendix D**). Subsurface utilities can act as a groundwater recharge source (e.g., a leaking potable water main) or could act as preferential pathways of migration (e.g., utility structures below the water table.

Storm water in the Site area is collected in a dedicated storm water sewer system. There is a 60-inch storm water sewer (New York City Department of Environmental Protection [NYCDEP] sewer number CI-602) which runs approximately south to north along 33rd Street. The invert elevation of the storm water sewer at the corner of 33rd Street and Neptune Avenue is -3.12 feet MSL and at the outfall at Gravesend Bay (Corner of Bay View Avenue and 33rd Street), the invert is at -5.10 feet MSL. Although the condition of this sewer is unknown to GZA, it is likely that this sewer, located partially below the apparent water table, is acting as a preferential pathways of migration and controlling groundwater flow.

4.00 FIELD INVESTIGATIONS

The proposed field program will focus on collecting additional data to assist in the further delineation of known Site contamination and delineation of off-Site contamination potentially originating from previous Site operations.

The field-sampling scope of work consists of:

- Advancing one (1) interior and one (1) exterior boring with soil and grab groundwater sampling;
- Collecting five (5) soil vapor samples outside around the exterior of the former Gateway Cleaners;
- Collecting of one (1) collocated indoor ambient air sample and sub-slab soil gas samples in the former Gateway Cleaners tenant space;
- Collecting of two (2) collocated indoor ambient air sample and sub-slab soil gas samples in the commercial retail space;
- Collecting of one (1) outdoor air sample north of the rear of the former Gateway Cleaners;
- Sampling groundwater from four existing groundwater monitoring wells;
- Resurvey the elevation of the ground surface and top of casing at all monitoring well locations; and

- Deploying one pressure transducer in an existing onsite permanent monitoring well to monitor tidal fluctuations.

The following sections describe the methods that will be used to complete the scope of work summarized above. Please refer to **Figure 8** for a depiction of the various field sampling activity locations.

4.10 PROJECT HEALTH AND SAFETY

GZA has prepared a Site-specific Health and Safety Plan (HASP) for NYSDEC to review, which is attached as **Appendix E**. A photoionization detector (PID) will be used to monitor the breathing zone of workers performing investigative activities, to assess the potential presence of organic vapors. It is anticipated that the work to be completed at the Site will be done at modified level D personal protection equipment (PPE). However, should health and safety monitoring during field activities indicate the need to upgrade to level C protection, then work will stop and Site conditions will be re-evaluated by GZA.

A project kick-off meeting will be held prior to initiating field work to orient field team members and subcontractors with the Site background, scope of work, potential hazards, health and safety requirements, emergency contingencies and other field procedures.

4.20 UTILITY CLEARENCE

Prior to performing any subsurface work, a complete utility clearance survey will be performed in accordance with New York State Dig-Safe protocol. The proposed boring locations will be marked on a map and provided to Bay Park personnel to compare to the known utility locations and utility drawings. If the location is deemed acceptable by Bay Park personnel, then the location will be screened using surface geophysical techniques such as electromagnetic (EM), ground penetrating radar (GPR) and radiofrequency (RF) techniques.

4.30 SUBSURFACE INVESTIGATION

The proposed subsurface investigation program will consist of two (2) exploratory soil borings. The exploratory soil borings will be designated P-9 (to continue the series of borings completed inside the Gateway Cleaners, and GZA-14 (to continue the series of borings completed outside the Gateway Cleaners). Proposed exploration locations are shown on **Figure 8**. The following text describes the action, rationale and proposed sampling schedule for the investigation activities.

4.31 Soil Borings

GZA will provide a test boring subcontractor to advance two (2) soil borings; one inside of Gateway Cleaners adjacent to sample P-3 which had an exceedance of tetrachloroethene, and another south and exterior of Gateway Cleaners. The borings will be advanced using direct push drilling techniques. Continuous sample cores will be obtained until the terminus of the boring. To confirm vertical delineation of soils, the soil borings will be advanced to the first observed confining layer, to a maximum of 30 feet below the water table, or until drilling rig advancement-refusal, whichever occurs first.

GZA must note, that due to the Site access limitations, a relatively small, limited-access drilling rig is required and the depth of penetration may be limited. Large scale intrusive work is not anticipated during the investigation; however, any ground intrusive work will be conducted in accordance with the Site-Specific Community Air Monitoring Plan (CAMP) provided in **Appendix F.**

4.32 Soil Sampling and Logging Methodology

A GZA scientist/engineer will be present to observe the subsurface explorations, classify soil samples and prepare soil boring logs. Descriptive information concerning soil from each sampling location will be recorded in a field notebook and classified using a modified Unified Soil Classification System (USCS). All soil samples will be logged based on appearance, texture, moisture content and odor. The boring log will also include the sample designation, sample collection date and depth, total depth of the boring, depth and apparent thickness of any identified layers of contaminated soil, and recovery percentages. Olfactory and visual evidence of impacted soils will also be noted on the boring log. Soil cores will be screened using a PID for VOCs, the results of which will be presented on boring log.

If elevated PID readings are encountered during sampling, up to two (2) vadose zone soil samples will be submitted for laboratory analysis per boring. Discrete soil samples will be collected from the interval with the highest observed PID reading and 6-inches above the observed water table; these samples will be selected for laboratory analysis. An additional set of saturated soil zone samples will be collected. Up to three (3) additional saturated zone soil samples will be collected from each boring for vertical delineation.

The samples will be placed directly from the sampling equipment into the sample container (a 4 oz. wide mouth jar) in a manner limiting head space by compacting the soil into the container. Completed sample labels will be affixed to the side of the container and the top of the jar will be labeled with the job name, boring number, sample number and depth collected.

Soil samples will be collected in laboratory provided containers and transported to a NYSDOH Environmental Laboratory Approval Program (ELAP) certified laboratory, under proper chain of custody procedures for analysis. Once the sample containers are filled, they will be immediately placed in the cooler with ice (in Ziploc plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at below $4^{o}C$. Samples will be shipped via courier or by an overnight delivery service.

One vadose, and one saturated zone soil sample, will be analyzed for the full NYSDEC Part 375 listed Target Compound List (TCL) and Target Analyte List (TAL) compounds; an additional vadose zone sample and the additional saturated zone samples will be submitted for analysis of NYSDEC Part 375 VOC-list compounds. Please refer to **Table 2** for the proposed analytical sampling schedule. Results will be compared to the NYSDEC Commercial and the Restricted Residential Soil Cleanup Levels, and the Part 375 Protection of Groundwater Soil Cleanup Objectives.

All soil investigation derived waste will be containerized, temporarily stored in a centralized location and disposed off-Site.

4.33 Groundwater Sampling Methodology

Prior to initiating the drilling and sampling program, all four existing groundwater monitoring wells will be gauged, to confirm depth to groundwater, and then sampled via USEPA Low-Flow methods.

For the purpose of vertical groundwater delineation, additional soil borings will be advanced, in five-foot increments, adjacent to the soil borings described above. Similarly, these borings will be advanced, when feasible, to a depth of 30 feet into the water table, to the first confining layer, or until drilling refusal. Grab samples will be collected every five feet below the water table using a GeoProbe HydroPunch® groundwater sampling system or an equivalent point-in-time groundwater sampler.

A retractable well screen will be advanced, step-wise in five-foot increments, below the groundwater table for the collection of vertical profile grab groundwater samples. A field filtered grab groundwater sample will be collected from the temporary well points using a peristaltic pump and a modified low-flow groundwater purging and sampling procedure based on USEPA methodologies. Field samples will be collected once parameters have stabilized or 20-minutes of purging have lapsed. Up to six groundwater samples will be collected from each boring.

The groundwater samples will be placed in laboratory supplied glassware, placed on ice and submitted under proper chain of custody. One groundwater sample per boring, and each permanent groundwater well, will be analyzed for the full NYSDEC TAL/TCL compounds and the remaining samples per boring will be analyzed for VOCs only. Sample results will be compared against the NYSDEC TOGS AQWS.

All purged groundwater will be containerized in 55-gallon drums and disposed off-Site at an appropriate accepting disposal facility.

4.40 SOIL GAS AND SUB-SLAB VAPOR SAMPLING

Due to the presence of VOCs in soil vapors and soil gas, subsurface sampling points will be conducted to assess migration. As stated in **Section 2.40**, several iterations of sub-slab soil vapor assessments have been conducted at the Site. Delineation of sub-slab soil vapor under the building, which houses the former Gateway Cleaners, is considered complete in regards to remedy selection. Sub-slab soil vapors are presumed to extend beneath the entire commercial building and will be addressed with an SSDS that will create negative vacuum within the footprint of the commercial building. Supplemental soil gas sampling will be completed to assess migration beyond the Site building. Samples will be collected in accordance with the NYSDOH GESVI.

4.41 Sub-Slab Soil Vapor Delineation

Three sub-slab soil as samples will be collected from the commercial space for additional delineation; one of the three sampling points will be completed in the Former Gateway French Cleaners. Further, collocated indoor air quality samples will be collected at and during the sub-slab sampling. Therefore, a total of 3 sub-slab soil gas and three collocated indoor quality samples will be completed.

As per the guidance, the sample will be obtained in at least one central location away from foundation footings, and from the soil or aggregate immediately below the slab-on-grade. The sub-slab sample will be collected using a low-flow summa canister and a flow rate of 0.0125 liters per minute or less.

The sampling point location will be installed by drilling through the building slab using a concrete drill equipped with an approximate 1/2-inch diameter drill bit. A new, clean $^{3}/_{16}$-inch inside diameter Teflon tubing will be installed, through the penetration, to a depth of two inches below the bottom of the concrete slab. The annulus at the surface (between the building concrete slab and tubing) will be sealed using hydrated bentonite clay.

The environmental field professional will then install new flexible hose to a peristaltic pump and connect the Teflon sample tubing to the hose with the other end (discharge end) of the flexible tubing connected to a 0.5-liter Tedlar bag. During purging, a flow of helium gas will be introduced into the plastic shroud overlying the soil gas sampling point. The soil gas sampler will be purged of approximately three sampler volumes (0.4 liters) by activating the pump to fill the Tedlar bag to near capacity.

The Tedlar bag will be analyzed in the field using a Marks Model 9822 helium detector to check for short-circuiting of outside air into the sampling port. If helium is detected at a concentration of greater than 10 percent, the soil gas point will be resealed with hydrated bentonite. The point will then be retested to ensure that the helium concentration is less than 10 percent.

Each probe will be connected via Teflon tubing to a laboratory-supplied SUMMA canister. Using a 0.0125 L/min flow regulator and individually certified clean six-liter capacity SUMMA canister the sample collection time will be eight-hour. GZA personnel will ensure that SUMMA canister regulators are turned off before end pressure reaches zero.

During collection of a sub-slab sample, one indoor air quality sample will also be collected. Summa canister flow regulators will be calibrated for an eight-hour sampling period. The corresponding summa canister for the indoor air sample will be placed at the seated breathing zone level (three feet above ground surface) in the designated sampling location adjacent to the soil gas sampling location.

4.42 Indoor and Outdoor Air Sampling

To assess outdoor ambient air, and the air quality with in the Former Gateway French Cleaners, one additional sample will be collected from the exterior and space, and three collocated indoor air quality samples will be collected. The collocated indoor samples will be collected at and during the sub-slab soil gas sampling locations as described above. Prior to collection of the indoor air sample the heating systems will be operated to maintain normal indoor air temperatures (i.e., 65 – 75°F) for at least 24 hours prior to and during the scheduled sampling time. Prior to collecting indoor samples, a pre-sampling inspection will be performed to evaluate the physical layout and conditions of the space and to identify conditions that may affect or interfere with the proposed sampling, and to prepare the building for sampling. Sample duration will reflect the exposure scenario being evaluated which is an 8 hour work shift.

An outdoor air sample will be collected at the rear of the medical space adjacent to the where the indoor air sample is collected and at a location which is clear of any apparent volatile sources of contaminants. The outdoor sample will be collected from a representative upwind location, away from wind obstructions and at a height above the ground to represent breathing zones (three to five feet) as indicated in the NYSDOH VI guidance which stipulates a representative sample is one that is not biased toward obvious sources of volatile chemicals (e.g., automobiles, lawn mowers, oil storage tanks, gasoline stations, industrial facilities, etc.). To obtain representative samples that meet the data quality objectives, outdoor air samples will be collected in a manner consistent with that for indoor air samples.

4.43 Off-Site Soil Gas Migration Assessment

Five soil gas sample locations will be conducted outside of the building containing the former dry cleaner to assess off-Site soil vapor migration. One sample point will be installed west of the building, three will be installed along the south face of the building (in the promenade) and an additional sample will be collected to the east of the building.

The soil vapor samples will be collected using a direct-push drilling rig (i.e., Geoprobe), utilizing drive rods to advance a stainless steel probe to the desired sample depth. Subsurface soil vapor samples will be generally collected at a depth of approximately 6 to 8-feet bgs and in accordance with NYSDOH guidance documents. The soil gas samples will be collected over a two hour collection time, in a manner similar to that described in **Section 4.41** above.

4.50 LABORATORY ANALYSIS

During the subsurface investigation, up to two discrete soil samples will be taken from the vadose zone in each of the soil borings, and up to three saturated soil samples will also be collected. Further, up to six (6) grab groundwater samples per delineation boring and four permanent groundwater well samples will be collected. The collected soil and groundwater samples will be placed in a cooler, kept on ice, and transported under chain-of-custody to a NYSDOH ELAP certified laboratory. Please refer to **Table 2** for an analytical sampling schedule.

As part of the field investigation, GZA will also collect Quality Assurance/Quality Control (QA/QC) samples in order to: (1) check sample bottle preparation; and (2) evaluate contamination introduced during transport. One trip blank per sample shipment will be analyzed for VOCs in order to assess any contamination introduced to the samples during the transportation process. Please refer to **Appendix G** for the Site specific Quality Assurance Project Plan (QAPP).

Exterior soil gas and sub-slab soil vapor samples will be collected using conventional sampling methods, with appropriate laboratory cleaned and supplied summa canisters. Analytical testing will be conducted by an ELAP certified laboratory, using EPA Method TO-15. In addition, analysis of the air samples will be conducted as described in Section 2.9 of the NYSDOH VI Guidance and include an expanded analyte list for petroleum compounds, particularly the indicator compounds for gasoline and middle distillate fuels including BTEX, trimethylbenzene isomers, the appropriate oxygenate additives (MTBE, ethanol, etc.), and the individual C-4 to C-12 aliphatics (e.g., hexane, cyclohexane, dimethylpentane, and 2,2,4-trimethylpentane [iso-octane], nonane, decane, undecane and dodecane). These compounds are not normally part of the TO-15 analyte list, and will be reported as tentatively identified compounds (TICs) if the laboratory does not have appropriate standards.

4.60 EQUIPMENT DECONTAMINATION

To avoid cross contamination, sampling equipment (defined as any piece of equipment which may contact a sample) will be decontaminated and/or managed according to the procedures outlined below:

4.61 Non-Dedicated Reusable Equipment

Non-dedicated reusable equipment such as stainless steel mixing bowls and spoons, pumps used for groundwater evacuation (and sampling, if applicable) etc. will require field decontamination. Acids and solvents will not be used in the field decontamination of such equipment. Decontamination typically involves scrubbing/washing with a laboratory grade detergent (e.g. alconox) to remove visible contamination, followed by potable (tap) water and analyte-free water rinses. Tap water may be used for this purpose from any treated municipal water system. Well water will not be used for this purpose. Equipment will be allowed to dry, or wiped dry with clean paper towels, prior to additional use. Steam cleaning or high pressure hot water cleaning may be used in the initial removal of gross, visible contamination.

4.62 Disposable Sampling Equipment

Disposable sampling equipment includes disposable gloves, disposable bailers, string, tubing associated with groundwater sampling/purging pumps, and polyethylene sampling spatulas. Disposable sampling equipment will be used only once.

4.63 Heavy Equipment

Certain heavy equipment such as drilling steel will be subject to high pressure hot water or steam cleaning between uses. A member of the sampling team will visually inspect the equipment to check that visible contamination has been removed by similar procedure listed above prior to sampling and between drilling locations. The drilling casing and down-hole equipment will be cleaned prior to arrival on Site and between soil borings.

5.00 CHAIN OF CUSTODY AND SHIPPING

A chain-of-custody form will trace the path of sample containers from the project site to the laboratory. The project manager will notify the laboratory of upcoming field sampling events and the subsequent transfer of samples. This notification will include information concerning the number and type of samples, and the anticipated date of arrival. Insulated sample shipping containers (typically coolers) will be provided by the laboratory for shipping samples. All sample bottles within each shipping container will be individually labeled with an adhesive identification label provided by the laboratory. Project personnel receiving the sample containers from the laboratory will check each cooler for the condition and integrity of the bottles prior to field work.

The field sampler will indicate the sample designation/location number in the space provided on the chain-of-custody form for each sample. The chain of custody forms will be signed and placed in a sealed plastic Ziploc bag in the cooler. The completed shipping container will be closed for transport with nylon strapping, or a similar shipping tape, and a paper custody seals will be affixed to the lid. The seals must be broken to open the cooler and will indicate tampering if the seals are broken before receipt at the laboratory. A label may be affixed identifying the cooler as containing "Environmental Samples" and the cooler will be shipped via courier or by an overnight delivery service to the laboratory. When the laboratory receives the coolers, the custody seals will be checked and lab personnel will sign the chain-of-custody form.

The following typical Chain-Of-Custody procedures will be implemented by GZA during the soil sampling:

A. The samples are under custody of the GZA field personnel, if:

   1. they are in his/her possession,
   2. they are in view after being in possession,
   3. they are locked up or sealed securely to prevent tampering, or
   4. they are in a designated secure area.

B. The original of the chain-of-custody form must accompany the samples at all times after collection, until receipt at the analytical laboratory. A copy of the chain-of-custody form will be kept by the sampling collector until it is filed in the project file.

C. When the possession of samples is transferred, the individuals relinquishing and receiving the samples will sign, date, and note the time on the Chain-Of-Custody form.

D. When samples are shipped, the GZA personnel, or designated representative, will note the courier name, and airbill number, if applicable, on the Chain-Of-Custody form. Prior to shipping, coolers will be secured with signed custody seals so the laboratory may confirm coolers were not opened during shipping.

The chain-of-custody form will contain information to distinguish each sample from any other sample. This information will include:

A. The project name and address for which sampling is being conducted;

B. The name(s) and signature(s) of sampler(s);

C. The matrix being sampled (sludge, groundwater, soil, etc.);

D. The sampling date and time;

E. The specific sampling location in sufficient detail to allow re-sampling at the same location;

F. The number of containers and the volume of sample collected;

G. The analytical method to be performed; and

H. The Chain-Of-Custody record is a color-coded, four copy form. Chain-of-custody copies are distributed upon completion to the following:

1. WHITE COPY - Original accompanies samples.
2. YELLOW COPY - Maintained by the Laboratory.
3. PINK COPY - Kept by the Sample Collector (GZA).

6.00 STORAGE AND DISPOSAL OF INVESTIGATION-DERIVED WASTE

All investigation derived waste (IDW) generated during the RI will be collected in properly labeled USDOT approved storage containers (55-gallon drums) or a small bulk roll-off container and grouped by environmental matrix (soil, water, PPE/plastic, construction debris). All drums or roll-offs will be staged in a central location on-Site prior to off-Site disposal.

If drums are used, as they are filled they will be tracked and given unique identification codes based on the following:

- A prefix indicating the drum's contents: i.e., S – Soil, W – Water, P – PPE/Plastic, and C&D – Construction Debris.
- Following the prefix and a hyphen will be the origin of the drum's contents. For example, drum SP-9 is a generated drum filled with soil form location P-9; while, drum WP-9 is water generated from P-9.

- As drums are generated, their identification code, date of generation, contents, source (i.e., drill cuttings from location x, purge water from well y), and date sampled will be entered on a tracking table.

The drums (or roll-off container) will be centrally stored on-Site. Subsequently, the waste soils will be characterized with laboratory analyses for proper disposal.

7.00 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

A Qualitative Human Health Exposure Assessment (QHHEA) will be conducted following NYSDEC guidance. The QHHEA will characterize the exposure setting, identify potentially complete exposure pathways, and qualitatively evaluate potential fate and transport of constituents from one medium to another (i.e., soil-to-air or soil-to-groundwater).

An exposure pathway is considered complete when the following five conditions are met:

1. Source (i.e., chlorinated volatile organic compounds);
2. Release and transport mechanism from source to environmental media (i.e., into the subsurface or volatilization to the air of an overlying building);
3. Point of human exposure (i.e., an occupied building or surface soil);
4. A route of exposure (ingestion, dermal contact, or inhalation);
5. A receptor population (i.e., on-site workers).

Once potentially complete exposure pathways are identified, the QHHEA will characterize site conditions to determine whether the site poses an existing or potential future hazard to the potentially exposed population. The evaluation will include a qualitative discussion of potential fate and transport mechanisms at the site. The results of the QHHEA will be included as part of the RI Report.

8.00 REPORTING

Upon completion of the field activities, an RI Report/Remedial Action Work Plan will be prepared to document the findings of the investigations performed at the Site and the proposed remedy. The report will be consistent with the specifications presented in the DER-10 document and will include:

- An executive summary;
- A site description and history;
- Summary information regarding previous investigations and remedial work performed at the site;
- Descriptions of all field activities performed;

- A summary of pertinent field observations, field measurements, and laboratory analytical data summarized in tabular format: soil and groundwater analytical results will be compared to appropriate NYSDEC guidance and standards;
- Plan view and cross-section figures presenting laboratory analytical data and field observations of surface and subsurface soil and groundwater impacts. A minimum of two profiles will be developed, one perpendicular to and one parallel with groundwater flow direction at the Site;
- A qualitative human health risk assessment which assesses the sources of impact, on and off-site human and ecological receptors, and exposure pathways;
- A data usability review and Data Usability Summary Report (DUSR) for the laboratory data collected during the RI.
- An integration of field observations and measurements with laboratory analytical data to evaluate the nature and extent of impacts and to develop a site conceptual model of potential contaminant migration;
- A Remedial Alternatives Analysis
- A set of conclusions for the investigation; and
- Recommendations

Data collected during the RI will be submitted in the Department's Environmental Information Management System (EIMS) format for Electronic Data Delivery (EDD).

9.00 PROJECT SCHEDULE AND PROJECT PERSONNEL

Our anticipated schedule to perform the investigation activities described in this work plan is summarized below:

Description	**Estimated Time to Complete** (from NYSDEC's approval of the RIWP)
Obtain contract with drillers	3 weeks
Drill and install borings	5 weeks
Receive laboratory analytical results	7 weeks
Complete RIR and submit to NYSDEC	13 weeks

We note that the proposed schedule may be adjusted if unforeseen delays occur due to inclement weather, DOT permit approval, drill rig availability or other conditions that are beyond Bay Park One's control.

The following GZA project personnel are proposed to be involved as part of the remedial activities. Qualifications of personnel are provided in **Appendix H**. Drilling subcontractors have not yet been retained.

Personnel	Role	Contact Information
David Winslow	Qualified Environmental Professional	973-774-3307
Brett Engard	Project Manager	973-774-3325
Kathleen Cyr	QA Officer	860-858-3161
Chunhua Liu	DUSR	781-278-5882
Arsheen Ehtesham	Field Scientist	973-774-3316
James Restaino	Field Tech	973-774-3300

TABLES

Table 1 - Well Construction Characteristics and Water Level Data

Remedial Investigation Work Plan
Former Gateway French Cleaners
3375 Neptune Avenue
Brooklyn, New York

Well ID	Ground Surface Elevation[1]	Well Diameter (inches)	Depth, BTOC (feet)	Well Screen Length (feet)	Well Screen, bgs (feet)		TOC Elevation[1] (feet)	Depth to Water[2], (feet)	Groundwater Elevation[2] (feet)	Depth to Water[3], (feet)	Groundwater Elevation[3] (feet)	Elevation Change, (feet)
					Top	Bottom						
MW-1	7.07	2	39.2	10	29.2	39.2	6.86	9.09	-2.23	9.40	-2.54	0.31
MW-2	6.96	2	39.3	10	29.3	39.3	6.76	8.85	-2.09	9.16	-2.40	0.31
MW-3	7.37	2	37.7	10	27.7	37.7	7.15	9.12	-1.97	9.46	-2.31	0.34
MW-4	6.21[4]	2	16.0	10	6.0	16.0	6.0[4]	NA	NA	8.28	-2.28[4]	NA

Notes

[1] - Elevation is relative to arbitrary Site benchmark, Rogers Surveying, PLLC

[2] - Groundwater measurements collected on on July 30, 2009

[3] - Groundwater measurements collected on on November 13, 2010

[4] - Elevation estimated from Site features and field measurements.

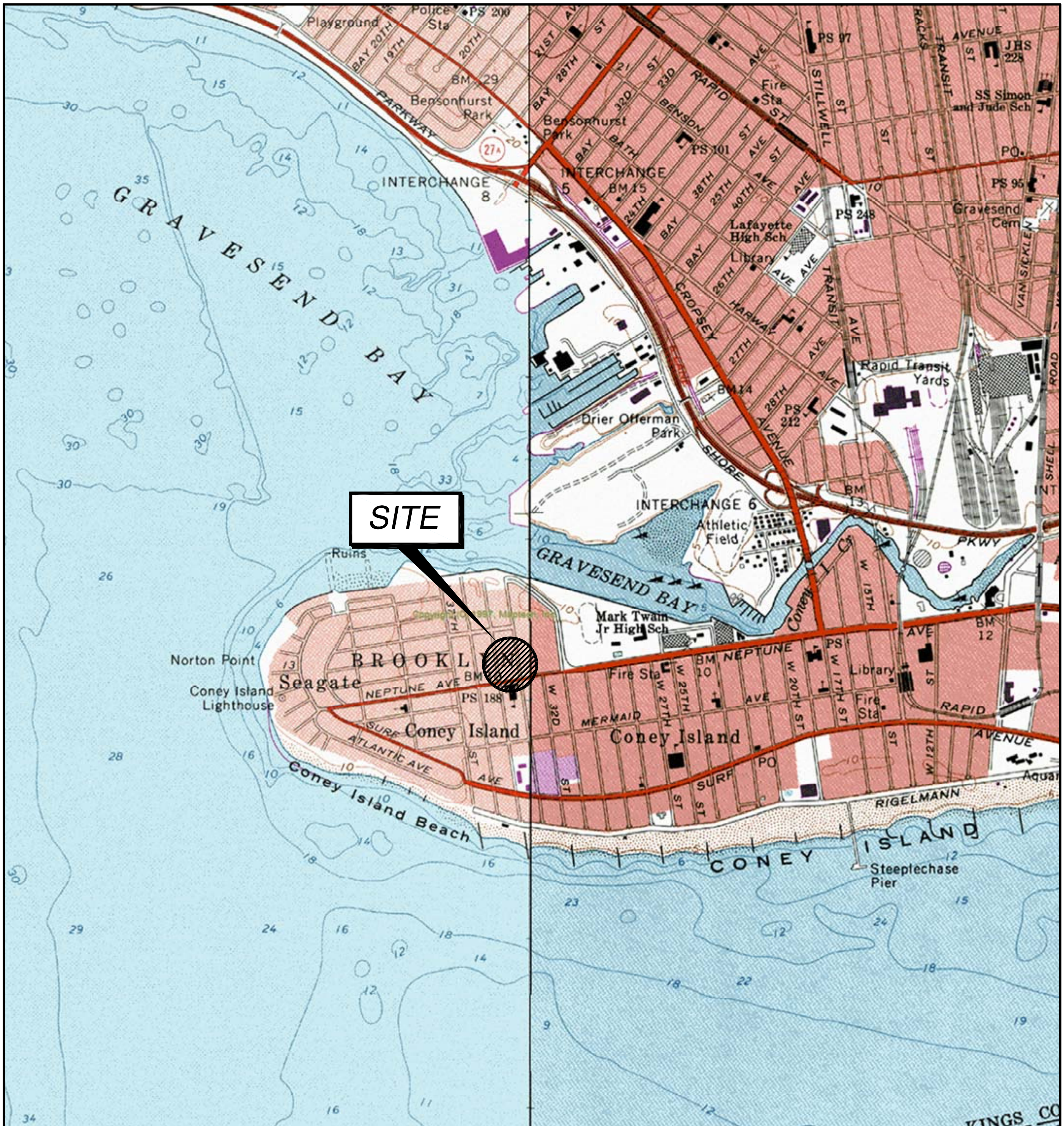
Table 2 - Sampling Schedule
Remedial Investigation Work Plan
Former Gateway French Cleaners
3375 Neptune Avenue
Brooklyn, New York

Location	Rational	Media Sampled	Laboratory Analytical Schedule							
			VOCs Method TO-15	TCL VOCs Method 8260	TCL SVOCs Method 8270	TAL Metals Method 6010/7470	Pesticides Method 8081	PCBs Method 8080	Cyanide Method 9014	Hexavalent and Trivalent Chromium Method 7196	Herbicides Method 8151
P-9	Potential source area investigation	Soil		6	2	2	2	2	2	2	2
		Groundwater		6	1	1	1	1	1	1	1
GZA-14	Potential source area investigation	Soil		6	2	2	2	2	2	2	2
		Groundwater		6	1	1	1	1	1	1	1
Trip Blank/DUPs	QA/QC - Potential Quantity	Various	1	12	4	4	4	4	4	4	4
IA-2	Indoor Air Quality	Ambient Air	1								
IA-3	Indoor Air Quality	Ambient Air	1								
IA-4	Indoor Air Quality	Ambient Air	1								
AA-1	Ambient Air Quality	Ambient Air	1								
SS-4	Subslab Soil Gas	Soil Gas	1								
SS-5	Subslab Soil Gas	Soil Gas	1								
SS-6	Subslab Soil Gas	Soil Gas	1								
SG-2	Soil Gas Delineation	Soil Vapor	1								
SG-3	Soil Gas Delineation	Soil Vapor	1								
SG-4	Soil Gas Delineation	Soil Vapor	1								
SG-5	Soil Gas Delineation	Soil Vapor	1								
SG-6	Soil Gas Delineation	Soil Vapor	1								
Existing Groundwater Wells											
MW-1	Dissolved Constituent Delineation	Groundwater		1	1	1	1	1	1	1	1
MW-2	Dissolved Constituent Delineation	Groundwater		1	1	1	1	1	1	1	1
MW-3	Dissolved Constituent Delineation	Groundwater		1	1	1	1	1	1	1	1
MW-4	Dissolved Constituent Delineation	Groundwater		1	1	1	1	1	1	1	1
		TOTAL	**13**	**51**	**16**	**16**	**16**	**16**	**16**	**16**	**16**

Notes:

VOCs - Volatile organic compounds
SVOCs - Semi-volatile organic compounds
PCBs - Polychlorinated biphenyl
QA/QC Quality Assurance/Quality Control
TAL - Target Analyte List
TCL - Target Compound List
SSDS - Sub-Slab Depressurization System

FIGURES



QUADRANGLE LOCATION

SOURCE:
USGS TOPOGRAPHIC MAPS: CONEY ISLAND, NY-NJ (1979) & THE NARROWS, NY-NJ (1998). CONTOUR INTERVAL 10 FT., ORIGINAL SCALE 1:24,000 (1"=2,000 FT.).

0 1000' 2000' 4000'
SCALE IN FEET

N
W E
S

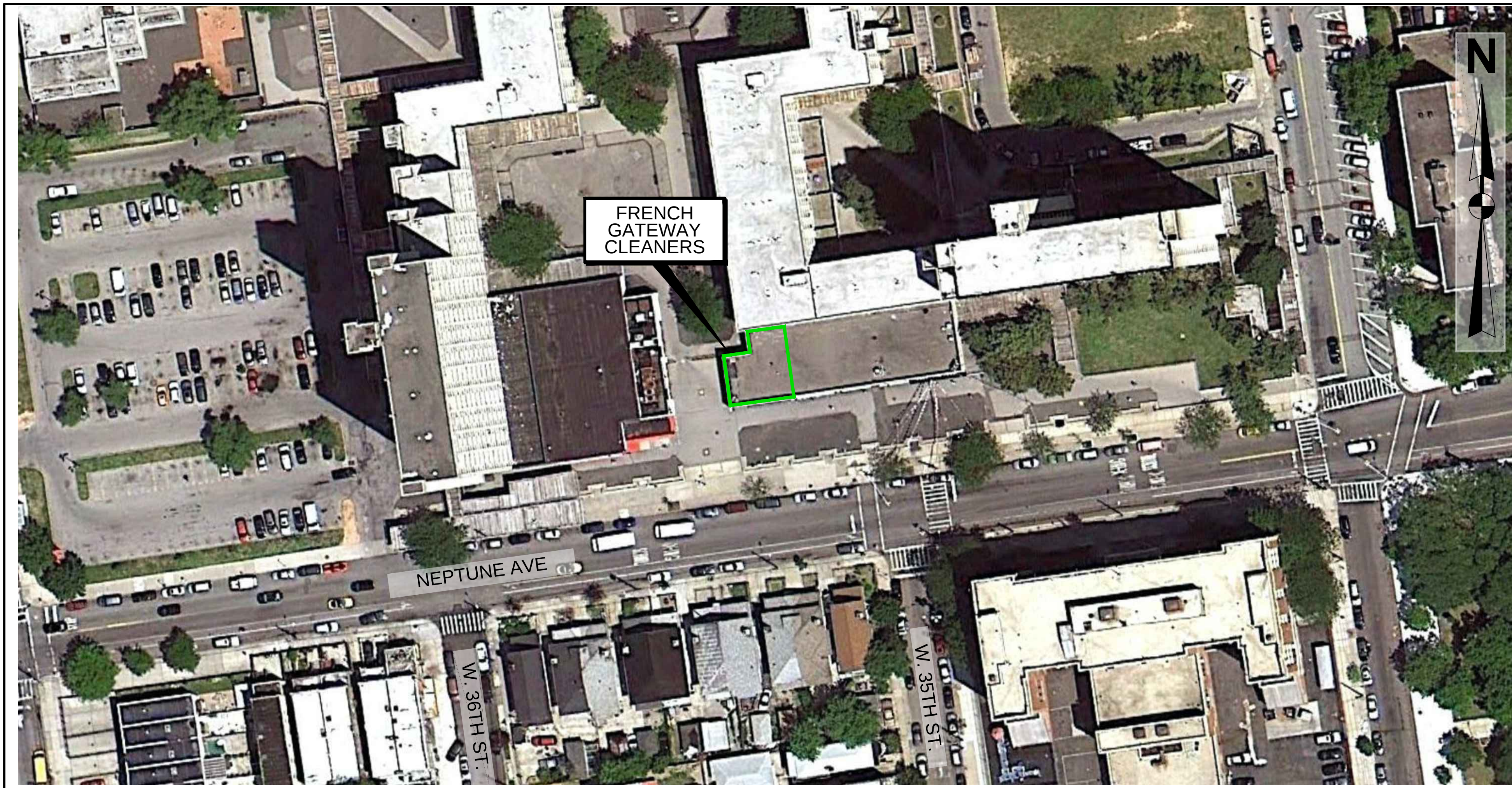
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

PREPARED BY:
GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:
BAY PARK ONE COMPANY

REMEDIAL INVESTIGATION WORK PLAN
SITE LOCATION MAP

PROJ MGR: CB	REVIEWED BY: CB	CHECKED BY: BE	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 2000'	1
DATE: AUGUST 2012	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.



NOTES:

1) BASE MAP DEVELOPED FROM IMAGES OBTAINED FROM GOOGLE EARTH PROFESSIONAL ON MY 7, 2012.

LEGEND:

BROWNFIELD CLEAN-UP APPLICATION AREA

0 50' 100' 200'

SCALE IN FEET

NO.	ISSUE/DESCRIPTION	BY	DATE

3375-3377 Neptune Avenue
Brooklyn, New York

Brownfield Cleanup Program
Citizen Participation Plan

PREPARED BY:

GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:

BAY PARK ONE COMPANY

PROJ MGR: CB	REVIEWED BY: CB	CHECKED BY: BE	FIGURE
DESIGNED BY: BE	DRAWN BY: EM	SCALE: 1" = 100'	2
DATE: AUGUST 2012	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.

LEGEND

- SOIL VAPOR POINT
- SOIL VAPOR POINT (PREVIOUS INVESTIGATION)
- SEAM IN CONCRETE
- OUTDOOR AIR SAMPLE
- INDOOR AIR SAMPLE
- PHASE II BORING LOCATION (AND GRAB GROUNDWATER)
- MONITORING WELL LOCATION
- INDOOR SUB-SLAB SOIL PROBE LOCATION
- SUSPECTED LOCATION OF FORMER DRY CLEANING EQUIPMENT
- BROWNFIELD CLEAN-UP APPLICATION AREA

NOTES:

1) BASE MAP DEVELOPED FROM PLAN PROVIDED BY FEHRINGER SURVEYING, P.C., ENTITLED "SITE SURVEY," DATED OCTOBER 16, 2206, TITLE No. 826891.

2) DIMENSIONS OF DENTAL SPACE APPROXIMATED.

3) THE LOCATION OF THE SAMPLING LOCATIONS WERE APPROXIMATELY DETERMINED BY LINE OF SIGHT FROM EXISTING TOPOGRAPHIC FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

NO.	ISSUE/DESCRIPTION	BY	DATE

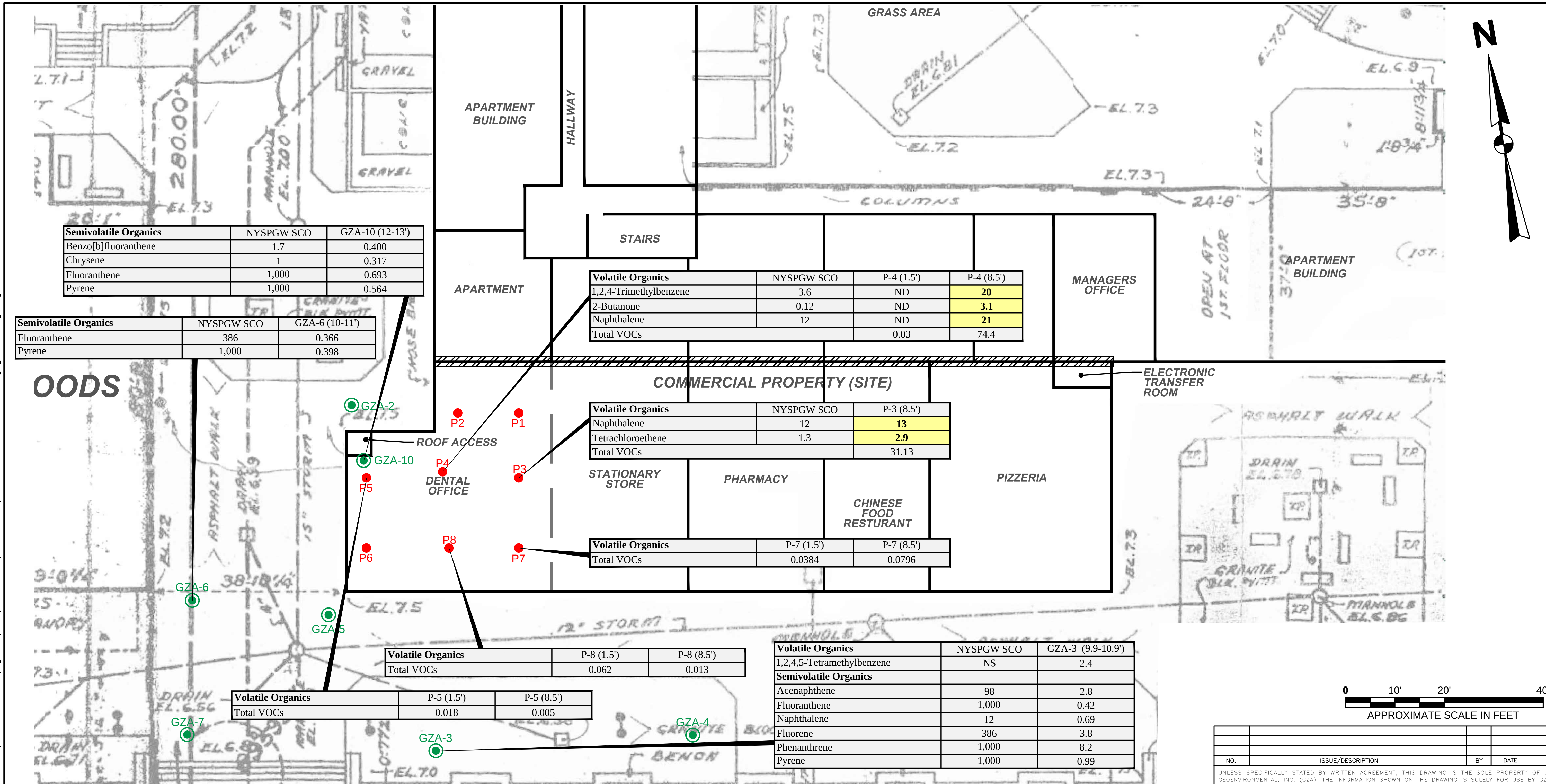
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

REMEDIAL INVESTIGATION WORK PLAN
SITE PLAN AND EXISTING
EXPLORATION LOCATION MAP

PREPARED BY: GZA GeoEnvironmental of New York, Engineers and Scientists, 104 WEST 29TH STREET, 10TH FLOOR, NEW YORK, NEW YORK 10001

PREPARED FOR: BAY PARK ONE COMPANY

PROJ MGR: CB	REVIEWED BY: CB	CHECKED BY: BE	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 20'	3
DATE: AUGUST 2012	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.



Semivolatile Organics	NYSPGW SCO	GZA-10 (12-13')
Benzo[b]fluoranthene	1.7	0.400
Chrysene	1	0.317
Fluoranthene	1,000	0.693
Pyrene	1,000	0.564

Semivolatile Organics	NYSPGW SCO	GZA-6 (10-11')
Fluoranthene	386	0.366
Pyrene	1,000	0.398

Volatile Organics	NYSPGW SCO	P-4 (1.5')	P-4 (8.5')
1,2,4-Trimethylbenzene	3.6	ND	**20**
2-Butanone	0.12	ND	**3.1**
Naphthalene	12	ND	**21**
Total VOCs		0.03	74.4

Volatile Organics	NYSPGW SCO	P-3 (8.5')
Naphthalene	12	**13**
Tetrachloroethene	1.3	**2.9**
Total VOCs		31.13

Volatile Organics	P-7 (1.5')	P-7 (8.5')
Total VOCs	0.0384	0.0796

Volatile Organics	P-8 (1.5')	P-8 (8.5')
Total VOCs	0.062	0.013

Volatile Organics	P-5 (1.5')	P-5 (8.5')
Total VOCs	0.018	0.005

Volatile Organics	NYSPGW SCO	GZA-3 (9.9-10.9')
1,2,4,5-Tetramethylbenzene	NS	2.4
Semivolatile Organics		
Acenaphthene	98	2.8
Fluoranthene	1,000	0.42
Naphthalene	12	0.69
Fluorene	386	3.8
Phenanthrene	1,000	8.2
Pyrene	1,000	0.99

LEGEND

SEAM IN CONCRETE

PHASE II BORING LOCATION (AND GRAB GROUNDWATER)

INDOOR SUB-SLAB SOIL PROBE LOCATION

NOTES:

1) BASE MAP DEVELOPED FROM PLAN PROVIDED BY FEHRINGER SURVEYING, P.C., ENTITLED "SITE SURVEY," DATED OCTOBER 16, 2206, TITLE No. 826891.

2) DIMENSIONS OF DENTAL SPACE APPROXIMATED.

3) THE LOCATION OF THE SAMPLING LOCATIONS WERE APPROXIMATELY DETERMINED BY LINE OF SIGHT FROM EXISTING TOPOGRAPHIC FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

NO.	ISSUE/DESCRIPTION	BY	DATE

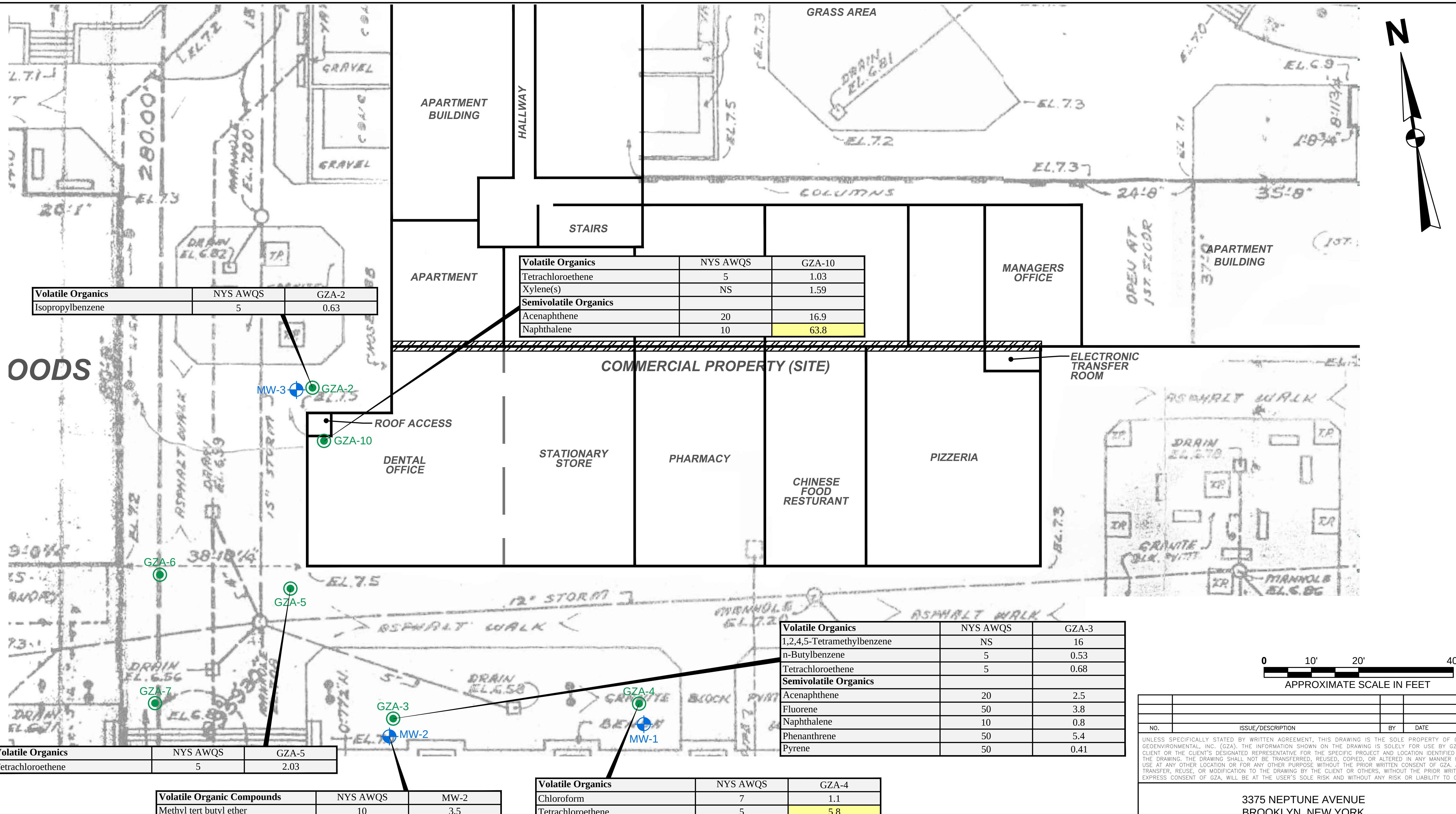
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

REMEDIAL INVESTIGATION WORK PLAN
SOIL ANALYTICAL DATA

PREPARED BY: GZA GeoEnvironmental of New York, Engineers and Scientists, 104 WEST 29TH STREET, 10TH FLOOR, NEW YORK, NEW YORK 10001

PREPARED FOR: BAY PARK ONE COMPANY

PROJ MGR: CB	REVIEWED BY: CB	CHECKED BY: BE	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 20'	4
DATE: AUGUST 2012	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.



Volatile Organics	NYS AWQS	GZA-2
Isopropylbenzene	5	0.63

Volatile Organics	NYS AWQS	GZA-10
Tetrachloroethene	5	1.03
Xylene(s)	NS	1.59
Semivolatile Organics		
Acenaphthene	20	16.9
Naphthalene	10	63.8

Volatile Organics	NYS AWQS	GZA-3
1,2,4,5-Tetramethylbenzene	NS	16
n-Butylbenzene	5	0.53
Tetrachloroethene	5	0.68
Semivolatile Organics		
Acenaphthene	20	2.5
Fluorene	50	3.8
Naphthalene	10	0.8
Phenanthrene	50	5.4
Pyrene	50	0.41

Volatile Organics	NYS AWQS	GZA-5
Tetrachloroethene	5	2.03

Volatile Organic Compounds	NYS AWQS	MW-2
Methyl tert butyl ether	10	3.5

Volatile Organics	NYS AWQS	GZA-4
Chloroform	7	1.1
Tetrachloroethene	5	5.8

LEGEND

SEAM IN CONCRETE

PHASE II BORING LOCATION (AND GRAB GROUNDWATER)

MONITORING WELL LOCATION

NOTES:

1) BASE MAP DEVELOPED FROM PLAN PROVIDED BY FEHRINGER SURVEYING, P.C., ENTITLED "SITE SURVEY," DATED OCTOBER 16, 2206, TITLE No. 826891.

2) DIMENSIONS OF DENTAL SPACE APPROXIMATED.

3) THE LOCATION OF THE SAMPLING LOCATIONS WERE APPROXIMATELY DETERMINED BY LINE OF SIGHT FROM EXISTING TOPOGRAPHIC FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

NO.	ISSUE/DESCRIPTION	BY	DATE

3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

REMEDIAL INVESTIGATION WORK PLAN
GROUNDWATER ANALYTICAL DATA

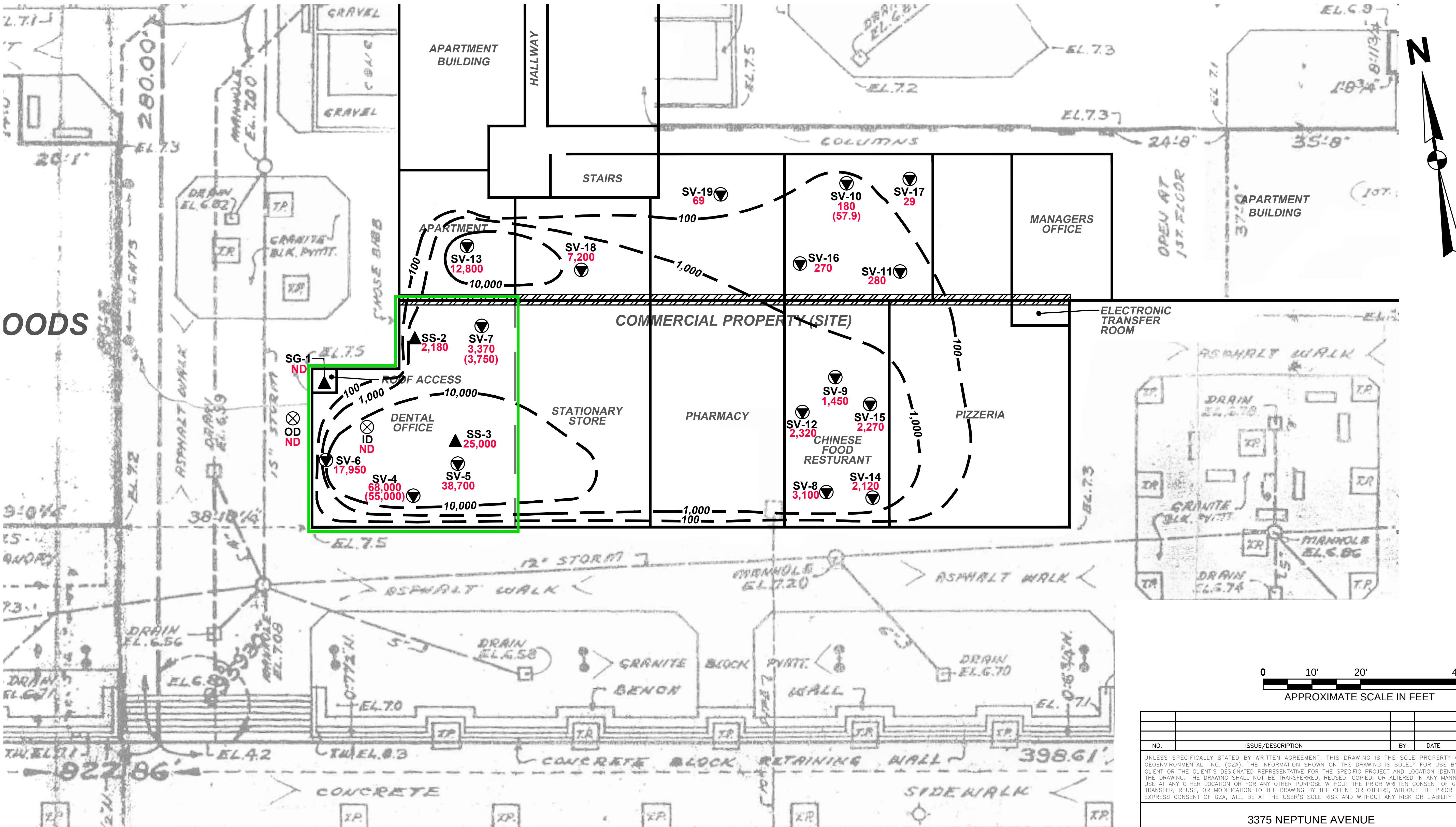
PREPARED BY:

GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:

BAY PARK ONE COMPANY

PROJ MGR: CB	REVIEWED BY: CB	CHECKED BY: BE	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 20'	5
DATE: AUGUST 2012	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.



LEGEND

- SOIL VAPOR POINT
- SOIL VAPOR POINT (PREVIOUS INVESTIGATION)
- ID OUTDOOR AMBIENT AIR SAMPLE
- OD INDOOR AIR SAMPLE
- SEAM IN CONCRETE
- 100 PCE ISO-CONCENTRATON CONTOUR/ DASHED WHERE INFERRED (MICROGRAMS PER CUBIC METER (ug/m³))
- 2,180 MOBILE LABORATORY PCE RESULTS
- (3,720) SUMMA CANISTER PCE RESULTS
- ND PCE NOT DETECTED
- BROWNFIELD CLEAN-UP APPLICATION AREA

NOTES:

1) BASE MAP DEVELOPED FROM PLAN PROVIDED BY FEHRINGER SURVEYING, P.C., ENTITLED "SITE SURVEY," DATED OCTOBER 16, 2206, TITLE No. 826891.

2) DIMENSIONS OF DENTAL SPACE APPROXIMATED.

3) THE LOCATION OF THE SAMPLING LOCATIONS WERE APPROXIMATELY DETERMINED BY LINE OF SIGHT FROM EXISTING TOPOGRAPHIC FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

NO.	ISSUE/DESCRIPTION	BY	DATE

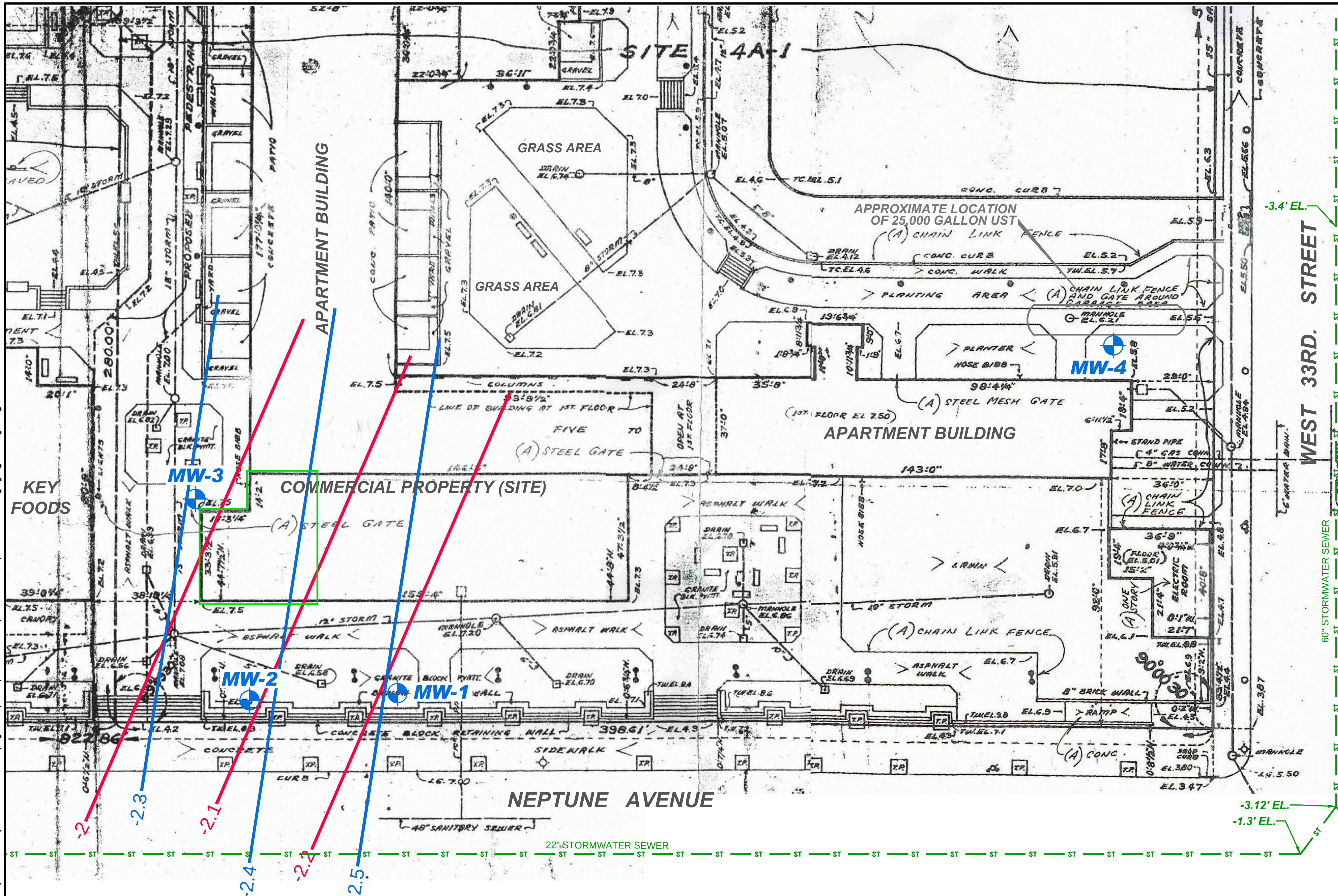
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

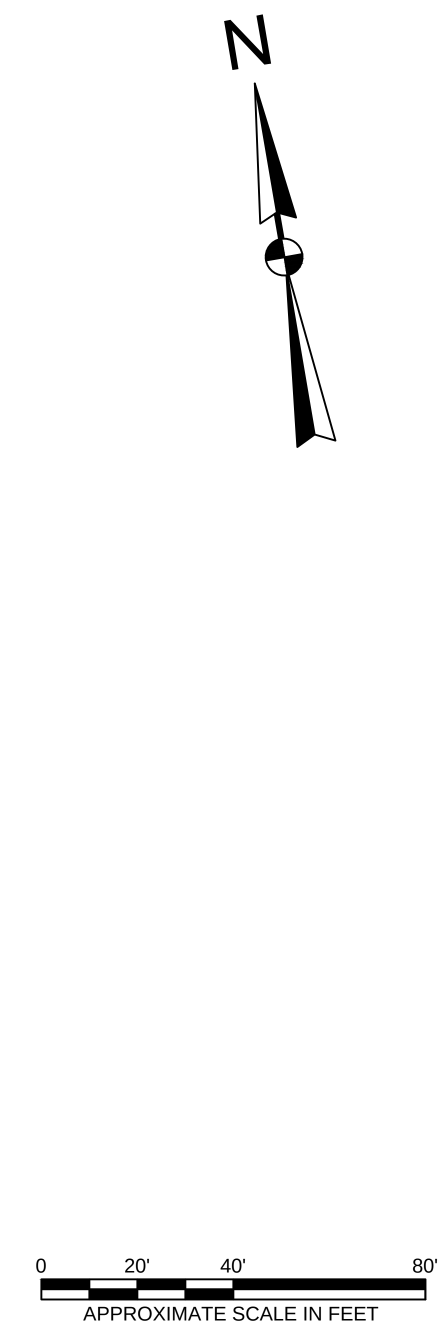
REMEDIAL INVESTIGATION WORK PLAN
SOIL VAPOR ANALYTICAL DATA

PREPARED BY: GZA GeoEnvironmental of New York, Engineers and Scientists, 104 WEST 29TH STREET, 10TH FLOOR, NEW YORK, NEW YORK 10001

PREPARED FOR: BAY PARK ONE COMPANY

PROJ MGR: CB	REVIEWED BY: CB	CHECKED BY: BE	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 20'	6
DATE: AUGUST 2012	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.





GROUNDWATER ELEVATION TABLE

Well ID	Ground Surface Elevation[1] (ft)	Well Diameter (inches)	Total Depth, BTOC (feet)	Well Screen Length (feet)	Well Screen, bgs (feet)		TOC Elevation[1] (feet)	Depth to Water[2] (feet)	Groundwater Elevation[2] (feet)	Depth to Water[3] (feet)	Groundwater Elevation[3] (feet)	Groundwater Elevation Change, (feet)
					Top	Bottom						
MW-1	7.07	2	39.2	10	29.2	39.2	6.86	9.09	-2.23	9.40	-2.54	0.31
MW-2	6.96	2	39.3	10	29.3	39.3	6.76	8.85	-2.09	9.16	-2.40	0.31
MW-3	7.37	2	37.7	10	27.7	37.7	7.15	9.12	-1.97	9.46	-2.31	0.34
MW-4	6.21[4]	2	16.0	10	6.0	16.0	6.0[4]	NA	NA	8.28	-2.28[4]	NA

Notes

1 - Elevation is relative to arbitrary Site benchmark, Rogers Surveying, PLLC

2 - Groundwater measurements collected on on July 30, 2009

3 - Groundwater measurements collected on on November 13, 2010

4 - Elevation estimated from Site features and field measurements.

LEGEND:

MW-3 MONITORING WELL

-2.3 GROUNDWATER MEASUREMENTS COLLECTED ON JULY 30, 2009

-2.2 GROUNDWATER MEASUREMENTS COLLECTED ON NOVEMBER 13, 2010

BROWNFIELD CLEAN-UP APPLICATION AREA

NO.	ISSUE/DESCRIPTION	BY	DATE

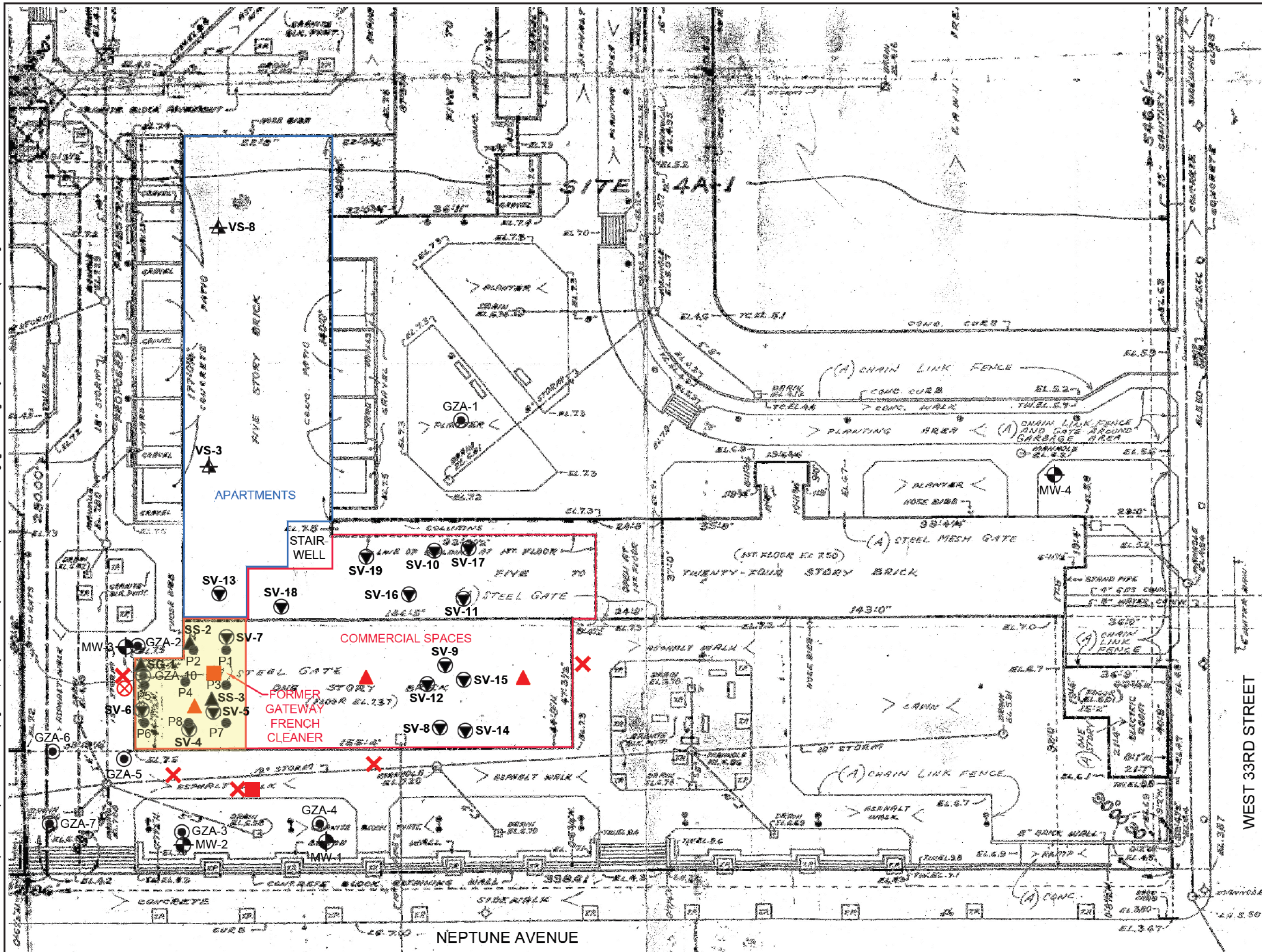
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

REMEDIAL INVESTIGATION WORK PLAN
GROUNDWATER CONTOUR MAP

PREPARED BY:
GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:
BAY PARK ONE COMPANY

PROJ MGR: CB	REVIEWED BY: CB	CHECKED BY: CE	FIGURE 7
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 40'	
DATE: AUGUST 2012	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.



LEGEND

- 2011 SOIL VAPOR POINT (PREVIOUS INVESTIGATION)
- 2010 SOIL VAPOR POINT (PREVIOUS INVESTIGATION)
- MONITORING WELL LOCATION
- 2012 SOIL VAPOR POINT - RESULTS WILL BE PRESENTED IN THE RI REPORT
- PHASE II BORING LOCATION (AND GRAB GROUNDWATER)
- INDOOR SUB-SLAB SOIL PROBE LOCATION
- PROPOSED INDOOR AIR AND SOIL VAPOR POINT SAMPLE LOCATION
- PROPOSED SOIL BORING AND GRAB GROUNDWATER SAMPLING LOCATION
- PROPOSED EXTERIOR SOIL GAS SAMPLE LOCATION
- PROPOSED OUTDOOR AIR SAMPLE LOCATION
- VOLUNTARY [BROWNFIELD] CLEANUP SITE, FORMER GATEWAY FRENCH CLEANER
- COMMERCIAL RETAIL SPACE
- RESIDENTIAL APARTMENTS

NOTES:

1. THE BASE MAP WAS DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY: STARRETT CORPORATION, ENTITLED: FINAL SURVEY, DATED: OCTOBER 22, 1976, ORIGINAL SCALE: 1" = 30'.
2. THE LOCATION OF THE SAMPLING LOCATIONS WERE APPROXIMATELY DETERMINED BY LINE OF SIGHT FROM EXISTING TOPOGRAPHIC FEATURES. THESE DATA SHOULD BE CONSIDERED ACCURATE ONLY TO THE DEGREE IMPLIED BY THE METHOD USED.

NO.	ISSUE/DESCRIPTION	BY	DATE

3325 NEPTUNE AVENUE
BROOKLYN, NEW YORK

REVISED REMEDIAL INVESTIGATION WORK PLAN
PROPOSED EXPLORATION LOCATION PLAN

PREPARED BY: GZA GeoEnvironmental of New York, Engineers and Scientists, 104 WEST 29TH STREET, 10TH FLOOR, NEW YORK, NEW YORK 10001

PREPARED FOR: STARRETT CORPORATION

PROJ MGR: DW	REVIEWED BY: BE	CHECKED BY: DW	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 40'	8
DATE: SEPT 2013	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.

APPENDIX A
LIMITATIONS

LIMITATIONS

The following Limitations are in reference to the *Remedial Investigation Work Plan*, produced and provided at the request of the Bay Park One Company, dated July 25, 2012, prepared for the property located at 3375 Neptune Avenue in Brooklyn, New York (Site).

1. The conclusions and recommendations submitted in this report are based in part upon the data obtained from a limited number of soil samples from widely spaced subsurface explorations. The nature and extent of variations between these explorations may not become evident until further investigation. If variations or other latent conditions then appear evident, it will be necessary to re-evaluate the recommendations of this report.

2. The generalized soil profile described in the text is intended to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized and have been developed by interpretations of widely spaced explorations and samples; actual soil transitions are probably more gradual. For specific information, refer to the boring logs.

3. Water level readings have been made in the test pits, borings, and/or observation wells at times and under conditions stated on the exploration logs. These data have been reviewed and interpretations have been made in the text of this report. However, it must be noted that fluctuations in the level of the groundwater may occur due to variations in rainfall and other factors different from those prevailing at the time measurements were made.

4. Where quantitative laboratory analyses have been conducted by an outside laboratory, GZA has relied upon the data provided, and has not conducted an independent evaluation of the reliability of these data.

5. The conclusions and recommendations contained in this report are based in part upon various types of chemical data and are contingent upon their validity. These data have been reviewed and interpretations made in the report. As indicated within the report, some of these data may be considered preliminary or "screening" level data, and should be confirmed with quantitative analyses if more specific information is necessary. Moreover, it should be noted that variations in the types and concentrations of contaminants and variations in their flow paths may occur due to seasonal water table fluctuations, past disposal practices, the passage of time, and other factors. Should additional chemical data become available in the future, these data should be reviewed by GZA, and the conclusions and recommendations presented therein modified accordingly.

6. Chemical analyses have been performed for specific parameters during the course of this study, as detailed in the text. It must be noted that additional constituents not searched for during the current study may be present in soil and groundwater at the site.

7. The observations described in this report were made under the conditions stated therein. The conclusions presented in the report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by Client. The work described in this report was carried out in accordance with agreed upon Terms and Conditions.

8. GZA's findings and conclusions must be considered not as scientific certainties, but rather as our professional opinion concerning the significance of the data gathered during the course of the study. No other warranty, expressed or implied is made. Specifically, GZA does not and cannot represent that the site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during the study.

Use of Report

9. This report has been prepared for the exclusive use of the **Starrett Corporation** for specific application to the real property located in **Coney Island**, **Brooklyn**, **New York**, in accordance with generally accepted soil and foundation engineering practices. No other warranty, express or implied, is made.

10. The conclusions presented in the report were based solely upon the services described therein, and not on scientific tasks or procedures beyond the scope of described services or the time and budgetary constraints imposed by the Starrett Corporation. The work described in this report was carried out in accordance with agreed upon Terms and Conditions.

11. This study was performed in accordance with generally accepted environmental and geotechnical engineering practices. Additionally, GZA makes no warranty that the findings of the study will be approved by the overseeing regulatory authorities.

16. This report has been prepared for this project by GZA and is for planning purposes only. Contractors wishing a copy of the report may secure it with the understanding that its scope is limited to design considerations only.

APPENDIX B
HISTORICAL INFORMATION

GZA
GeoEnvironmental, Inc.

Engineers and Scientists

55 Lane Road Suite 407
Fairfield, NJ 07004
(973) 774 3300
Fax (973) 774 3350
www.gza.com

January 7, 2013
File No. 12.0076112.00

Randy Beck
Coney Island Site 4-A-1 Housing Company
c/o Starrett Corporation
70 East 55th Street- 7th Floor
New York, NY 10022

Subject: Vapor Testing, Sub-Slab Depressurization System Pilot Test
Preliminary Design
Bay Park One
2770 West 33rd Street
Brooklyn, New York 11224

Dear Mr. Beck:

GZA GeoEnvironmental, Inc. (GZA) is pleased to present Coney Island Site 4-A-1 Housing Company (Bay Park One) with this letter report describing the recently completed sub-slab depressurization system (SSDS) pilot test and vapor delineation at the above-referenced residential property in Brooklyn, New York (the Site). Please refer to **Figure 1** for a Site Location Map and **Figure 2** for a Site Plan. The former Gateway French [Dry] Cleaners occupied an adjacent commercial space, located at 3375 Neptune Avenue. The results of recent field and laboratory testing indicate the presence of dry cleaning-related chemicals in the sub-slab soil vapor. Detected concentrations are above regulatory guidance values for mitigation of vapor intrusion.

GZA performed the work in accordance with our proposal dated December 13, 2012. This letter report is subject to the limitations presented in **Attachment A**.

OBJECTIVE

In order to design a SSDS for the apartment space at the Site, GZA conducted a vapor delineation survey and a vacuum influence pilot test. The objective of the pilot test was to estimate the sub-slab airflow and applied vacuum necessary to achieve a uniform depressurization beneath the concrete floor slab. The SSDS performance goal was to achieve a uniform vacuum of 0.025 inches of water beneath the building slab. GZA performed the following tasks at the Site:

- Installation of 13 delineation and vacuum monitoring points (VMPs)
- Collection of field photo-ionization detector (PID) screening data from VMPs
- Collection of soil vapor samples for laboratory analysis from two of the VMPs
- Installation of a suction pit, fan and piping

- Performance of an SSDS pilot test
- Collection of two sub-slab soil vapor effluent samples during the pilot test

The following sections present the vapor delineation, installation and execution of the pilot test, and the results of laboratory analyses.

VAPOR DELINEATION METHODOLOGIES

GZA installed 13 VMPs, labeled VS-1 through VS-13, by drilling approximately 3/8-inch holes through the concrete floor slab of the residential area, inserting tubing with filter tips through the each hole, and sealing the annular space around the tubing. The VMPs were located at distances of between six and 86 feet from the suction pit. **Figure 3** depicts the locations of the VMPs and suction pit. GZA performed a helium tracer test at each VMP location to assess the integrity of the VMP surface seal. While installing the VMPs with a drill, GZA noted that there appeared to be a gap between the bottom of the slab and the underlying soils at many of the locations.

GZA then obtained PID readings from the VMPs as a field screening and delineation method. The PID collected parts per million (ppm) estimates of total organic vapors. GZA collected two vapor samples for laboratory analysis to validate screening delineation results. Laboratory samples were collected in flow controller equipped Summa canisters analyzed by a NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory using EPA Method TO-15. GZA notes that PID readings are a relative measure of the total volatile organics in soil vapor may differ by an order of magnitude or more from laboratory analytical results.

PILOT TEST METHODOLOGIES

GZA mobilized and installed temporary vacuum testing equipment to perform the SSDS pilot test. We installed a suction pit in the central portion of the building by cutting a 12-inch square penetration in the concrete floor slab, removing the slab and excavating the underlying soil to a depth of approximately 18 inches. GZA installed a blower manifold with piping and sampling ports into the pit, and backfilled the pit with gravel around the manifold influent end. The sump pit was also fitted with a VMP to measure the applied vacuum. The backfill was then covered with plastic sheeting and approximately three inches of concrete.

The concrete slab was an 8-inch thick structural slab with rebar. The soil excavated from the pit consisted of slightly moist, light brown fine to medium grain sand. We temporarily placed the excavated soil on polyethylene sheeting; the soil was used to backfilled the sump pit at the end of the pilot test. The soil did not exhibit any olfactory or visual evidence (i.e., staining) of impacts.

GZA also observed numerous penetrations in the concrete floor slab accommodating potable and wastewater connections, as well as electrical conduits. GZA made observations of the soil-slab contact through several large cutouts in the concrete floor slab. An air-filled gap or space, up to 2-inches deep, was observed at many locations between the slab and the soil. GZA attempted to seal these large penetrations with polyethylene sheeting, spray adhesive and duct tape.

The suction manifold was fitted with field and laboratory sampling ports. GZA measured the total effluent organic vapors throughout the pilot test utilizing a PID. GZA also recorded the pre- and post-blower airflow, the pre-blower temperature and relative percent humidity. Please refer to **Figure 4** for a graph of field parameters measured and recorded during the testing. All 13 VMPs were monitored, with a magnehelic vacuum gauge, for vacuum influence during testing.

We collected two laboratory air samples of vapor effluent: one near the beginning (labeled PT-1) and one at end of the pilot test (labeled PT-2). A NYSDOH Environmental Laboratory Accreditation Program (ELAP)-certified laboratory analyzed the air samples by EPA Method TO-15.

VAPOR DELINEATION RESULTS

GZA collected PID field screening readings for vapor delineation beneath the concrete floor slab. **Figure 3** presents the field screening results and distribution of readings; please note that the potential source area is adjacent to (south of) the most southern apartment. The highest readings were recorded from VMPs in the southwestern corner of the study area. Please refer to the March 30, 2012 GZA *Vapor Delineation and Mitigation Design Interim Report* for additional delineation information.

GZA collected soil vapor samples for laboratory analysis as part of the recent fieldwork. Samples were collected at locations VS-3 and VS-8 on Figure 3. VS-3 and VS-8 were located approximately 55 feet and 141 feet north of the former Gateway French Cleaners, respectively. The samples were analyzed for VOCs by EPA Method TO-15; results are summarized on **Table 1**. As shown on Table 1, these samples did not contain tetrachloroethene (PCE) above the NYSDOH Air Guidance Value of 100 micrograms per cubic meter ($\mu g/m^3$). Sample VS-3 had a PCE concentration of 92.2 $\mu g/m^3$ and VS-8 had a concentration of 28.4 $\mu g/m^3$.

PILOT TEST RESULTS

GZA installed the sump pit and VMPs on December 18, 2012 and performed the pilot test on December 19, 2012. GZA recorded background vacuum readings at all VMPs, using a magnehelic pressure gauge, prior to the start of the pilot test; all VMPs exhibited zero inches of water (in-H_2O). We commenced the pilot test at 9:50 am with a constant vacuum applied for 273 minutes or 4.55 hours. The vacuum measured in the sump pit remained constant at 2.0 in-H_2O.

On average, the airflow velocity was approximately 25 feet per second (ft/sec) and the air flow was 131 cubic feet per minute (CFM). The approximate average relative humidity was 35%, and the average temperature was approximately 59 degrees Fahrenheit. The maximum-recorded PID value, recorded at the suction pit during the pilot test, was 20.7 ppm at 47 minutes after the start; the average sustained PID reading was less than 11 ppm. As stated above, the PID readings are a relative measure of the total volatile organics in the soil vapor. Please refer to **Figure 4** for a representation of the pilot test data.

Of the two laboratory samples collected, PT-1 contained PCE at a concentration above the NYS Department of Health air guidance value, above which vapor mitigation is recommended. This sample represents early time data and concentrations did reduce with time as evident with the sample PT-2 concentration data. Please refer to Table 1 for a summary of the laboratory analytical results. There was more than an order of magnitude decrease in total VOC concentrations between sample PT-1 (674.51 ug/m^3, approximately 0.76 ppm) and the late time sample PT-2 (88.78 ug/m^3, approximately 0.089 ppm). **Table 1** presents a summary of laboratory analytical results. L laboratory analytical data reports are provided in **Attachment B**.

GZA measured the sub-slab vacuum influence of the pilot test at the thirteen VMPs at various time intervals. The maximum vacuum reading recorded was 0.08 in-H_2O measured at VS-2; which we installed 63 feet from the sump pit. A vacuum influence was also measured at VS-12 at 0.05 in-H_2O; VS-2 was located at a distance of approximately 36 feet from the suction pit.

DISCUSSION

GZA has generally delineated of the sub-slab vapor VOC concentrations to the north of the former Gateway French Cleaners. While measured vacuums beneath the slab at the vapor monitoring points were relatively low, field data and the laboratory sampling results indicate that the blower apparatus was effective in removing organic vapors from below the slab. Low vacuums are likely attributable to the influence of the sub-slab gap between the slab and underlying soil and to the numerous penetrations through the existing slab that could not adequately be sealed during the pilot test. Based on decision matrices presented in the NYSDOH document, *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, (October 2006) for PCE (Matrix 2), the soil vapor concentrations measured during the pilot test will require mitigation to minimize the potential exposure associated with soil vapor intrusion.

As stated above, the vacuum influence goal for the pilot test was 0.025 in-H_2O. Although vacuum under the concrete floor slab occurred, penetrations in the concrete slab and the air gap between the slab and underlying soil did not allow for the optimal vacuum influence. All penetrations will need to be sealed and a larger blower used for optimal SSDS performance. Approximately twice the influence required for mitigation design was measured at a single point (VS-12); however, it is not known if air filled gaps between the soil and concrete slab created preferential channelization of airflow.

GZA will continue to work with Starrett Corporation to design an effective SSDS system that will be protective of the future occupants. We thank you for the opportunity to provide continued environmental consulting services to Starrett Corporation, and we look forward to working with you towards the successful completion of this project. If you have any questions, please feel free to contact the undersigned.

Very truly yours,

GZA GEOENVIRONMENTAL OF NEW YORK

Brett Engard
Assistant Project Manager

Kathleen Cyr
Consultant Reviewer

Dave Winslow
Associate Principal

Attachments: TABLE 1 – Laboratory Analytical Results

FIGURE 1 – Site Location Map
FIGURE 2 – Site Plan
FIGURE 3 – Sub-Slab Delineation Results
FIGURE 4 – Pilot Test Data Plot

ATTACHMENT A – Limitations
ATTACHMENT B – Laboratory Analytical Report

TABLES

Table 1
Summary of Laboratory Results
Bay Park One
2770 West 33rd Street
Brooklyn, New York

LOCATION	Regulatory Guidance Values							PT-1		PT-2		VS-3		VS-8	
SAMPLING DATE								12/19/2012		12/19/2012		12/19/2012		12/19/2012	
LAB SAMPLE ID	1	2	3	4	5	6		L1223079-03		L1223079-04		L1223079-02		L1223079-01	
Volatile Organics in Air							Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,2,4-Trimethylbenzene	6	6.2	2.8	5	--	-	ug/m3	5.65		2.75		2.12	U	2.1	U
2-Butanone		5,100					ug/m3	45.7		6.25		1.81		3.78	
4-Methyl-2-pentanone		3,100					ug/m3	2.16		1.78	U	1.77	U	1.76	
Acetone		3,300					ug/m3	51.5		13.1		13.6		24	
Benzene	3.1	0.25	3.4	2.5	2.19	-	ug/m3	2.04		1.39	U	1.38	U	1.36	U
Chloroform	110	0.083				-	ug/m3	11.5		6.1		2.11	U	46.1	
Cyclohexane		6,200					ug/m3	1.81		1.5	U	1.49	U	1.47	U
Dichlorodifluoromethane	2,000	210	6.7	<1	--	-	ug/m3	2.57		2.6		3.64		2.55	
Ethanol							ug/m3	43.7		13.1		10.2	U	10.1	U
Ethylbenzene	22	1,100	1.4	<4.4	1.46	-	ug/m3	7.34		1.89	U	1.88	U	1.85	U
Heptane							ug/m3	3.4		1.78	U	1.77	U	1.75	U
Isopropanol							ug/m3	17.6		3.52		2.65	U	2.63	U
n-Hexane		210					ug/m3	4.23		1.53	U	1.52	U	1.5	U
o-Xylene	7,000					-	ug/m3	10.4		1.89	U	1.88	U	1.85	U
p/m-Xylene	7,000		6.9	5	4.07	-	ug/m3	28.1		3.78	U	3.75	U	5.39	
Tetrachloroethene (PCE)	810	0.32				100	ug/m3	**500**		57.5		92.2		28.4	
Tetrahydrofuran		0.99					ug/m3	9.67		1.44		1.27	U	1.26	U
Toluene	4,000	400	15.7	13	10.1	-	ug/m3	29.9		4.52		2.49		3	
Trichlorofluoromethane	700	730	3.9	<1	--	-	ug/m3	4.29		3.51		4.52		2.99	
Total VOCs								674.51		88.78		102.85		88.43	

Notes:

500 Exceeds the respective New York State Department of Health Air Guidance Value

Regulatory Guidance Values

1 - USEPA Target Shallow Gas Concentrations (risk=1x10-6)* ug/m3

2 - EPA-Ambient Air PRGs Criteria per Region 9 PRG Table, October 2004.

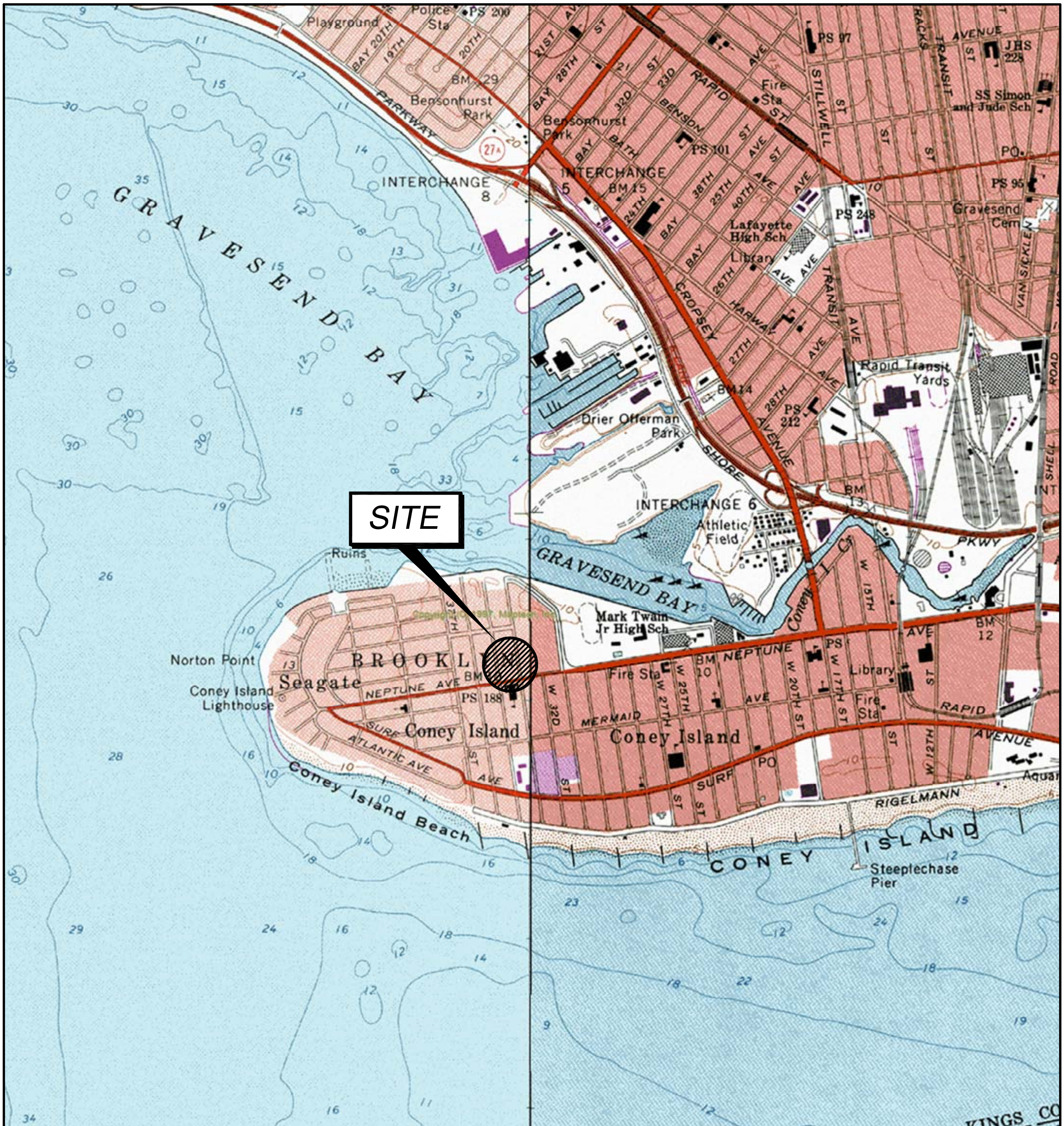
3 - Table C-2 2001 USEPA BASE Median for Indoor Air ug/m3**

4 - Table C-3 NYSDOH 1997: Control Home Database Median for Indoor Air ug/m3**

5 - Table C-5 2005 Health Effects Institute Median for Indoor Air ug/m3**

6 - NYSDOH Air Guidance Value

FIGURES



QUADRANGLE LOCATION

SOURCE:
USGS TOPOGRAPHIC MAPS: CONEY ISLAND, NY-NJ (1979) & THE NARROWS, NY-NJ (1998). CONTOUR INTERVAL 10 FT., ORIGINAL SCALE 1:24,000 (1"=2,000 FT.).

0 1000' 2000' 4000'
SCALE IN FEET

N W E S

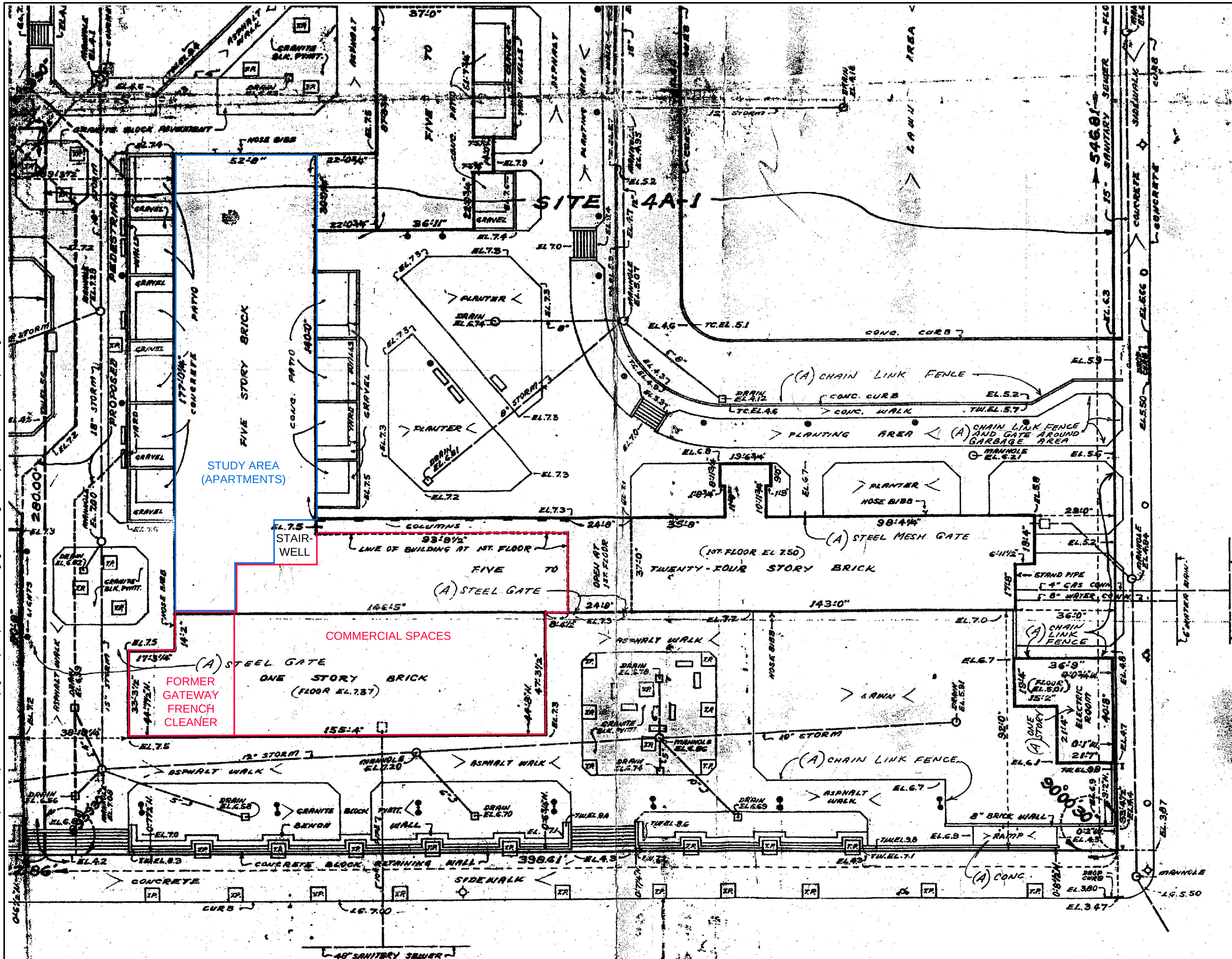
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

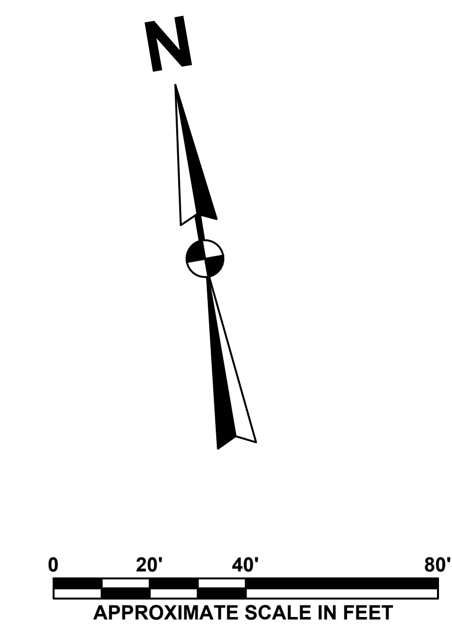
PREPARED BY:
GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:
STARRETT CORPORATION

SUB-SLAB DEPRESSURIZATION SYSTEM PILOT TEST
SITE LOCATION MAP

PROJ MGR: DW	REVIEWED BY: BE	CHECKED BY: DW	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 2000'	1
DATE: JANUARY 2013	PROJECT NO. 12.0076112.00	REVISION NO.	SHEET NO.





NOTES:

1. THE BASE MAP WAS DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY: STARRETT CORPORATION, ENTITLED: FINAL SURVEY, DATED: OCTOBER 22, 1976, ORIGINAL SCALE: 1" = 30'.

NO.	ISSUE/DESCRIPTION	BY	DATE

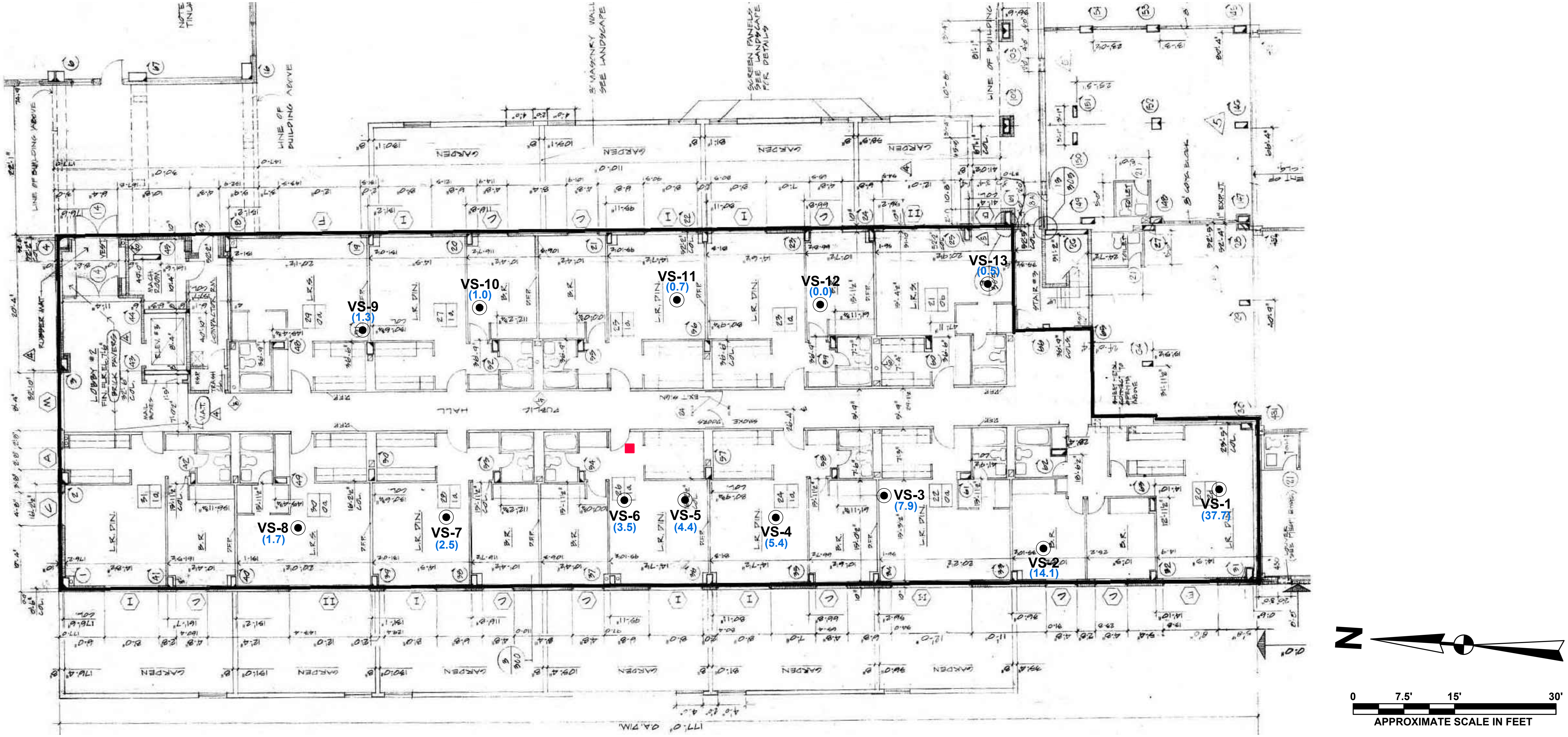
3325 NEPTUNE AVENUE
BROOKLYN, NEW YORK

SUB-SLAB DEPRESSURIZATION SYSTEM PILOT TEST
SITE MAP

PREPARED BY:
GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:
STARRETT CORPORATION

PROJ MGR: DW	REVIEWED BY: BE	CHECKED BY: DW	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 40'	2
DATE: JANUARY 2013	PROJECT NO. 12.0076112.00	REVISION NO.	SHEET NO.



LEGEND:

VS-6 ◉ VAPOR DELINEATION SAMPLE LOCATION COLLECTED ON 12/18/12

(3.5) PID READING IN PARTS PER MILLION (PPM)

■ SUCTION PIT

NOTES:

1. THE BASE MAP WAS DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY: STARRETT CORPORATION, ENTITLED: GROUND FLOOR PLAN, DATED: FEBRUARY 7, 1972, ORIGINAL SCALE: 1/8" = 1', DRAWING NUMBER: A-102.

NO.	ISSUE/DESCRIPTION	BY	DATE

3325 NEPTUNE AVENUE
BROOKLYN, NEW YORK

SUB-SLAB DEPRESSURIZATION SYSTEM PILOT TEST SAMPLING LOCATION PLAN

PREPARED BY:

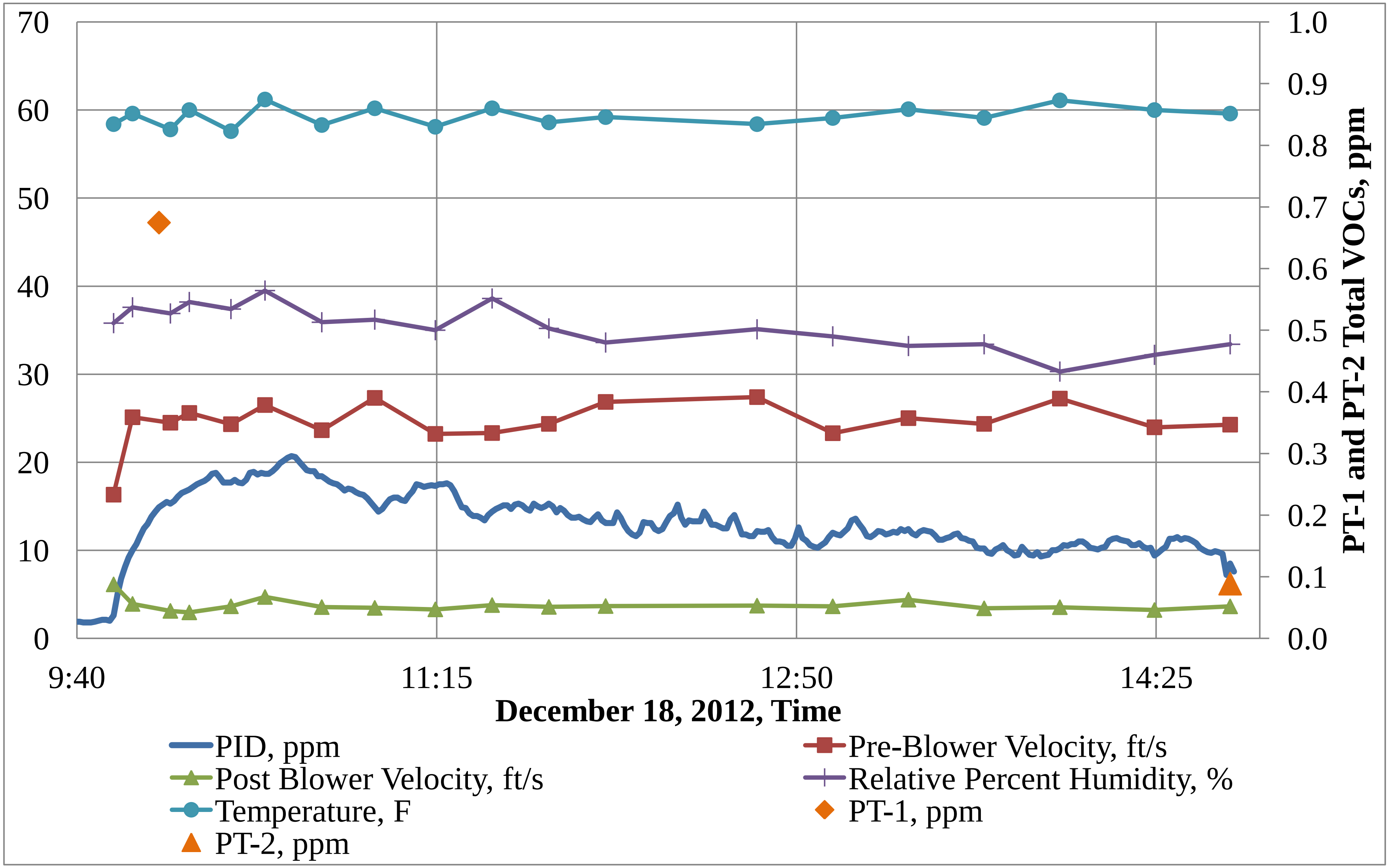
GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:

STARRETT CORPORATION

PROJ MGR: DW	REVIEWED BY: BE	CHECKED BY: DW	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 15'	3
DATE: JANUARY 2013	PROJECT NO. 12.0076112.00	REVISION NO.	SHEET NO.

Figure 4
Pilot Test Data Plot
Bay Park One
2770 West 33rd Street
Brooklyn, New York 11224



APPENDIX A

LIMITATIONS

GEOHYDROLOGICAL LIMITATIONS

Use of Report

1. GZA GeoEnvironmental, Inc. (GZA) prepared this report on behalf of, and for the exclusive use of our Client for the stated purpose(s) and location(s) identified in the Proposal for Services and/or Report. Use of this report, in whole or in part, at other locations, or for other purposes, may lead to inappropriate conclusions; and we do not accept any responsibility for the consequences of such use(s). Further, reliance by any party not expressly identified in the agreement, for any use, without our prior written permission, shall be at that party's sole risk, and without any liability to GZA.

Standard of Care

2. GZA's findings and conclusions are based on the work conducted as part of the Scope of Services set forth in the Proposal for Services and/or Report and reflect our professional judgment. These findings and conclusions must be considered not as scientific or engineering certainties, but rather as our professional opinions concerning the limited data gathered during the course of our work. Conditions other than described in this report may be found at the subject location(s).

3. GZA's services were performed using the degree of skill and care ordinarily exercised by qualified professionals performing the same type of services, at the same time, under similar conditions, at the same or a similar property. No warranty, expressed or implied, is made. Specifically, GZA does not and cannot represent that the Site contains no hazardous material, oil, or other latent condition beyond that observed by GZA during its study. Additionally, GZA makes no warranty that any response action or recommended action will achieve all of its objectives or that the findings of this study will be upheld by a local, state or federal agency.

4. In conducting our work, GZA relied upon certain information made available by public agencies, Client and/or others. GZA did not attempt to independently verify the accuracy or completeness of that information. Inconsistencies in this information which we have noted, if any, are discussed in the Report.

Subsurface Conditions

5. The generalized soil profile(s) provided in our Report are based on widely-spaced subsurface explorations and are intended only to convey trends in subsurface conditions. The boundaries between strata are approximate and idealized, and were based on our assessment of subsurface conditions. The composition of strata, and the transitions between strata, may be more variable and more complex than indicated. For more specific information on soil conditions at a specific location refer to the exploration logs.

6. Water level observations have been made (as described in the Report) at the specified times and under the stated conditions. These data have been reviewed and interpretations have been made in this report. Fluctuations in the level of the groundwater however occur due to temporal or spatial variations in areal recharge rates, soil heterogeneities, the presence of subsurface utilities, and/or natural or artificially induced perturbations. The observed water table may be other than indicated in the Report.

Compliance with Codes and Regulations

7. We used reasonable care in identifying and interpreting applicable codes and regulations necessary to execute our scope of work. These codes and regulations are subject to various, and possibly contradictory, interpretations. Interpretations and compliance with codes and regulations by other parties is beyond our control.

Screening and Analytical Testing

8. GZA collected environmental samples at the locations identified in the Report. These samples were analyzed for the specific parameters identified in the report. Additional constituents, for which analyses were not conducted, may be present in soil, groundwater, surface water, sediment and/or air. Future Site activities and uses may result in a requirement for additional testing.

9. Our interpretation of field screening and laboratory data is presented in the Report. Unless otherwise noted, we relied upon the laboratory's QA/QC program to validate these data.

10. Variations in the types and concentrations of contaminants observed at a given location or time may occur due to release mechanisms, disposal practices, changes in flow paths, and/or the influence of various physical, chemical, biological or radiological processes. Subsequently observed concentrations may be other than indicated in the Report.

Interpretation of Data

11. Our opinions are based on available information as described in the Report, and on our professional judgment. Additional observations made over time, and/or space, may not support the opinions provided in the Report.

Additional Information

12. In the event that the Client or others authorized to use this report obtain information on environmental or hazardous waste issues at the Site not contained in this report, such information shall be brought to GZA's attention forthwith. GZA will evaluate such information and, on the basis of this evaluation, may modify the conclusions stated in this report.

Additional Services

13. GZA recommends that we be retained to provide services during any future investigations, design, implementation activities, construction, and/or property development/ redevelopment at the Site. This will allow us the opportunity to: i) observe conditions and compliance with our design concepts and opinions; ii) allow for changes in the event that conditions are other than anticipated; iii) provide modifications to our design; and iv) assess the consequences of changes in technologies and/or regulations.

APPENDIX B

LABORATORY REPORTS

ANALYTICAL REPORT

Lab Number:	L1223079
Client:	GZA GeoEnvironmental, Inc. 104 West 29th Street, 10th Floor New York, NY 10001
ATTN:	Brett Engard
Phone:	(212) 594-8140
Project Name:	BAY PARK
Project Number:	Not Specified
Report Date:	12/21/12

Certifications & Approvals: MA (M-MA086), NY (11148), CT (PH-0574), NH (2003), NJ NELAP (MA935), RI (LAO00065), ME (MA00086), PA (68-03671), USDA (Permit #P-330-11-00240), NC (666), TX (T104704476), DOD (L2217), US Army Corps of Engineers.

320 Forbes Boulevard, Mansfield, MA 02048-1806
508-822-9300 (Fax) 508-822-3288 800-624-9220 - www.alphalab.com

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Alpha Sample ID	Client ID	Sample Location	Collection Date/Time
L1223079-01	SV-8	BROOKLYN	12/19/12 08:46
L1223079-02	SV-3	BROOKLYN	12/19/12 09:17
L1223079-03	PT-1	BROOKLYN	12/19/12 10:02
L1223079-04	PT-2	BROOKLYN	12/19/12 14:59

Case Narrative

The samples were received in accordance with the Chain of Custody and no significant deviations were encountered during the preparation or analysis unless otherwise noted. Sample Receipt, Container Information, and the Chain of Custody are located at the back of the report.

Results contained within this report relate only to the samples submitted under this Alpha Lab Number and meet all of the requirements of NELAC, for all NELAC accredited parameters. The data presented in this report is organized by parameter (i.e. VOC, SVOC, etc.). Sample specific Quality Control data (i.e. Surrogate Spike Recovery) is reported at the end of the target analyte list for each individual sample, followed by the Laboratory Batch Quality Control at the end of each parameter. If a sample was re-analyzed or re-extracted due to a required quality control corrective action and if both sets of data are reported, the Laboratory ID of the re-analysis or re-extraction is designated with an "R" or "RE", respectively. When multiple Batch Quality Control elements are reported (e.g. more than one LCS), the associated samples for each element are noted in the grey shaded header line of each data table. Any Laboratory Batch, Sample Specific % recovery or RPD value that is outside the listed Acceptance Criteria is bolded in the report. Performance criteria for CAM and RCP methods allow for some LCS compound failures to occur and still be within method compliance. In these instances, the specific failures are not narrated but are noted in the associated QC table. This information is also incorporated in the Data Usability format for our Data Merger tool where it can be reviewed along with any associated usability implications. Soil/sediments, solids and tissues are reported on a dry weight basis unless otherwise noted. Definitions of all data qualifiers and acronyms used in this report are provided in the Glossary located at the back of the report.

In reference to questions H (CAM) or 4 (RCP) when "NO" is checked, the performance criteria for CAM and RCP methods allow for some quality control failures to occur and still be within method compliance. In these instances the specific failure is not narrated but noted in the associated QC table. The information is also incorporated in the Data Usability format of our Data Merger tool where it can be reviewed along with any associated usability implications.

Please see the associated ADEx data file for a comparison of laboratory reporting limits that were achieved with the regulatory Numerical Standards requested on the Chain of Custody.

HOLD POLICY
For samples submitted on hold, Alpha's policy is to hold samples free of charge for 30 days from the date the project is completed. After 30 days, we will dispose of all samples submitted including those put on hold unless you have contacted your Client Service Representative and made arrangements for Alpha to continue to hold the samples.

Please contact Client Services at 800-624-9220 with any questions.

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Case Narrative (continued)

Volatile Organics in Air

Canisters were released from the laboratory on December 18, 2012.

The canister certification results are provided as an addendum.

L1223079-01 through -04: Prior to sample analysis, the canisters were pressurized with UHP Nitrogen due to canister size. The pressurization resulted in a dilution of the samples. The reporting limits have been elevated accordingly.

I, the undersigned, attest under the pains and penalties of perjury that, to the best of my knowledge and belief and based upon my personal inquiry of those responsible for providing the information contained in this analytical report, such information is accurate and complete. This certificate of analysis is not complete unless this page accompanies any and all pages of this report.

Authorized Signature: Andy Rezendes

Title: Technical Director/Representative

Date: 12/21/12

AIR

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-01 D
Client ID: SV-8
Sample Location: BROOKLYN
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/20/12 14:26
Analyst: MB

Date Collected: 12/19/12 08:46
Date Received: 12/19/12
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	1.07	--	ND	1.84	--		2.137
Dichlorodifluoromethane	0.515	0.427	--	2.55	2.11	--		2.137
Chloromethane	ND	0.427	--	ND	0.882	--		2.137
Freon-114	ND	0.427	--	ND	2.98	--		2.137
Vinyl chloride	ND	0.427	--	ND	1.09	--		2.137
1,3-Butadiene	ND	0.427	--	ND	0.945	--		2.137
Bromomethane	ND	0.427	--	ND	1.66	--		2.137
Chloroethane	ND	0.427	--	ND	1.13	--		2.137
Ethanol	ND	5.34	--	ND	10.1	--		2.137
Vinyl bromide	ND	0.427	--	ND	1.87	--		2.137
Acetone	10.1	2.14	--	24.0	5.08	--		2.137
Trichlorofluoromethane	0.532	0.427	--	2.99	2.40	--		2.137
Isopropanol	ND	1.07	--	ND	2.63	--		2.137
1,1-Dichloroethene	ND	0.427	--	ND	1.69	--		2.137
Methylene chloride	ND	2.14	--	ND	7.43	--		2.137
3-Chloropropene	ND	0.427	--	ND	1.34	--		2.137
Carbon disulfide	ND	0.427	--	ND	1.33	--		2.137
Freon-113	ND	0.427	--	ND	3.27	--		2.137
trans-1,2-Dichloroethene	ND	0.427	--	ND	1.69	--		2.137
1,1-Dichloroethane	ND	0.427	--	ND	1.73	--		2.137
Methyl tert butyl ether	ND	0.427	--	ND	1.54	--		2.137
Vinyl acetate	ND	0.427	--	ND	1.50	--		2.137
2-Butanone	1.28	0.427	--	3.78	1.26	--		2.137
cis-1,2-Dichloroethene	ND	0.427	--	ND	1.69	--		2.137

Project Name: BAY PARK
Project Number: Not Specified
Lab Number: L1223079
Report Date: 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-01 D
Client ID: SV-8
Sample Location: BROOKLYN
Date Collected: 12/19/12 08:46
Date Received: 12/19/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Ethyl Acetate	ND	1.07	--	ND	3.86	--		2.137
Chloroform	9.43	0.427	--	46.1	2.09	--		2.137
Tetrahydrofuran	ND	0.427	--	ND	1.26	--		2.137
1,2-Dichloroethane	ND	0.427	--	ND	1.73	--		2.137
n-Hexane	ND	0.427	--	ND	1.50	--		2.137
1,1,1-Trichloroethane	ND	0.427	--	ND	2.33	--		2.137
Benzene	ND	0.427	--	ND	1.36	--		2.137
Carbon tetrachloride	ND	0.427	--	ND	2.69	--		2.137
Cyclohexane	ND	0.427	--	ND	1.47	--		2.137
1,2-Dichloropropane	ND	0.427	--	ND	1.97	--		2.137
Bromodichloromethane	ND	0.427	--	ND	2.86	--		2.137
1,4-Dioxane	ND	0.427	--	ND	1.54	--		2.137
Trichloroethene	ND	0.427	--	ND	2.29	--		2.137
2,2,4-Trimethylpentane	ND	0.427	--	ND	1.99	--		2.137
Heptane	ND	0.427	--	ND	1.75	--		2.137
cis-1,3-Dichloropropene	ND	0.427	--	ND	1.94	--		2.137
4-Methyl-2-pentanone	0.430	0.427	--	1.76	1.75	--		2.137
trans-1,3-Dichloropropene	ND	0.427	--	ND	1.94	--		2.137
1,1,2-Trichloroethane	ND	0.427	--	ND	2.33	--		2.137
Toluene	0.795	0.427	--	3.00	1.61	--		2.137
2-Hexanone	ND	0.427	--	ND	1.75	--		2.137
Dibromochloromethane	ND	0.427	--	ND	3.64	--		2.137
1,2-Dibromoethane	ND	0.427	--	ND	3.28	--		2.137
Tetrachloroethene	4.19	0.427	--	28.4	2.90	--		2.137
Chlorobenzene	ND	0.427	--	ND	1.97	--		2.137
Ethylbenzene	ND	0.427	--	ND	1.85	--		2.137
p/m-Xylene	1.24	0.855	--	5.39	3.71	--		2.137
Bromoform	ND	0.427	--	ND	4.41	--		2.137

Project Name: BAY PARK | **Lab Number:** L1223079
Project Number: Not Specified | **Report Date:** 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-01 D | Date Collected: 12/19/12 08:46
Client ID: SV-8 | Date Received: 12/19/12
Sample Location: BROOKLYN | Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Styrene	ND	0.427	--	ND	1.82	--		2.137
1,1,2,2-Tetrachloroethane	ND	0.427	--	ND	2.93	--		2.137
o-Xylene	ND	0.427	--	ND	1.85	--		2.137
4-Ethyltoluene	ND	0.427	--	ND	2.10	--		2.137
1,3,5-Trimethybenzene	ND	0.427	--	ND	2.10	--		2.137
1,2,4-Trimethylbenzene	ND	0.427	--	ND	2.10	--		2.137
Benzyl chloride	ND	0.427	--	ND	2.21	--		2.137
1,3-Dichlorobenzene	ND	0.427	--	ND	2.57	--		2.137
1,4-Dichlorobenzene	ND	0.427	--	ND	2.57	--		2.137
1,2-Dichlorobenzene	ND	0.427	--	ND	2.57	--		2.137
1,2,4-Trichlorobenzene	ND	0.427	--	ND	3.17	--		2.137
Hexachlorobutadiene	ND	0.427	--	ND	4.55	--		2.137

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	109		60-140
Bromochloromethane	93		60-140
chlorobenzene-d5	92		60-140

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-02 D
Client ID: SV-3
Sample Location: BROOKLYN
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/20/12 14:57
Analyst: MB

Date Collected: 12/19/12 09:17
Date Received: 12/19/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	1.08	--	ND	1.86	--		2.158
Dichlorodifluoromethane	0.736	0.432	--	3.64	2.14	--		2.158
Chloromethane	ND	0.432	--	ND	0.892	--		2.158
Freon-114	ND	0.432	--	ND	3.02	--		2.158
Vinyl chloride	ND	0.432	--	ND	1.10	--		2.158
1,3-Butadiene	ND	0.432	--	ND	0.956	--		2.158
Bromomethane	ND	0.432	--	ND	1.68	--		2.158
Chloroethane	ND	0.432	--	ND	1.14	--		2.158
Ethanol	ND	5.40	--	ND	10.2	--		2.158
Vinyl bromide	ND	0.432	--	ND	1.89	--		2.158
Acetone	5.71	2.16	--	13.6	5.13	--		2.158
Trichlorofluoromethane	0.805	0.432	--	4.52	2.43	--		2.158
Isopropanol	ND	1.08	--	ND	2.65	--		2.158
1,1-Dichloroethene	ND	0.432	--	ND	1.71	--		2.158
Methylene chloride	ND	2.16	--	ND	7.50	--		2.158
3-Chloropropene	ND	0.432	--	ND	1.35	--		2.158
Carbon disulfide	ND	0.432	--	ND	1.35	--		2.158
Freon-113	ND	0.432	--	ND	3.31	--		2.158
trans-1,2-Dichloroethene	ND	0.432	--	ND	1.71	--		2.158
1,1-Dichloroethane	ND	0.432	--	ND	1.75	--		2.158
Methyl tert butyl ether	ND	0.432	--	ND	1.56	--		2.158
Vinyl acetate	ND	0.432	--	ND	1.52	--		2.158
2-Butanone	0.613	0.432	--	1.81	1.27	--		2.158
cis-1,2-Dichloroethene	ND	0.432	--	ND	1.71	--		2.158

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-02 D Date Collected: 12/19/12 09:17
Client ID: SV-3 Date Received: 12/19/12
Sample Location: BROOKLYN Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Ethyl Acetate	ND	1.08	--	ND	3.89	--		2.158
Chloroform	ND	0.432	--	ND	2.11	--		2.158
Tetrahydrofuran	ND	0.432	--	ND	1.27	--		2.158
1,2-Dichloroethane	ND	0.432	--	ND	1.75	--		2.158
n-Hexane	ND	0.432	--	ND	1.52	--		2.158
1,1,1-Trichloroethane	ND	0.432	--	ND	2.36	--		2.158
Benzene	ND	0.432	--	ND	1.38	--		2.158
Carbon tetrachloride	ND	0.432	--	ND	2.72	--		2.158
Cyclohexane	ND	0.432	--	ND	1.49	--		2.158
1,2-Dichloropropane	ND	0.432	--	ND	2.00	--		2.158
Bromodichloromethane	ND	0.432	--	ND	2.89	--		2.158
1,4-Dioxane	ND	0.432	--	ND	1.56	--		2.158
Trichloroethene	ND	0.432	--	ND	2.32	--		2.158
2,2,4-Trimethylpentane	ND	0.432	--	ND	2.02	--		2.158
Heptane	ND	0.432	--	ND	1.77	--		2.158
cis-1,3-Dichloropropene	ND	0.432	--	ND	1.96	--		2.158
4-Methyl-2-pentanone	ND	0.432	--	ND	1.77	--		2.158
trans-1,3-Dichloropropene	ND	0.432	--	ND	1.96	--		2.158
1,1,2-Trichloroethane	ND	0.432	--	ND	2.36	--		2.158
Toluene	0.662	0.432	--	2.49	1.63	--		2.158
2-Hexanone	ND	0.432	--	ND	1.77	--		2.158
Dibromochloromethane	ND	0.432	--	ND	3.68	--		2.158
1,2-Dibromoethane	ND	0.432	--	ND	3.32	--		2.158
Tetrachloroethene	13.6	0.432	--	92.2	2.93	--		2.158
Chlorobenzene	ND	0.432	--	ND	1.99	--		2.158
Ethylbenzene	ND	0.432	--	ND	1.88	--		2.158
p/m-Xylene	ND	0.863	--	ND	3.75	--		2.158
Bromoform	ND	0.432	--	ND	4.47	--		2.158

Project Name: BAY PARK | ***Lab Number:*** L1223079
Project Number: Not Specified | ***Report Date:*** 12/21/12

SAMPLE RESULTS

Lab ID:	L1223079-02 D	Date Collected:	12/19/12 09:17
Client ID:	SV-3	Date Received:	12/19/12
Sample Location:	BROOKLYN	Field Prep:	Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Styrene	ND	0.432	--	ND	1.84	--		2.158
1,1,2,2-Tetrachloroethane	ND	0.432	--	ND	2.97	--		2.158
o-Xylene	ND	0.432	--	ND	1.88	--		2.158
4-Ethyltoluene	ND	0.432	--	ND	2.12	--		2.158
1,3,5-Trimethybenzene	ND	0.432	--	ND	2.12	--		2.158
1,2,4-Trimethylbenzene	ND	0.432	--	ND	2.12	--		2.158
Benzyl chloride	ND	0.432	--	ND	2.24	--		2.158
1,3-Dichlorobenzene	ND	0.432	--	ND	2.60	--		2.158
1,4-Dichlorobenzene	ND	0.432	--	ND	2.60	--		2.158
1,2-Dichlorobenzene	ND	0.432	--	ND	2.60	--		2.158
1,2,4-Trichlorobenzene	ND	0.432	--	ND	3.21	--		2.158
Hexachlorobutadiene	ND	0.432	--	ND	4.61	--		2.158

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	98		60-140
Bromochloromethane	90		60-140
chlorobenzene-d5	93		60-140

Project Name: BAY PARK
Project Number: Not Specified
Lab Number: L1223079
Report Date: 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-03 D
Client ID: PT-1
Sample Location: BROOKLYN
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/20/12 15:28
Analyst: MB

Date Collected: 12/19/12 10:02
Date Received: 12/19/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	1.08	--	ND	1.86	--		2.167
Dichlorodifluoromethane	0.520	0.433	--	2.57	2.14	--		2.167
Chloromethane	ND	0.433	--	ND	0.894	--		2.167
Freon-114	ND	0.433	--	ND	3.03	--		2.167
Vinyl chloride	ND	0.433	--	ND	1.11	--		2.167
1,3-Butadiene	ND	0.433	--	ND	0.958	--		2.167
Bromomethane	ND	0.433	--	ND	1.68	--		2.167
Chloroethane	ND	0.433	--	ND	1.14	--		2.167
Ethanol	23.2	5.42	--	43.7	10.2	--		2.167
Vinyl bromide	ND	0.433	--	ND	1.89	--		2.167
Acetone	21.7	2.17	--	51.5	5.15	--		2.167
Trichlorofluoromethane	0.763	0.433	--	4.29	2.43	--		2.167
Isopropanol	7.14	1.08	--	17.6	2.65	--		2.167
1,1-Dichloroethene	ND	0.433	--	ND	1.72	--		2.167
Methylene chloride	ND	2.17	--	ND	7.54	--		2.167
3-Chloropropene	ND	0.433	--	ND	1.36	--		2.167
Carbon disulfide	ND	0.433	--	ND	1.35	--		2.167
Freon-113	ND	0.433	--	ND	3.32	--		2.167
trans-1,2-Dichloroethene	ND	0.433	--	ND	1.72	--		2.167
1,1-Dichloroethane	ND	0.433	--	ND	1.75	--		2.167
Methyl tert butyl ether	ND	0.433	--	ND	1.56	--		2.167
Vinyl acetate	ND	0.433	--	ND	1.52	--		2.167
2-Butanone	15.5	0.433	--	45.7	1.28	--		2.167
cis-1,2-Dichloroethene	ND	0.433	--	ND	1.72	--		2.167

Project Name: BAY PARK
Project Number: Not Specified
Lab Number: L1223079
Report Date: 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-03 D
Client ID: PT-1
Sample Location: BROOKLYN
Date Collected: 12/19/12 10:02
Date Received: 12/19/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Ethyl Acetate	ND	1.08	--	ND	3.89	--		2.167
Chloroform	2.35	0.433	--	11.5	2.11	--		2.167
Tetrahydrofuran	3.28	0.433	--	9.67	1.28	--		2.167
1,2-Dichloroethane	ND	0.433	--	ND	1.75	--		2.167
n-Hexane	1.20	0.433	--	4.23	1.53	--		2.167
1,1,1-Trichloroethane	ND	0.433	--	ND	2.36	--		2.167
Benzene	0.637	0.433	--	2.04	1.38	--		2.167
Carbon tetrachloride	ND	0.433	--	ND	2.72	--		2.167
Cyclohexane	0.526	0.433	--	1.81	1.49	--		2.167
1,2-Dichloropropane	ND	0.433	--	ND	2.00	--		2.167
Bromodichloromethane	ND	0.433	--	ND	2.90	--		2.167
1,4-Dioxane	ND	0.433	--	ND	1.56	--		2.167
Trichloroethene	ND	0.433	--	ND	2.33	--		2.167
2,2,4-Trimethylpentane	ND	0.433	--	ND	2.02	--		2.167
Heptane	0.830	0.433	--	3.40	1.77	--		2.167
cis-1,3-Dichloropropene	ND	0.433	--	ND	1.97	--		2.167
4-Methyl-2-pentanone	0.526	0.433	--	2.16	1.77	--		2.167
trans-1,3-Dichloropropene	ND	0.433	--	ND	1.97	--		2.167
1,1,2-Trichloroethane	ND	0.433	--	ND	2.36	--		2.167
Toluene	7.93	0.433	--	29.9	1.63	--		2.167
2-Hexanone	ND	0.433	--	ND	1.77	--		2.167
Dibromochloromethane	ND	0.433	--	ND	3.69	--		2.167
1,2-Dibromoethane	ND	0.433	--	ND	3.33	--		2.167
Tetrachloroethene	73.8	0.433	--	500	2.94	--		2.167
Chlorobenzene	ND	0.433	--	ND	1.99	--		2.167
Ethylbenzene	1.69	0.433	--	7.34	1.88	--		2.167
p/m-Xylene	6.46	0.867	--	28.1	3.77	--		2.167
Bromoform	ND	0.433	--	ND	4.48	--		2.167

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

SAMPLE RESULTS

Lab ID:	L1223079-03 D	Date Collected:	12/19/12 10:02
Client ID:	PT-1	Date Received:	12/19/12
Sample Location:	BROOKLYN	Field Prep:	Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
Styrene	ND	0.433	--	ND	1.84	--		2.167
1,1,2,2-Tetrachloroethane	ND	0.433	--	ND	2.97	--		2.167
o-Xylene	2.40	0.433	--	10.4	1.88	--		2.167
4-Ethyltoluene	ND	0.433	--	ND	2.13	--		2.167
1,3,5-Trimethybenzene	ND	0.433	--	ND	2.13	--		2.167
1,2,4-Trimethylbenzene	1.15	0.433	--	5.65	2.13	--		2.167
Benzyl chloride	ND	0.433	--	ND	2.24	--		2.167
1,3-Dichlorobenzene	ND	0.433	--	ND	2.60	--		2.167
1,4-Dichlorobenzene	ND	0.433	--	ND	2.60	--		2.167
1,2-Dichlorobenzene	ND	0.433	--	ND	2.60	--		2.167
1,2,4-Trichlorobenzene	ND	0.433	--	ND	3.21	--		2.167
Hexachlorobutadiene	ND	0.433	--	ND	4.62	--		2.167

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	100		60-140
Bromochloromethane	94		60-140
chlorobenzene-d5	95		60-140

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

SAMPLE RESULTS

Lab ID: L1223079-04 D
Client ID: PT-2
Sample Location: BROOKLYN
Matrix: Soil_Vapor
Anaytical Method: 48,TO-15
Analytical Date: 12/20/12 15:59
Analyst: MB

Date Collected: 12/19/12 14:59
Date Received: 12/19/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Propylene	ND	1.09	--	ND	1.88	--		2.175
Dichlorodifluoromethane	0.526	0.435	--	2.60	2.15	--		2.175
Chloromethane	ND	0.435	--	ND	0.898	--		2.175
Freon-114	ND	0.435	--	ND	3.04	--		2.175
Vinyl chloride	ND	0.435	--	ND	1.11	--		2.175
1,3-Butadiene	ND	0.435	--	ND	0.962	--		2.175
Bromomethane	ND	0.435	--	ND	1.69	--		2.175
Chloroethane	ND	0.435	--	ND	1.15	--		2.175
Ethanol	6.94	5.44	--	13.1	10.3	--		2.175
Vinyl bromide	ND	0.435	--	ND	1.90	--		2.175
Acetone	5.51	2.18	--	13.1	5.18	--		2.175
Trichlorofluoromethane	0.624	0.435	--	3.51	2.44	--		2.175
Isopropanol	1.43	1.09	--	3.52	2.68	--		2.175
1,1-Dichloroethene	ND	0.435	--	ND	1.72	--		2.175
Methylene chloride	ND	2.18	--	ND	7.57	--		2.175
3-Chloropropene	ND	0.435	--	ND	1.36	--		2.175
Carbon disulfide	ND	0.435	--	ND	1.35	--		2.175
Freon-113	ND	0.435	--	ND	3.33	--		2.175
trans-1,2-Dichloroethene	ND	0.435	--	ND	1.72	--		2.175
1,1-Dichloroethane	ND	0.435	--	ND	1.76	--		2.175
Methyl tert butyl ether	ND	0.435	--	ND	1.57	--		2.175
Vinyl acetate	ND	0.435	--	ND	1.53	--		2.175
2-Butanone	2.12	0.435	--	6.25	1.28	--		2.175
cis-1,2-Dichloroethene	ND	0.435	--	ND	1.72	--		2.175

Project Name:	BAY PARK	***Lab Number:***	L1223079
Project Number:	Not Specified	***Report Date:***	12/21/12

SAMPLE RESULTS

Lab ID:	L1223079-04 D	Date Collected:	12/19/12 14:59
Client ID:	PT-2	Date Received:	12/19/12
Sample Location:	BROOKLYN	Field Prep:	Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Ethyl Acetate	ND	1.09	--	ND	3.93	--		2.175
Chloroform	1.25	0.435	--	6.10	2.12	--		2.175
Tetrahydrofuran	0.487	0.435	--	1.44	1.28	--		2.175
1,2-Dichloroethane	ND	0.435	--	ND	1.76	--		2.175
n-Hexane	ND	0.435	--	ND	1.53	--		2.175
1,1,1-Trichloroethane	ND	0.435	--	ND	2.37	--		2.175
Benzene	ND	0.435	--	ND	1.39	--		2.175
Carbon tetrachloride	ND	0.435	--	ND	2.74	--		2.175
Cyclohexane	ND	0.435	--	ND	1.50	--		2.175
1,2-Dichloropropane	ND	0.435	--	ND	2.01	--		2.175
Bromodichloromethane	ND	0.435	--	ND	2.91	--		2.175
1,4-Dioxane	ND	0.435	--	ND	1.57	--		2.175
Trichloroethene	ND	0.435	--	ND	2.34	--		2.175
2,2,4-Trimethylpentane	ND	0.435	--	ND	2.03	--		2.175
Heptane	ND	0.435	--	ND	1.78	--		2.175
cis-1,3-Dichloropropene	ND	0.435	--	ND	1.97	--		2.175
4-Methyl-2-pentanone	ND	0.435	--	ND	1.78	--		2.175
trans-1,3-Dichloropropene	ND	0.435	--	ND	1.97	--		2.175
1,1,2-Trichloroethane	ND	0.435	--	ND	2.37	--		2.175
Toluene	1.20	0.435	--	4.52	1.64	--		2.175
2-Hexanone	ND	0.435	--	ND	1.78	--		2.175
Dibromochloromethane	ND	0.435	--	ND	3.71	--		2.175
1,2-Dibromoethane	ND	0.435	--	ND	3.34	--		2.175
Tetrachloroethene	8.48	0.435	--	57.5	2.95	--		2.175
Chlorobenzene	ND	0.435	--	ND	2.00	--		2.175
Ethylbenzene	ND	0.435	--	ND	1.89	--		2.175
p/m-Xylene	ND	0.870	--	ND	3.78	--		2.175
Bromoform	ND	0.435	--	ND	4.50	--		2.175

Project Name:	BAY PARK	***Lab Number:***	L1223079
Project Number:	Not Specified	***Report Date:***	12/21/12

SAMPLE RESULTS

Lab ID:	L1223079-04	D	Date Collected:	12/19/12 14:59
Client ID:	PT-2		Date Received:	12/19/12
Sample Location:	BROOKLYN		Field Prep:	Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Styrene	ND	0.435	--	ND	1.85	--		2.175
1,1,2,2-Tetrachloroethane	ND	0.435	--	ND	2.99	--		2.175
o-Xylene	ND	0.435	--	ND	1.89	--		2.175
4-Ethyltoluene	ND	0.435	--	ND	2.14	--		2.175
1,3,5-Trimethybenzene	ND	0.435	--	ND	2.14	--		2.175
1,2,4-Trimethylbenzene	0.559	0.435	--	2.75	2.14	--		2.175
Benzyl chloride	ND	0.435	--	ND	2.25	--		2.175
1,3-Dichlorobenzene	ND	0.435	--	ND	2.62	--		2.175
1,4-Dichlorobenzene	ND	0.435	--	ND	2.62	--		2.175
1,2-Dichlorobenzene	ND	0.435	--	ND	2.62	--		2.175
1,2,4-Trichlorobenzene	ND	0.435	--	ND	3.23	--		2.175
Hexachlorobutadiene	ND	0.435	--	ND	4.64	--		2.175

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-Difluorobenzene	109		60-140
Bromochloromethane	92		60-140
chlorobenzene-d5	100		60-140

Project Name:	BAY PARK	**Lab Number:**	L1223079
Project Number:	Not Specified	**Report Date:**	12/21/12

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/19/12 18:49

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab for sample(s): 01-04 Batch: WG580675-4								
Propylene	ND	0.500	--	ND	0.861	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	2.50	--	ND	4.71	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Methylene chloride	ND	1.00	--	ND	3.47	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	0.200	--	ND	0.704	--		1
2-Butanone	ND	0.200	--	ND	0.590	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1

Project Name: BAY PARK
Project Number: Not Specified
Lab Number: L1223079
Report Date: 12/21/12

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/19/12 18:49

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab for sample(s): 01-04 Batch: WG580675-4								
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.200	--	ND	0.590	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1
Trichloroethene	ND	0.200	--	ND	1.07	--		1
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.200	--	ND	0.820	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1
Ethylbenzene	ND	0.200	--	ND	0.869	--		1

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

Method Blank Analysis
Batch Quality Control

Analytical Method: 48,TO-15
Analytical Date: 12/19/12 18:49

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab for sample(s): 01-04 Batch: WG580675-4								
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethybenzene	ND	0.200	--	ND	0.983	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

Lab Control Sample Analysis
Batch Quality Control

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 Batch: WG580675-3								
Propylene	103		-		70-130	-		
Dichlorodifluoromethane	99		-		70-130	-		
Chloromethane	94		-		70-130	-		
1,2-Dichloro-1,1,2,2-tetrafluoroethane	99		-		70-130	-		
Vinyl chloride	96		-		70-130	-		
1,3-Butadiene	99		-		70-130	-		
Bromomethane	97		-		70-130	-		
Chloroethane	97		-		70-130	-		
Ethyl Alcohol	85		-		70-130	-		
Vinyl bromide	97		-		70-130	-		
Acetone	107		-		70-130	-		
Trichlorofluoromethane	98		-		70-130	-		
iso-Propyl Alcohol	92		-		70-130	-		
1,1-Dichloroethene	98		-		70-130	-		
Methylene chloride	95		-		70-130	-		
3-Chloropropene	110		-		70-130	-		
Carbon disulfide	96		-		70-130	-		
1,1,2-Trichloro-1,2,2-Trifluoroethane	101		-		70-130	-		
trans-1,2-Dichloroethene	87		-		70-130	-		
1,1-Dichloroethane	99		-		70-130	-		
Methyl tert butyl ether	102		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 Batch: WG580675-3								
Vinyl acetate	109		-		70-130	-		
2-Butanone	93		-		70-130	-		
cis-1,2-Dichloroethene	116		-		70-130	-		
Ethyl Acetate	104		-		70-130	-		
Chloroform	108		-		70-130	-		
Tetrahydrofuran	105		-		70-130	-		
1,2-Dichloroethane	99		-		70-130	-		
n-Hexane	112		-		70-130	-		
1,1,1-Trichloroethane	112		-		70-130	-		
Benzene	114		-		70-130	-		
Carbon tetrachloride	106		-		70-130	-		
Cyclohexane	114		-		70-130	-		
1,2-Dichloropropane	112		-		70-130	-		
Bromodichloromethane	110		-		70-130	-		
1,4-Dioxane	101		-		70-130	-		
Trichloroethene	107		-		70-130	-		
2,2,4-Trimethylpentane	112		-		70-130	-		
Heptane	100		-		70-130	-		
cis-1,3-Dichloropropene	122		-		70-130	-		
4-Methyl-2-pentanone	108		-		70-130	-		
trans-1,3-Dichloropropene	101		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 Batch: WG580675-3								
1,1,2-Trichloroethane	120		-		70-130	-		
Toluene	109		-		70-130	-		
2-Hexanone	104		-		70-130	-		
Dibromochloromethane	98		-		70-130	-		
1,2-Dibromoethane	109		-		70-130	-		
Tetrachloroethene	101		-		70-130	-		
Chlorobenzene	107		-		70-130	-		
Ethylbenzene	111		-		70-130	-		
p/m-Xylene	112		-		70-130	-		
Bromoform	94		-		70-130	-		
Styrene	108		-		70-130	-		
1,1,2,2-Tetrachloroethane	113		-		70-130	-		
o-Xylene	113		-		70-130	-		
4-Ethyltoluene	101		-		70-130	-		
1,3,5-Trimethylbenzene	108		-		70-130	-		
1,2,4-Trimethylbenzene	109		-		70-130	-		
Benzyl chloride	100		-		70-130	-		
1,3-Dichlorobenzene	108		-		70-130	-		
1,4-Dichlorobenzene	107		-		70-130	-		
1,2-Dichlorobenzene	106		-		70-130	-		
1,2,4-Trichlorobenzene	111		-		70-130	-		

Lab Control Sample Analysis
Batch Quality Control

Project Name: BAY PARK

Project Number: Not Specified

Lab Number: L1223079

Report Date: 12/21/12

Parameter	LCS %Recovery	Qual	LCSD %Recovery	Qual	%Recovery Limits	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 Batch: WG580675-3								
Hexachlorobutadiene	108		-		70-130	-		

Lab Duplicate Analysis
Batch Quality Control

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Parameter	Native Sample	Duplicate Sample	Units	RPD	Qual	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG580675-5 QC Sample: L1223081-01 Client ID: DUP Sample						
Propylene	2.29	2.22	ppbV	3		25
Dichlorodifluoromethane	ND	ND	ppbV	NC		25
Chloromethane	0.556	ND	ppbV	NC		25
1,2-Dichloro-1,1,2,2-tetrafluoroethane	ND	ND	ppbV	NC		25
Vinyl chloride	ND	ND	ppbV	NC		25
1,3-Butadiene	ND	ND	ppbV	NC		25
Bromomethane	ND	ND	ppbV	NC		25
Chloroethane	ND	ND	ppbV	NC		25
Ethyl Alcohol	175	172	ppbV	2		25
Vinyl bromide	ND	ND	ppbV	NC		25
Acetone	3.17	2.82	ppbV	12		25
Trichlorofluoromethane	ND	ND	ppbV	NC		25
iso-Propyl Alcohol	1.71	1.61	ppbV	6		25
1,1-Dichloroethene	ND	ND	ppbV	NC		25
Methylene chloride	ND	ND	ppbV	NC		25
3-Chloropropene	ND	ND	ppbV	NC		25
Carbon disulfide	ND	ND	ppbV	NC		25
1,1,2-Trichloro-1,2,2-Trifluoroethane	ND	ND	ppbV	NC		25
trans-1,2-Dichloroethene	ND	ND	ppbV	NC		25

Lab Duplicate Analysis
Batch Quality Control

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG580675-5 QC Sample: L1223081-01 Client ID: DUP Sample					
1,1-Dichloroethane	ND	ND	ppbV	NC	25
Methyl tert butyl ether	ND	ND	ppbV	NC	25
Vinyl acetate	ND	ND	ppbV	NC	25
2-Butanone	ND	ND	ppbV	NC	25
cis-1,2-Dichloroethene	ND	ND	ppbV	NC	25
Ethyl Acetate	ND	ND	ppbV	NC	25
Chloroform	ND	ND	ppbV	NC	25
Tetrahydrofuran	ND	ND	ppbV	NC	25
1,2-Dichloroethane	ND	ND	ppbV	NC	25
n-Hexane	0.630	0.662	ppbV	5	25
1,1,1-Trichloroethane	ND	ND	ppbV	NC	25
Benzene	0.815	0.847	ppbV	4	25
Carbon tetrachloride	ND	ND	ppbV	NC	25
Cyclohexane	ND	ND	ppbV	NC	25
1,2-Dichloropropane	ND	ND	ppbV	NC	25
Bromodichloromethane	ND	ND	ppbV	NC	25
1,4-Dioxane	ND	ND	ppbV	NC	25
Trichloroethene	ND	ND	ppbV	NC	25
2,2,4-Trimethylpentane	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG580675-5 QC Sample: L1223081-01 Client ID: DUP Sample					
Heptane	ND	ND	ppbV	NC	25
cis-1,3-Dichloropropene	ND	ND	ppbV	NC	25
4-Methyl-2-pentanone	ND	ND	ppbV	NC	25
trans-1,3-Dichloropropene	ND	ND	ppbV	NC	25
1,1,2-Trichloroethane	ND	ND	ppbV	NC	25
Toluene	2.27	2.36	ppbV	4	25
2-Hexanone	ND	ND	ppbV	NC	25
Dibromochloromethane	ND	ND	ppbV	NC	25
1,2-Dibromoethane	ND	ND	ppbV	NC	25
Tetrachloroethene	0.569	0.614	ppbV	8	25
Chlorobenzene	ND	ND	ppbV	NC	25
Ethylbenzene	ND	ND	ppbV	NC	25
p/m-Xylene	1.21	1.26	ppbV	4	25
Bromoform	ND	ND	ppbV	NC	25
Styrene	ND	ND	ppbV	NC	25
1,1,2,2-Tetrachloroethane	ND	ND	ppbV	NC	25
o-Xylene	ND	ND	ppbV	NC	25
4-Ethyltoluene	ND	ND	ppbV	NC	25
1,3,5-Trimethylbenzene	ND	ND	ppbV	NC	25

Lab Duplicate Analysis
Batch Quality Control

Project Name: BAY PARK
Project Number: Not Specified

Lab Number: L1223079
Report Date: 12/21/12

Parameter	Native Sample	Duplicate Sample	Units	RPD	RPD Limits
Volatile Organics in Air - Mansfield Lab Associated sample(s): 01-04 QC Batch ID: WG580675-5 QC Sample: L1223081-01 Client ID: DUP Sample					
1,2,4-Trimethylbenzene	ND	ND	ppbV	NC	25
Benzyl chloride	ND	ND	ppbV	NC	25
1,3-Dichlorobenzene	ND	ND	ppbV	NC	25
1,4-Dichlorobenzene	ND	ND	ppbV	NC	25
1,2-Dichlorobenzene	ND	ND	ppbV	NC	25
1,2,4-Trichlorobenzene	ND	ND	ppbV	NC	25
Hexachlorobutadiene	ND	ND	ppbV	NC	25

Project Name: BAY PARK

Lab Number: L1223079

Project Number:

Report Date: 12/21/12

Canister and Flow Controller Information

Samplenum	Client ID	Media ID	Media Type	Date Prepared	Bottle Order	Cleaning Batch ID	Can Leak Check	Initial Pressure (in. Hg)	Pressure on Receipt (in. Hg)	Flow Controler Leak Chk	Flow Out mL/min	Flow In mL/min	% RPD
L1223079-01	SV-8	0355	#90 SV	12/18/12	84170	L1220970-02	-	-	-	Pass	166	138	18
L1223079-01	SV-8	1510	1.0L Can	12/18/12	84170	L1220970-02	Pass	-29.1	-0.4	-	-	-	-
L1223079-02	SV-3	0181	#90 SV	12/18/12	84170	L1220970-02	-	-	-	Pass	166	177	6
L1223079-02	SV-3	1500	1.0L Can	12/18/12	84170	L1220970-02	Pass	-29.1	0.0	-	-	-	-
L1223079-03	PT-1	0263	#90 SV	12/18/12	84170	L1220970-02	-	-	-	Pass	165	176	6
L1223079-03	PT-1	702	1.0L Can	12/18/12	84170	L1220970-02	Pass	-28.8	-0.3	-	-	-	-
L1223079-04	PT-2	0232	#90 SV	12/18/12	84170	L1220970-02	-	-	-	Pass	166	173	4
L1223079-04	PT-2	834	1.0L Can	12/18/12	84170	L1220970-02	Pass	-29.1	-0.5	-	-	-	-

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1220970

Project Number: CANISTER QC BAT **Report Date:** 12/21/12

Air Canister Certification Results

Lab ID: L1220970-02
Client ID: CAN 868 SHELF 11
Sample Location:
Matrix: Air
Anaytical Method: 48,TO-15
Analytical Date: 11/20/12 16:27
Analyst: MB

Date Collected: 11/16/12 16:11
Date Received: 11/17/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Chlorodifluoromethane	ND	0.200	--	ND	0.707	--		1
Propylene	ND	0.500	--	ND	0.860	--		1
Propane	ND	0.200	--	ND	0.361	--		1
Dichlorodifluoromethane	ND	0.200	--	ND	0.989	--		1
Chloromethane	ND	0.200	--	ND	0.413	--		1
Freon-114	ND	0.200	--	ND	1.40	--		1
Methanol	ND	5.00	--	ND	6.55	--		1
Vinyl chloride	ND	0.200	--	ND	0.511	--		1
1,3-Butadiene	ND	0.200	--	ND	0.442	--		1
Butane	ND	0.200	--	ND	0.475	--		1
Bromomethane	ND	0.200	--	ND	0.777	--		1
Chloroethane	ND	0.200	--	ND	0.528	--		1
Ethanol	ND	2.50	--	ND	4.71	--		1
Dichlorofluoromethane	ND	0.200	--	ND	0.842	--		1
Vinyl bromide	ND	0.200	--	ND	0.874	--		1
Acrolein	ND	0.500	--	ND	1.15	--		1
Acetone	ND	1.00	--	ND	2.38	--		1
Acetonitrile	ND	0.200	--	ND	0.336	--		1
Trichlorofluoromethane	ND	0.200	--	ND	1.12	--		1
Isopropanol	ND	0.500	--	ND	1.23	--		1
Acrylonitrile	ND	0.200	--	ND	0.434	--		1
Pentane	ND	0.200	--	ND	0.590	--		1
Ethyl ether	ND	0.200	--	ND	0.606	--		1
1,1-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Tertiary butyl Alcohol	ND	0.500	--	ND	1.52	--		1

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1220970
Project Number: CANISTER QC BAT **Report Date:** 12/21/12

Air Canister Certification Results

Lab ID: L1220970-02
Client ID: CAN 868 SHELF 11
Sample Location:
Date Collected: 11/16/12 16:11
Date Received: 11/17/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Methylene chloride	ND	1.00	--	ND	3.47	--		1
3-Chloropropene	ND	0.200	--	ND	0.626	--		1
Carbon disulfide	ND	0.200	--	ND	0.623	--		1
Freon-113	ND	0.200	--	ND	1.53	--		1
trans-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
1,1-Dichloroethane	ND	0.200	--	ND	0.809	--		1
Methyl tert butyl ether	ND	0.200	--	ND	0.721	--		1
Vinyl acetate	ND	0.200	--	ND	0.704	--		1
2-Butanone	ND	0.200	--	ND	0.590	--		1
cis-1,2-Dichloroethene	ND	0.200	--	ND	0.793	--		1
Ethyl Acetate	ND	0.500	--	ND	1.80	--		1
Chloroform	ND	0.200	--	ND	0.977	--		1
Tetrahydrofuran	ND	0.200	--	ND	0.590	--		1
2,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
1,2-Dichloroethane	ND	0.200	--	ND	0.809	--		1
n-Hexane	ND	0.200	--	ND	0.705	--		1
Diisopropyl ether	ND	0.200	--	ND	0.836	--		1
tert-Butyl Ethyl Ether	ND	0.200	--	ND	0.836	--		1
1,1,1-Trichloroethane	ND	0.200	--	ND	1.09	--		1
1,1-Dichloropropene	ND	0.200	--	ND	0.908	--		1
Benzene	ND	0.200	--	ND	0.639	--		1
Carbon tetrachloride	ND	0.200	--	ND	1.26	--		1
Cyclohexane	ND	0.200	--	ND	0.688	--		1
tert-Amyl Methyl Ether	ND	0.200	--	ND	0.836	--		1
Dibromomethane	ND	0.200	--	ND	1.42	--		1
1,2-Dichloropropane	ND	0.200	--	ND	0.924	--		1
Bromodichloromethane	ND	0.200	--	ND	1.34	--		1
1,4-Dioxane	ND	0.200	--	ND	0.721	--		1

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1220970
Project Number: CANISTER QC BAT **Report Date:** 12/21/12

Air Canister Certification Results

Lab ID: L1220970-02
Client ID: CAN 868 SHELF 11
Sample Location:
Date Collected: 11/16/12 16:11
Date Received: 11/17/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								
Trichloroethene	ND	0.200	--	ND	1.07	--		1
2,2,4-Trimethylpentane	ND	0.200	--	ND	0.934	--		1
Methyl Methacrylate	ND	0.500	--	ND	2.05	--		1
Heptane	ND	0.200	--	ND	0.820	--		1
cis-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
4-Methyl-2-pentanone	ND	0.200	--	ND	0.820	--		1
trans-1,3-Dichloropropene	ND	0.200	--	ND	0.908	--		1
1,1,2-Trichloroethane	ND	0.200	--	ND	1.09	--		1
Toluene	ND	0.200	--	ND	0.754	--		1
1,3-Dichloropropane	ND	0.200	--	ND	0.924	--		1
2-Hexanone	ND	0.200	--	ND	0.820	--		1
Dibromochloromethane	ND	0.200	--	ND	1.70	--		1
1,2-Dibromoethane	ND	0.200	--	ND	1.54	--		1
Butyl acetate	ND	0.500	--	ND	2.38	--		1
Octane	ND	0.200	--	ND	0.934	--		1
Tetrachloroethene	ND	0.200	--	ND	1.36	--		1
1,1,1,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
Chlorobenzene	ND	0.200	--	ND	0.921	--		1
Ethylbenzene	ND	0.200	--	ND	0.869	--		1
p/m-Xylene	ND	0.400	--	ND	1.74	--		1
Bromoform	ND	0.200	--	ND	2.07	--		1
Styrene	ND	0.200	--	ND	0.852	--		1
1,1,2,2-Tetrachloroethane	ND	0.200	--	ND	1.37	--		1
o-Xylene	ND	0.200	--	ND	0.869	--		1
1,2,3-Trichloropropane	ND	0.200	--	ND	1.20	--		1
Nonane	ND	0.200	--	ND	1.05	--		1
Isopropylbenzene	ND	0.200	--	ND	0.983	--		1
Bromobenzene	ND	0.200	--	ND	0.793	--		1

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1220970
Project Number: CANISTER QC BAT **Report Date:** 12/21/12

Air Canister Certification Results

Lab ID: L1220970-02
Client ID: CAN 868 SHELF 11
Sample Location:

Date Collected: 11/16/12 16:11
Date Received: 11/17/12
Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air - Mansfield Lab								
2-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
n-Propylbenzene	ND	0.200	--	ND	0.983	--		1
4-Chlorotoluene	ND	0.200	--	ND	1.04	--		1
4-Ethyltoluene	ND	0.200	--	ND	0.983	--		1
1,3,5-Trimethybenzene	ND	0.200	--	ND	0.983	--		1
tert-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2,4-Trimethylbenzene	ND	0.200	--	ND	0.983	--		1
Decane	ND	0.200	--	ND	1.16	--		1
Benzyl chloride	ND	0.200	--	ND	1.04	--		1
1,3-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
1,4-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
sec-Butylbenzene	ND	0.200	--	ND	1.10	--		1
p-Isopropyltoluene	ND	0.200	--	ND	1.10	--		1
1,2-Dichlorobenzene	ND	0.200	--	ND	1.20	--		1
n-Butylbenzene	ND	0.200	--	ND	1.10	--		1
1,2-Dibromo-3-chloropropane	ND	0.200	--	ND	1.93	--		1
Undecane	ND	0.200	--	ND	1.28	--		1
Dodecane	ND	0.200	--	ND	1.39	--		1
1,2,4-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Naphthalene	ND	0.200	--	ND	1.05	--		1
1,2,3-Trichlorobenzene	ND	0.200	--	ND	1.48	--		1
Hexachlorobutadiene	ND	0.200	--	ND	2.13	--		1

	Results	Qualifier	Units	RDL	Dilution Factor
Tentatively Identified Compounds					
No Tentatively Identified Compounds					

Project Name:	BATCH CANISTER CERTIFICATION	**Lab Number:**	L1220970
Project Number:	CANISTER QC BAT	**Report Date:**	12/21/12

Air Canister Certification Results

Lab ID:	L1220970-02	Date Collected:	11/16/12 16:11
Client ID:	CAN 868 SHELF 11	Date Received:	11/17/12
Sample Location:		Field Prep:	Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air - Mansfield Lab								

Internal Standard	% Recovery	Qualifier	Acceptance Criteria
1,4-Difluorobenzene	98		60-140
Bromochloromethane	98		60-140
chlorobenzene-d5	92		60-140

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1220970
Project Number: CANISTER QC BAT **Report Date:** 12/21/12

Air Canister Certification Results

Lab ID:	L1220970-02	Date Collected:	11/16/12 16:11
Client ID:	CAN 868 SHELF 11	Date Received:	11/17/12
Sample Location:		Field Prep:	Not Specified
Matrix:	Air		
Anaytical Method:	48,TO-15-SIM		
Analytical Date:	11/19/12 18:26		
Analyst:	MB		

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
Dichlorodifluoromethane	ND	0.050	--	ND	0.247	--		1
Chloromethane	ND	0.500	--	ND	1.03	--		1
Freon-114	ND	0.050	--	ND	0.349	--		1
Vinyl chloride	ND	0.020	--	ND	0.051	--		1
1,3-Butadiene	ND	0.020	--	ND	0.044	--		1
Bromomethane	ND	0.020	--	ND	0.078	--		1
Chloroethane	ND	0.020	--	ND	0.053	--		1
Acetone	ND	2.00	--	ND	4.75	--		1
Trichlorofluoromethane	ND	0.050	--	ND	0.281	--		1
Acrylonitrile	ND	0.500	--	ND	1.08	--		1
1,1-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Methylene chloride	ND	1.00	--	ND	3.47	--		1
Freon-113	ND	0.050	--	ND	0.383	--		1
Halothane	ND	0.050	--	ND	0.404	--		1
trans-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
1,1-Dichloroethane	ND	0.020	--	ND	0.081	--		1
Methyl tert butyl ether	ND	0.020	--	ND	0.072	--		1
2-Butanone	ND	0.500	--	ND	1.47	--		1
cis-1,2-Dichloroethene	ND	0.020	--	ND	0.079	--		1
Chloroform	ND	0.020	--	ND	0.098	--		1
1,2-Dichloroethane	ND	0.020	--	ND	0.081	--		1
1,1,1-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Benzene	ND	0.100	--	ND	0.319	--		1
Carbon tetrachloride	ND	0.020	--	ND	0.126	--		1
1,2-Dichloropropane	ND	0.020	--	ND	0.092	--		1

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1220970
Project Number: CANISTER QC BAT **Report Date:** 12/21/12

Air Canister Certification Results

Lab ID: L1220970-02 Date Collected: 11/16/12 16:11
Client ID: CAN 868 SHELF 11 Date Received: 11/17/12
Sample Location: Field Prep: Not Specified

Parameter	ppbV Results	ppbV RL	ppbV MDL	ug/m3 Results	ug/m3 RL	ug/m3 MDL	Qualifier	Dilution Factor
Volatile Organics in Air by SIM - Mansfield Lab								
Bromodichloromethane	ND	0.020	--	ND	0.134	--		1
Trichloroethene	ND	0.020	--	ND	0.107	--		1
1,4-Dioxane	ND	0.100	--	ND	0.360	--		1
cis-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
4-Methyl-2-pentanone	ND	0.500	--	ND	2.05	--		1
trans-1,3-Dichloropropene	ND	0.020	--	ND	0.091	--		1
1,1,2-Trichloroethane	ND	0.020	--	ND	0.109	--		1
Toluene	ND	0.050	--	ND	0.188	--		1
Dibromochloromethane	ND	0.020	--	ND	0.170	--		1
1,2-Dibromoethane	ND	0.020	--	ND	0.154	--		1
Tetrachloroethene	0.106	0.020	--	0.719	0.136	--		1
1,1,1,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
Chlorobenzene	ND	0.020	--	ND	0.092	--		1
Ethylbenzene	ND	0.020	--	ND	0.087	--		1
p/m-Xylene	ND	0.040	--	ND	0.174	--		1
Bromoform	ND	0.020	--	ND	0.207	--		1
Styrene	ND	0.020	--	ND	0.085	--		1
1,1,2,2-Tetrachloroethane	ND	0.020	--	ND	0.137	--		1
o-Xylene	ND	0.020	--	ND	0.087	--		1
Isopropylbenzene	ND	0.500	--	ND	2.46	--		1
1,3,5-Trimethybenzene	ND	0.020	--	ND	0.098	--		1
1,2,4-Trimethylbenzene	ND	0.020	--	ND	0.098	--		1
1,3-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
1,4-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
sec-Butylbenzene	ND	0.500	--	ND	2.74	--		1
p-Isopropyltoluene	ND	0.500	--	ND	2.74	--		1
1,2-Dichlorobenzene	ND	0.020	--	ND	0.120	--		1
n-Butylbenzene	ND	0.500	--	ND	2.74	--		1

Project Name: BATCH CANISTER CERTIFICATION **Lab Number:** L1220970
Project Number: CANISTER QC BAT **Report Date:** 12/21/12

Air Canister Certification Results

Lab ID: L1220970-02
Client ID: CAN 868 SHELF 11
Sample Location:

Date Collected: 11/16/12 16:11
Date Received: 11/17/12
Field Prep: Not Specified

	ppbV			ug/m3				
Parameter	**Results**	**RL**	**MDL**	**Results**	**RL**	**MDL**	**Qualifier**	**Dilution Factor**
Volatile Organics in Air by SIM - Mansfield Lab								
1,2,4-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Naphthalene	ND	0.050	--	ND	0.262	--		1
1,2,3-Trichlorobenzene	ND	0.050	--	ND	0.371	--		1
Hexachlorobutadiene	ND	0.050	--	ND	0.533	--		1

Internal Standard	**% Recovery**	**Qualifier**	**Acceptance Criteria**
1,4-difluorobenzene	97		60-140
bromochloromethane	99		60-140
chlorobenzene-d5	99		60-140

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

Sample Receipt and Container Information

Were project specific reporting limits specified? YES

Reagent H2O Preserved Vials Frozen on: NA

Cooler Information Cooler	Custody Seal
N/A	Present/Intact

Container Information

Container ID	Container Type	Cooler	pH	Temp deg C	Pres	Seal	Analysis(*)
L1223079-01A	Canister - 1 Liter	N/A	NA		Y	Present/Intact	TO15-LL(30)
L1223079-02A	Canister - 1 Liter	N/A	NA		Y	Present/Intact	TO15-LL(30)
L1223079-03A	Canister - 1 Liter	N/A	NA		Y	Present/Intact	TO15-LL(30)
L1223079-04A	Canister - 1 Liter	N/A	NA		Y	Present/Intact	TO15-LL(30)

*Values in parentheses indicate holding time in days

Project Name: BAY PARK **Lab Number:** L1223079
Project Number: Not Specified **Report Date:** 12/21/12

GLOSSARY

Acronyms

EDL - Estimated Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The EDL includes any adjustments from dilutions, concentrations or moisture content, where applicable. The use of EDLs is specific to the analysis of PAHs using Solid-Phase Microextraction (SPME).

EPA - Environmental Protection Agency.

LCS - Laboratory Control Sample: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

LCSD - Laboratory Control Sample Duplicate: Refer to LCS.

LFB - Laboratory Fortified Blank: A sample matrix, free from the analytes of interest, spiked with verified known amounts of analytes or a material containing known and verified amounts of analytes.

MDL - Method Detection Limit: This value represents the level to which target analyte concentrations are reported as estimated values, when those target analyte concentrations are quantified below the reporting limit (RL). The MDL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

MS - Matrix Spike Sample: A sample prepared by adding a known mass of target analyte to a specified amount of matrix sample for which an independent estimate of target analyte concentration is available.

MSD - Matrix Spike Sample Duplicate: Refer to MS.

NA - Not Applicable.

NC - Not Calculated: Term is utilized when one or more of the results utilized in the calculation are non-detect at the parameter's reporting unit.

NI - Not Ignitable.

RL - Reporting Limit: The value at which an instrument can accurately measure an analyte at a specific concentration. The RL includes any adjustments from dilutions, concentrations or moisture content, where applicable.

RPD - Relative Percent Difference: The results from matrix and/or matrix spike duplicates are primarily designed to assess the precision of analytical results in a given matrix and are expressed as relative percent difference (RPD). Values which are less than five times the reporting limit for any individual parameter are evaluated by utilizing the absolute difference between the values; although the RPD value will be provided in the report.

SRM - Standard Reference Material: A reference sample of a known or certified value that is of the same or similar matrix as the associated field samples.

Footnotes

1 - The reference for this analyte should be considered modified since this analyte is absent from the target analyte list of the original method.

Terms

Analytical Method: Both the document from which the method originates and the analytical reference method. (Example: EPA 8260B is shown as 1,8260B.) The codes for the reference method documents are provided in the References section of the Addendum.

Data Qualifiers

A - Spectra identified as "Aldol Condensation Product".

B - The analyte was detected above the reporting limit in the associated method blank. Flag only applies to associated field samples that have detectable concentrations of the analyte at less than five times (5x) the concentration found in the blank. For MCP-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank. For DOD-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte at less than ten times (10x) the concentration found in the blank AND the analyte was detected above one-half the reporting limit (or above the reporting limit for common lab contaminants) in the associated method blank. For NJ-Air-related projects, flag only applies to associated field samples that have detectable concentrations of the analyte above the reporting limit.

C - Co-elution: The target analyte co-elutes with a known lab standard (i.e. surrogate, internal standards, etc.) for co-extracted analyses.

D - Concentration of analyte was quantified from diluted analysis. Flag only applies to field samples that have detectable concentrations of the analyte.

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

G - The concentration may be biased high due to matrix interferences (i.e, co-elution) with non-target compound(s). The result should be considered estimated.

H - The analysis of pH was performed beyond the regulatory-required holding time of 15 minutes from the time of sample collection.

I - The RPD between the results for the two columns exceeds the method-specified criteria; however, the lower value has been reported

Data Qualifiers

due to obvious interference.

M - Reporting Limit (RL) exceeds the MCP CAM Reporting Limit for this analyte.

NJ - Presumptive evidence of compound. This represents an estimated concentration for Tentatively Identified Compounds (TICs), where the identification is based on a mass spectral library search.

P - The RPD between the results for the two columns exceeds the method-specified criteria.

Q - The quality control sample exceeds the associated acceptance criteria. For DOD-related projects, LCS and/or Continuing Calibration Standard exceedences are also qualified on all associated sample results. Note: This flag is not applicable for matrix spike recoveries when the sample concentration is greater than 4x the spike added or for batch duplicate RPD when the sample concentrations are less than 5x the RL. (Metals only.)

R - Analytical results are from sample re-analysis.

RE - Analytical results are from sample re-extraction.

J - Estimated value. This represents an estimated concentration for Tentatively Identified Compounds (TICs).

ND - Not detected at the reporting limit (RL) for the sample.

REFERENCES

48 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air. Second Edition. EPA/625/R-96/010b, January 1999.

LIMITATION OF LIABILITIES

Alpha Analytical performs services with reasonable care and diligence normal to the analytical testing laboratory industry. In the event of an error, the sole and exclusive responsibility of Alpha Analytical shall be to re-perform the work at it's own expense. In no event shall Alpha Analytical be held liable for any incidental, consequential or special damages, including but not limited to, damages in any way connected with the use of, interpretation of, information or analysis provided by Alpha Analytical.

We strongly urge our clients to comply with EPA protocol regarding sample volume, preservation, cooling, containers, sampling procedures, holding time and splitting of samples in the field.

Certificate/Approval Program Summary

Last revised August 3, 2012 – Mansfield Facility

The following list includes only those analytes/methods for which certification/approval is currently held.
For a complete listing of analytes for the referenced methods, please contact your Alpha Customer Service Representative.

Connecticut Department of Public Health Certificate/Lab ID: PH-0141.

Wastewater/Non-Potable Water (Inorganic Parameters: pH, Turbidity, Conductivity, Alkalinity, Aluminum, Antimony, Arsenic, Barium, Beryllium, Boron, Cadmium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Strontium, Thallium, Tin, Titanium, Vanadium, Zinc, Total Residue (Solids), Total Suspended Solids (non-filterable). Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Acid Extractables, Benzidines, Phthalate Esters, Nitrosamines, Nitroaromatics & Isophorone, PAHs, Haloethers, Chlorinated Hydrocarbons, Volatile Organics.)

Solid Waste/Soil (Inorganic Parameters: pH, Aluminum, Antimony, Arsenic, Barium, Beryllium, Cadmium, Calcium, Chromium, Hexavalent Chromium, Cobalt, Copper, Iron, Lead, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Silver, Sodium, Thallium, Titanium, Vanadium, Zinc, Total Organic Carbon, Corrosivity, TCLP 1311, SPLP 1312. Organic Parameters: PCBs, Organochlorine Pesticides, Technical Chlordane, Toxaphene, Volatile Organics, Acid Extractables, Benzidines, Phthalates, Nitrosamines, Nitroaromatics & Cyclic Ketones, PAHs, Haloethers, Chlorinated Hydrocarbons.)

Florida Department of Health Certificate/Lab ID: E87814. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SM2320B, SM2540D, SM2540G.)

Solid & Chemical Materials (Inorganic Parameters: 6020, 7470, 7471, 9045. Organic Parameters: EPA 8260, 8270, 8082, 8081.)

Air & Emissions (EPA TO-15.)

Louisiana Department of Environmental Quality Certificate/Lab ID: 03090. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: EPA 180.1, 245.7, 1631E, 3020A, 6020A, 7470A, 9040, 9050A, SM2320B, 2540D, 2540G, 4500H-B, Organic Parameters: EPA 3510C, 3580A, 3630C, 3640A, 3660B, 3665A, 5030B, 8015D, 3570, 8081B, 8082A, 8260B, 8270C, 8270D.)

Solid & Chemical Materials (Inorganic Parameters: EPA 1311, 3050B, 3051A, 3060A, 6020A, 7196A, 7470A, 7471B, 7474, 9040B, 9045C, 9060. Organic Parameters: EPA 3540C, 3570, 3580A, 3630C, 3640A, 3660, 3665A, 5035, 8015D, 8081B, 8082A, 8260B, 8270C, 8270D.)

Biological Tissue (Inorganic Parameters: EPA 6020A. Organic Parameters: EPA 3570, 3510C, 3610B, 3630C, 3640A, 8270C, 8270D.)

Air & Emissions (EPA TO-15.)

New Hampshire Department of Environmental Services Certificate/Lab ID: 2206. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: EPA 180.1, 1631E, 6020A, 7470A, 9040B, 9050A, SM2540D, 2540G, 4500H+B, 2320B, 3020A, . Organic Parameters: EPA 3510C, 3630C, 3640A, 3660B, 8081B, 8082A, 8270C, 8270D, 8015D.)

Solid & Chemical Materials (Inorganic Parameters: SW-846 1311, 3050B, 3051A, 6020A, 7471B, 9040B, 9045C. Organic Parameters: SW-846 3540C, 3580A, 3630C, 3640A, 3660B, 3665A, 8270C, 8015D, 8082A, 8081B.)

New Jersey Department of Environmental Protection Certificate/Lab ID: MA015. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SW-846 1312, 3020A, SM2320B, SM2540D, 2540G, 4500H-B, EPA 180.1, 1631E, SW-846 7470A, 9040C, 6020A, 9050A. Organic Parameters: SW-846 3510C, 3580A, 3630C, 3640A, 3660B, 3665A, 8015D, 8081B, 8082A, 8270C, 8270D)

Solid & Chemical Materials (Inorganic Parameters: SW-846 1311, 1312, 3050B, 3051A, 6020A, 7471B, 7474, 9040B, 9040C, 9045C, 9045D, 9060. Organic Parameters: SW-846 3540C, 3570, 3580A, 3630C, 3640A, 3660B, 3665A, 8081B, 8082A, 8270C, 8270D, 8015D.)

Atmospheric Organic Parameters (EPA 3C, TO-15, TO-10A, TO-13A-SIM.)

Biological Tissue (Inorganic Parameters: SW-846 6020A. Organic Parameters: SW-846 8270C, 8270D, 3510C, 3570, 3610C, 3630C, 3640A)

New York Department of Health Certificate/Lab ID: 11627. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters: SM2320B, SM2540D, 6020A, 1631E, 7470A, 9050A, EPA 180.1, 3020A. Organic Parameters: EPA 8270C, 8270D, 8081B, 8082A, 3510C.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 6020A, 7471B, 7474, 9040C, 9045D. Organic Parameters: EPA 8270C, 8270D, 8081B, 8082A, 1311, 3050B, 3580A, 3570, 3051A.)

Air & Emissions (EPA TO-15, TO-10A.)

Pennsylvania Certificate/Lab ID: 68-02089 ***NELAP Accredited***

Non-Potable Water (Inorganic Parameters: 1312, 1631E, 180.1, 3020A, 6020A, 7470A, 9040B, 9050A, 2320B, 2540D, 2540G, SM4500H+-B. Organic Parameters: 3510C, 3580A, 3630C, 3640A, 3660B, 3665A, 8015D, 8081B, 8082A, 8270C, 8270D .)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 3051A, 6020A, 7471B, 7474 9040B, 9045C, 9060. Organic Parameters: EPA3050B, 3540C, 3570, 3580A, 3630C, 3640A, 3660B, 3665A, 8270C, 8270D, 8081B, 8015D, 8082A.)

Rhode Island Department of Health Certificate/Lab ID: LAO00299. ***NELAP Accredited via NJ-DEP.***

Refer to NJ-DEP Certificate for Non-Potable Water.

Texas Commission of Environmental Quality Certificate/Lab ID: T104704419-08-TX. ***NELAP Accredited.***

Solid & Chemical Materials (Inorganic Parameters: EPA 6020, 7470, 7471, 1311, 9040, 9045, 9060. Organic Parameters: EPA 8015, 8270, 8081, 8082.)

Air (Organic Parameters: EPA TO-15)

Virginia Division of Consolidated Laboratory Services Certificate/Lab ID:460194. ***NELAP Accredited.***

Non-Potable Water (Inorganic Parameters:EPA 3020A, 6020A, 245.7, 9040B. Organic Parameters: EPA 3510C, 3640A, 3660B, 3665A, 8270C, 8270D, 8082A, 8081B, 8015D.)

Solid & Chemical Materials (Inorganic Parameters: EPA 6020A,7470A,7471B,9040B,9045C,3050B,3051, 9060. Organic Parameters: EPA 3540C, 3580A, 3630C, 3640A, 3660B, 3665A, 3570, 8270C, 8270D, 8081B, 8082A, 8015D.)

Washington State Department of Ecology Certificate/Lab ID: C954. *Non-Potable Water* (Inorganic Parameters: SM2540D, 180.1, 1631E.)

Solid & Chemical Materials (Inorganic Parameters: EPA 6020, 7470, 7471, 7474, 9045C, 9050A, 9060. Organic Parameters: EPA 8081, 8082, 8015, 8270.)

U.S. Army Corps of Engineers

Department of Defense, L-A-B Certificate/Lab ID: L2217.01.

Non-Potable Water (Inorganic Parameters: EPA 6020A, SM4500H-B. Organic Parameters: 3020A, 3510C, 8270C, 8270D, 8270C-ALK-PAH, 8270D-ALK-PAH, 8082A, 8081B, 8015D-SHC, 8015D.)

Solid & Hazardous Waste (Inorganic Parameters: EPA 1311, 3050B, 6020A, 7471A, 9045C, 9060, SM 2540G, ASTM D422-63. Organic Parameters: EPA 3580A, 3570, 3540C, 8270C, 8270D, 8270C-ALK-PAH, 8270D-ALK-PAH 8082A, 8081B, 8015D-SHC, 8015D.

Air & Emissions (EPA TO-15.)

Analytes Not Accredited by NELAP

Certification is not available by NELAP for the following analytes: **8270C:** Biphenyl. **TO-15:** Halothane, 2,4,4-Trimethyl-2-pentene, 2,4,4-Trimethyl-1-pentene, Thiophene, 2-Methylthiophene, 3-Methylthiophene, 2-Ethylthiophene, 1,2,3-Trimethylbenzene, Indan, Indene, 1,2,4,5-Tetramethylbenzene, Benzothiophene, 2-Methylnaphthalene, 1-Methylnaphthalene.

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Fax: 508-822-3288

AIR Chain-of-Custody - NJ

Date Rec'd in Lab

ALPHA Job# L1223079

Carrier:

1 of 1 COCs

Samplers Name(s) JAMES RESTAINO

Client Contact Information

Company: GZA
Address: 104 W 29TH ST
City/State/Zip NEW YORK, N.Y. 10001
Phone:
FAX:
Email:

Project Information

Project Name: BAY PARK
Site/Location: BROOKLYN
Project Manager: BRETT ENGARD
Site Contact:
Phone:

Analysis Turn-Around Time

Standard (Specify)
Rush (Specify) 48 HOUR

Report Information - Data Deliverables:

☐ FAX:
☐ ADEx ☐ Criteria Checker:
☐ EMail (standard pdf report)

Billing Information

☒ Same as Client Info PO #:

ALPHA LAB ID (Lab Use Only)	Sample Identification	Sample Date(s)	Time Start (24 hr clock)	Time Stop (24 hr clock)	Canister Pressure in Field ("Hg) (Start)	Canister Pressure in Field ("Hg) (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Outgoing Canister Pressure ("Hg) (Lab)	Incoming Canister Pressure ("Hg) (Lab)	Flow Reg. ID	Can ID	Can Size (L)	Flow Controller Readout (ml/min)	Can Cert ID	Analysis: TO-15	Analysis: EPA 3C					Matrix: Indoor / Ambient Air	Matrix: Soil Gas	
23079. 1	SV8	12/19/12	840	846	-29.08	-0.91	43°F				0355	1510	1L	~~0355~~		X							X	
2	SV-3	12-19-12	912	917	-28.60	-0.64	43°F				0181	1500	1L			X							X	
3	PT-1	12/19/12	956	1002	-29.11	-0.78	45°F				0263	702	1L			X							X	
4	PT-2	12/19/12	1450	1459	-27.03	-0.83	47°F				0232	834	1L			X							X	

Temperature (Fahrenheit)	Ambient	Maximum	Minimum	
Start	43°F			
Stop				

GC/MS Analyst Signature (TO-15)

Pressure (inches of Hg)	Ambient	Maximum	Minimum	
Start	29.77			
Stop				

Special Instructions/QC Requirements & Comments:

Canisters Shipped by:	Date/Time:	Canisters Received by:	Date/Time:
Samples Relinquished by: James Restaino	Date/Time: 12/19/12 17:00	Received by:	Date/Time: 12/19/12 17:00
Relinquished by:	Date/Time: 12/19/12 2355	Received by:	Date/Time: 12/19/12 2355

Please print clearly, legibly and completely. Samples can not be logged in and turnaround time clock will not start until all ambiguities are resolved. All samples submitted are subject to Alpha's Payment Terms. See reverse side.

Form: 101-06 April 20, 2009

APPENDIX C
PREVIOUS ANALYTICAL RESULTS SUMMARY TABLES

TABLE C1A - May 2009 Soil Data

Remedial Investigation Work Plan
Summary of Soil Analytical Results
3375 Neptune Avenue
Brooklyn, New York

LOCATION			GZA-1 (8-9')		GZA-2 (8.2-9.2')		GZA-3 (9.9-10.9')		GZA-4 (8.5-9.5')	
SAMPLING DATE			5/14/2009		5/14/2009		5/14/2009		5/14/2009	
LAB SAMPLE ID			L0906204-01		L0906204-02		L0906204-03		L0906204-04	
	NY-TAGM	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics[1]										
1,2,4,5-Tetramethylbenzene	NS	mg/kg	0.011	U	0.01	U	2.4		0.011	U
Semivolatile Organics										
Acenaphthene	50	mg/kg	0.014	U	0.014	U	2.8		0.014	U
Fluoranthene	50	mg/kg	0.014	U	0.014	U	0.42		0.014	U
Naphthalene	13	mg/kg	0.014	U	0.014	U	0.69		0.014	U
Fluorene	50	mg/kg	0.014	U	0.014	U	3.8		0.014	U
Phenanthrene	50	mg/kg	0.014	U	0.014	U	8.2		0.014	U
Pyrene	50	mg/kg	0.014	U	0.014	U	0.99		0.014	U

Notes:

[1] - Only detections are listed. See complete analytical package for a list of all compounds analyzed.

ID - Identification

mg/kg - Milligrams per kilogram

NS - No standard

NY-TAGM - New York Technical and Administrative Guidance Memorandum Soil Cleanup Objectives (inc Fuel Oil Contaminated Soils).

U - The analyte was not detected at concentrations above the the laboratory method detection limit.

TABLE C1B - July 2009 Soil Data

Remedial Investigation Work Plan

Summary of Soil Analytical Results

3375 Neptune Avenue

Brooklyn, New York

Sample ID	NYSDEC Part 375	GZA-5	GZA DUP	GZA-6	GZA-7	GZA-8	GZA-9	GZA-10	TB	TB	FB
Sample Depth	Restricted	(9-10')	(9-10')	(10-11')	(8-9')	(9-10')	(9-10')	(12-13')	--	--	--
Laboratory ID	Residential Use	G992-28-1B	G992-28-2B	G992-28-5A	G992-28-9A	G992-28-11A	G992-28-13C	G992-29-2A	G992-28-8A	G992-29-1A	G992-28-7A
Sampling Date	Soil Cleanup	7/16/09	7/16/09	7/16/09	7/16/09	7/16/09	7/16/09	7/17/09	7/16/09	7/17/09	7/16/09
Matrix	Objectives	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Water	Water	Water
Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
VOLATILE ORGANIC COMPOUNDS - None Detected											
SEMI-VOLATILE ORGANIC COMPOUNDS[1]											
Benzo[b]fluoranthene	1	< 0.339	< 0.33	< 0.313	< 0.309	< 0.365	< 7.08	0.400	NA	NA	< 0.00543
Chrysene	NS	< 0.339	< 0.33	< 0.313	< 0.309	< 0.365	< 7.08	0.317	NA	NA	< 0.00543
Fluoranthene	100	< 0.339	< 0.33	0.366	< 0.309	< 0.365	< 7.08	0.693	NA	NA	< 0.00543
Pyrene	100	< 0.339	< 0.33	0.398	< 0.309	< 0.365	< 7.08	0.564	NA	NA	< 0.00543

Notes:

[1] - Only detections are listed. See complete analytical package for a list of all compounds analyzed.

NA - Not Analyzed

NS - No Standard

< 0.339 - The compound was not detected at the indicated concentration.

TABLE C1C - December 2011 Soil Data
Remedial Investigation Work Plan
Summary of Soil Analytical Results
3375 Neptune Avenue
Brooklyn, New York

LOCATION			P-1 (8')		P-2 (8.5')		P-3 (8.5')		P-4 (1.5)		P-4 (8.5')		P-5 (1.5)		P-5 (8.5')	
SAMPLING DATE			05-DEC-11		05-DEC-11		05-DEC-11		06-DEC-11		06-DEC-11		05-DEC-11		06-DEC-11	
LAB SAMPLE ID			L1120276-01		L1120276-02		L1120276-03		L1120276-10		L1120276-04		L1120276-11		L1120276-05	
Volatile Organics	NYSPGW SCO	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,2,4,5-Tetramethylbenzene		mg/kg	0.01	U	0.01	U	9.2	---	0.011	U	14	---	0.011	U	0.012	U
1,2,4-Trimethylbenzene	3.6	mg/kg	0.013	U	0.013	U	0.59	U	0.013	U	20		0.014	U	0.015	U
1,3,5-Trimethylbenzene	8.4	mg/kg	0.013	U	0.013	U	0.29	J	0.013	U	0.61		0.014	U	0.015	U
1,4-Diethylbenzene		mg/kg	0.01	U	0.01	U	1.4	---	0.011	U	4.2		0.011	U	0.012	U
2-Butanone	0.12	mg/kg	0.026	U	0.026	U	1.2	U	0.026	U	3.1		0.028	U	0.03	U
4-Ethyltoluene		mg/kg	0.01	U	0.01	U	0.26	J	0.011	U	2.9		0.011	U	0.012	U
cis-1,2-Dichloroethene	0.25	mg/kg	0.0026	U	0.0026	U	0.12	U	0.0026	U	0.11	U	0.0028	U	0.003	U
Ethylbenzene	1	mg/kg	0.0026	U	0.0026	U	0.59	---	0.0026	U	0.11	---	0.0028	U	0.003	U
Isopropylbenzene	2.3	mg/kg	0.0026	U	0.0026	U	0.39		0.0026	U	0.51		0.0028	U	0.003	U
n-Butylbenzene	12	mg/kg	0.0026	U	0.0026	U	1.4		0.0026	U	2.5		0.0028	U	0.003	U
n-Propylbenzene	3.9	mg/kg	0.0026	U	0.0026	U	1.1		0.0026	U	1.5		0.0028	U	0.003	U
Naphthalene	12	mg/kg	0.013	U	0.013	U	13		0.013	U	21		0.014	U	0.005	J
p-Isopropyltoluene	10	mg/kg	0.0026	U	0.0026	U	0.12	U	0.0026	U	2		0.0028	U	0.003	U
p/m-Xylene		mg/kg	0.0052	U	0.0051	U	0.24	U	0.0053	U	0.15	J	0.0056	U	0.0061	U
sec-Butylbenzene	11	mg/kg	0.0026	U	0.0026	U	0.89	---	0.0026	U	1.3	---	0.0028	U	0.003	U
tert-Butylbenzene	5.9	mg/kg	0.013	U	0.013	U	0.21	J	0.013	U	0.57	U	0.014	U	0.015	U
Tetrachloroethene	1.3	mg/kg	0.0026	U	0.0026	U	2.9	---	0.03	---	0.67	---	0.018	---	0.003	U

Notes:

(shaded) Sample in exceedance of NY-RESGW criteria

mg/kg - milligrams per kilogram

D - The reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.

E - Indicates the analyte ‘s concentration exceeds the calibrated range of the instrument for that specific analysis.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL and the concentration given is an approximate value.

NYSPGW SCO - Sample Results Comparison with New York State Protection of Groundwater Soil Clean-Up Objectives

Qual - Laboratory Qualifier

U - The compound was not detected at the indicated concentration.

TABLE C1C - December 2011 Soil Data

Remedial Investigation Work Plan

Summary of Soil Analytical Results

3375 Neptune Avenue

Brooklyn, New York

LOCATION			P-6 (8')		P-7 (1.5')		P-7 (8.5')		P-8 (1.5')		P-8 (8.5')	
SAMPLING DATE			06-DEC-11		06-DEC-11		06-DEC-11		06-DEC-11		06-DEC-11	
LAB SAMPLE ID			L1120276-06		L1120276-08		L1120276-07		L1120276-09		L1120276-12	
Volatile Organics	NYSPGW SCO	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual	Result	Qual
1,2,4,5-Tetramethylbenzene		mg/kg	0.011	U	0.011	U	0.01	J	0.011	U	0.013	J
1,2,4-Trimethylbenzene	3.6	mg/kg	0.014	U	0.014	U	0.0042	J	0.013	U	0.059	U
1,3,5-Trimethylbenzene	8.4	mg/kg	0.014	U	0.014	U	0.015	U	0.013	U	0.059	U
1,4-Diethylbenzene		mg/kg	0.011	U	0.011	U	0.012	U	0.011	U	0.047	U
2-Butanone	0.12	mg/kg	0.028	U	0.027	U	0.03	U	0.027	U	0.12	U
4-Ethyltoluene		mg/kg	0.011	U	0.011	U	0.0013	J	0.011	U	0.047	U
cis-1,2-Dichloroethene	0.25	mg/kg	0.0028	U	0.0027	U	0.0021	J	0.0027	U	0.012	U
Ethylbenzene	1	mg/kg	0.0028	U	0.0027	U	0.004	---	0.0027	U	0.012	U
Isopropylbenzene	2.3	mg/kg	0.0028	U	0.0027	U	0.003	U	0.0027	U	0.012	U
n-Butylbenzene	12	mg/kg	0.0028	U	0.0027	U	0.003	U	0.0027	U	0.012	U
n-Propylbenzene	3.9	mg/kg	0.0028	U	0.0027	U	0.003	U	0.0027	U	0.012	U
Naphthalene	12	mg/kg	0.014	U	0.0054	J	0.058	---	0.013	U	0.059	U
p-Isopropyltoluene	10	mg/kg	0.0028	U	0.0027	U	0.003	U	0.0027	U	0.012	U
p/m-Xylene		mg/kg	0.0056	U	0.0054	U	0.0061	U	0.0054	U	0.024	U
sec-Butylbenzene	11	mg/kg	0.0028	U	0.0027	U	0.003	U	0.0027	U	0.012	U
tert-Butylbenzene	5.9	mg/kg	0.014	U	0.014	U	0.015	U	0.013	U	0.059	U
Tetrachloroethene	1.3	mg/kg	0.0028	U	0.033	---	0.003	U	0.062	---	0.012	U

TABLE C2A - May 2009 Groundwater Data

Remedial Investigation Work Plan

Summary of Groundwater Analytical Results

3375 Neptune Avenue

Brooklyn, New York

LOCATION			GZA-1		GZA-2		GZA-3		GZA-4	
SAMPLING DATE			5/14/2009		5/14/2009		5/14/2009		5/14/2009	
LAB SAMPLE ID			L0906204-05		L0906204-06		L0906204-07		L0906204-08	
	NYS AWQS	Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics[1]										
1,2,4,5-Tetramethylbenzene	NS	ug/l	2	U	2	U	16		2	U
Chloroform	7	ug/l	0.75	U	0.75	U	0.75	U	1.1	
Isopropylbenzene	5	ug/l	0.5	U	0.63		0.5	U	0.5	U
n-Butylbenzene	5	ug/l	0.5	U	0.5	U	0.53		0.5	U
Tetrachloroethene	5	ug/l	0.5	U	0.5	U	0.68		5.8	
Semivolatile Organics										
Acenaphthene	20	ug/l	0.2	U	0.19	U	2.5		0.2	U
Fluorene	50	ug/l	0.2	U	0.19	U	3.8		0.2	U
Naphthalene	10	ug/l	0.2	U	0.19	U	0.8		0.2	U
Phenanthrene	50	ug/l	0.2	U	0.19	U	5.4		0.2	U
Pyrene	50	ug/l	0.2	U	0.19	U	0.41		0.2	U

Notes

[1] - Only detections are listed. See complete analytical package for a list of all compounds analyzed.

(shaded) Exceeds NYS AWQS Standard

NYS AWQS - New York Ambient Water Quality Standards

U - The compound was not detected at the indicated concentration.

ug/l - Micrograms per liter

TABLE C2B - July 2009 Groundwater Data

Remedial Investigation Work Plan
Summary of Groundwater Analytical Results
3375 Neptune Avenue
Brooklyn, New York

Sample ID Laboratory ID Sampling Date Matrix	Ambient Water Quality Standards and Guidance Values	GZA-5 G992-28-3A 7/16/09 Water	GZA-6 G992-28-6A 7/16/09 Water	GZA-7 G992-28-10B 7/16/09 Water	GZA-8 G992-28-12A 7/16/09 Water	GZA-9 G992-28-14A 7/16/09 Water	GZA-10 G992-29-3F 7/17/09 Water	GZA DUP G992-28-4E 7/16/09 Water
Units	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L	UG/L
VOLATILE ORGANIC COMPOUNDS								
Tetrachloroethene	5	2.03	< 1	< 1	< 1	< 1	1.03	2.07
Xylene(s)	NS	< 1	< 1	< 1	< 1	< 1	1.59	< 1
SEMI-VOLATILE ORGANIC COMPOUNDS								
Acenaphthene	20	< 5.31	NA	< 5.04	< 5.05	< 5.06	16.9	< 5.63
Naphthalene	10	< 5.31	NA	< 5.04	< 5.05	< 5.06	63.8	< 5.63

Notes:

[1] - Only detections are listed. See complete analytical package for a list of all compounds analyzed.

(shaded) Exceeds NYS AWQS Standard

NYS AWQS - New York State Ambient Water Quality Standards

U - The compound was not detected at the indicated concentration.

ug/l - Micrograms per liter

TABLE C2C - July 2009 Groundwater Data

Remedial Investigation Work Plan

Summary of Groundwater Analytical Results

3375 Neptune Avenue

Brooklyn, New York

Sample ID Laboratory ID Sampling Date Matrix	New York Ambient Water Quality Standards	MW-1 L0910524-03 7/30/09 UG/L		MW-2 L0910524-02 7/30/09 UG/L	MW-3 L0910524-01 7/30/09 UG/L		FB L0910524-04 7/30/09 UG/L		TB L0910524-05 7/30/09 UG/L	
Volatile Organic Compounds										
Methyl tert butyl ether	10	1	U	3.5	1	U	1	U	1	U

Notes:

NS- No standard

U- The compound was not detected at the indicated concentration.

Only detections are listed. See complete analytical package for a list of all compounds analyzed.

TABLE C3A - July 2009 Sub-Slab Soil Vapor and Ambient Air Data

Remedial Investigation Work Plan

Summary of Soil Vapor and Ambielnt Air Analytical Results

3375 Neptune Avenue

Brooklyn, New York

Sample ID Laboratory ID Sampling Date Matrix Units	USEPA Target Shallow Gas Concentrations (risk=1x10-6)* ug/m3	Table C-2 2001 USEPA BASE Median for Indoor Air	Table C-3 NYSDOH 1997: Control Home Database Median for Indoor Air	Table C-5 2005 Health Effects Insitute Median for	Ambient Air 7/30/09 Air ug/m3	Ambient Air Lab 7/30/09 Air ug/m3	SG-1 7/30/09 Air ug/m3
Volatile Organic Compounds							
1,2,4-Trimethylbenzene	6	2.8	5	--	< 0.76	< 0.76	***840***
1,3,5-Trimethylbenzene	6	<1.5	<5	--	< 0.76	< 0.76	220
Benzene	3.1	3.4	2.5	2.19	< 0.5	0.5	***240***
Chloromethane	--	2.5	<1	--	1.0	1.1	< 7.1
Dichlorodifluoromethane (Freon 12)	2,000	6.7	<1	--	2.3	2.4	< 17.0
Ethyl Benzene	22	1.4	<4.4	1.46	< 0.67	< 0.67	***630***
m,p-Xylene	7,000	6.9	5	4.07	< 0.67	0.68	***2,600***
Toluene	4,000	15.7	13	10.1	1.5	1.8	***3,400***
Trichlorofluoromethane (Freon 11)	700	3.9	<1	--	1.4	1.4	< 19.0

Notes:

** From New York State Department of Health Center of Health Bureau of Environment Exposure Investigation

* See USEPA Office of Solid Waste and Emergency Response (OSWER) Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), EPA530-D-02-004, Table 2C; November 2002.

Exceeds USPEA OSWER Guidance

Exceeds either Table C-2 2001 USEPA BASE Median for Indoor Air; Table C-3 NYSDOH 1997 Control Home Database Median for Indoor Air; Table C-5 2005 Health Effects Institue Median for Indoor Air

Only detections are listed. See complete analytical package for a list of all compounds analyzed.

TABLE C3B - February 2010 Sub-Slab Soil Vapor Data

Remedial Investigation Work Plan

Summary of Soil Vapor Analytical Results

3375 Neptune Avenue

Brooklyn, New York

LOCATION SAMPLING DATE LAB SAMPLE ID MATRIX UNITS	C-2 EPA 2001: BASE Database Median for Indoor Air ug/m^3	Helen Dawson EPA Database ug/m^3	NYSDOH Table 3.1 Air Guideline Value ug/m^3	SS-3 2/4/2010 L1001891-03 Air ug/m^3	Q	SS-2 2/4/2010 L1001891-04 Air ug/m^3	Q
Volatile Organics in Air (Low Level)							
Acetone	<1.2	-	-	*203*		*11.9*	
Benzene	3.4	4.7	-	34	U	*9.82*	
Carbon disulfide	<1.3	-	-	*38.7*		3.11	U
Isopropanol	-	-	-	142		6.14	U
Tetrachloroethene	3	1.4	100	***25000***		***2180***	
Trichloroethene	<1.4	0.1	5	***289***		***25.8***	
Methanol	-	-	-	2470		32.7	U

Notes:

Groundwater and Soils (Subsurface Vapor Intrusion Guidance), EPA530-D-02-004, Table 2C; November 2002.

Excceds NYSDOH Table 3.1 Guidance

Exceeds USEPA Helen Dawson Guidance

Exceeds Table C-2 2001 USEPA BASE Median for Indoor Air

Only detections are listed. See complete analytical package for a list of all compounds analyzed.

U - Not detected

"-" - Not supplied

TABLE C3C - February 2010 Ambient Air Quality Data

Remedial Investigation Work Plan

Summary of Ambient Air Quality Analytical Results

3375 Neptune Avenue

Brooklyn, New York

LOCATION SAMPLING DATE LAB SAMPLE ID MATRIX Units	C-2 EPA 2001: BASE Database Median for Outdoor Air ug/m^3	C-2 EPA 2001: BASE Database Median for Indoor Air ug/m^3	Helen Dawson EPA Database ug/m^3	GZA-OD 2/4/2010 L1001891-01 Air ug/m^3	Q	GZA-ID 2/4/2010 L1001891-02 Air ug/m^3	Q
Volatile Organics in Air							
Acetone	22.5	<1.2	-	6.16		***7.19***	
Chloromethane	2.3	2.5	-	1.26		1.24	
Dichlorodifluoromethane	4.4	6.7	-	2.62		2.56	
Ethanol	24.5	79	-	4.71	U	***97.7***	
Isopropanol	-	-	-	1.23	U	251	E
Propylene	-	-	-	0.344	U	0.471	
Toluene	9.6	15.7	25	0.753	U	0.761	
Trichlorofluoromethane	<1.8	3.9	-	1.34		***11.1***	
Pentane	-	-	-	0.652		1.37	
Methanol	-	-	-	6.55	U	12.6	
Butane	-	-	-	1.32		2.59	

Notes:

Exceeds Table C-2 2001 USEPA BASE Median for Indoor Air;

Only detections are listed. See complete analytical package for a list of all compounds analyzed.

U - Not Detected

E - Concentration of analyte exceeds the range of the calibration curve and/or linear range of the instrument.

ID - Indoor Data

OD - Outdoor Data

"-" - Not supplied

TABLE C3D - October 2011 Sub-Slab Soil Vavpor Data
Remedial Investigation Work Plan
Mobile Laboratory Soil Vapor Sample Results
Bay Park One
3375 Neptune Avenue
Brooklyn, New York

DATE	Units	Sample Point	Results[2]		
			Trans[1]	TCE[1]	PCE[1]
10/20/2011	ug/m^3	SV-4	ND	610	64,500
10/21/2011	ug/m^3	SV-4	ND	680	68,000
10/21/2011	ug/m^3	SV-4 Post Summa	ND	730	76,300
10/20/2011	ug/m^3	SV-5	ND	690	38,700
10/20/2011	ug/m^3	SV-6	ND	150	17,950
10/20/2011	ug/m^3	SV-7	ND	ND	4,160
10/21/2011	ug/m^3	SV-7	ND	ND	3,370
10/21/2011	ug/m^3	SV-7 Post Summa	ND	ND	4,490
10/20/2011	ug/m^3	SV-8	ND	ND	3,100
10/20/2011	ug/m^3	SV-9	ND	ND	1,450
10/20/2011	ug/m^3	SV-10	ND	ND	180
10/21/2011	ug/m^3	SV-10 Post Summa	ND	ND	113
10/20/2011	ug/m^3	SV-11	ND	ND	280
10/20/2011	ug/m^3	SV-12	ND	ND	2,320
10/21/2011	ug/m^3	SV-13	ND	ND	9,200
10/21/2011	ug/m^3	SV-13 Dup	ND	ND	12,800
10/21/2011	ug/m^3	SV-14	ND	ND	2,120
10/21/2011	ug/m^3	SV-15	ND	ND	2,270
10/21/2011	ug/m^3	SV-16	ND	ND	280
10/21/2011	ug/m^3	SV-17	ND	ND	32
10/21/2011	ug/m^3	SV-18	ND	ND	7,200
10/21/2011	ug/m^3	SV-19	ND	ND	480

Notes:

(shaded) Concentrations were measured at concentrations above or below the calibration curve.

[1] - Method 8021 modified for vapor

[2] - Method Detection Limit (MDL) is 10 ug/L^3

Dup - Duplicate

ND - Sample results were below the method detection limit.

PCE - Tetrachloroethelene

Post Summa - Mobile laboratory resuls oa a field sample collected after laboratory sample collection.

TCE - Trichloroethelene

Trans - Trans-1,2 Dichloroethene

ug/m^3 - micrograms per cubic meter

TABLE C3E - October 2011 Sub-Slab Soil Vavpor Data

Remedial Investigation Work Plan
Fixed Laboratory Soil Vapor Sample Results
Bay Park One
3375 Neptune Avenue
Brooklyn, New York

LOCATION		SV-4		SV-4		SV-7		SV-10		SV-10	
SAMPLING DATE		10/21/2011		10/21/2011		10/21/2011		10/21/2011		10/21/2011	
LAB SAMPLE ID		L1117479-02		L1117479-02 R1		L1117479-03		L1117479-01		L1117479-01 R1	
Volatile Organics in Air	Units	Results	Qual	Results	Qual	Results	Qual	Results	Qual	Results	Qual
Dichlorodifluoromethane	ug/m3	62.8	U	---	---	9.89	U	9.74	---	---	---
Butane	ug/m3	30.2	U	---	---	4.75	U	5.7	---	---	---
Ethanol	ug/m3	298	U	---	---	47.1	U	27.9	---	---	---
Acetone	ug/m3	150	U	---	---	23.8	U	264	E	256	---
Trichlorofluoromethane	ug/m3	71.4	U	---	---	46	---	27.1	---	---	---
Isopropanol	ug/m3	77.7	U	---	---	12.3	U	74.2	---	---	---
Pentane	ug/m3	37.5	U	---	---	5.9	U	4.13	---	---	---
Freon-113	ug/m3	97.3	U	---	---	15.3	U	1.67	---	---	---
2-Butanone	ug/m3	37.4	U	---	---	5.9	U	4.07	---	---	---
Chloroform	ug/m3	62	U	---	---	9.77	U	18.5	---	---	---
n-Hexane	ug/m3	44.8	U	---	---	7.05	U	2.07	---	---	---
Benzene	ug/m3	40.6	U	---	---	6.39	U	8.21	---	---	---
Cyclohexane	ug/m3	43.7	U	---	---	6.88	U	6.95	---	---	---
Trichloroethene	ug/m3	392	---	---	---	32.8	---	1.21	---	---	---
Heptane	ug/m3	52	U	---	---	8.2	U	0.906	---	---	---
Toluene	ug/m3	47.9	U	---	---	9.08	---	18.1	---	---	---
Tetrachloroethene	ug/m3	54,000	E	55,000	---	3720	---	57.9	---	---	---
Ethylbenzene	ug/m3	55.2	U	---	---	8.69	U	3.62	---	---	---
p/m-Xylene	ug/m3	110	U	---	---	17.4	U	12.6	---	---	---
o-Xylene	ug/m3	55.2	U	---	---	8.69	U	4.78	---	---	---
4-Ethyltoluene	ug/m3	62.4	U	---	---	9.83	U	1.96	---	---	---
1,3,5-Trimethybenzene	ug/m3	62.4	U	---	---	9.83	U	1.87	---	---	---
1,2,4-Trimethylbenzene	ug/m3	62.4	U	---	---	9.83	U	7.72	---	---	---
1,2,3-Trimethylbenzene	ug/m3	62.4	U	---	---	9.83	U	2.62	---	---	---
Undecane	ug/m3	81.2	U	---	---	12.8	U	6.09	---	---	---
Dodecane	ug/m3	88.4	U	---	---	13.9	U	5.18	---	---	---

Notes:

ug/m^3 - micrograms per cubic meter

D - The reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.

E - Indicates the analyte ‘s concentration exceeds the calibrated range of the instrument for that specific analysis.

J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL and the concentration given is an approximate value.

Qual - Laboratory Qualifier

U - The compound was not detected at the indicated concentration.

TABLE C3F - October 2012 Sub-Slab Soil Vavpor Data
Remedial Investigation Work Plan
SSDS Pilot Test Sampling Results
Bay Park One
3375 Neptune Avenue
Brooklyn, New York

LOCATION	Regulatory Guidance Values							PT-1		PT-2		VS-3		VS-8	
SAMPLING DATE								12/19/2012		12/19/2012		12/19/2012		12/19/2012	
LAB SAMPLE ID	1	2	3	4	5	6		L1223079-03		L1223079-04		L1223079-02		L1223079-01	
							Units	Result	Qual	Result	Qual	Result	Qual	Result	Qual
Volatile Organics in Air															
1,2,4-Trimethylbenzene	6	6.2	2.8	5	--	-	ug/m3	5.65		2.75		2.12	U	2.1	U
1,3,5-Trimethybenzene	6	6.2	<1.5	<5	--	-	ug/m3	2.13	U	2.14	U	2.12	U	2.1	U
2-Butanone		5,100					ug/m3	45.7		6.25		1.81		3.78	
4-Ethyltoluene							ug/m3	2.13	U	2.14	U	2.12	U	2.1	U
4-Methyl-2-pentanone		3,100					ug/m3	2.16		1.78	U	1.77	U	1.76	
Acetone		3,300					ug/m3	51.5		13.1		13.6		24	
Benzene	3.1	0.25	3.4	2.5	2.19	-	ug/m3	2.04		1.39	U	1.38	U	1.36	U
Chloroform	110	0.083				-	ug/m3	11.5		6.1		2.11	U	46.1	
Cyclohexane		6,200					ug/m3	1.81		1.5	U	1.49	U	1.47	U
Dichlorodifluoromethane	2,000	210	6.7	<1	--	-	ug/m3	2.57		2.6		3.64		2.55	
Ethanol							ug/m3	43.7		13.1		10.2	U	10.1	U
Ethylbenzene	22	1,100	1.4	<4.4	1.46	-	ug/m3	7.34		1.89	U	1.88	U	1.85	U
Heptane							ug/m3	3.4		1.78	U	1.77	U	1.75	U
Isopropanol							ug/m3	17.6		3.52		2.65	U	2.63	U
Methyl tert butyl ether		7.4					ug/m3	1.56	U	1.57	U	1.56	U	1.54	U
n-Hexane		210					ug/m3	4.23		1.53	U	1.52	U	1.5	U
o-Xylene	7,000					-	ug/m3	10.4		1.89	U	1.88	U	1.85	U
p/m-Xylene	7,000		6.9	5	4.07	-	ug/m3	28.1		3.78	U	3.75	U	5.39	
Tetrachloroethene (PCE)	810	0.32				100	ug/m3	**500**		57.5		92.2		28.4	
Tetrahydrofuran		0.99					ug/m3	9.67		1.44		1.27	U	1.26	U
Toluene	4,000	400	15.7	13	10.1	-	ug/m3	29.9		4.52		2.49		3	
Trichlorofluoromethane	700	730	3.9	<1	--	-	ug/m3	4.29		3.51		4.52		2.99	
Total VOCs								674.51		88.78		102.85		88.43	

Notes:

7.92	Exceeds the respective USEPA Target Shallow Gas Concentrations Guidance Value
500	Exceeds the respective New York State Department of Health Air Guidance Value

Regulatory Guidance Values

1 - USEPA Target Shallow Gas Concentrations (risk=1x10-6)* ug/m3
2 - EPA-Ambient Air PRGs Criteria per Region 9 PRG Table, October 2004.
3 - Table C-2 2001 USEPA BASE Median for Indoor Air ug/m3**
4 - Table C-3 NYSDOH 1997: Control Home Database Median for Indoor Air ug/m3**
5 - Table C-5 2005 Health Effects Institute Median for Indoor Air ug/m3**
6 - NYSDOH Air Guidance Value

APPENDIX D
CONEY ISLAND W.P.C.P DRAINAGE AREA SHEET 8 OF 52

NO.	DATE	DESCRIPTIONS	APP'D
		REVISIONS	

SCALE IN FEET
150 100 50 0 150 300

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF SEWERS

CONEY ISLAND W.P.C.P. DRAINAGE AREA
BOROUGH OF BROOKLYN
EXISTING SYSTEMS
COMBINED, SANITARY AND STORM WATER SEWERS

DATE

SHEET 8 OF 52

APPENDIX E
HEALTH AND SAFETY PLAN

GZA SITE-SPECIFIC HEALTH, SAFETY & ACCIDENT PREVENTION PLAN

1. CLIENT/SITE/PROJECT INFORMATION		
Job/Project #: 41.0161826.60		
Client: Starrett Corporation		
Site Address: 33-75 Neptune Avenue, Brooklyn, New York		
Site Description, Work Environment: Commercial Space with Promenade and Low Income Housing		
Estimated Start Date: July 2013	Estimated Finish Date: June 2014	Hours of Work: 8 am – 5 pm

2. EMERGENCY INFORMATION		
Hospital Name & Address: New York Methodist Hospital 3049 Ocean Parkway, Brooklyn, New York		Hospital #: (718) 265-0005
Directions and Street Map of Route to Nearest Hospital Attached: ☒ Yes (required)		
Fire #: 911	Ambulance #: 911	Police #: 911
Other Emergency Contact(s): Clifford Bell		Phone #'s: 646-483-6250
Location of Nearest Phone: Cell Phone on Person		
Site Specific Emergency Preparedness/Response Procedures/Concerns: Evacuate to grass area north of the Site. Contact Alex Santiogo Facilities Manager ((347) 579-0122		
IMPORTANT: All incidents (injuries, fires, chemical spills, property damage, and significant near misses) must be reported within 24-hours to your EHS Coordinator and the EHS Director and Insurance Coordinator, per GZA Incident Reporting Policy # 03-1005. Incident Report/Analysis form (HASP Attachment C) located on GZA Intranet under "Health and Safety," "Incident Report/Analysis Form"		

3. SUB-SURFACE WORK, UNDERGROUND UTILITY LOCATION	
Will subsurface explorations be conducted as part of this work? ☒ Yes ☐ No	
Site property ownership where underground explorations will be conducted on:	Public Access Property ☒ Yes ☐ No Private Property ☒ Yes ☐ No
Have Necessary Underground Utility Notifications For Subsurface Work Been Made?	☐ Yes - ☒ Yet to be conducted - ☐ N/A
Specify Clearance Date & Time, Dig Safe Clearance I.D. #, And Other Relevant Information: Driller's will provide the location ticket reference number prior to the start of wok. Consult the utility map at drilling locations.	
IMPORTANT! For subsurface work, prior to the initiation of ground penetrating activities, GZA personnel to assess whether the underground utility clearance (UUC) process has been completed in an manner that appears acceptable, based on participation/ confirmation by other responsible parties (utility companies, subcontractor, client, owner, etc.), for the following:	

Electric:	☐ Yes	☐ No	☐ NA	☐ Other________
Fuel (gas, petroleum, steam):	☐ Yes	☐ No	☐ NA	☐ Other________
Communication:	☐ Yes	☐ No	☐ NA	☐ Other________
Water:	☐ Yes	☐ No	☐ NA	☐ Other________
Sewer:	☐ Yes	☐ No	☐ NA	☐ Other________
Other:________	☐ Yes	☐ No	☐ NA	☐ Other________

Comments: Please perform a Site reconnaissance for the above utilities at all drilling location prior the Start of work.

4. SCOPE OF WORK	
Any OSHA PERMIT-REQUIRED CONFINED SPACE entry? ☐ **YES** ☒ **NO** If yes, use Site Specific H&S Plan/Confined Space Entry Permit for that portion of the work	**Any INDOOR fieldwork?** ☒ **YES** ☐ **NO** If yes, explain:
General project description, and phase(s) or work to which this H&S Plan applies.	Soil, groundwater and vapor sampling through drilling points including installed groundwater wells.
Specific Tasks Performed by GZA:	Over see drilling point installation; soil, groundwater, and vapor sampling.
Concurrent Tasks to be Performed by GZA Subcontractors (List Subcontractors by Name):	Drilling contractor to advance soil borings, install vapor and groundwater points.
Concurrent Tasks to be Performed by Others:	N/A
IMPORTANT! Subcontractors may use GZA's plan for general informational purposes only. Each subcontractor is responsible for determining the adequacy and applicability of the information herein to its own activities on site. Each subcontractor engaged by GZA is responsible for all matters relating to the H&S of its personnel and equipment in performance of its work, as well as obligations for compliance with H&S regulations applicable to its work. GZA subcontractors are subject to GZA's review, recommendations, and contractual requirements pertaining to H&S.	

5. DOCUMENTATION TO BE COMPLETED

- **Initial Site Health and Safety Briefing Record** (Attachment A) must be completed prior to the initiation of on-site activities, with any change in the scope of work, or a change in the Site or weather working conditions of each GZA Employee and provided to each GZA subcontractor.
- **Daily Safety Meeting** (Attachment B) must be completed at the initiation of daily on-site activities, and reviewed or updated with any change in the scope of work, or a change in the Site or weather working conditions, until the completion of GZA on-site activities.
- **Incident Analysis Form** (Attachment C) must be completed for each accident, injury, incident, near miss.
- **Route to Hospital** (Attachment D) must be completed prior to the start of each job.
- **Review of the appropriate Task Hazard Analyses.**

6. SITE-SPECIFIC OVERVIEW OF H&S HAZARDS/ SAFETY MEASURES (Based on Hazard Assessment, Section 11)

For the hazards identified by the Hazard Assessment checklist, describe the specific nature of that hazard as it relates to your jobsite, and describe the safety measures to be implemented for worker protection. Use brief abstract statements or more detailed narrative as may be appropriate.

ON-SITE HAZARDS:	THA NUMBER	SAFETY MEASURES:
Slip, Trips and Falls	NA	Most Common and Costly. Maintain an orderly site and good housekeeping. Keep foot paths clear of tripping hazards (hoses, tools, etc.). Use 3 points of contact when climbing on or off equipment.
Urban Fill/Petroleum	04.01, 04.02, 04.07, and 04.08	Wear nitrile gloves while collecting samples; keep hands clean.
Lifting Hazards	NA	Use help to lift anything above 50 pounds.
Noise, vibration and flying object hazards	04.01, 04.02, 04.07, and 04.08	Wear hearing, side impact eye protection and hard hat. Use hand signals and eye contact when unable to communicate verbally.
Operator Hazards	04.01	Use hand signals and eye contact when unable to communicate verbally. Operator to display hands off the controls if another person is to enter the operator's work area.
General unknown or unexpected	N/A	Communicate Job Hazard Analysis and Lessons Learned

conditions		information to returning personnel.
		Do not assume that the Site has been maintained for safety.
		Coordinate site visit with other personnel not present on site, so that they aware of your location and can provide assistance if needed.
		Wear appropriate Personal Protective Equipment (PPE) as required by the Site Specific Health and Safety Plan (e.g., steel toe boots, hearing protection, and work clothes).
		Follow procedures identified in the HASP for required training, medical monitoring and work practices.

7. HEALTH AND SAFETY EQUIPMENT AND CONTROLS

AIR MONITORING INSTRUMENTS
(ensure instruments are calibrated)

- ☒ PID Type: MiniRae Lamp Energy: 10.6 eV
- ☐ FID Type:
- ☐ Carbon Monoxide Meter
- ☐ Hydrogen Sulfide Meter
- ☐ O_2/LEL Meter
- ☐ Particulate (Dust) Meter
- ☐ Calibration Gas Type: Isobutylene
- ☐ Others:

Discuss/Clarify, as Appropriate:

OTHER H&S EQUIPMENT & GEAR

- ☐ Fire Extinguisher
- ☒ Caution Tape
- ☒ Traffic Cones or Stanchions
- ☐ Warning Signs or Placards
- ☒ Decontamination Buckets, Brushes, etc.
- ☐ Portable Ground Fault Interrupter (GFI)
- ☐ Lock-out/Tag-out Equipment
- ☐ Ventilation Equipment
- ☐ Others:

Discuss/Clarify, as Appropriate:
Set up an Exclusion Zone to protect public safety and to prevent vandalism to temporary sampling points.

PERSONAL PROTECTIVE EQUIPMENT

- ☐ Respirator Type:
- ☐ Respirator-Cartridge Type:
- ☒ Hardhat
- ☒ Outer Gloves Type: Nitrile
- ☐ Inner Gloves Type:
- ☒ Steel-toed boots/shoes
- ☐ Coveralls Type:
- ☐ Outer Boots Type:
- ☒ Eye Protection with side shields
- ☐ Face Shield
- ☒ Traffic Vest
- ☐ Personal Flotation Device (PFD)
- ☐ Fire Retardant Clothing
- ☐ EH (Electrical Hazard) Rated Boots, Gloves, etc.
- ☒ Noise/Hearing Protection
- ☐ Others:

Discuss/Clarify, as Appropriate:

8. AIR MONITORING ACTION LEVELS

Is air monitoring to be performed for this project? Yes ☒ No ☐

Make sure air monitoring instruments are in working order and have been calibrated prior to use. Depending on project-specific requirements, periodic field calibration checks may be necessary during the day of instrument use.

A. ACTION LEVELS FOR OXYGEN DEFICIENCY AND EXPLOSIVE ATMOSPHERIC HAZARDS

(Action levels apply to occupied work space in general work area.)

☐ **Applicable, See Below.** ☒ **Not Applicable**

Parameter	**Response Actions for Elevated Airborne Hazards**
Oxygen	At 19.5% or below, exit area, provide adequate ventilation, or proceed to Level B, or discontinue activities Verify presence of adequate oxygen (approx. 12% or more) before taking readings with LEL meter. If oxygen levels are below 12%, LEL meter readings are not valid.
LEL	Less than 10% LEL - Continue working, continue to monitor LEL levels Greater than or Equal to 10% LEL- Discontinue work operation and immediately withdraw from area. Resume work activities ONLY after LEL readings have been reduced to less than 10% through passive dissipation, or through active vapor control measures.

B. ACTION LEVELS FOR INHALATION OF TOXIC/HAZARDOUS SUBSTANCES (Action levels are for sustained breathing zone concentrations.)

☒ **Applicable, See Below.** ☐ **Not Applicable**

Air Quality Parameters (Check all that apply)	**Remain in Level D or Modified D**	**Response Actions for Elevated Airborne Hazards**
☒ VOCs	0 to 5 ppm	5 ppm to 25 ppm: Proceed to Level C, or Ventilate, or Discontinue Activities > 25 ppm: Proceed to Level B, or, Ventilate, or Discontinue Activities
☐ Carbon Monoxide	0 to 35 ppm	At greater than 35 ppm, exit area, provide adequate ventilation, or proceed to Level B, or discontinue activities.
☐ Hydrogen Sulfide	0 to 10 ppm	At greater than 10 ppm, exit area, provide adequate ventilation, or proceed to Level B, or discontinue activities
☐ Dust	0 to mg/m^3	
☐		
☐		

C. SPECIAL INSTRUCTIONS/COMMENTS REGARDING AIR MONITORING (IF APPLICABLE)

9. H&S TRAINING/QUALIFICATIONS FOR FIELD PERSONNEL

☒ Project-Specific H&S Orientation Required for All Projects and All Field Staff Including Subcontractors
☒ OSHA 40-Hr. Hazwoper/8-Hr. Refreshers
☐ Hazard Communication (for project-specific chemical products)
☒ First Aid/CPR (at least one individual on site)
☐ General Construction Safety Training
☐ Lock-out/Tag-out Training
☐ Electrical Safety Training
☐ Blood-borne Pathogen Training

☐ Fall Protection Training
☐ Trenching & Excavation
Others:
☐
☐
☐
☐
☐
☐
☐

Discuss/Clarify, as needed:

10. PROJECT PERSONNEL - ROLES AND RESPONSIBILITIES

GZA ON-SITE PERSONNEL:

Name	Project Title/Assigned Role	Telephone Numbers
TBD	Site Supervisor	work: cell:
TBD	Site Safety Officer	work: cell:
TBD	First Aid Personnel	work: cell:

Site Supervisors and Project Managers (SS/PM): Responsibility for compliance with GZA Health and Safety programs, pol procedures and applicable laws and regulations is shared by all GZA management and supervisory personnel. This includes the for effective oversight and supervision of project staff necessary to control the Health and Safety aspects of GZA on-site activiti
Site Safety Officer (SSO): The SSO is responsible for implementation of the Site Specific Health and Safety Plan.
First Aid Personnel: At least one individual designated by GZA who has current training and certification in basic first ai cardiopulmonary resuscitation (CPR) must be present during on-site activities involving multiple GZA personnel.

OTHER PROJECT PERSONNEL:

Name	Project Title/Assigned Role	Telephone Numbers
Dave Winslow	Associate/Principal-in-Charge	Work: 973-774-3300 ex3307 Cell: 347-242-7107
Clifford Bell	Project Manager	Work: 212-594-8140 Cell: 646-483-6250
Brett Engard	Health and Safety Coordinator (HSC)	Work: 212-594-8140 Cell: 347-640-2760
Jayanti Chatterjee	GZA Director of Health and Safety	Work: 973-774-3335 Cell: 973-303-9796

Principal-in-Charge: Responsible of overall project oversight, including responsibility for Health and Safety.
Project Manager: Responsible for day-to-day project management, including Health and Safety.
Health and Safety Coordinator: General Health and Safety guidance and assistance.
Director of Health and Safety: H &S technical and regulatory guidance, assistance regarding GZA H&S policies and procedures.

11. HAZARD ASSESSMENT (CHECK ALL THAT APPLY)

A. GENERAL FIELDWORK HAZARDS: (Investigative, remedial or construction-related work; environmental, geological, geotechnical, geo-civil, wetland/upland/woodland work, etc.)

☐ Confined Space Entry – USE CONFINED SPACE H&S PLAN/ENTRY PERMIT (tanks, vessels, tunnels, misc. equipment enclosures)

☐ Enclosed Spaces (Non-Confined Spaces) – (trenches, basements, sub-basements, attics)

☒ General Housekeeping, Slip/Trip/Fall Hazards

☐ Unsanitary/Infectious Hazards (wastewater, sewage, landfill, medical waste, blood borne pathogens)

☐ Poisonous Plants, Plant Allergies

☐ Biting/Stinging Insects, Spiders, Lyme Disease

☐ Animal Hazards (snakes/rats/vermin, feral dogs/cats, urban dogs, wild animals, etc.)

☐ Water/Wetland Hazards (boating, barge, raft, wading, diving, ice/thin ice, hazardous currents, shoreline/tidewater hazards, dam release/flash floods, river/stream crossing, mud/silt, etc.)

☐ Remote Location/Navigation/Orientation Hazards (need for map/compass/GPS, limited communication/cell phone coverage, getting lost, distance from medical facility, lack of potable water)

☐ Rough Terrain Hazards (ledges, cliffs, high altitude, climbing, strenuous hiking, rip rap, holes, pits, mine shaft/sink holes, avalanche, or falling rocks)

☐ Fall Hazards (ladders, stairs, scaffolds, towers, elevated work platforms, retaining walls, rope access work, use of areal lifts, pits, holes, etc.)

☐ Weather/Seasonal Hazards (heat/cold stress, sunburn, dehydration, wind/weather/lightning, snow/ice, hunting season)

☐ Roadway/Highway/Transportation Corridor Hazards (moving vehicles, traffic safety, railroad hazards, airport traffic)

☐ Motor Vehicle Operation Hazards (towing, hauling, transporting loads, etc.)

☒ Pedestrians/General Public (any need for special measures to protect bystanders, secure work area during off hours)

☒ Construction/Heavy Equipment, (operation of, or working near, loaders, excavator, backhoe, drill rig, GeoProbe, cranes, etc.)

☐ Overhead Hazards (Falling tools, equipment, debris, rocks, tree limbs, etc.)

☒ Hand Tools/Power Tools/Equipment (tool use hazards, chips, blades, projectiles, electrical generators, compressors, hoists, etc.)

☐ Material Handling/Storage Hazards (manual handling, lifting, repetitive motion, mechanical transport, ropes/slings/chains, rigging, stacking, etc.)

☐ Gas Welding/Cutting, Arc Welding/Cutting

☐ Electrical Hazards (electrical equipment 120 volts or greater, low voltage electric shock hazards, etc.)

☐ Fire and/or Explosion Hazards (compressed gas, fuels, flammable materials, heat-producing equipment, unexploded ordnance, explosives, etc.)

☒ Noise and Noise Source Awareness

☒ Utility-Related Hazards (underground/overhead electric utilities, gas pipelines, water, sewer, fiber optic, etc.)

☐ Trenching & Excavation, Test Pits and Related Hazards

A. General Fieldwork Hazards, Continued

☐ Unexploded Ordnance and Related Hazards

☐ Long-Distance/Overnight Travel (distance driving/fatigue, unfamiliar territory, unfamiliar rental vehicles, etc.)

☒ Security/Personal Safety/Criminal Activity/Theft Concerns, High Crime Area

☐ Working Alone (in a manner requiring special considerations, notifications, etc.)

☐ Lack of Visibility (night work, poor lighting, etc)

☐ Chemical/Toxicity/Irritant Hazards (See Part III for details)

☐ Other:

B. BUILDING-RELATED FIELDWORK HAZARDS (Work in operating or abandoned facilities, including temporary remediation system facilities, or during construction/demolition/renovation/abatement activities)

☐ No Building-Related Work

☒ Operating, ☐ Abandoned/Vacant Building, ☐ Active Construction Site

☐ Confined Space Entry – USE CONFINED SPACE H&S PLAN/ENTRY PERMIT

☐ Enclosed Spaces (Non-Confined Spaces) – (trenches, basements, sub-basements, attics)

☐ General Environmental Conditions (degraded walking/working surfaces, housekeeping, poor lighting, too hot, too cold, etc., unsanitary)

☐ Fire, Hot Work, Explosion (welding/cutting, compressed gases, flammable/combustible liquids)

☐ Biological (mold, bird or bat guano, medical waste, insects, vermin, unsanitary, sewerage, waste water, etc.)

☐ Ionizing/Non-Ionizing Radiation (radioactive materials, x-ray equipment, lasers, UV/IR from welding/process equipment, microwave, magnetic fields, radio frequency hazards)

☐ Fall Hazards (open pits, elevator shafts, working on roof, elevated work areas, elevated equipment access, stairs, ladders, scaffolding, powered boom lifts/scissors lifts)

☐ Electrical (operating equipment, power tools, extension cords, GFI, wet locations, abandoned electrical equip, batteries, capacitors, static electricity, arc flash/arc blast hazards, high voltage, need for lockout)

☐ Stored Energy Hazards (pneumatic/hydraulic pressure, hot surfaces, etc. including remediation injection wells)

☐ Mechanical/Moving Equipment/Machinery (cranes, operating equipment, conveyors, lockout hazards, robotic equipment, machine guarding hazards)

☐ Traffic/Vehicles/Pedestrian (moving fork trucks, parking lot, access road way, loading dock)

☒ Noise, Vibration Hazards

☐ Structural Hazards (unsafe floors/stairways/roof, deteriorated building components)

☐ Demolition/Renovation (overhead hazards, unstable building structures, heavy equipment, restricted access areas, etc.)

☐ Chemical/Toxicity/Irritant Hazards (See Part III for details)

☒ Other:

Indoor work may be performed in occupied commercial retail and residential areas of the building. Need to manage walkways for public access and safety from slip, trips, and falls, as well as vandalism and damage to temporary sampling points.

C. Chemical/Exposure Hazards

☐ No Chemical Hazards Anticipated

☐ Chemicals Subject to OSHA Hazard Communication (for commercial chemical products, attach MSDSs if applicable)

☒ Soil and/or Groundwater Contaminants

☐ Drums and Buried Drums

☐ Former Chemical Lagoon/Disposal Site

☒ Miscellaneous Residual "Urban Fill" Hazards and Similar Residual Hazard Conditions

☐ Contaminated Building Surfaces, Paint, Settled Dust, Accumulated Hazardous Substances

☐ Vapor/Fume/Particulate from Industrial/ Manufacturing or Welding/Cutting/Hot Processes

☐ Containerized Waste, Chemicals in Piping & Process Equipment

☐ Emissions from Gasoline-, Diesel-, Propane-fired Engine, Heater, Similar Equipment

☐ Spill, Potential for Spill

☐ General Work Site Airborne Dust Hazards

☐ Volatile Organic Compounds (VOCs), BTEX

☒ Chlorinated Organic Compounds

☒ Fuel Oil, Gasoline, Petroleum Products, Waste Oil

☐ Asbestos

☐ Oxygen Deficiency, Asphyxiation Hazards

☐ Methane Hazards

☐ Sulfides, Hydrogen Sulfide (H_2S)

☐ Cyanides, Hydrogen Cyanide (HCN)

☐ Carbon Monoxide

☐ Herbicides, Pesticide, Fungicide, Animal Poisons

☐ Metals, Metal Compounds (esp. heavy metals, toxic metals, etc.)

☐ Corrosives, Acids, Caustics, Strong Irritants

☐ Polychlorinated Biphenyls (PCBs)

☐ Polycyclic Aromatic Hydrocarbons (PAHs)

☐ Compressed Gases

☐ Cryogenic Hazard (hazards of extremely low temperature materials)

☐ Flammable/Combustible Liquids

☐ Explosives, Explosive Dust, Unexploded Ordnance, etc.

☐ Radiation Hazards (radioactive sealed/open source, x-rays, ultra violet, infrared, radio-frequency, etc.)

☐ Sensitizers

C. CHEMICAL/EXPOSURE HAZARDS, CONTINUED

☐ Other:

12. PLAN ACKNOWLEDGEMENT AND APPROVALS

The following individuals indicate their acknowledgement and/or approval of the contents of this Site Specific H&S Plan based on their understanding of project work activities, associated hazards and the appropriateness of health and safety measures to be implemented.

Signature		Date
Prepared by:		
Project Manager:		
EHS Approval[1]:		
PIC:		

[1.] - EHS Coordinator, EHS Director, or designated H&S Plan Reviewer

Attachments:	Attachment A	Health and Safety Plan Briefing Record
	Attachment B	Daily Safety Meeting
	Attachment C	Incident Analysis/Reporting Form
	Attachment D	Route to Hospital
	Attachment E	Task Hazard Analyses and / or GZA Policy, as required

Attach additional information if required.
(Revised March 2012)

ATTACHMENT A
INITIAL HEALTH AND SAFETY PLAN BRIEFING RECORD

Project: ___________________________________ Job No.:____________________________

Project Location: ____

PM: ______________________________________ Phone No.:____________________________

PIC: ______________________________________ Phone No.:____________________________

The undersigned have attended a Health and Safety briefing, consisting of a review of the provisions of the Site Specific H&S Plan, and/or appropriate prior H&S events or concerns, and/or review of anticipated H&S concerns and safety measures for the project.

SUMMARY OF HEALTH AND SAFETY TOPICS COVERED	
	Project Specific Information and Site History
	Site Specific Hazards
	Scope of Work
	Roles and Responsibilities
	H&S Equipment and Site Control Measures
	Evacuation Route, Assembly Point, and Route to Hospital

NAME (printed)	SIGNATURE	COMPANY	DATE

Conducted by: ____ Date: ______________________

Conducted by: ____ Date: ______________________

Conducted by: ____ Date: ______________________

- *USE ADDITIONAL SHEETS AS NECESSACARY*

GZA GeoEnvironmental
104 West 29th Street, 10th Floor
New York, New York, 10001

Phone: 212-594-8140
Fax: 212-279-8180

DAILY SAFETY MEETING

Project Name: ____________________ Date: __________

Project Number: ____________________ Presented By: __________

Check the Applicable/Reviewed Information:

- ☐ safety is everyone's responsibility
- ☐ site health and safety plan reviewed
- ☐ safety glasses, hard hat, safety boots
- ☐ employee Right-to-Know/MSDS location
- ☐ vehicle safety and driving/road conditions
- ☐ equipment and machinery familiarization
- ☐ portable tool safety and awareness
- ☐ update HASP/THA for new tasks or changing conditions
- ☐ first aid, safety and PPE location
- ☐ sharp objects, rebar and scrap metal hazards
- ☐ latex gloves inner/nitrite gloves outer
- ☐ open pits, excavations and trenching hazards
- ☐ excavation/trenching inspections/documentation
- ☐ full face respirators with proper cartridges
- ☐ upgrade to Level C at: PID (10.6 eV)>____ppm
- ☐ work stoppage at: PID (10.6 eV)>___ppm, % LEL >10%
- ☐ slips, trips and falls
- ☐ strains and sprains
- ☐ anticipated visitors
- ☐ electrical ground fault
- ☐ public safety and fences
- ☐ excavator swing and loading
- ☐ ordering site and housekeeping
- ☐ smoking in designated areas
- ☐ leather gloves for protection
- ☐ effects of the night before? Rain or snow?
- ☐ vibration related injuries
- ☐ noise hazards
- ☐ confined space entry
- ☐ hot work permits
- ☐ overhead utility locations cleared?
- ☐ all underground utilities cleared?
- ☐ daily work scope reviewed
- ☐ fire extinguisher locations
- ☐ eye wash station locations
- ☐ directions to hospital
- ☐ heat and cold stress
- ☐ decontamination steps
- ☐ review emergency protocol
- ☐ parking and laydown area
- ☐ vehicle backing up hazards
- ☐ accidents can be costly
- ☐ no horseplay
- ☐ dust and vapor control
- ☐ refueling procedures
- ☐ flying debris hazards
- ☐ poison ivy/oak/sumac
- ☐ Flex-N-Stretch performed

Other Health and Safety Topics Discovered, Comments, Discussions or Action Items

____

____

NAME	SIGNATURE	COMPANY

- Conduct a daily safety meeting prior to beginning of each day.
- Complete this form, obtain signatures and file with the Daily Field Report.

INCIDENT/ACCIDENT REPORT and ANALYSIS

For initial report to be submitted within 24 hours of the incident, fill in as much information as available in Sections 1 through 4, and submit to your EHS Coordinator, EHS Director (J. Chatterjee), and Property and Casualty Insurance Manager (S.Domko). Incident analysis to be completed ASAP thereafter, and distributed as appropriate.

Initial Incident Report Prepared/Submitted by:

Click here to enter text.	Manhattan, NY	Click here to enter a date.
Name	**GZA Office**	**Date**

1. Classify Incident (select all that apply):

Choose an item.	Click here to enter text.	Choose an item.	Click here to enter text.
Choose an item.	Click here to enter text.	Choose an item.	Click here to enter text.
Choose an item.	Click here to enter text.	Choose an item.	Click here to enter text.

2. Description of Incident/Injury and Related Information (Attach photos, drawings, separate page if needed.)

a. Date of Incident: Click here to enter a date.	b. Time of Incident: Click here to enter text.
b. Address Where Incident Occurred: Click here to enter text.	
c. If incident occurred on a project work site, provide project information (project number, project name, client info., etc.): Click here to enter text. - Click here to enter text. - Click here to enter text.	
d. GZA Supervisor/Project Manager/PIC: Click here to enter text.	
e. Work conducted out of which GZA office? Choose an item.	
f. EHS Coordinator in Your Office: Click here to enter text.	
g. Detailed Description of the Incident: Click here to enter text.	

3. For Work Place Injury or Illness, Fill in this Section (otherwise, skip to Section 4),

a. Person Injured/Illness: Choose an item.	
b. Full Name of Injured: Click here to enter text.	
c. Injured Person's Mailing Address: Click here to enter text.	
d. Injured Person's Title, Department, etc. Click here to enter text.	
e. Home or Cell Phone No. Click here to enter text.	f. Date of Birth: Click here to enter text.
g. Detailed Description of Injury (be specific): Click here to enter text.	
h. Was 1st aid administered on site? Choose an item. i. If yes, who administered 1st aid, and describe actions: Click here to enter text.	
j. Did injured person receive emergency medical treatment or ambulance service? Choose an item. k. If yes, describe: Click here to enter text.	
l. Did injured receive professional medical care and/or treatment? Choose an item. m. If yes, what was the nature of care? Choose an item. n. Date of first treatment or hospitalization: Click here to enter a date. o. Identify name of clinic, hospital, doctor, specialty, (name, address, city, state, zip code, and phone): Click here to enter text. p. Describe the specific medical care or treatment (provide details, specific treatment, specific medications, over-the-counter or prescription, recommendations for follow up, etc.): Click here to enter text.	

q. Did injured person resume work on the same day of the incident? Choose an item.
r. Did injured person miss any days at work after the day of the incident? Choose an item. s. If yes, first day missed: Click here to enter a date. t. Total number of days of work missed: Click here to enter text. u. Was injured person assigned any days of restricted duty at work? Choose an item. v. If yes, first day of restricted work duty: Click here to enter a date. w. Total number of days of restricted work duty: Click here to enter text.

4. Names of Other Individuals Directly Involved or Witnesses (if any)

Name	Nature of Involvement	Contact Info. (Company, Phone No.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

5. Contributory Factors

a. What was the apparent immediate or direct cause(s) of the incident? Click here to enter text.
b. Was any safety equipment provided? Choose an item. c. If yes, was it used? Click here to enter text.
d. Was an unsafe act being performed, or was an unsafe condition present? Choose an item. e. If yes, describe: Click here to enter text.
f. Were any machine parts, tools, or equipment involved? Choose an item. g. If yes, describe: Click here to enter text. h. Was the machine part/tool/equipment in proper working order? Choose an item. i. If no, explain: Click here to enter text.
j. Was a non-GZA party (subcontractor, public, etc.) involved in or responsible for the incident? Choose an item. k. If yes, explain and provide contact information: Click here to enter text.
l. Identify possible indirect causes, root causes of the incident: Click here to enter text.
m. Other Comments: Click here to enter text.

6. Corrective Actions, Recommendations, Follow-up (Attach separate page if necessary.)

a. Describe corrective or preventative actions implemented at the time of the incident: Click here to enter text.
b. Suggest additional corrective or preventative actions that may prevent recurrence of the incident: Click here to enter text.
c. Suggest additional follow-up actions (such as corrective actions needed for similar work, safety alert, information, or guidelines to be communicated company-wide, etc.): Click here to enter text.

7. Distribution

V.P. Risk Management: Kenneth Johnston EHS Director: Jayanti Chatterjee Property and Casualty Insurance Manager: Susan Domko Regional Office Managers: William Hadge and Kim Anderson District Office Manager: Click here to enter text. Principal-in-Charge (if project-related): Click here to enter text. Project Manager (if project-related): Click here to enter text. Employee Supervisor: Click here to enter text. Other: Click here to enter text.

8. Participants in Incident Analysis/Investigation

Name	Title	Role/Involvement
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter text.	Click here to enter text.

9. Incident Analysis Completion

OSHA-Recordable? Choose an item.
Explain: Click here to enter text.

For hospitalization, have discharge papers been received? Choose an item.
Explain: Click here to enter text.

For police involvement, has police report been received? Choose an item.
Explain: Click here to enter text.

____ __________________

Susan Domko, Property & Casualty Insurance Manager Date

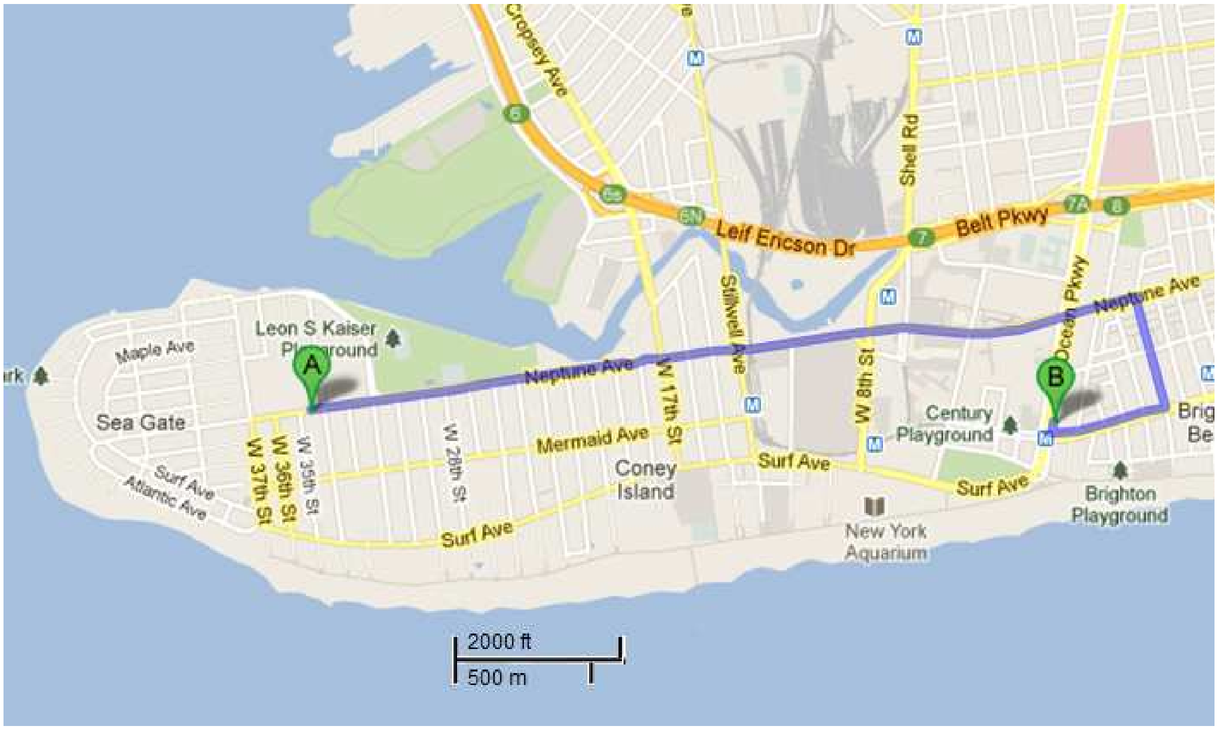
____ __________________

Jayanti Chatterjee, EHS Director Date

____ __________________

Kenneth Johnston, VP Risk Management Date

ATTACHMENT D – ROUTE TO HOSPITAL



Directions:

3375 Neptune Ave
Brooklyn, NY 11224

1. Head **east** on **Neptune Ave** toward **W 33rd St** — 1.9 mi

2. Turn right onto **Brighton 4th St** — 0.3 mi

3. Turn right onto **Brighton Beach Ave** — 0.3 mi

4. Turn right onto **Ocean Pkwy**
Destination will be on the right — 151 ft

New York Methodist Hospital
3049 Ocean Parkway
Brooklyn, NY 11235
(718) 265-0005

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Drilling Observations, Monitoring Well Installation Observation and Soil Sampling		
Analysis By: Andrew Whitsitt	**Reviewed By: Michael McCoy, CIH, CHMM**	**Approved By: Kim Anderson, Ph.D.** **Jayanti Chatterjee, CIH**
Date: September 28, 2011	**Date: November 9, 2011**	**Date: December 9, 2011**

TASK 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS AND SOIL SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Observation of Deploying of Traffic Protection Equipment by Drilling Contractor (e.g., cones, signs, etc.)	Personal injury due to vehicle traffic	Wear high visibility vest at all times when out of vehicle.
		Park in designated parking locations, or select off-road area that is firm, and without hazards. Directly inspect parking location on foot if necessary.
		Use emergency flashers or other appropriate vehicle warning system as appropriate to local conditions when parking personal or GZA vehicle.
		Use emergency flashers or other appropriate vehicle warning system when placing equipment.
		Confirm with contractor that police detail (if necessary) has been arranged to direct traffic while entering traffic safety zone.
Observation of Moving Drill Rig To Job Site and positioning at borehole by Drilling Contractor	Struck by	Stand clear of moving Drill Rig and away from any overhead utility lines until safely in position and rig has been parked properly and securely by the contractor.
		Wear high visibility vests. Make sure that the driver can see you or be aware of where you are at all times.
Observation of drilling operations and monitoring well installations	Insect Bites; Plant toxins; Poisonous Snakes. Incidental contact	Ticks carry risk of Lyme's and other Diseases. Tick season is basically any field day above 40 degrees F. • Tuck pants into long socks and apply DEET (or permethrin pre-treatment) to clothing in season to control exposure to ticks. • Check clothing for ticks frequently Check whole body immediately upon returning from field and shower.
		Know the appearance of poison ivy and poison sumac in all seasons, and if sensitive to these toxins, carry and use special cleaning soaps/solutions when thought to be exposed. Stock first aid kit with poison ivy/sumac cleaning soaps/solutions.
		Be aware of intermittent seasonal reports of mosquito borne diseases, such as West Nile disease and Eastern Equine Encephalitis (EEE), and their locations relative to your field site. Use DEET or other mosquito repellant.
		Be aware of potential cavity, suspended or ground nesting bee/wasp/hornet nests. Avoid undue disturbance or approach with appropriate safety clothing protection and netting.
		Be aware of terrain likelihood of harboring poisonous snakes in your work zone. Avoid reaching or stepping into hidden areas (such as into wood pile, rock pile, debris pile, stone wall, etc.) without pre-inspection.
	Underground utilities	Confirm that proper due diligence has been exercised for clearing utility location/clearance prior to breaking ground.
	Moving machinery, rotating parts, etc.	Maintain safe distance from rotating auger at all times. Observe operations from a safe distance.

TASK 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS AND SOIL SAMPLING

HAZARD CONTROLS		
GZA Job Tasks	**Potential Hazards**	**Controls**
		Do not wear loose fitting clothing.
		Do not touch or operate or assist with any rig operations and maintenance work.
		Make eye contact with operator before approaching equipment.
		Be alert and take proper precautions regarding slippery ground surfaces and similar hazards near rotating auger.
		Do not engage the driller or helper when drill is in operation. Work out prearranged signals to get their attention before approaching them.
		Confirm prior to drilling operations that driller and helper communicate and coordinate their actions and movements.
	Falling objects, debris	Wear steel toed boots, hardhat and safety glasses/goggles.
		Stand clear of stacked drill rods. If stack appears unstable inform driller.
	Noise	Wear appropriate hearing protection.
	Roadway/traffic hazards	Be alert at all times; never step outside traffic cones.
		Wear high visibility vests at all times.
		Be familiar with escape routes at each location.
		Regularly inspect cone pattern to ensure proper setup.
		Modify traffic protection pattern as needed in response to "close call incidents."
	Adverse weather	Assess weather conditions prior to on-site work and examine forecast for anticipated period of work.
		Dress appropriately for weather conditions (e.g., precipitation, temperature ranges over anticipated duration of field work).
		Use protective ointments such as sunscreen and chap stick, as appropriate to the field conditions.
		Be aware of the anticipated weather conditions prior to mobilization to the site. Unacceptable field work conditions are not precise, but may include site specific conditions, general location, extreme weather conditions (e.g., icing, lightening, excessive cold or wind), travel conditions, and other factors. Professional judgment is required, and personal assessment of safety must always be individually assessed.
	Slips, trips and falls	Maintain clean and sanitary work area free of tripping/slipping hazards.
		Store any hand tools used for sampling in their proper storage location when not in use.
		Assure ample space for each employee to work safely with sound footing.
		Assure ample lighting.
	Emergency Conditions	Ensure that all site workers are familiar with emergency contact procedures route to nearest hospital.
		Ensure a first aid kit is present in field vehicle.
		It is required that at least one individual in the field has had first aid training.
		Discuss any worker physical conditions that may require medical attention.
		Carry a cell phone during all field work for emergency purposes, and confirm that a cell phone signal is available at the site.
	Cuts, bruises, shocks, lacerations, sprains and strains during tool use	Do not use electrical tools with damaged cords or other electrical components.
		Observe proper electrical safety practices. Do not use electrical tools in wet areas.

TASK 4.1
DRILLING OBSERVATIONS, MONITORING WELL INSTALLATION OBSERVATIONS AND SOIL SAMPLING

HAZARD CONTROLS		
GZA Job Tasks	**Potential Hazards**	**Controls**
		Ensure tools are properly maintained; do not use damaged tools.
		Wear eye protection.
		Store and carry tools correctly.
		Use the correct tool for the job.
	Fire hazards	Be familiar with emergency procedures and where fire extinguishers are being placed on site.
		Inform contractor if you observe improper storage of used rags and unsafe storage of flammable/combustible liquids brought on site.
		Confirm with driller that a fire extinguisher is present with rig.
		If driller is welding or cutting on site confirm there are no flammables or combustible materials near the vicinity of welding machines or torches (such as debris, fuels, grass/weeds, etc.). Stand well clear of welding/cutting/burning areas.
		There is no smoking on GZA project sites.
	Exposure to Hazardous Substances	Become familiar with hazards associated with hazardous commercial products used in drilling (fuels, grout, cement, bentonite, etc.). Review MSDSs for such products. Do not handle drilling chemicals.
		Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Ensure that procedures and contingencies are in place for characterizing hazards and protecting workers by use of appropriate personal protective clothing and respiratory protection, as needed.
Sampling Soil	Exposure to chemicals	Become familiar with drilling related hazards through review of comprehensive Job Hazard Analysis and participate in daily safety tailgate meetings.
		Coordinate activities with driller.
		Use proper personal protective equipment (PPE) as described in the HASP.
		Adhere to proper work practices and decontamination procedures specified in the HASP.
		Wash hands before eating and drinking.
	Strains and sprains due to manual lifting of sampling rods and breaking open rods and bending and standing activities.	Use proper lifting techniques when lifting rods. Seek assistance with heavy loads. Place rods at proper heights whenever possible to limit excessive bending and awkward positions.
		Use work gloves to handle rods to prevent hand injuries and slippage.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Groundwater Sampling		
Analysis By: Andrew Whitsitt	**Reviewed By: Michael McCoy, CIH, CHMM**	**Approved By: Kim Anderson, Ph.D.** **Jayanti Chatterjee, CIH**
Date: September 30, 2011	**Date: November 9, 2011**	**Date: December 9, 2011**

TASK 4.2
GROUNDWATER SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Deploying Traffic Protection Equipment	Personal injury due to vehicle traffic; Collisions, injuries	All drivers shall be properly licensed. Abide by driving safety procedures. Inspect vehicle to ensure it is in safe operating condition.
		Park in designated parking locations, or select off-road area that is firm, and without hazards. Directly inspect parking location on foot if necessary.
		Use emergency flashers or other appropriate vehicle warning system as appropriate to local conditions.
		Utilize police detail (if present) to direct traffic while entering traffic safety zone, if applicable.
Working outdoors	Unescorted or vacant site /Working Alone	Do not assume that Site has been maintained for safety.
		Coordinate site visit with other personnel not present, so that your failure to return would be noticed. Sign out or call into the office to leave site specific information where you are working, the anticipated duration/hours of work on site. Do this for each site if multiple in one day. See GZA working alone policy.
	Hunters, Abutters, and Property Owners	Always wear high visibility safety vest and hat. Make deliberate noise
		Permission for field work on private and public lands must almost always be obtained in advance. When possible, contact the local landowners when on site. Leave the site immediately if threatened or made to feel uncomfortable.
		Always announce yourself and your business at the site.
		Leave the site immediately if threatened or made to feel uncomfortable.
		Understand local hunting seasons and requirements.
	Insect Bites; Plant toxins; Poisonous Snakes. Incidental contact	Ticks carry risk of Lyme's and other Diseases. Tick season is basically any field day above 40 degrees F. • Tuck pants into long socks and apply DEET (or permethrin pre-treatment) to clothing in season to control exposure to ticks. • Check clothing for ticks frequently • Check whole body immediately upon returning from field and shower.
		Know the appearance of poison ivy and poison sumac in all seasons, and if sensitive to these toxins, carry and use special cleaning soaps/solutions when thought to be exposed. Stock first aid kit with poison ivy/sumac cleaning soaps/solutions.
		Be aware of intermittent seasonal reports of mosquito borne diseases, such as West Nile disease and Eastern Equine Encephalitis (EEE), and their locations relative to your field site. Use DEET or other mosquito repellant.

TASK 4.2
GROUNDWATER SAMPLING

HAZARD CONTROLS		
GZA Job Tasks	**Potential Hazards**	**Controls**
		Be aware of potential cavity, suspended or ground nesting bee/wasp/hornet nests. Avoid undue disturbance or approach with appropriate safety clothing protection and netting.
		Be aware of terrain likelihood of harboring poisonous snakes in your work zone. Avoid reaching or stepping into hidden areas (such as into wood pile, rock pile, debris pile, stone wall, etc.) without pre-inspection.
	Exposure to Hazardous Substances	Become familiar with the hazards associated with hazardous commercial products used while groundwater sampling (laboratory preservatives, decontamination solutions, etc.). Review MSDS for such products.
		Wear proper personal protective equipment (PPE)) as specified in the Health and Safety Plan (HASP) to avoid direct contact with Site contaminants, calibration solutions, decontamination supplies, and laboratory preservatives.
		Assure proper respiratory protection is available as specified by the HASP.
		Assure decontamination procedures are in place per the HASP.
	Emergency conditions	Ensure that all site workers are familiar with emergency contact procedures route to nearest hospital.
		Ensure a first aid kit is present in field vehicle.
		It is required that at least one individual in the field has had first aid training.
	Adverse Weather Conditions	Assess weather conditions prior to on-site work and examine forecast for anticipated period of work.
		Dress appropriately for weather conditions (e.g., precipitation, temperature ranges over anticipated duration of field work).
		Use protective ointments such as sunscreen and chap stick, as appropriate to the field conditions.
		Be aware of the anticipated weather conditions prior to mobilization to the site. Unacceptable field work conditions are not precise, but may include site specific conditions, general location, extreme weather conditions (e.g., icing, lightening, excessive cold or wind), travel conditions, and other factors. Professional judgment is required, and personal assessment of safety must always be individually assessed.
Handling Flammable Liquids	Fire Hazards	Use only approved fuel containers for fuel, heavy duty metal cans with stable base and self closing nozzle is recommended.
		Store flammable liquids in an appropriate area when not in use.
		Provide proper fire extinguisher with the sampling equipment.
		Observe GZA's "no smoking" policy at all work sites.
Mobilizing Equipment	Collision; struck by	Perform a pre-operation check of the vehicle, ensuring service brakes, parking brake, steering, lights, tires, horn, wipers mirrors, and glass are in good condition. Ensure that the vehicle is roadworthy.
		All vehicle occupants shall wear seat belts.
		Secure loose materials in the cab or bed of the vehicle.
		Keep the windows and lights clean.
		Do not operate the vehicle if it is in an unsafe condition.
		Abide by driving safety procedures and laws.
Positioning vehicle at monitoring well	Unstable, uneven terrain and ground obstacles	Locate the vehicle on stable ground.
		Avoid wet areas/mud when possible.
	Backing Collisions	If possible, avoid backing by using a route that allows you to pull through.
		If you must back, do a quality 360^0 walk around.
		Use a spotter to help guide the backing safely.
		Look over the right shoulder and glance back to make sure fenders are clearing objects.

TASK 4.2
GROUNDWATER SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Block/chock wheels.
Well Sampling	Hazardous material contact	Identify wells with hazardous concentrations of contaminants.
		Sample wells in order from least to most impacted.
		Wear proper gloves (nitrile, etc.) when handling jars, preservatives could leak during shipment from the laboratory.
	Cuts and bruises from Sample jar	Do not over-tighten glass jars (especially VOAs); they can break, causing a cut.
Sampling Equipment Operation	Splashes, electrical shocks, fires, caught by	Perform an equipment inspection before use; ensure that pumps, flow meters, and water quality meters are calibrated and are in good working condition.
		Use GFCI with all cords.
		Be sure all equipment (especially generators) is properly grounded.
		Completely shut down all equipment prior to conducting maintenance activities, fueling, servicing or repairs.
	Manual lifting, equipment handling	Use proper lifting techniques when lifting equipment (generators, pumps, air compressors, tubing, etc.). Seek assistance with heavy loads.
		Use work gloves where appropriate to prevent hand injuries.
		Wear steel toed boots.
	Noise	Wear appropriate hearing protection during activities that produce noise (running generators, pumps, air compressors, etc.).
	Slips, trips and falls	Maintain a clean and sanitary work area free of tripping/slipping hazards.
		Store hand tools in their proper storage location when not in use.
		Provide ample space for each employee to work safely with sound footing.
		Provide ample lighting.
		Provide adequate facilities/equipment/hand sanitizers for hand washing prior to eating.
	Tool-related hazards	Do not use electrical tools with damaged cords or other electrical components.
		Observe proper electrical safety practices.
		Ensure tools are properly maintained; do not use damaged tools.
		Wear eye protection.
		Store and carry tools correctly.
		Use the correct tool for the job.
		Protect from gouges, hammer blows, cutting tools, etc. Position your hands to prevent injury in case the tool slips while in use.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Temporary/Permanent Sampling Equipment Operation		
Analysis By: James Wieck	**Reviewed By: Michael McCoy, CIH, CHMM**	**Approved By: Kim Anderson, Ph.D.** **Jayanti Chatterjee, CIH**
Date: September 30, 2011	**Date: November 17, 2011**	**Date: December 10, 2011**

TASK 4.7
TEMPORARY/PERMANENT SAMPLING EQUIPMENT OPERATION

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Installation of equipment within monitoring wells by GZA (transducers, probes and multiparameter sonds, pumps, solid and pneumatic slugs, and borehole logging equipment)	Cuts, lacerations, bruises, pinch points, electrical shocks.	Become familiar with equipment installation procedures and related hazards through review of Job Hazard Analysis and participate in daily safety tailgate meetings.
		Review potential pinch, trip, abrasion/cut, and entanglement hazards. Wear gloves to limit potential pinch, cut, and abrasion hazards.
		Wear appropriate safety equipment as required by the Site Specific Health and Safety Plan when in general work area (steel toe boots, work clothes, gloves, high visibility vest, eye and hearing protection, etc.).
		Keep cables, electrical lines, tubing organized and within view when installing or retrieving from well.
		Review weight of equipment being installed or retrieved and select methods sufficient to insure control of deployment/retrieval rate with equipment suspended in well.
		If tripods and winches are needed to control the deployment or retrieval of equipment, review related safety procedures and manufacturers recommendations; consider hazards associated with electrical or fuel power sources and exhaust as applicable and consider entanglement and overhead hazards.
		Use a dedicated cable or cord secured to the equipment and the well casing or secure object at the ground surface for deployment and retrieval. Do not deploy or retrieve equipment using data cables or sample tubing to carry the weight of the equipment.
	Insect Bites; Plant toxins; Poisonous Snakes. Incidental contact	Use caution when opening monitoring wells for the presence of insects and vermin. Wear gloves to protect against unanticipated stinging insects or biting vermin.
		Ticks carry risk of Lyme's and other Diseases. Tick season is basically any field day above 40 degrees F. • Tuck pants into long socks and apply DEET (or permethrin pre-treatment) to clothing in season to control exposure to ticks. • Check clothing for ticks frequently • Check whole body immediately upon returning from field and shower.
		Know the appearance of poison ivy and poison sumac in all seasons, and if sensitive to these toxins, carry and use special cleaning soaps/solutions when thought to be exposed. Stock first aid kit with poison ivy/sumac cleaning soaps/solutions.

TASK 4.7
TEMPORARY/PERMANENT SAMPLING EQUIPMENT OPERATION

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
		Be aware of intermittent seasonal reports of mosquito borne diseases, such as West Nile disease and Eastern Equine Encephalitis (EEE), and their locations relative to your field site. Use DEET or other mosquito repellant.
		Be aware of potential cavity, suspended or ground nesting bee/wasp/hornet nests. Avoid undue disturbance or approach with appropriate safety clothing protection and netting.
		Be aware of terrain likelihood of harboring poisonous snakes in your work zone. Avoid reaching or stepping into hidden areas (such as into wood pile, rock pile, debris pile, stone wall, etc.) without pre-inspection.
	Exposure to Hazardous Substances	Ensure that workers are familiar with hazards associated with hazardous commercial products used in drilling (fuels, calibration solutions, etc.). Ensure that MSDSs for such products are available, and that workers wear appropriate personal protective equipment.
		Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Ensure that procedures and contingencies are in place for characterizing hazards and protecting workers by use of appropriate personal protective clothing and respiratory protection, as needed.
		Implement work practices and procedures identified in the HASP.
	Adverse Weather Conditions	Assess weather conditions prior to on-site work and examine forecast for anticipated period of work.
		Dress appropriately for weather conditions (e.g., precipitation, temperature ranges over anticipated duration of field work).
		Use protective ointments such as sunscreen and chap stick, as appropriate to the field conditions.
	Emergency Procedures	Ensure that all site workers are familiar with emergency contact procedures route to nearest hospital.
		Ensure a first aid kit is present in field vehicle.
		It is required that at least one individual in the field has had first aid training.
		Discuss any worker physical conditions that may require medical attention.
		Carry a cell phone during all field work for emergency purposes, and confirm that a cell phone signal is available at the site.

GZA GEOENVIRONMENTAL, INC.
JOB HAZARD ANALYSIS WORKSHEET

Job: Subsurface Vapor Sampling		
Analysis By: Guy Dalton	**Reviewed By: Michael McCoy, CIH, CHMM**	**Approved By: Kim Anderson, Ph.D.**
Date: September 29, 2011	**Date: November 17, 2011**	**Date: December 10, 2011**

TASK 4.8
SUBSURFACE VAPOR SAMPLING

HAZARD CONTROLS

GZA Job Tasks	Potential Hazards	Controls
Review Related THA's – 4.1 Drilling Observations, Monitoring Well Installation Observations and Soil Sampling 4.5 Soil-Gas Sampling 4.7 Temporary/Permanent Sampling Equipment Operation NOTE - As a sampling THA, this THA assumes the subsurface vapor sampling well(s) or port(s) have already been installed.		
Pre-work tasks	Emergency Conditions	Ensure that all site workers are familiar with emergency contact procedures route to nearest hospital.
		Ensure a first aid kit is present in field vehicle.
		It is required that at least one individual in the field has had first aid training.
		Discuss any worker physical conditions that may require medical attention.
		Carry a cell phone during all field work for emergency purposes, and confirm that a cell phone signal is available at the site.
Screening Work Zone Atmosphere	Exposure to Hazardous Substances	Review site specific Health and Safety Plan and implement work practices and procedures specified.
		Monitor breathing air in work zone for hazardous atmospheres (e.g., low oxygen, elevated VOCs, H_2S, CO, etc.) and do not proceed unless it is determined that no hazardous conditions exist.
		Be alert for hazardous site contaminants (as indicated by odor, visual characteristics, location, and site history). Assure that procedures and contingencies are in place for characterizing hazards and protecting workers by use of appropriate personal protective clothing and respiratory protection, as needed.
		Assure adequate facilities/equipment for hand washing prior to eating.
All Site related work Work	Insect Bites; Plant toxins; Poisonous Snakes. Incidental contact	Ticks carry risk of Lyme's and other Diseases. Tick season is basically any field day above 40 degrees F. • Tuck pants into long socks and apply DEET (or permethrin pre-treatment) to clothing in season to control exposure to ticks. • Check clothing for ticks frequently • Check whole body immediately upon returning from field and shower.
		Know the appearance of poison ivy and poison sumac in all seasons, and if sensitive to these toxins, carry and use special cleaning soaps/solutions when thought to be exposed. Stock first aid kit with poison ivy/sumac cleaning soaps/solutions.

TASK 4.8
SUBSURFACE VAPOR SAMPLING

HAZARD CONTROLS		
GZA Job Tasks	**Potential Hazards**	**Controls**
		Be aware of intermittent seasonal reports of mosquito borne diseases, such as West Nile disease and Eastern Equine Encephalitis (EEE), and their locations relative to your field site. Use DEET or other mosquito repellant.
		Be aware of potential cavity, suspended or ground nesting bee/wasp/hornet nests. Avoid undue disturbance or approach with appropriate safety clothing protection and netting.
		Be aware of terrain likelihood of harboring poisonous snakes in your work zone. Avoid reaching or stepping into hidden areas (such as into wood pile, rock pile, debris pile, stone wall, etc.) without pre-inspection.
	Adverse weather	Assess weather conditions prior to on-site work and examine forecast for anticipated period of work.
		Dress appropriately for weather conditions (e.g., precipitation, temperature ranges over anticipated duration of field work).
		Use protective ointments such as sunscreen and chap stick, as appropriate to the field conditions.
		Be aware of the anticipated weather conditions prior to mobilization to the site. Unacceptable field work conditions are not precise, but may include site specific conditions, general location, extreme weather conditions (e.g., icing, lightening, excessive cold or wind), travel conditions, and other factors. Professional judgment is required, and personal assessment of safety must always be individually assessed.
	Working Alone	Sign out or call into the office to leave site specific information where you are working, the anticipated duration/hours of work on site. Do this for each site if multiple in one day. Review GZA's working alone policy.
		Call office when off site.
Constructing Sampling Train	Slips, trips and falls	Store hand tools in their proper storage location when not in use.
		Assure ample space for each employee to work safely with sound footing is provided.
		Assure ample lighting is provided.
	Electrical shocks, cuts, bruises, from Tool-Related use	Do not use electrical tools with damaged cords or other electrical components.
		Observe proper electrical safety practices.
		Assure tools are properly maintained; do not use damaged tools.
		Wear eye protection.
		Store and carry tools correctly.
		Use the correct tool for the job.
		Protect "off hand" from gouges, hammer blows, cutting tools, etc. Position your "off hand" to prevent injury in case of slip of the tool.
Evaluating Leaks in Sampling Train	Working with Pressurized Cylinders (Helium)	Use caution when screwing in pressure regulator and valve (if this wasn't already done by the helium vendor). Take care not to hit the regulator and valve once it is installed and do not drop the cylinder. Cylinder should remain on the ground surface at all times or (ideally) fixed to a cylinder dolly.
Purging the Sampling Train	Working with Electrical Equipment	If using 12-volt DC pump to purge sampling train, inspect power cord and battery terminal connectors to assure they are free of defects or damage.
		If using 120-volt AC pump to purge sampling train, verify that the ground fault circuit interrupter (GFCI) is functioning properly.
	Electrical shocks, cuts, bruises, from Tool-Related use	See above.
Sample Collection	Electrical shocks, cuts,	See above.

TASK 4.8
SUBSURFACE VAPOR SAMPLING

HAZARD CONTROLS		
GZA Job Tasks	**Potential Hazards**	**Controls**
	bruises, from Tool-Related use	

APPENDIX F
COMMUNITY AIR MONITORING PLAN

Appendix 1A
New York State Department of Health
Generic Community Air Monitoring Plan
Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. APeriodic@ monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap oroverturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

APPENDIX G
QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE/QUALITY CONTROL PROJECT PLAN (QAPP)
BAY PARK ONE
3375 NEPTUNE AVENUE
BROOKLYN, NEW YORK

PREPARED FOR:
Bay Park One Company
3325 Neptune Avenue
Brooklyn, New York 11224

PREPARED BY:
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New York, New York 10001

July 2013
File No. 41.0161826.60

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FIGURES

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ATTACHMENTS

1.0 INTRODUCTION

This Quality Assurance/Quality Control Project Plan (QAPP) presents the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the Remedial Investigation Work Plan at the Bay Park One, development in Brooklyn, Queens, New York. Refer to **Figure 1** for Site Plan.

The Plan describes specific protocols for field sampling, sample handling and storage, chain-of-custody, laboratory analysis, and data handling and management. Preparation of the Plan was based on EPA Quality Assurance Project Plan guidance documents, including:

- *EPA Requirements for Quality Assurance Project Plans* (EPA QA/R-5, March 2001); and
- *Guidance for Quality Assurance Project Plans* (EPA QA/G-5, December 2002).

The data generated from the analysis of samples will be used to determine the extent of contamination, identify impacted targets, and to compare the results of the remedial actions to site-specific cleanup goals. A list of the potential parameters to be analyzed, including their respective quantitation limits (QLs), and data quality levels (DQLs), is shown in **Table 1**.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

A qualified person will coordinate and manage the Site sampling and analysis program, data reduction, QA/QC, data validation, analysis, and reporting. A qualified environmental professional (QEP), as defined by the New York State Department of Environmental Conservation (NYSDEC) will direct the sampling activities and coordinate laboratory and drilling activities.

A qualified person will insure that the QA/QC plan is implemented and will oversee data validation. A qualified person will provide oversight and technical support for the sampling and analytical procedures followed in this project. This individual has the broad authority to approve or disapprove project plans, specific analyses, and final reports. The QEP is independent from the data generation activities. In general, the QA officer will be responsible for reviewing and advising on all QA/QC aspects of this program. Qualifications of the QA officer are provided in **Attachment A.**

Laboratories used will be New York State Department of Health ELAP certified laboratories. The laboratories will communicate directly with the sampler regarding the analytical results and reporting and will be responsible for providing all labels, sample containers, field blank water, trip blanks, shipping coolers, and laboratory documentation.

3.0 QA OBJECTIVES FOR DATA MANAGEMENT

The analytical data will be provided by the laboratory using the New York State Department of Environmental Conservation (NYSDEC) Category B deliverable format. Analytical data collected for disposal characteristics that may be requested by off-site soil or wastewater disposal facilities will be provided in the format that the facility requests.

All analytical measurements will be made so that the results are representative of the media sampled and the conditions measured. Data will be reported in consistent dry weight units for solid samples (i.e., µg/kg and/or mg/kg), µg/L or mg/L for aqueous samples and in micrograms per cubic meter ($\mu g/m^3$) and ppbV for soil vapor and air samples. **Table 2** presents the proposed samples, sampling and analytical parameters, analytical methods, sample preservation requirements and containers.

Quantitation Limits (QLs) are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. Data Quality Levels (DQLs) are those reporting limits required to meet the objectives of the program (i.e., program action levels, cleanup standards, etc.). Data Quality Objectives (DQOs) define the quality of data and documentation required to support decisions made in the various phases of the data collection activities. The DQOs are dependent on the end uses of the data to be collected and are also expressed in terms of objectives for precision, accuracy, representativeness, completeness, and comparability.

The analytical methods to be used at this site provide the highest level of data quality and can be used for purposes of risk assessment, evaluation of remedial alternatives and verification that cleanup standards have been met. However, in order to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy, precision, and completeness.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide results that are scientifically valid, and the levels of which are sufficient to meet DQOs. Specific procedures for sampling, chain of custody, laboratory instrument calibration, laboratory analysis, reporting of data, internal quality control, and corrective action are described in other sections of this Plan.

Tables 3, **4**, and **5** present the precision and accuracy requirements for each parameter to be analyzed. For quantitation limits for parameters associated with soil, sediment, and solid waste samples, the laboratory will be required to attempt to meet or surpass the parameter-specific limits listed in 6 NYCRR Part 375.

For quantitation limits for parameters associated with groundwater samples, the laboratory will be required to attempt to meet or surpass the parameter-specific limits for groundwater from the Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Ambient Water Quality Standards and Guidance Values. In certain instances, if the TOGS criteria are not achievable due to analytical limitations, the laboratory will report the lowest possible quantitation limit.

For quantitation limits for parameters associated with soil gas samples, the laboratory will be required to meet the parameter-specific limits from EPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Table 3c-SG: Question 5 Soil Gas Screening Levels for Scenario-Specific Vapor Attenuation Factors (α=2H10^{-3}), November 2002. In certain instances, if these criteria are not achievable due to analytical limitations, the laboratory will report the lowest possible quantitation limits (see **Table 1** for affected analytes).

The QA objectives are defined as follows:

- ***Accuracy*** is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being used (e.g., split spoons, groundwater sampling pumps).

The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of "standards," materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic analyses, or %R of spiked compounds in matrix spikes (MSs), matrix spike duplicates (MSDs) and/or laboratory control samples (LCSs). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds. **Tables 3**, **4**, and **5** summarize the laboratory accuracy requirements.

- ***Precision*** is the agreement among a set of replicate measurements without consideration of the "true" or accurate value: i.e., variability between measurements of the same material for the same analyte. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation.

  Precision in the field is assessed through the collection and measurement of field duplicates (one extra sample in addition to the original field sample). Field duplicates will be collected at a frequency of one per twenty investigative samples per matrix per analytical parameter, with the exception of the TCLP parameters and parameters associated with wastewater samples. Precision will be measured through the calculation of relative percent differences (RPDs). The resulting information will be used to assess sampling and analytical variability. Field duplicate RPDs must be $\leq$ 50 for soil samples and $\leq$ 30 for aqueous samples. These criteria apply only if the sample and/or duplicate results are >5x the quantitation limit; if both results are $\leq$ 5x the quantitation limit, the criterion will be doubled. Due to the uncertainty of available representative soil gas volume, field duplicates will not be collected for this matrix.

  Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic soil, sediment and water analyses, laboratory precision will be assessed through the analysis of MS/MSD samples and field duplicates. For the inorganic analyses, laboratory precision will be assessed through the analysis of matrix duplicates and field duplicates. For soil gas analyses, laboratory precision will be assessed through the analysis of matrix duplicates. MS/MSD samples or matrix duplicates will be performed at a frequency of one per twenty investigative samples per matrix per parameter. **Tables 3**, **4**, and **5** summarize the laboratory precision requirements.

- ***Completeness*** is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned.

  Field completeness is a measure of the amount of (1) valid measurements obtained from all the measurements taken in the project and (2) valid samples collected. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95 percent.

- ***Representativeness*** is a qualitative parameter that expresses the degree to which data accurately and precisely represent either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data. In addition, field duplicate samples will provide an additional measure of representativeness at a given location.

  Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plans and QAPP are followed and that proper sampling, sample handling, and sample preservation techniques are used.

  Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample holding times.

- ***Comparability*** expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plans and QAPP are followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

  Comparability is dependent on the use of recognized EPA or equivalent analytical methods and the reporting of data in standardized units. Laboratory procedures are consistent with those used for previous sampling efforts.

4.0 SAMPLING PLAN

Environmental sampling may include soil, groundwater, soil vapor, and sediment sampling. Additionally wastes generated during remediation or development will be sampled and tested for characterization for disposal. Direct push drilling (GeoProbe®), hollow-stem auger drilling, and test pit excavations will be the preferred methods for obtaining subsurface soil samples; however, other drilling methods including mud rotary and drive and wash may also be used if warranted by site conditions. Groundwater samples will be collected using peristaltic, bladder or submersible pumps. Soil vapor samples will be collected in SUMMA® canisters. Sediment samples will be collected from boat-mounted, four-foot vibracore samplers. Performing grab or composite sampling using appropriate hand-held sampling equipment will be the preferred method for waste characterization sampling.

4.1 Grab/Composite Sampling

Grab soil/solid samples will be collected from the material or interval in question by retrieving a volume for analysis using a clean stainless steel, aluminum, or mild steel scoop, trowel, spoon, or bucket auger and placing the soil in a cleaned stainless steel pan for homogenization before inserting into the sample container. Samples collected for analysis for volatile organic compounds and total organic halides will not be homogenized. Samples for volatile organics analysis and total organic halides will be placed directly into the sample container.

Composite samples will be collected in the same manner described above, except that the discrete sample volumes will be placed in a clean stainless steel pan and mixed to form the composite. Composite sampling will be performed for the following objectives:

- Waste characterization;
- Determination of the suitability of the soil for on-site re-use; and
- Evaluation of health and safety requirements for workers that will disturb the soil during subsequent construction work.

4.2 Soil Sampling (Direct Push Drilling)

Sampling will be performed using four-foot-long acetate sleeves that will be advanced continuously to the desired depth below the surface. Soil samples from each sleeve will be screened using a photoionization detector (PID), to detect possible organic vapors. Organic vapor screening will be performed by slicing open the acetate sleeve, making a small slice in the soil column with a clean knife or sampling tool, inserting the PID probe and pushing the slice closed, and monitoring the soil for approximately 5 to 10 seconds. This procedure will be repeated at intervals along the soil column at the field geologist's discretion.

The samples will be examined for staining, discoloration, odors, and debris indicative of contamination (ash, coal fragments, wood chips, cinders, petroleum staining, etc.) Samples for laboratory analysis will be collected from the six-inch interval most likely to be contaminated, based on PID readings, discoloration, staining, and the field geologist's judgment (field conditions may require a section longer than six inches to make sufficient sample; however this decision will be field-based).

The samples will be collected by cutting the soil in two places with a decontaminated steel, stainless steel, or aluminum trowel, spoon, or knife and homogenized in a decontaminated stainless steel pan before being placed in the sample bottles. Samples collected for analysis for VOCs and total organic halides will be placed directly into the sample containers without homogenization (as per EPA sampling method 5035A). Samplers will wear phthalate-free gloves such as nitrile (no latex will be used) and will avoid contact of the gloves with the sample. Only clean metal instruments will be allowed to touch the sample. If there is insufficient soil volume in the spoon, then this will be made up by attempting a second direct push sleeve at the same depth, or by using the next immediate sample interval above or below this depth, if appropriate. If there is no recovery, then the sample depth will be skipped, and drilling will progress to the next depth interval.

Soil samples will be collected in laboratory provided containers and transported to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP) certified laboratory, under proper chain of custody procedures for analysis. Once the sample containers are filled, they will be immediately placed in the cooler with ice (in Ziploc plastic bags to prevent leaking) or synthetic ice packs to maintain the samples at below 4°C.

4.3 Soil Sampling (Hollow-Stem Auger)

Soil samples will be collected utilizing 2-inch-diameter by 2-foot-long split spoon samplers driven ahead of a hollow stem auger. Three-inch-diameter split spoon samplers may also be used. Augers with a minimum inside diameter of 4¼ inches will be used for drilling where wells are proposed. If soil sampling below the groundwater table is required, augers will be equipped with center plugs and/or inert "knock out" plates to control sub-water table sediments from rising inside the auger flights and hampering collection of representative soil samples.

Each split spoon sample will be screened using a PID to detect possible organic vapors. Organic vapor screening will be performed by opening the split spoon, making a small slice in the soil column with a clean knife or sampling tool, inserting the PID probe and pushing the slice closed, and monitoring the soil for approximately 5 to 10 seconds. This procedure will be repeated at intervals along the split spoon soil column at the field geologist's discretion.

The split spoons will be examined for staining, discoloration, odors, and debris indicative of contamination (ash, coal fragments, wood chips, cinders, petroleum staining, etc.). One sample will be collected from each split spoon, from the six-inch interval most likely to be contaminated, based on PID readings, discoloration, staining, and the field geologist's judgment. Note that due to sample recovery or field conditions, sample intervals other than six inches may be necessary to collect sufficient sample.

The samples will be collected by cutting the soil in two places with a decontaminated steel, stainless steel, or aluminum trowel, spoon, or knife and homogenizing in a decontaminated stainless steel pan before being placed in the sample bottles (refer to **Table 2**). Samples collected for analysis for VOCs and total organic halides samples will be placed directly into the sample containers without homogenization. Samplers will wear phthalate-free gloves such as nitrile (no latex will be used) and will avoid contact of the gloves with the sample. Only clean metal instruments will be allowed to touch the sample. If there is no recovery, then the sample depth will be skipped, and drilling will progress to the next sampling interval.

4.4 Soil Sampling (Test Pits)

Soil samples will be collected utilizing a backhoe or excavator and dedicated sampling equipment. At most locations, test pits will be excavated to the groundwater table. A tape will be lowered into the excavated test pit to establish a depth profile prior to sample collection. At the direction of the field geologist, the excavator will collect soil from the test pit and bring the soil to a location where the field geologist will evaluate the soil quality. Each sample will be field screened following the procedures described for soil borings (see **Section 4.3**). The samples will be containerized for laboratory analysis in accordance with the procedures established for the soil borings.

4.5 Drive and Wash/Mud Rotary

Borings will be advanced vertically by driving a 4-inch-diameter steel casing with a 300-pound hammer falling freely for 24 inches. The casing will be cleaned with water using a tri-cone roller bit and/or chopping bit. A 2-inch-diameter by 2-foot-long split spoon sampler will be driven ahead of the tri-cone roller bit and samples will be collected as described in **Section 4.3**. Any drilling fluids used to advance the drill bit will be contained within a steel trough and re-circulated into the drill hole. Uncontaminated drilling fluids containing drilling mud will be mixed with cement to form a grout that will be used to backfill the borehole where required; otherwise the mud will be pumped into 55-gallon drums for on-site storage and subsequent off-site disposal. In drive and wash drilling where only potable water will be used as the drilling fluid, the water will be allowed to diffuse into the borehole. Samples will be collected in the same manner as with hollow-stem auger drilling. Where drilling mud is necessary, bentonite and/or Revert® will be used. Every effort will be made to collect samples for soil analysis before the addition of drilling mud. Only bentonite mixed with cement will be used to prepare grout for sealing the borehole.

4.6 Groundwater Sampling (Permanent Well)

Groundwater sampling of permanent monitoring wells is described according to the following distinct phases of this work: well installation/construction, well development, well purging, and well sampling.

4.6.1 Well Installation/Construction

To collect representative groundwater samples, previously installed soil borings will be converted into permanent two-inch or four-inch diameter monitoring wells. Groundwater monitoring wells will be constructed of threaded two-inch or four-inch-diameter PVC well casing and 10-slot well screen. Clean silica sand, Morie No. 1, or equivalent, will be placed in the annular space around the well to a minimum of one foot above the top of the well screen, two feet being optimal. Solid PVC riser, attached to the well screen, will extend to grade or above if the well is a stick-up. For a two-inch diameter well, the annular space for the filter pack should be between 2 to 4 inches thick. (The 4 ¼ inside diameter hollow stem augers will have to be retracted as the filter pack is installed to yield the required annular space.) A two-foot thick bentonite seal will then be placed above the sand pack and moistened with potable water for a minimum of 15 minutes before backfilling the remaining space with a cement-bentonite grout. If warranted by depth, filling will be completed using a tremie pipe placed below the surface of the grout. A stick-up or flush-mount protective casing with a locking well cap will then be installed and a measuring point marked on each PVC well riser. Well construction diagrams will be prepared for each well.

4.6.2 Well Development

Following installation, the groundwater monitoring wells will be developed using a two-inch diameter submersible pump(s) (or equivalent) until the water is reasonably free of turbidity and field readings (pH, conductivity, temperature, and dissolved oxygen) sufficiently stabilize. Fifty nephelometric turbidity units (NTUs) or less will be the turbidity goal but not an absolute value.

The wells will be developed aggressively to remove fines from the formation and sand pack. The wells will be allowed to equilibrate for 7 days prior to sampling. The volume of water removed, the well development time, and field instrument readings will be recorded in the logbook.

4.6.3 Well Purging

The objective is to purge monitoring wells until turbidity stabilizes to a level as low as possible and this parameter will be given the greatest weight in determining when groundwater sampling may begin. With this objective in mind, a low-flow pump will be used to avoid entrainment of particulates within the well or from the formation. Groundwater from each well will be purged until parameters have stabilized. A turbidity level of fifty NTUs or less is the well purging goal, but not an absolute value before sampling. Other field parameters including temperature, conductivity, pH, and dissolved oxygen (DO) will also be monitored. As practical, all field measurements will be taken from the flow cell and will be recorded during and after purging, and before sampling. Field parameters should generally be within ±10 percent for three consecutive readings, one minute apart, prior to sampling.

Upon opening each monitoring well and point, the concentration of VOCs in the headspace will be measured using a PID and water level measurements will be recorded using an electronic oil-water interface probe. The depth to product (if present), depth to water, and the total depth will be measured from the top of the marked PVC casings. Water level and free product measurements will first be made and the volume of water in the well determined. The volume of water in the well will be calculated so that the number of well volumes purged and an estimate of the time required to purge the well can be made. Before sampling, the wells will be purged utilizing a low-flow submersible stainless steel pump using dedicated Teflon® or Teflon®-lined polyethylene tubing connected to a flow cell. Very low purging rates are proposed, on the order of 100 ml/minute to 500 ml/minute, to minimize suspension of particulate matter in the well.

Purging will be done with the pump intake placed at the midpoint of the well screen or the midpoint of the water column (to be determined based on the depth and length of the screen interval) to insure that all stagnant water in the well is removed, while not stirring up sediment that may have accumulated on the bottom of the well. Equipment will be lowered into the well very carefully to prevent suspension of bottom sediment and subsequent entrainment onto sampling equipment. Surging will be avoided. Tubing will be replaced between each well. Pumps must be carefully cleaned between wells according to the procedures specified in **Section 4.13**. It is anticipated that no more than three well volumes will be purged in order for turbidity to reach a minimum and the other parameters to stabilize. Ideally, pumping rates will be at a rate so that no drawdown of the groundwater level occurs (i.e., pumping rate is less than recharge rate). During purging, the sampler will actively monitor and track the volume of water purged and the field parameter readings. Data will be recorded in the field logbook. For example, the sampler will record the running total volume purged from each well and note the readings for the corresponding field parameters.

4.6.4 Well Sampling

Once groundwater conditions have stabilized and groundwater levels have recovered, samples will be collected from the flow cell outlet (connected to the low-flow submersible pump). All non-disposable/non-dedicated (re-usable) sampling equipment will be cleaned according to the procedures specified in **Section 4.13**.

Sampling will be performed with the pump intake at the same location used for purging. Pumping rates for withdrawing the samples will be similar to those followed for well purging.

The samples will be collected in sample bottles (pre-preserved, if appropriate), placed in iced coolers and removed from light immediately after collection. In addition, all sample bottles must be filled to the top so that no aeration of the samples occurs during transport. All bottles will be filled to avoid cascading and aeration of the samples, the goal being to minimize any precipitation of colloidal matter. Samples for dissolved metals will be collected in unpreserved containers and will be filtered and preserved at the laboratory within 24 hours of sampling.

4.7 Sediment Sampling

Sediment samples shall be collected from a boat-mounted, vibracore sampler, geoprobe and/or other auger rig. The sediment samples will be collected in clean, dedicated soft (polycarbonate) liner inside the core tubes and the sample tubes will have a top valve and stainless steel core catcher to maximize the completeness of core retrieval. At the direction of the field geologist, the vibracore sampler will collect sediment at the sampling location to a depth below the sediment/water interface as specified by the geologist.

Organic vapor screening will be performed by slicing open the liner, making a small slice in the sediment column with a clean knife or sampling tool, inserting the PID probe and pushing the slice closed, and monitoring the sediment for approximately 5 to 10 seconds. This procedure will be repeated at intervals along the sediment column at the field geologist's discretion.

The samples will be examined for staining, discoloration, odors, and debris indicative of contamination (ash, coal fragments, wood chips, cinders, petroleum staining, etc.) Samples for laboratory analysis will be collected from the six-inch interval most likely to be contaminated, based on PID readings, discoloration, staining, and the field geologist's judgment (field conditions may require a section longer than six inches to make sufficient sample; however this decision will be field-based). The samples will be collected by cutting the sediment in two places with a decontaminated steel, stainless steel, or aluminum trowel, spoon, or knife and homogenized in a decontaminated stainless steel pan before being placed in the sample bottles. Samples collected for analysis for VOCs will be placed directly into the sample containers without homogenization. Samplers will wear phthalate-free gloves such as nitrile (no latex will be used) and will avoid contact of the gloves with the sample. Only clean metal instruments will be allowed to touch the sample. If there is insufficient sediment volume in the liner, then this will be made up by attempting a second vibracore sample at the same depth, or by using the next immediate sample interval above or below this depth, if appropriate. If there is no recovery, then the sample depth will be skipped, and vibracore sampling will progress to the next depth interval.

Each sample selected for laboratory analysis will be homogenized separately by thoroughly mixing in a clean stainless steel pan using a clean stainless steel, aluminum or Teflon® sampling tool. The exception to this will be the portion of each sample that will be submitted for analysis for VOCs which will not be homogenized. If gross contamination is encountered, petroleum hydrocarbon fingerprint analysis may be conducted.

4.8 Soil Reuse and Worker Health & Safety Sampling

Soil reuse sampling may be performed to determine whether the soil can be reused elsewhere on the Site, or to determine whether contaminant levels in the soil would warrant OSHA 40-hour HAZWOPER training for workers disturbing the soil during post-remediation construction activities. This sampling would consist of compositing discrete soil samples from borings advanced by direct push (see **Section 4.2**) or hollow-stem auger drilling (see **Section 4.3**). The compositing of the discrete soil samples will follow the procedures outlined in **Section 4.1**.

4.9 Waste Characterization Sampling

Waste classification sampling will be conducted to characterize soil, liquids and/or groundwater for the purpose of proper off-site waste disposal. Specific methods for sampling liquid and solid wastes are briefly discussed below.

4.9.1 Solid Waste

Solid sampling methods include utilizing dedicated stainless steel or Teflon® scoops/shovels, triers, and thiefs. Scoops and shovels are the preferred method for sampling solids from piles or containers. Stainless steel triers are similar to a scoop and are used for the collection of a core sample of a solid material. Thiefs are long hollow tubes, with an inner tube, and are used for sampling of dry free running solids (e.g., pile of fine sand). To sample solid material at varying depths, a hollow stem auger or a core sampler in conjunction with an auger can be utilized (see Soil Sampling Section).

4.9.2 Liquid Waste

Liquid sampling methods include utilizing dedicated dippers, glass tube samplers, pump and tubing, kemmerer bottles, and Bacon Bomb samplers. Dippers are used to collect samples from the surface of the liquid, and are appropriate for wastes that are homogeneous. Glass tube samplers consist of glass tubes of varying length and diameter used to collect a full-depth liquid sample from a drum or similar container. Pump and tubing (e.g., bladder pump or peristaltic pump) are used to collect liquid samples from a depth (up to approximately 20 feet below grade), and are typically relied upon for sampling subsurface structures, such as underground storage tanks. To minimize the loss of volatile organic components in the liquid, the lowest achievable flow rate is utilized for collecting the sample by this method. Kemmerer bottles and Bacon Bomb samplers are discrete-depth samplers. These samplers are lowered into the liquid and opened to collect a sample at a desired depth.

4.9.3 Grab versus Composite Sampling

Waste characterization of a liquid or a solid can involve grab or composite sampling depending upon the homogeneity and the volume of the waste. Grab sampling consists of collecting a discrete sample or samples of a material, and submitting each sample for separate analysis. Grab sampling is appropriate for characterizing small quantities of waste as well as waste streams of varying content (e.g., drums of different contents). Composite sampling consists of taking discrete grab samples of a material and combining them into a smaller number of samples for analysis. Composite sampling generally is appropriate for large volumes of a homogenous waste material, such as a pile of soil or construction debris. The specific number of composite and grab samples largely will depend upon the size and nature of the waste pile (i.e., cubic yards) as well as the analysis required for characterization of the waste.

4.10 Soil Gas Sampling

A direct-drive rig will be utilized to drive rods with a decontaminated stainless steel probe through six-mil plastic sheeting to the desired sample depth, which will be approximately 1.5 feet above the capillary fringe. The soil gas probe will then be purged at a flow rate not greater than 0.2 liters/minute to evacuate one to three volumes using a photoionization detector (PID) with an integrated vacuum pump (PhotoVac 2020 or appropriate alternate). No PID readings will be taken prior to sample collection. Following the stabilization period, each probe will be connected to an evacuated laboratory-supplied SUMMA® canister. SUMMA® canisters are passivated stainless steel vessels that have been cleaned and certified contaminant-free by the contract laboratory. Each SUMMA® canister will be shipped to the sampling site under a high vacuum (30" Hg) to ensure that the canister remains free of contaminants prior to use. After connecting the SUMMA® canister to the soil gas probe, a regulator valve on the canister will be opened and the vacuum will slowly draw the sample into the canister over a period of 30 minutes. The samples will not be drawn at greater than 0.2 liters per minute. Quantitation limits for all analytes range between 1.6 ppbV and 4.0 ppbV, depending on the compound. After collecting the soil gas sample, the valve will be closed and disconnected from the soil gas probe. The soil-gas samples will be shipped overnight to a New York ELAP certified laboratory for TO-15 analysis.

A tracer gas (e.g., helium, butane, or sulfur hexafluoride) will be utilized prior to sample collection to evaluate the potential for infiltration of outdoor air into the sample. Subsequent rounds of soil gas sampling would include the use of tracer gas only if the initial round of sampling indicates that outdoor air has the potential to influence soil gas sample results.

When soil vapor samples are collected, the following conditions that may influence the interpretation of results will be documented:

- Identification of any nearby commercial or industrial buildings that likely uses volatile organic compounds;
- A sketch of the Site, showing streets, neighboring commercial or industrial facilities (with estimated distances to the Site, and soil-gas sampling locations);

- Weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed and direction); and
- Any pertinent observations, such as odors or readings from field instrumentation.

4.11 QC Sample Collection

QC samples will include equipment blanks, trip blanks, field duplicates and MS/MSDs.

Equipment blanks will consist of distilled water and will be used to check for potential contamination of the equipment that may cause sample contamination. Equipment blanks will be collected by routing the distilled water through the sampling equipment prior to sample collection. Equipment blanks will be submitted to the laboratory at a frequency of one per 20 samples per matrix per type of equipment being used per parameter. Equipment blanks will not be collected with samples for analysis for TCLP parameters, parameters associated with wastewater samples, samples collected for disposal purposes, soil gas samples, and samples collected for grain size analyses.

Trip blanks will consist of distilled water (supplied by the laboratory) and will be used to assess the potential for volatile organic compound contamination of groundwater samples due to contaminant migration during sample shipment and storage. Trip blanks will be transported to the site unopened, stored with the investigative samples, and kept closed until analyzed by the laboratory. Trip blanks will be submitted to the laboratory at a frequency of one per cooler that contains groundwater samples for analysis for VOCs.

Field duplicates are an additional aliquot of the same sample submitted for the same parameters as the original sample. Field duplicates will be used to assess the sampling and analytical reproducibility. Field duplicates will be collected by alternately filling sample bottles from the source being sampled. Field duplicates will be submitted at a frequency of one per 20 samples for all matrices and all parameters with the exception of TCLP parameters, parameters associated with wastewater samples, samples collected for waste characterization purposes, soil gas samples and samples collected for grain size analyses. It should be noted that due to the uncertainty of acceptable representative soil gas volume, field duplicates are not planned for this matrix.

MSs and MSDs are two additional aliquots of the same sample submitted for the same parameters as the original sample. However, the additional aliquots are spiked with the compounds of concern. Matrix spikes provide information about the effect of the sample matrix on the measurement methodology. MS/MSDs will be submitted at a frequency of one per 20 investigative samples per matrix for organic parameters for soil, sediment, and groundwater. MSs will be submitted at a frequency of one per 20 investigative samples per matrix for inorganic parameters.

Refer to **Table 6** for a summary of QC sample preservation and container requirements.

4.12 Sample Preservation and Containerization

The analytical laboratory will supply the sample containers for the chemical samples. These containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest U.S. EPA's *Specifications and Guidance for Contaminant-Free Sample Containers*. Certificates of analysis are provided with each bottle lot and maintained on file to document conformance to EPA specifications. The containers will be pre-preserved, where appropriate (see **Table 2**).

4.13 Equipment Decontamination

Re-usable Teflon®, stainless steel, and aluminum sampling equipment shall be cleaned between each use in the following manner:

- Wash/scrub with a biodegradable degreaser ("Simple Green") if there is oily residue on equipment surface
- Tap water rinse
- Wash and scrub with Alconox and water mixture
- Tap water rinse
- 10 percent HNO_3 rinse for non-dedicated, stainless steel groundwater sampling equipment for metals analysis only (excludes submersible pump and flow cell) and 1 percent HNO_3 rinse for non-dedicated, non-stainless steel equipment.
- Hexane rinse (optional, only if required to remove heavy petroleum coating)
- Distilled/deionized water rinse
- Air dry

Cleaned equipment shall be wrapped in aluminum foil if not used immediately after air-drying.

Groundwater sampling pumps will be cleaned by washing and scrubbing with an Alconox/water mixture, rinsing with tap water and irrigating with distilled/deionized water.

5.0 DOCUMENTATION AND CHAIN-OF-CUSTODY

5.1 Sample Collection Documentation

5.1.1 Field Notes

Field team members will keep a field logbook to document all field activities. Field logbooks will provide the means of recording the chronology of data collection activities performed during the remediation. As such, entries will be described in as much detail as possible so that a particular situation could be reconstructed without reliance on memory.

The logbook will be a bound notebook with water-resistant pages. Logbook entries will be dated, legible, and contain accurate and inclusive documentation of the activity. The title page of each logbook should contain the following:

- Person to whom the logbook is assigned
- The logbook number
- Project name and number
- Site name and location
- Project start date
- End date

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, and names of sampling team members present will be entered. Each page of the logbook will be signed and dated by the person making the entry. All entries will be made in permanent ink, signed, and dated and no erasures or obliterations will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark that is signed and dated by the sampler. The correction shall be written adjacent to the error.

Field activities will be fully documented. Information included in the logbook should include, but may not be limited to the following:

- Chronology of activities, including entry and exit times
- Names of all people involved in sampling activities
- Level of personal protection used
- Any changes made to planned protocol
- Names of visitors to the site during sampling and reason for their visit
- Sample location and identification
- Changes in weather conditions
- Dates (month/day/year) and times (military) of sample collection
- Measurement equipment identification (model/manufacturer) and calibration information
- Sample collection methods and equipment
- Sample depths
- Whether grab or composite sample collected
- How sample composited, if applicable
- Sample description (color, odor, texture, etc.)
- Sample identification code
- Tests or analyses to be performed

- Sample preservation and storage conditions
- Equipment decontamination procedures
- QC sample collection
- Unusual observations
- Record of photographs
- Sketches or diagrams
- Signature of person recording the information

Field logbooks will be reviewed on a daily basis by the Field Team Leader. Logbooks will be supported by standardized forms.

5.1.2 Chain-of-Custody Records

Sample custody is discussed in detail in **Section 5.2** of this Plan. Chain-of-custody records are initiated by the samplers in the field. The field portion of the custody documentation should include: (1) the project name; (2) signatures of samplers; (3) the sample number, date and time of collection, and whether the sample is grab or composite; (4) signatures of individuals involved in sampling; and (5) if applicable, air bill or other shipping number. Sample receipt and log-in procedures at the laboratory are described in **Section 5.2.2** of this Plan.

On a regular basis (daily or on such a basis that all holding times will be met), samples will be transferred to the custody of the respective laboratories, via third-party commercial carriers or via laboratory courier service. Sample packaging and shipping procedures, and field chain-of-custody procedures are described in **Section 5.2.1** of this Plan.

5.1.3 Sample Labeling

Immediately upon collection, each sample will be labeled with a pre-printed adhesive label, which includes the date and time of collection, sampler's initials, tests to be performed, preservative (if applicable), and a unique identifier. The following identification scheme will be used:

A. The sample ID number will include the soil, soil gas, sediment, wastewater, or monitoring well location, along with the sample depth, sample interval, and the depth interval at which it was collected.

Example:

Sample P-9(5-5.5') indicates the sample was taken at boring location P-9, from the 6-inch interval in the spoon beginning at 5.0 feet below grade and ending at 5.5 feet below grade.

Duplicate samples will be labeled as blind duplicates by giving them sample numbers indistinguishable from a normal sample.

Blanks should be spelled out and identify the associated matrix, e.g. Equipment Blank, Soil

MS/MSDs will be noted in the Comments column of the COC.

B. The analysis required will be indicated for each sample.

Example: SVOC

C. Date taken will be the date the sample was collected, using the format: MM-DD-YY.

Example: 03-22-12

D. Time will be the time the sample was collected, using military time.

Example: 14:30

E. The sampler's name will be printed in the "Sampled By" section.

F. Other information relevant to the sample.

Example: Equipment Blank

An example sample label is presented below:

Job No:	XXXXXXXXX
Client:	Name
Sample No:	OU1-B22(5-5.5')
Matrix:	Soil
Date Taken:	3/22/12
Time Taken:	14:30
Sampler:	B. Smith
Analysis:	SVOC

Job No. ____

Client: ____

Sample Number ______________________________________

Date ______________________ Sample Time ______________________

Sample Matrix ______________________________________

Grab or Composite (explain) _________________________

Preservatives _______________________________________

Analyses ____

Sampler Signature____________________________________

This sample label contains the authoritative information for the sample. Inconsistencies with other documents will be settled in favor of the vial or container label unless otherwise corrected in writing from the field personnel collecting samples or the QEP.

5.2 Sample Custody

Custody is one of several factors that are necessary for the admissibility of environmental data as evidence in a court of law. Custody procedures help to satisfy the two major requirements for admissibility: relevance and authenticity. Sample custody is addressed in three parts: field sample collection, laboratory analysis, and final evidence files.

A sample or evidence file is considered to be under a person's custody if

- the item is in the actual possession of a person
- the item is in the view of the person after being in actual possession of the person
- the item was in the actual physical possession of the person but is locked up to prevent tampering
- the item is in a designated and identified secure area

5.2.1 Field Custody Procedures

Samples will be collected following the sampling procedures documented in **Section 4.0** of this Plan. Documentation of sample collection is described in **Section 5.1** of this Plan. Sample chain-of-custody and packaging procedures are summarized below. These procedures are intended to ensure that the samples will arrive at the laboratory with the chain-of-custody intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.

- All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis. The sample numbering system is presented in **Section 5.1.3** of this Plan.

- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because the pen would not function in wet weather.

- Samples will be accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage location.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and placed in the project files.

- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the front right and back left of the cooler and covered with clear plastic tape after being signed by field personnel. The cooler will be strapped shut with strapping tape in at least two locations.

- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on chain-of-custody document as receiving the samples and signature of sampler as relinquishing samples.

5.2.2 Laboratory Custody Procedures

Samples will be received and logged in by a designated sample custodian or his/her designee. Upon sample receipt, the sample custodian will

- Examine the shipping containers to verify that the custody tape is intact,
- Examine all sample containers for damage,
- Determine if the temperature required for the requested testing program has been maintained during shipment and document the temperature on the chain-of-custody records,
- Compare samples received against those listed on the chain-of-custody,
- Verify that sample holding times have not been exceeded,
- Examine all shipping records for accuracy and completeness,
- Determine sample pH (if applicable) and record on chain-of-custody forms,
- Sign and date the chain-of-custody immediately (if shipment is accepted) and attach the air bill,
- Note any problems associated with the coolers and/or samples on the cooler receipt form and notify the Laboratory Project Manager, who will be responsible for contacting the QEP,
- Attach laboratory sample container labels with unique laboratory identification and test, and
- Place the samples in the proper laboratory storage.

Following receipt, samples will be logged in according to the following procedure:

- The samples will be entered into the laboratory tracking system. At a minimum, the following information will be entered: project name or identification, unique sample numbers (both client and internal laboratory), type of sample, required tests, date and time of laboratory receipt of samples, and field ID provided by field personnel.

- The Laboratory Project Manager will be notified of sample arrival.

- The completed chain-of-custody, air bills, and any additional documentation will be placed in the final evidence file.

6.0 CALIBRATION PROCEDURES

6.1 Field Instruments

Field instruments will be calibrated according to the manufacturer's specifications. Calibration procedures performed will be documented in the field logbook and will include the date/time of calibration, name of person performing the calibration, reference standard used, temperature at which the readings were taken, and the readings.

6.2 Laboratory Instruments

Calibration procedures for a specific laboratory instrument will consist of initial calibrations, initial calibration verifications, and/or continuing calibration verification. Detailed descriptions of the calibration procedures for a specific laboratory instrument are included in the laboratory's standard operating procedures (SOPs), which describe the calibration procedures, their frequency, acceptance criteria, and the conditions that will require recalibration. These procedures are as required in the respective analytical methodologies (summarized in **Table 2** of this Plan). The initial calibration associated with all analyses must contain a low-level calibration standard which is less than or equal to the quantitation limit.

7.0 SAMPLE PREPARATION AND ANALYTICAL PROCEDURES

No field analyses are anticipated for this program. If site conditions were to warrant field analysis, the responsible contractor will prepare an addendum establishing the field analytical procedures. Analyses of all soil, sediment, groundwater, wastewater, and waste classification samples will be performed by Accutest Laboratories in Dayton, New Jersey or Lancaster Laboratories in Lancaster, PA or equivalent laboratory. Analyses of all soil gas samples will be performed by Accutest Laboratories in Dayton, NJ or equivalent laboratory. **Table 2** summarizes the analytical methods to be used during the remediation.

8.0 DATA REDUCTION, VALIDATION, AND REPORTING

Appropriate QC measures will be used to ensure the generation of reliable data from sampling and analysis activities. Proper collection and organization of accurate information followed by clear and concise reporting of the data is a primary goal in this project. Complete data packages suitable for data validation will be provided by the analytical laboratory.

For all analyses, the laboratory will report results that are below the laboratory's reporting limit; these results will be qualified as estimated (J) by the laboratory. The laboratory may be required to report tentatively identified compounds (TICs) for the VOC and SVOC analyses; this will be requested by the sampler on an as-needed basis. A Data Usability Summary Report (DUSR) will be prepared and will be included in the Remedial Investigation Report (RIR). Qualifications of the DUSR preparer can be found in **Attachment A.**

8.1 Data Evaluation/Validation

8.1.1 Field Data Evaluation

Measurements and sample collection information will be transcribed directly into the field logbook or onto standardized forms. If errors are made, results will be legibly crossed out, initialed and dated by the person recording the data, and corrected in a space adjacent to the original (erroneous) entry. Daily reviews of the field records by the Field Team Leader will ensure that:

- Logbooks and standardized forms have been filled out completely and that the information recorded accurately reflects the activities that were performed.

- Records are legible and in accordance with good record keeping procedures, i.e., entries are signed and dated, data are not obliterated, changes are initialed, dated, and explained.

- Sample collection, handling, preservation, and storage procedures were conducted in accordance with the protocols described in the Plan, and that any deviations were documented and approved by the appropriate personnel.

8.1.2 Analytical Data Validation

The responsible contractor will be responsible for performing an independent validation of the analytical data. Project-specific procedures will be used to validate analytical laboratory data. The basis for the validation will be the USEPA CLP National Functional Guidelines for Organic Data Review (June 2008) and the USEPA CLP National Functional Guidelines for Inorganic Data Review (January 2010), modified to accommodate the criteria in the analytical methods used in this program, and Region II SOPs for data validation. **Tables 1**, **2**, **3** and **5** highlight the QC criteria and holding time requirements for all analyses conducted under this program. These criteria will be used to evaluate and qualify the data during validation.

The responsible contractor will validate an appropriate number of soil and sediment samples collected for characterizing the subsurface and/or delineating impacted areas to ensure that verifiable data are used to support decision-making and endpoint documentation. Likewise, an appropriate number of groundwater samples will be validated to ensure that cleanup criteria have been achieved. Samples collected for waste classification or NYC Sewer Discharge parameters will not be validated. Validation will include all technical holding times, as well as QC sample results (blanks, surrogate spikes, laboratory duplicates, MS/MSDs, and LCSs), tunes, internal standards, calibrations, target compound identification, and results calculations.

The overall completeness of the data package will also be evaluated by the data validator. Completeness checks will be administered on all data to determine whether full data deliverables were provided. The reviewer will determine whether all required items are present and request copies of missing deliverables.

Upon completion of the validation, a report will be prepared. This report will summarize the samples reviewed, elements reviewed, any nonconformances with the established criteria, and validation actions. Data qualifiers will be consistent with EPA National Functional Guidelines. Waste characterization validation will be conducted per the accepting facility requirements.

8.2 Identification and Treatment of Outliers

Any data point which deviates markedly from others in its set of measurements will be investigated; however, the suspected outlier will be recorded and retained in the data set. One or both of the following tests will be used to identify outliers.

Dixon's test for extreme observations is an easily computed procedure for determining whether a single very large or very small value is consistent with the remaining data. The one-tailed t-test for difference may also be used in this case. It should be noted that these tests are designed for testing a single value. If more than one outlier is suspected in the same data set, other statistical sources may be consulted and the most appropriate test of hypothesis will be used and documented, if warranted.

Since an outlier may result from unique circumstances at the time of sample analysis or data collection, those persons involved in the analysis and data reduction will be consulted. This may provide an experimental reason for the outlier. Further statistical analysis may be performed with and without the outlier to determine its effect on the conclusions. In many cases, two data sets may be reported, one including, and one excluding the outlier.

In summary, every effort will be made to include the outlying values in the reported data. If the value is rejected, it will be identified as an outlier, reported with its data set and its omission noted.

9.0 INTERNAL QUALITY CONTROL

The subcontracting laboratories' Quality Assurance Project Plans will identify the supplemental internal analytical quality control procedures to be used. At a minimum, this will include:

- Matrix spike and/or matrix spike duplicate samples
- Matrix duplicate analyses

- Laboratory control samples
- Instrument calibrations
- Instrument tunes for SW-846 8260B and 8270C and EPA Method TO-15 analyses
- Method and/or instrument blanks
- Surrogate spikes for organic analyses
- Internal standard spikes for SW-846 8260B and 8270C and EPA Method TO-15 analyses
- Quantitation limit determination and confirmation by analysis of low-level calibration standard

Field quality control samples will include:

- Equipment blanks as outlined in **Table 5**
- Field duplicate samples as outlined in **Table 5**
- Trip blanks as outlined in **Table 5**
- MS/MSDs described in **Section 4.11**

10.0 CORRECTIVE ACTION

The entire sampling program will be under the direction of the QEP. The emphasis in this program is on preventing problems by identifying potential errors, discrepancies, and gaps in the data-collection-laboratory-analysis-interpretation process. Any problems identified will be promptly resolved. Likewise, follow-up corrective action is always an option in the event that preventative corrective actions are not totally effective.

The acceptance limits for the sampling and analyses to be conducted in this program will be those stated in the method or defined by other means in the Plan. Corrective actions are likely to be immediate in nature and most often will be implemented by the contracted laboratory analyst or the Program Manager. The corrective action will usually involve recalculation, reanalysis, or resampling.

10.1 Immediate Corrective Action

Corrective action in the field may be needed when the sample network is changed (i.e., more/less samples, sampling locations other than those specified in the Plan), or when sampling procedures and/or field analytical procedures require modification, etc. due to unexpected conditions. The field team may identify the need for corrective action. The Field Team Leader will approve the corrective action and notify the Program Manager. The Program Manager will approve the corrective measure. The Field Team Leader will ensure that the corrective measure is implemented by the field team.

Corrective actions will be implemented and documented in the field logbook. Documentation will include:

- A description of the circumstances that initiated the corrective action,
- The action taken in response,
- The final resolution, and

- Any necessary approvals

No staff member will initiate corrective action without prior communication of findings through the proper channels.

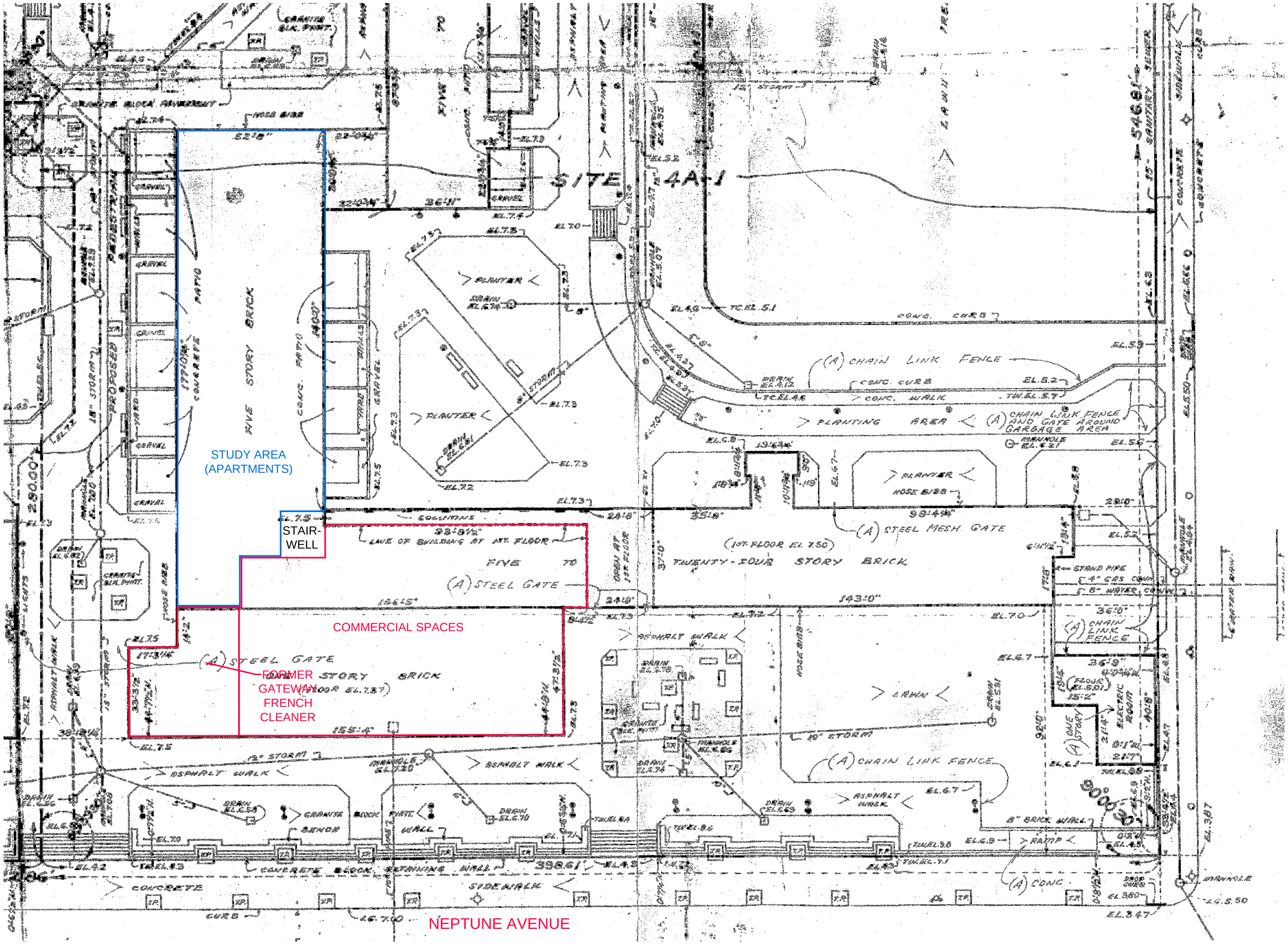
Corrective action in the laboratory may occur prior to, during, and after initial analyses. A number of conditions such as broken sample containers, omissions or discrepancies with chain-of-custody documentation, low/high pH readings, and potentially high concentration samples may be identified during sample log-in or just prior to analysis. Following consultation with laboratory analysts and Laboratory Section Leaders, it may be necessary for the Laboratory QA Manager to approve the implementation of corrective action. The laboratory SOPs specify some conditions during or after analysis that may automatically trigger corrective action or optional procedures. These conditions may include dilution of samples, additional sample extract cleanup, automatic reinjection/reanalysis when certain QC criteria are not met, loss of sample through breakage or spillage, etc.

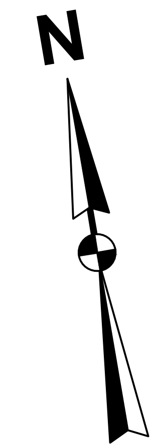
The analyst may identify the need for corrective action. The Laboratory Section Leader, in consultation with the staff, will approve the required corrective action to be implemented by the laboratory staff. The Laboratory QA Manager will ensure implementation and documentation of the corrective action. If the nonconformance causes project objectives not to be achieved, the QEP will be notified. The QEP will notify the Program Manager, who in turn will contact all levels of project management for concurrence with the proposed corrective action.

These corrective actions are performed prior to release of the data from the laboratory. The corrective action will be documented in both the laboratory's corrective action files, and the narrative data report sent from the laboratory to the Program Manager. If the corrective action does not rectify the situation, the laboratory will contact the Program Manager, who will determine the action to be taken and inform the appropriate personnel.

If potential problems are not solved as an immediate corrective action, the contractor will apply formalized long-term corrective action, if necessary.

FIGURES





0 20' 40' 80'

APPROXIMATE SCALE IN FEET

NOTES:

1. THE BASE MAP WAS DEVELOPED FROM AN ELECTRONIC FILE PROVIDED BY: STARRETT CORPORATION, ENTITLED: FINAL SURVEY, DATED: OCTOBER 22, 1976, ORIGINAL SCALE: 1" = 30'.

NO.	ISSUE/DESCRIPTION	BY	DATE

3325 NEPTUNE AVENUE
BROOKLYN, NEW YORK

QUALITY ASSURANCE/QUALITY CONTROL PROJECT PLAN
SITE MAP

PREPARED BY:
GZA GeoEnvironmental of New York
Engineers and Scientists
104 WEST 29TH STREET, 10TH FLOOR
NEW YORK, NEW YORK 10001

PREPARED FOR:
STARRETT CORPORATION

PROJ MGR: DW	REVIEWED BY: BE	CHECKED BY: DW	FIGURE
DESIGNED BY: BE	DRAWN BY: MT	SCALE: 1" = 40'	1
DATE: JULY 2013	PROJECT NO. 41.0161826.60	REVISION NO.	SHEET NO.

TABLES

Table 1
Media Criteria Table
Bay Park One
QA/QA Project Plan

Contaminant	Industrial Soil Cleanup Objectives[1], mg/kg	Aqueous Water Quality Standards[2], ug/L	Soil Gas Criteria[3], ppbv
Metals			
Antimony	---	3	---
Arsenic	19	---	---
Arsenic	---	25	---
Barium	10,000	1,000	---
Beryllium	2,700	3	---
Cadmium	60	5	---
Chromium, hexavalent	800	---	---
Chromium, trivalent	6,800	50	---
Copper	10,000	200	---
Cyanide	10,000	---	---
Iron	---	300	---
Lead	3,900	25	---
Magnesium	---	35,000	---
Manganese	10,000	300	---
Mercury	5.7	0.7	---
Nickel	10,000	100	---
Selenium	6,800	10	---
Silver	6,800	50	---
Sodium	---	20,000	---
Thallium	---	0.5	---
Zinc	10,000	2000	---
PCBs/Pesticides			
alpha-BHC	6.8	0.01	---
2,4,5-TP Acid (Silvex)	1,000	---	---
4,4'-DDD	180	0.3	---
4,4'-DDE	120	0.2	---
4,4'-DDT	94	0.2	---
Aldrin	1.4	---	---
beta-BHC	14	0.04	---
Chlordane (alpha)	47	---	---
Dibenzofuran	1,000	---	---
Dieldrin	2.8	0.004	---
Endosulfan I	920	0.12	---
Endosulfan II	920	0.12	---
Endosulfan sulfate	920	0.12	---
Endrin	410	---	---
Endrin aldehyde	---	5	---
Endrin ketone	---	5	---
gamma-BHC (Lindane)	---	0.05	---

Table 1
Media Criteria Table
Bay Park One
QA/QA Project Plan

Contaminant	Industrial Soil Cleanup Objectives[1], mg/kg	Aqueous Water Quality Standards[2], ug/L	Soil Gas Criteria[3], ppbv
PCBs/Pesticides, Con't.			
gamma-Chlordane	---	0.12	---
Heptachlor	29	0.04	---
Heptachlor epoxide	---	0.03	---
Lindane	23	---	---
Methoxychlor	---	35	---
Polychlorinated biphenyls	25	---	---
Toxaphene		0.06	---
Semivolatiles			
1,1'-Biphenyl	---	5	---
2,2'-oxybis(1-Chloropropane)	---	5	---
2,4,5-Trichlorophenol	---	1	---
2,4-Dichlorophenol	---	1	---
2,4-Dimethylphenol	---	50	---
2,4-Dinitrophenol	---	10	---
2,4-Dinitrotoluene	---	5	---
2,6-Dinitrotoluene	---	5	---
2-Chloronaphthalene	---	10	---
2-Chlorophenol	---	1	---
2-Methylnaphthalene	---	502	---
2-Methylphenol	---	1	---
2-Nitroaniline	---	5	---
2-Nitrophenol	---	1	---
3,3'-Dichlorobenzidine	---	5	---
3-Nitroaniline	---	5	---
4-Chloro-3-methylphenol	---	1	---
4-Chloroaniline	---	5	---
4-Methylphenol	---	1	---
4-Nitroaniline	---	5	---
4-Nitrophenol	---	1	---
Acenaphthene	1,000	20	---
Acenapthylene	1,000	202	---
Anthracene	1,000	50	---
Atrazine	---	7.5	---
Benz(a)anthracene	11	0.002	---
Benzo(a)pyrene	1.1	---	---
Benzo(b)fluoranthene	11	0.002	---
Benzo(g,h,i)perylene	1,000	52	---
Benzo(k)fluoranthene	110	0.002	---
bis(2-Chloroethoxy)methane	---	5	---

Table 1
Media Criteria Table
Bay Park One
QA/QA Project Plan

Contaminant	Industrial Soil Cleanup Objectives[1], mg/kg	Aqueous Water Quality Standards[2], ug/L	Soil Gas Criteria[3], ppbv
Semivolatiles, Con't.			
Bis(2-Chloroethyl)ether	---	1	---
bis(2-Ethylhexyl)phthalate	---	5	---
Butylbenzylphthalate	---	50	---
Chrysene	110	0.002	---
Dibenz(a,h)anthracene	1.1	502	---
Dibenzofuran	---	52	---
Diethylphthalate	---	50	---
Dimethylphthalate	---	50	---
Di-n-butylphthalate	---	50	---
Di-n-octylphthalate	---	50	---
Fluoranthene	1,000	50	---
Fluorene	1,000	50	---
Hexachlorobenzene	---	0.04	---
Hexachlorobutadiene	---	0.5	---
Hexachlorocyclopentadiene	---	5	---
Hexachloroethane	---	5	---
Indeno(1,2,3-cd)pyrene	11	0.002	---
Isophorone	---	50	---
m-Cresol	1,000	---	---
Naphthalene	1,000	10	---
Nitrobenzene	---	0.4	---
N-Nitrosodiphenylamine	---	50	---
o-Cresol	1,000	---	---
p-Cresol	1,000	---	---
Pentachlorophenol	55	1	---
Phenanthrene	1,000	50	---
Phenol	1,000	1	---
Pyrene	1,000	50	---
Volatiles			
1,1,1-Trichloroethane	1,000	5	200,000
1,1,2,2-Tetrachloroethane	---	5	3.1
1,1,2-Trichloro-1,2,2-trifluoroethane	---	5	---
1,1,2-Trichloroethane	---	1	14
1,1-Dichloroethane	480	5	62,000
1,1-Dichloroethene	1,000	5	---
1,1-Dichloroethylene	---	---	25,000
1,2,4-Trichlorobenzene	---	---	13,000

Table 1
Media Criteria Table
Bay Park One
QA/QA Project Plan

Contaminant	Industrial Soil Cleanup Objectives[1], mg/kg	Aqueous Water Quality Standards[2], ug/L	Soil Gas Criteria[3], ppbv
Volatiles, Con't.			
1,2,4-Trimethylbenzene	380	5	610
1,2-Dibromo-3-chloropropane	---	0.04	62,000
1,2-Dibromoethane	---	0.0006	1
1,2-Dichlorobenzene	1,000	3	25,000
1,2-Dichloroethane	60	0.6	12
1,2-Dichloropropane	---	1	430
1,3,5- Trimethylbenzene	380	---	610
1,3-Butadiene	---	---	2
1,3-Dichlorobenzene	---	3	12
1,3-Dichlorobenzene	560	---	430
1,4-Dichlorobenzene	---	3	610
1,4-Dichlorobenzene	250	---	2
1,4-Dioxane	250	---	---
2-Butanone	---	50	---
2-Hexanone	---	50	---
4-Methyl-2-pentanone	---	502	---
Acetone	1,000	50	74,000
Benzene	89	1	49
Bromodichloromethane	---	50	10
Bromoform	---	50	110
Bromomethane	---	5	640
Butylbenzene	1,000	---	---
Carbon Disulfide	---	60	110,000
Carbon tetrachloride	44	5	13
Chlorobenzene	1,000	5	6,500
Chloroethane	---	5	1,900,000
Chloroform	700	7	11
Chloromethane	---	5	590
Cis- 1,3-Dichloropropene	---	0.4	67
cis-1,2-Dichloroethene	1,000	5	1,900,000
cis-1,2-Dichloroethylene	---	---	4,400
Cyclohexane	---	---	---
Dibromochloromethane	---	50	6
Dichlorodifluoromethane	---	5	20,000
Ethyl Acetate	---	---	440,000
Ethylbenzene	780	5	250
Freon 113	---	---	2,000,000
Hexachlorobenzene	12	---	---

Table 1
Media Criteria Table
Bay Park One
QA/QA Project Plan

Contaminant	Industrial Soil Cleanup Objectives[1], mg/kg	Aqueous Water Quality Standards[2], ug/L	Soil Gas Criteria[3], ppbv
Volatiles, Con't.			
Hexachlorobutadiene	---	---	5.2
Hexane	---	---	28,000
Isopropylbenzene	---	5	---
m,p-Xylene	---	---	810,000
m-Dichlorobenzene	---	---	8,700
Methyl Acetate	---	NS	---
Methyl ethyl ketone	1,000	---	170,000
Methyl Isobutyl Ketone	---	---	9,800
Methyl tert-butyl ether	1,000	10	420,000
Methylcyclohexane	---	---	---
Methylene chloride	1,000	5	750
n-Propylbenzene	1,000	---	---
o-Dichlorobenzene	---	---	17,000
o-Xylene	---	---	810,000
p-Dichlorobenzene	---	---	67,000
sec-Butylbenzene	1,000	---	---
Volatiles, Con't.			
Styrene	---	5	120,000
tert-Butylbenzene	1,000	---	---
Tertiary Butyl Alcohol	---	---	---
Tetrachloroethene	300	5	60
Toluene	1,000	5	53,000
trans-1,2-Dichloroethene	1,000	5	8,800
trans-l,3-Dichloropropene	---	0.4	67
Trichloroethene	400	5	2.1
Trichlorofluoromethane	---	5	62,000
Vinyl Acetate	---	---	28,000
Vinyl Chloride	27	2	54
Xylene (mixed)	1,000	5	810,000

Notes:

[1] - New York State Department of Environmental Conservation Department of Remediation specified Industrial Soil Cleanup Objectives, NYSCC 6 Part 375 Table-6.8(b).

[2] - Division of Water Technical and Operational Guidance Vaslues (TOGS) Ambient Water Quality Standards and Guidance Values (AWQS), ug/L

[3] - EPA's Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), Table 3c-SG:Question 5 Soil Gas Screening Levels for Scenario-Specific Vapor Attenuation Factors (α = 2x10-3), November 2002, bbbV

mg/kg - milligrams per kilogram
ug/L - micro gram per liter
ppbv - part per billion by volume.

Table 2
Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Soil/Sediment	VOCs (STARS or TCL)	Grab	TBD	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil/Sediment	PCBs	Grab	TBD	SW-846 Method 8082A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil/Sediment	Pesticides (TCL)	Grab	TBD	SW-846 Method 8081A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil/Sediment	PAHs or SVOCs (STARS or TCL)	Grab	TBD	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Sediment	Grain Size	Grab	TBD	ASTM Method D422 (with hydrometer)	None	None	(1) 500 mL polyethylene jar or 16 oz. Ziploc bag
Soil/Sediment	Metals (TAL)	Grab	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Soil	Cyanide	Grab	TBD	SW-846 Method 9012A	Cool to 4^0 C	14 days to analysis	(1) 300 mL amber glass jar
Soil	Herbicides	Grab	TBD	SW-846 Method 8151A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	Organophosphorous Pesticides	Grab	TBD	SW-846 Method 8141A[6]	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Soil/Sediment	VOCs (STARS or TCL)	Grab	TBD	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil/Sediment	PCBs	Grab	TBD	SW-846 Method 8082A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil/Sediment	Pesticides (TCL)	Grab	TBD	SW-846 Method 8081A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil/Sediment	PAHs or SVOCs (STARS or TCL)	Grab	TBD	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Sediment	Grain Size	Grab	TBD	ASTM Method D422 (with hydrometer)	None	None	(1) 500 mL polyethylene jar or 16 oz. Ziploc bag
Soil/Sediment	Metals (TAL)	Grab	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Soil	Cyanide	Grab	TBD	SW-846 Method 9012A	Cool to 4^0 C	14 days to analysis	(1) 300 mL amber glass jar
Soil	Herbicides	Grab	TBD	SW-846 Method 8151A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	Organophosphorous Pesticides	Grab	TBD	SW-846 Method 8141A[6]	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Sediment	Total Organic Carbon	Grab	TBD	Lloyd Kahn Method, EPA Region 2	Cool to 4^0 C	14 days to analysis	(1) 300 mL amber glass jar
Soil/Solid Waste/Liquid Waste	TCLP VOC (RCRA)	Grab	TBD	SW 846 Methods 1311/8260B	Cool to 4^0 C; no headspace	14 days to TCLP extraction; 14 days from TCLP extraction to analysis	(1) 60 ml VOC vial
Soil/Solid Waste	TCLP SVOC (RCRA)	Grab	TBD	SW 846 Methods 1311/ 8270C	Cool to 4^0 C	14 days to TCLP extraction; 7 days from TCLP extraction to SVOC extraction; 40 days from SVOC extraction to analysis	(1) 950 mL amber glass jar
Liquid Waste	TCLP SVOC (RCRA)	Grab	TBD	SW 846 Methods 1311/ 8270C	Cool to 4^0 C	7 days to TCLP extraction; 7 days from TCLP extraction to SVOC extraction; 40 days from SVOC extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Pesticides (RCRA)	Grab	TBD	SW-846 Methods 1311/8081A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to pesticide extraction; 40 days from pesticide extraction to analysis	(1) 950 mL amber glass jar
Liquid Waste	TCLP Pesticides (RCRA)	Grab	TBD	SW-846 Methods 1311/8081A	Cool to 4ºC	7 days to TCLP extraction; 7 days from TCLP extraction to pesticide extraction; 40 days from pesticide extraction to analysis	(1) 950 mL amber glass jar
Solid Waste	TCLP Herbicides (RCRA)	Grab	TBD	SW-846 Methods 1311/8151A	Cool to 4ºC	14 days to TCLP extraction; 7 days from TCLP extraction to herbicide extraction; 40 days from herbicide extraction to analysis	(1) 950 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Liquid Waste	TCLP Herbicides (RCRA)	Grab	TBD	SW-846 Methods 1311/8151A	Cool to 4ºC	7 days to TCLP extraction; 7 days from TCLP extraction to herbicide extraction; 40 days from herbicide extraction to analysis	(1) 950 mL amber glass jar
Solid Waste/Liquid Waste	TCLP Metals (RCRA)	Grab	TBD	SW 846 Methods 1311/ 6010B/7000 Series	Cool to 4^0 C	Hg: 28 days to TCLP extraction; 28 days from TCLP extraction to analysis Other Metals: 6 months to TCLP extraction; 6 months from TCLP extraction to analysis	(1) 500 mL amber glass jar
Solid Waste/Liquid Waste	Ignitability	Grab	TBD	SW-846 Method 1010/1030	Cool to 4^0 C	None specified	(1) 500 mL amber glass jar
Solid Waste/Liquid Waste	Corrosivity	Grab	TBD	SW-846 Method 9045C	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Solid Waste/Liquid Waste	Reactive cyanide	Grab	TBD	SW-846 Chapter 7, Section 7.3.3	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar
Solid Waste/Sediment	TPH-DRO	Grab	TBD	SW-846 Method 8015B	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Solid Waste	Total Organic Halides	Grab	TBD	SW-846 Method 9023	Cool to 4^0 C; no headspace	28 days to analysis	(1) 2-oz. glass jar
Solid Waste/Liquid Waste	Reactive sulfide	Grab	TBD	SW-846 Chapter 7, Section 7.3.4	Cool to 4^0 C; no headspace	As soon as possible (within 3 days of collection)	(1) 500 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Groundwater	VOCs (STARS or TCL)	Grab	TBD	SW-846 Method 8260B	pH<2 with HCl; Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Groundwater	SVOCs (STARS or TCL)	Grab	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 950 mL amber glass jar
Groundwater/Wastewater	Metals- total (TAL)	Grab	TBD	SW-846 Method 6010B/7000 Series	pH<2 with HNO_3; Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1 L polyethylene container
Groundwater	Metals-dissolved (TAL)	Grab	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	24 hours to filtering and preservation (pH<2 with HNO_3); 28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1 L polyethylene container
Groundwater	Ammonia	Grab	TBD	EPA Method 350.1 (350.2 for distillation)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 250 mL polyethylene container
Groundwater	Nitrate	Grab	TBD	EPA Method 353.2/SM 4500-NO_2B (18th edition)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 100 mL polyethylene container
Groundwater	Nitrite	Grab	TBD	SM 4500-NO_2B (18th edition)	Cool to 4^0 C	48 hours to analysis	(1) 100 mL polyethylene container
Groundwater	Pesticides (TCL)	Grab	TBD	SW-846 Method 8081A	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 950 mL amber glass jar

Table 2
Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Groundwater	Sulfate	Grab	TBD	SW-846 9056	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 100 mL polyethylene container
Groundwater	Carbonate	Grab	TBD	SM 4500-CO_2D (18^{th} edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Bicarbonate	Grab	TBD	SM 4500-CO_2D (18^{th} edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Total Cyanide	Grab	TBD	EPA Method 335.4	pH>12 with NaOH; Cool to 4ºC	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Total Dissolved Solids	Grab	TBD	EPA Method 160.1	Cool to 4ºC	7 days to analysis	(1) 100 mL polyethylene container
Groundwater	Chloride	Grab	TBD	SM 2540C (18th edition)	Cool to 4ºC	28 days to analysis	(1) 100 mL polyethylene container
Wastewater	Total Petroleum Hydrocarbons	Grab	TBD	EPA Method 418.1	pH<2 with HCl; Cool to 4^0 C	28 days to analysis	(2) 950 mL amber glass jar
Wastewater	pH	Grab	TBD	EPA Method 150.1	Cool to 4ºC	As soon as possible (24 hours to analysis)	(1) 100 mL polyethylene container
Wastewater	Amenable cyanide	Grab	TBD	EPA Method 335.1	pH>12 with NaOH; Cool to 4ºC	14 days to analysis	(1) 300 mL polyethylene container
Wastewater	Flashpoint	Grab	TBD	SW-846 Method 1010	Cool to 4ºC	None	(1) 100 mL polyethylene container

Table 2

Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements

Bay Park One

QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type[1]	No. of Samples[2]	EPA Analytical Method	Sample Preservation	Holding Time[3]	Sample Container[4,5]
Wastewater	Hexavalent chromium	Grab	TBD	SW-846 Method 7196A	Cool to 4ºC	24 hours to analysis	(1) 500 mL polyethylene container
Soil Gas	VOCs	Grab	TBD	EPA Method TO-15	None	14 days to analysis	(1) Evacuated 6-Liter SUMMA® canister

Notes:

[1] For soil samples, a six-inch sampling interval is the preferred sample size; however, sample volume recovery, analytical method requirements, and field

conditions can affect the actual sample interval size. For these reasons, the actual sampling interval may change in order to obtain adequate volume.

[2] Actual number of samples may vary depending on field conditions, sample material availability, and field observations. See Remedial Work Plan for estimates.

[3] Holding times listed are method holding time calculated from time of collection and not NYSDEC ASP holding times.

[4] I-Chem Series 300 bottles

[5] MS/MSDs require duplicate volume for all parameters for solid matrices; MS/MSDs require triplicate volume for organic parameters for aqueous matrices and duplicate volume for inorganic parameters for aqueous matrices

[6] Accutest utilizes SW-846 Method 8270C for organophosphorous pesticides and Lancaster utilizes SW-846 Method 8141A.

TBD = To Be Determined

Table 3
Typical Laboratory Data Quality Objectives
Soil, Sediment, and Solid Waste Samples
Bay Park One
QA/QA Project Plan

Parameter	**Method**	**Matrix**	**Accuracy Control Limits**	**Accuracy Frequency Requirements**	**Precision (RPD) Control Limits**	**Precision Frequency Requirements**
VOCs	SW-846	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
(TCL or STARS)	Method		1,2-Dichloroethane-d4 61-133	All samples, standards,		One per 20 per soils
	8260B		4-Bromofluorobenzene 65-142	QC samples	RPD <50	
			Dibromofluoromethane 70-120			
			Toluene-d8 75-123			
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			1,1-Dichloroethene 47-136	One per 20 per matrix	1,1-Dichloroethene 20	One per 20 per matrix type
			Trichloroethene 42-145	type	Trichloroethene 19	
			Benzene 49-134		Benzene 17	
			Toluene 41-143		Toluene 19	
			Chlorobenzene 42-142		Chlorobenzene 20	
PCBs	SW-846	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
			Decachlorobiphenyl 40-151	All samples, standards,		One per 20 per soils
			Tetrachloro-m-xylene 37-140	QC samples	RPD <50	
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			Aroclor 1016 43-161	One per 20 per matrix	Aroclor 1016 19	One per 20 per matrix type
			Aroclor 1020 37-164	type	Aroclor 1020 24	
PAHs	SW-846	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
(CP-51)	Method		Nitrobenzene-d5 26-113	All samples, standards,		One per 20
	8270C		2-Fluorobiphenyl 40-106	QC samples	RPD <50	
			Terphenyl-d14 35-142			
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			Naphthalene 24-115	One per 20 per matrix	Naphthalene 25	One per 20 per matrix type
			2-Methylnaphthalene 25-120	type	2-Methylnaphthalene 23	
			Acenaphthylene 31-105		Acenaphthylene 22	
			Acenaphthene 31-118		Acenaphthene 25	
			Fluorene 35-123		Fluorene 25	
			Fluoranthene 28-130		Fluoranthene 39	
			Pyrene 18-149		Pyrene 42	
			Phenanthrene 31-128		Phenanthrene 39	
			Anthracene 31-129		Anthracene 32	
			Benzo(a)anthracene 31-129		Benzo(a)anthracene 33	
			Chrysene 27-134		Chrysene 32	
			Benzo(b)fluoranthene 21-151		Benzo(b)fluoranthene 33	
			Benzo(k)fluoranthene 29-142		Benzo(k)fluoranthene 37	
			Benzo(a)pyrene 26-133		Benzo(a)pyrene 33	
			Indeno(1,2,3-cd)pyrene 12-134		Indeno(1,2,3-cd)pyrene 34	
			Dibenzo(a,h)anthracene 18-125		Dibenzo(a,h)anthracene 31	
			Benzo(g,h,i)perylene 0-132		Benzo(g,h,i)perylene 35	
SVOCs	SW-846	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
(TCLP or CP-51)	Method		Phenol-d5 34-110	All samples, standards,		One per 20 per soils
and	8270C		2-Fluorophenol 33-105	QC samples	RPD <50	
Organophosphorous			2,4,6-Tribromophenol 33-124			
Pesticides			Nitrobenzene-d5 26-113			
			2-Fluorobiphenyl 40-106			
			Terphenyl-d14 35-142			
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			Phenol 40-109	One per 20 per matrix	Phenol 18	One per 20 per matrix type
			2-Chlorophenol 43-107	type	2-Chlorophenol 16	
			4-Chloro-3-methylphenol 42-104		4-Chloro-3-methylphenol 19	
			Acenaphthene 31-118		Acenaphthene 25	
			4-Nitrophenol 14-138		4-Nitrophenol 34	
			Pentachlorophenol 22-125		Pentachlorophenol 21	
			Pyrene 18-149		Pyrene 42	

Table 3
Typical Laboratory Data Quality Objectives
Soil, Sediment, and Solid Waste Samples
Bay Park One
QA/QA Project Plan

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
Pesticides (TCL)	SW-846 Method 8081A	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
			Decachlorobiphenyl 28-148 Tetrachloro-m-xylene 31-136	All samples, standards, QC samples	RPD <50	One per 20 per soils
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			Gamma-BHC 35-148 Heptachlor 51-136 Aldrin 49-137 Dieldrin 51-151 Endrin 27-168 4,4'-DDT 20-193	One per 20 per matrix	Gamma-BHC 29 Heptachlor 32 Aldrin 29 Dieldrin 28 Endrin 30 4,4'-DDT 42	One per 20 per matrix type
Total Petroleum Hydrocarbons	SW-846 Method 8015B	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
			o-Terphenyl 27-153 Tetracosane-d50 28-148 5α-androstane 27-148	All samples, standards, QC samples	RPD <50	One per 20 per soils
			TPH-DRO 10-149	One per 20 per matrix type	TPH-DRO 44	One per 20 per matrix type
Herbicides	SW-846 Method 8151A	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
			2,4-DCAA 10-147	All samples, standards, QC samples	RPD V50	One per 20 per soils
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			2,4-D 10-130 2,4,5-TP 19-108 2,4,5-T 10-121	One per 20 per matrix type	2,4-D 53 2,4,5-TP 59 2,4,5-T 62	One per 20 per matrix type
Metals (TAL)	SW-846 Methods 6010B/7000 Series	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
					RPD <50	One per 20 per soils
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			75-125% recovery	One per 20 per matrix type	RPD <20	One per 20 per matrix type
Cyanide	SW-846 Method 9012A	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
					RPD <50	One per 20 per soils
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			85-120% recovery	One per 20 per matrix type	RPD <10	One per 20 per matrix type
Total Organic Halides	SW-846 Method 9023	Soil	Surrogates % Rec.	Surrogates:	Field Duplicates	Field Duplicates:
					RPD <50	One per 20 per soils
			Matrix Spikes	Matrix Spikes:	MS/MSDs (RPD)	MS/MSDs:
			69-132% recovery	One per 20 per matrix type	RPD <16	One per 20 per matrix type

Parameter	Method	Matrix	Accuracy Control Limits		Accuracy Frequency Requirements	Precision (RPD) Control Limits		Precision Frequency Requirements
Organophosphorous	SW-846 Method 8141A	Soil	Surrogates	% Rec.	Surrogates:	Field Duplicates		Field Duplicates:
Pesticides			2-Nitro-m-xylene	67-134	All samples, standards, QC samples	RPD <50		One per 20 per soils
			Matrix Spikes		Matrix Spikes:	MS/MSDs	(RPD)	MS/MSDs:
			Parathion	63-147	One per 20 per matrix type	RPD <35		One per 20 per matrix type
TCLP VOCs (RCRA)	SW-846 Methods 1311/8260B	Solid Waste/Liquid Waste	Surrogates	% Rec.	Surrogates:	Field Duplicates		Field Duplicates:
			1,2-Dichloroethane-d4	65-133	All samples, standards, QC samples			
			4-Bromofluorobenzene	79-124				
			Dibromofluoromethane	77-121				
			Toluene-d8	80-117				
			Matrix Spikes		Matrix Spikes:	MS/MSDs	(RPD)	MS/MSDs:
			1,1-Dichloroethene	63-135	One per 20 per matrix type	1,1-Dichloroethene	15	One per 20 per matrix type
			1,2-Dichloroethane	62-150		1,2-Dichloroethane	15	
			2-Butanone	45-146		2-Butanone	19	
			Chloroform	73-133		Chloroform	14	
			Carbon Tetrachloride	65-152		Carbon Tetrachloride	17	
			Benzene	50-141		Benzene	13	
			Trichloroethene	64-139		Trichloroethene	13	
			Tetrachloroethene	60-138		Tetrachloroethene	14	
			Chlorobenzene	73-124		Chlorobenzene	12	
			Vinyl chloride	56-146		Vinyl chloride	18	
			1,4-Dichlorobenzene	71-122		1,4-Dichlorobenzene	13	
TCLP SVOCs (RCRA)	SW-846 Methods 1311/8270C	Solid Waste/Liquid Waste	Surrogates	% Rec.	Surrogates:	Field Duplicates		Field Duplicates:
			Phenol-d5	10-59	All samples, standards, QC samples			
			2-Fluorophenol	12-76				
			2,4,6-Tribromophenol	42-128				
			Nitrobenzene-d5	30-122				
			2-Fluorobiphenyl	34-113				
			Terphenyl-d14	42-125				
			Matrix Spikes		Matrix Spikes:	MS/MSDs	(RPD)	MS/MSDs:
			Hexachloroethane	24-118	One per 20 per matrix type	Hexachloroethane	33	One per 20 per matrix type
			Nitrobenzene	37-117		Nitrobenzene	28	
			Hexachlorobutadiene	29-119		Hexachlorobutadiene	30	
			2,4,6-Trichlorophenol	46-122		2,4,6-Trichlorophenol	26	
			2,4,5-Trichlorophenol	50-120		2,4,5-Trichlorophenol	25	
			2,4-Dinitrotoluene	45-129		2,4-Dinitrotoluene	25	
			Hexachlorobenzene	52-119		Hexachlorobenzene	22	
			Pentachlorophenol	38-134		Pentachlorophenol	20	
			Pyridine	10-91		Pyridine	41	
			2-Methylphenol	29-108		2-Methylphenol	27	
			3&4-Methylphenol	25-105		3&4-Methylphenol	26	
TCLP Pesticides (RCRA)	SW-846 Methods 1311/8081A	Solid Waste/Liquid Waste	Surrogates	% Rec.	Surrogates:	Field Duplicates		Field Duplicates:
			Decachlorobiphenyl	19-153	All samples, standards, QC samples			
			Tetrachloro-m-xylene	35-138				
			Matrix Spikes		Matrix Spikes:	MS/MSDs	RPD	MS/MSDs:
			Gamma-BHC	51-145	One per 20 per matrix type	Gamma-BHC	39	One per 20 per matrix type
			Heptachlor	46-149		Heptachlor	38	
			Heptachlor epoxide	49-154		Heptachlor epoxide	41	
			Endrin	56-151		Endrin	35	
			Methoxychlor	44-160		Methoxychlor	38	
			Technical Chlordane	50-150		Technical Chlordane	20	
			Toxaphene	50-150		Toxaphene	20	

Table 3
Typical Laboratory Data Quality Objectives
Soil, Sediment, and Solid Waste Samples
Bay Park One
QA/QA Project Plan

Parameter	**Method**	**Matrix**	**Accuracy Control Limits**	**Accuracy Frequency Requirements**	**Precision (RPD) Control Limits**	**Precision Frequency Requirements**
TCLP Herbicides	SW-846 Methods 1311/8151A	Solid Waste/Liquid Waste	Surrogates % Rec. 2,4-DCAA 54-141 Matrix Spikes 2,4-D 37-146 2,4,5-TP 21-144	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20 per matrix type	Field Duplicates MS/MSDs RPD 2,4-D 40 2,4,5-TP 39	Field Duplicates: MS/MSDs: One per 20 per matrix type
TCLP Metals	SW-846 Methods 1311/ 6010B/7000	Solid Waste/Liquid Waste	Matrix Spikes 75-125% recovery	Matrix Spikes: One per 20 per matrix type	Matrix Duplicates RPD <20	Matrix Duplicates: One per 20 per matrix type
Ignitability	SW-846 Method 1010	Solid Waste/Liquid Waste	Not Applicable	Not Applicable	Matrix Duplicates RPD <46	Matrix Duplicates: One per 20 per matrix type
Corrosivity	SW-846 Method 9045C	Solid Waste/Liquid Waste	Not Applicable	Not Applicable	Matrix Duplicates RPD <5	Matrix Duplicates: One per 20 per matrix type
Reactive cyanide	SW-846 Chapter 7, Section 7.3.3	Solid Waste/Liquid Waste	Matrix Spikes 0-5% recovery	Not Applicable	Matrix Duplicates RPD <10	Matrix Duplicates: One per 20 per matrix type
Reactive sulfide	SW-846 Chapter 7, Section 7.3.4	Solid Waste/Liquid Waste	Matrix Spikes 1-80% recovery	Not Applicable	Matrix Duplicates RPD £10	Matrix Duplicates: One per 20 per matrix type
TPH-DRO	SW846 Method 8015B	Solid Waste	Surrogates % Rec. o-terphenyl 45-129 Matrix Spikes 21-136% recovery	Matrix Spikes: One per 20 per matrix	Matrix Duplicates RPD <20	Matrix Duplicates: One per 20 per matrix type

Recovery criteria for laboratory control samples must be at least as stringent as MS/MSD criteria.
Laboratory control limits are periodically updated. The latest control limits will be utilized at the time of sample analysis.

Table 4
Typical Laboratory Data Quality Objectives: Precision and Accuracy:
Groundwater and Wastewater Samples
Bay Park One
QA/QA Project Plan

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
VOCs (CP-51 or TCL)	SW-846 Method 8260B	Groundwater	Surrogates % Rec. 1,2-Dichloroethane-d4 65-133 4-Bromofluorobenzene 79-124 Dibromofluoromethane 77-121 Toluene-d8 80-117 Matrix Spikes 1,1-Dichloroethene 63-135 Trichloroethene 64-139 Benzene 51-138 Toluene 49-147 Chlorobenzene 76-120	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20	Field Duplicates RPD <30 MS/MSDs RPD 1,1-Dichloroethene 15 Trichloroethene 13 Benzene 13 Toluene 13 Chlorobenzene 12	Field Duplicates: One per 20 MS/MSDs: One per 20
SVOCs (CP-51 or TCL)	SW-846 Method 8270C	Groundwater	Surrogates % Rec. Phenol-d5 10-59 2-Fluorophenol 12-76 2,4,6-Tribromophenol 42-128 Nitrobenzene-d5 30-122 2-Fluorobiphenyl 34-113 Terphenyl-d14 42-125 Matrix Spikes Phenol 10-86 2-Chlorophenol 37-112 4-Chloro-3-methylphenol 43-128 Acenaphthene 43-109 4-Nitrophenol 10-109 Pentachlorophenol 38-134 Pyrene 48-121	Surrogates: All samples, standards, QC Matrix Spikes: One per 20	Field Duplicates RPD <30 MS/MSDs RPD Phenol 30 2-Chlorophenol 26 4-Chloro-3-methylphenol 24 Acenaphthene 28 4-Nitrophenol 40 Pentachlorophenol 20 Pyrene 22	Field Duplicates: One per 20 MS/MSDs: One per 20
Metals (TAL)	SW-846 Methods 6010B/7000 Series	Groundwater/Waste water	Matrix Spikes 75-125% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Ammonia	EPA Method 350.1 (350.2 for distillation)	Groundwater	Matrix Spikes 63-131% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <24	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Nitrate	EPA Method 353.2/SM 4500-NO_2B (18th edition)	Groundwater	Matrix Spikes 80-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Nitrite	SM 4500-NO_2B (18th edition)	Groundwater	Matrix Spikes 71-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <10	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Pesticides (TCL)	SW-846 Method 8081A	Groundwater	Surrogates % Rec. Decachlorobiphenyl 15-142 Tetrachloro-m-xylene 36-126 Matrix Spikes Gamma-BHC 64-140 Heptachlor 52-145 Aldrin 52-137 Dieldrin 65-153 Endrin 61-156 4,4'-DDT 55-162	Surrogates: All samples, standards, QC samples Matrix Spikes: One per 20	Field Duplicates RPD <30 MS/MSDs RPD Gamma-BHC 23 Heptachlor 24 Aldrin 30 Dieldrin 22 Endrin 21 4,4'-DDT 25	Field Duplicates: One per 20 MS/MSDs: One per 20

Table 4
Typical Laboratory Data Quality Objectives: Precision and Accuracy:
Groundwater and Wastewater Samples
Bay Park One
QA/QA Project Plan

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
Sulfate	SW-846 9056	Groundwater	Matrix Spikes 80-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Carbonate	SM 4500-CO_2D (18^{th} edition)	Groundwater	Not Applicable	Not Applicable	Field Duplicates RPD <30 Matrix Duplicates RPD <10	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Bicarbonate	SM 4500-CO_2D (18^{th} edition)	Groundwater	Not Applicable	Not Applicable	Field Duplicates RPD <30 Matrix Duplicates RPD <10	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Cyanide	EPA Method 335.3	Groundwater	Matrix Spikes 75-125% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <23	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Total Dissolved Solids	EPA Method 160.1	Groundwater	Not Applicable	Not Applicable	Field Duplicates RPD <30 Matrix Duplicates RPD <16	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Chloride	EPA Method 300.0	Groundwater	Matrix Spikes 80-120% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Total Petroleum Hydrocarbons	EPA Method 418.1	Wastewater	Matrix Spikes 55-132% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <24	Field Duplicates: One per 20 Matrix Duplicates: One per 20
pH	EPA Method 150.1	Wastewater	Not Applicable	Not Applicable	Field Duplicates RPD <30 Matrix Duplicates RPD <10	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Amenable Cyanide	EPA Method 335.2	Wastewater	Not Applicable	Not Applicable	Field Duplicates RPD <30 Matrix Duplicates RPD <16	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Hexavalent Chromium	SW-846 Method 7196A	Wastewater	Matrix Spikes 85-115% recovery	Matrix Spikes: One per 20	Field Duplicates RPD <30 Matrix Duplicates RPD <20	Field Duplicates: One per 20 Matrix Duplicates: One per 20
Recovery criteria for laboratory control samples must be at least as stringent as MS/MSD criteria. Laboratory control limits are periodically updated. The latest control limits will be utilized at the time of sample analysis.						

Table 5
Typical Laboratory Data Quality Objectives: Precision and Accuracy: Soil Gas Samples
Bay Park One
QA/QA Project Plan

Parameter	Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
VOCs	EPA Method TO-15	Soil Gas	Surrogates % Rec.	Surrogates:	Matrix Duplicates	Matrix Duplicates
			4-Bromofluorobenzene 78-124	All samples, standards, QC samples	RPD ≤30	One per 20

Table 6
QC Sample Preservation and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2]
Soil/Sediment	VOCs (CP-51 or TCL)	Field Duplicate	TBD	SW-846 Method 8260B	Cool to 4^0 C; no headspace	14 days to analysis	(2) 2-oz. glass jars
Soil/Sediment	PCBs	Field Duplicate	TBD	SW-846 Method 8082A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil/Sediment	Pesticides (TCL)	Field Duplicate	TBD	SW-846 Method 8081A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	Herbicides	Field Duplicate	TBD	SW-846 Method 8151A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil/Sediment	PAHs or SVOCs (CP-51 or TCL)	Field Duplicate	TBD	SW-846 Method 8270C	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Soil	Cyanide	Field Duplicate	TBD	SW-846 Method 9012A	Cool to 4^0 C	14 days to analysis	(1) 300 mL amber glass jar
Soil/Sediment	Metals (TAL)	Field Duplicate	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 300 mL amber glass jar
Groundwater	VOCs (CP-51S or TCL)	Field Duplicate	TBD	SW-846 Method 8260B	pH<2 with HCl; Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Soil	Organophosphorous Pesticides	Field Duplicate	TBD	SW-846 Method 8270C or 8141A	Cool to 4^0 C	14 days to extraction; 40 days from extraction to analysis	(1) 300 mL amber glass jar
Groundwater	SVOCs (CP-51 or TCL)	Field Duplicate	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40 days from	(2) 950 mL amber glass jars
Groundwater	Pesticides (TCL)	Field Duplicate	TBD	SW-846 Method 8081A	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 950 mL amber glass jars

Table 6
QC Sample Preservation and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2]
Groundwater	Metals- total (TAL)	Field Duplicate	TBD	SW-846 Method 6010B/7000 Series	pH<2 with HNO_3; Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1 L polyethylene container
Groundwater	Metals-dissolved (TAL)	Field Duplicate	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	24 hours to filtering and preservation (pH<2 with HNO_3); 28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1 L polyethylene container
Groundwater	Ammonia	Field Duplicate	TBD	EPA Method 350.1 (350.2 for distillation)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 250 mL polyethylene container
Groundwater	Nitrate	Field Duplicate	TBD	EPA Method 353.2/SM 4500-NO_2B (18^{th} edition)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 100 mL polyethylene container
Groundwater	Nitrite	Field Duplicate	TBD	SM 4500-NO_2B (18^{th} edition)	Cool to 4^0 C	48 hours to analysis	(1) 100 mL polyethylene container
Groundwater	Sulfate	Field Duplicate	TBD	SW-846 9056	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 100 mL polyethylene container
Groundwater	Carbonate	Field Duplicate	TBD	SM 4500-CO_2D (18^{th} edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Bicarbonate	Field Duplicate	TBD	SM 4500-CO_2D (18^{th} edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Cyanide	Field Duplicate	TBD	EPA Method 335.3	pH>12 with NaOH; Cool to 4ºC	14 days to analysis	(1) 250 mL polyethylene container
Groundwater	Chloride	Field Duplicate	TBD	EPA Method 300.0	Cool to 4ºC	28 days to analysis	(1) 100 mL polyethylene container
Groundwater	Total Dissolved Solids	Field Duplicate	TBD	EPA Method 160.1	Cool to 4ºC	7 days to analysis	(1) 100 mL polyethylene container
Aqueous	Ammonia	Equipment Blank	TBD	EPA Method 350.1 (350.2 for distillation)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 250 mL polyethylene container

Table 6
QC Sample Preservation and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2]
Aqueous	Nitrate	Equipment Blank	TBD	EPA Method 353.2/SM 4500-NO_2B (18th edition)	pH<2 with H_2SO_4; Cool to 4^0 C	28 days to analysis	(1) 100 mL polyethylene container
Aqueous	Nitrite	Equipment Blank	TBD	SM 4500-NO_2B (18th edition)	Cool to 4^0 C	48 hours to analysis	(1) 100 mL polyethylene container
Aqueous	Sulfate	Equipment Blank	TBD	SW-846 9056	Cool to 4^0 C	As soon as possible (within 3 days of collection)	(1) 100 mL polyethylene container
Aqueous	Carbonate	Equipment Blank	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Aqueous	Bicarbonate	Equipment Blank	TBD	SM 4500-CO_2D (18th edition)	Cool to 4^0 C	14 days to analysis	(1) 250 mL polyethylene container
Aqueous	Cyanide	Equipment Blank	TBD	SW-846 Method 9010B	pH>12 with NaOH; Cool to 4ºC	14 days to analysis	(1) 250 mL polyethylene container
Aqueous	Chloride	Equipment Blank	TBD	SW-846 Method 9250	Cool to 4ºC	28 days to analysis	(1) 100 mL polyethylene container
Aqueous	Total Dissolved Solids	Equipment Blank	TBD	EPA Method 160.1	Cool to 4ºC	7 days to analysis	(1) 100 mL polyethylene container
Aqueous	VOCs (CP-51 or TCL)	Equipment Blank	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials
Aqueous	Pesticides (TCL)	Equipment Blank	TBD	SW-846 Method 8081A	Cool to 4^0 C	7 days to extraction; 40	(2) 950 mL amber glass jars
Aqueous	PCBs	Equipment Blank	TBD	SW-846 Method 8082A	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 950 mL amber glass jars
Aqueous	SVOCs (CP-51 or TCL)	Equipment Blank	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40 days from	(2) 950 mL amber glass jars
Aqueous	PAHs (CP-51)	Equipment Blank	TBD	SW-846 Method 8270C	Cool to 4^0 C	7 days to extraction; 40	(2) 950 mL amber glass jars
Aqueous	Herbicides	Equipment Blank	TBD	SW-846 Method 8151A	Cool to 4^0 C	7 days to extraction; 40 days from extraction to analysis	(2) 950 mL amber glass jars

Table 6
QC Sample Preservation and Container Requirements
Bay Park One
QA/QA Project Plan

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples	EPA Analytical Method	Sample Preservation	Holding Time[1]	Sample Container[2]
Aqueous	Metals-total (TAL)	Equipment Blank	TBD	SW-846 Method 6010B/7000 Series	pH<2 with HNO_3; Cool to 4^0 C	28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1 L polyethylene container
Aqueous	Metals-dissolved (TAL)	Equipment Blank	TBD	SW-846 Method 6010B/7000 Series	Cool to 4^0 C	24 hours to filtering and preservation (pH<2 with HNO_3); 28 days to analysis for Hg; 6 months to analysis for other metals	(1) 1 L polyethylene container
Aqueous	VOCs (CP-51 or TCL)	Trip Blank	TBD	SW-846 Method 8260B	pH<2 with HCl Cool to 4^0 C; no headspace	14 days to analysis	(2) 40 mL VOA vials

Notes:
[1] Holding times listed are method holding time calculated from time of collection and not NYSDEC ASP holding times.
[2] I-Chem Series 300 bottles
TBD = To Be Determined

ATTACHMENT A

Kathleen A. Cyr, P.E., LEP, P.G.
Associate Principal

RESUME

Education

B.S., 1978, Geology,
University of Connecticut
B.S., 1979, Civil Engineering,
University of Connecticut
M.B.A., 1994, Business Administration,
University of Connecticut

Professional Registrations

1983, Professional Engineer,
Connecticut, #13037
1989, Professional Engineer,
New Jersey, #34078
1990, Professional Engineer,
New York, #067143
1997, Licensed Environmental
Professional, Connecticut, #125
2002, Professional Geologist,
New Hampshire, #296

Areas of Specialization

Environmental Investigation
Environmental Remediation
Hazardous Waste Management
Environmental Compliance
Landfill Services
Litigation Support

Summary of Experience

Ms. Cyr has managed over 1000 environmental investigations for sites throughout the US. In addition, she has extensive experience in remedial planning, design, and implementation as they relate to industrial contaminants. She has supervised numerous geohydrologic studies for surface and groundwater contamination from industrial and commercial development and uncontrolled hazardous and solid waste disposal sites. Relevant project experience includes:

Relevant Project Experience

ENVIRONMENTAL INVESTIGATION

Principal-in-Charge, Shelton Economic Development Corporation, a Municipal Redevelopment Agency. Several parcels of land used by a variety of heavy industrial manufacturers were underutilized and in disrepair. The parcels had been developed for over 100 years. In anticipation of brownfield redevelopment, Ms. Cyr was responsible for environmental investigations designed to identify major environmental issues and preliminary remedial costs. Investigation techniques included geophysical and soil gas surveys, boring and well installations, and soil, sediment, groundwater and surface water screening and analyses for a variety of constituents. Results indicated impact by metals, petroleum product and solvents, including the likely presence of dense non-aqueous phase solvents in groundwater. Order of magnitude remedial estimates were provided for urban planning purposes.

Subsequently, Ms. Cyr directed supplemental (Phase III) investigations to refine contaminant extent and degree estimates and develop remedial plans and specifications for UST removal, excavation, on-site soil placement/capping, off-site disposal and in-situ treatment. The firm, under Ms. Cyr's direction, acted as client Representative overseeing environmental remediation as part of site redevelopment.

Principal-in-Charge, Licensed Environmental Professional, Danbury, CT. As a result of a transfer of Establishment as defined by Connecticut Regulation, a former industry owner was obligated to perform property investigations in accordance with prevailing standards and guidelines and remediation of releases from the Establishment in accordance with Remediation Standard Regulations. Ms. Cyr was retained by the former Industry Owner to act as LEP to develop Conceptual Site Modeling, complete investigations, identify needed remediation and achieve compliance with RSR criteria. Investigations included sampling of soil, groundwater and/or soil gas in ten Areas of Concern, including areas below an existing building. Investigations were complicated by upgradient sources of chlorinated organics with associated impact to groundwater.

Principal-in-Charge, A Regional Hospital. As part of due diligence requirements for CHEFA refinancing, Ms Cyr directed activities to perform an Environmental Compliance Audit for regulatory issues, and a Phase I Environmental Assessment to identify the presence of Areas of Concern. Re-financing subsequently occurred. To full-fill re-financing requirements, Ms. Cyr directed staff during environmental testing in

Areas of Concern at the property, and preparation of SPCC Plans. She also assisted the Hospital to identify and obtain wastewater discharge permits, and managed training to Hospital staff.

Principal-in-Charge, Sewer Line Construction. During installation of new sewer mains through an industrialized area, the contractor noted gasoline-type odors within excavations. Work was temporarily suspended as a result. Acting on behalf of the Town, Ms. Cyr managed a program of field monitoring and testing to identify types and degree of contaminants along the remainder of the construction project to protect workers and evaluate options to manage excavation wastes. The project was completed with no additional delays.

Principal-in-Charge, Pre-Transaction Site Evaluation. As part of pre-transaction due diligence conducted on behalf of a property owner, The firm performed a Phase I Environmental Assessment, identified over a dozen Areas of Concern, performed Phase II and Phase II investigations and developed conceptual remedial alternatives and cost estimates. The project was completed under Ms. Cyr's direction on an expedited basis within tight time constraints dictated by the purchase and sale agreement. In order to facilitate information transfers, Ms. Cyr and staff completed weekly status reports, provided daily client communication and performed real time data evaluation to identify resulting data gaps. As a result of the work conducted, 12 of 14 Areas of Concern were identified as requiring no or little additional action. Two Areas of Concern were qualified and preliminary remedial technologies and costs were identified. Constituents of concern initially included aromatic and chlorinated hydrocarbons, petroleum products, semi-volatile organic compounds, metals, and PCBs. Final constituents of concern for remedial action and/or future monitoring included petroleum products, chlorinated VOCs, arsenic and PCBs.

Principal-in-Charge, Pre-Transaction Site Evaluations, New York & Connecticut. A large wholesale distributor planned on opening new facilities in Westbury, NY, and Fairfield, CT. Prior to property purchase and construction, the client required environmental site assessments to identify and characterize environmental impacts from historical land use practices. Acting within rigorous schedule requirements, Ms. Cyr managed both projects. Each required background file reviews, subsurface explorations and chemical testing. At the Westbury site, volatile organic compounds were documented in groundwater and an off-site source area was identified. Heavy metals, volatile organic compounds, petroleum products and PCBs contaminated the Fairfield site, a historic metal casting facility. Working with the client, construction contractor and State and local regulatory bodies, remedial actions plans were developed, approved and initiated to proceed on time and as planned. Remedial actions included limited soil removals, capping procedures and installation of passive oil recovery and barrier systems to protect adjacent wetlands and waterways.

Principal-in-Charge, Private Industrial Client, Long Island, NY. Managed a multi-phase investigation of soil, sediment and groundwater contamination at an operating shipyard. The shipyard, which had operated for decades at the same location, had impacted soils and sediments with lead paint residues, oil and grease and volatile organic compounds above remedial requirements. Remedial action plans were developed and implemented under Ms. Cyr's direction. Remedial actions included removal of hazardous soils for off-site disposal and on-site fixation of soils containing organic contaminants.

Principal-in-Charge, Connecticut Department of Transportation. As a subcontractor to a major Engineering Company, managed environmental site investigation associated with the reconstruction of an 18-acre railroad maintenance and storage facility to assess known petroleum and PCB contamination in soil and groundwater. During the investigations, field and laboratory screening were used extensively to cost-effectively delineate PCB-contaminated areas. A floating layer of PCB-contaminated petroleum product was also found and delineated. Remedial plans and cost estimates were prepared for an *in situ* oil recovery system for groundwater and off-site disposal of soils. In addition, pre-demolition asbestos surveys were conducted in buildings and plans and specifications for asbestos abatement were developed. During the construction/remediation phase, Ms. Cyr directed on-site mobile laboratory and sampling services to provide real-time PCB, TPH and VOC screening resulting in significant cost and time savings to the project.

Associate-in-Charge, Industrial Facility. Due to a history of solvent discharge to the land (overburden and bedrock) in an area served by private water supply wells, the client was required by State Order to conduct investigations and install treatment facilities to address these issues. Soil gas surveys subsurface investigations and testing, fracture trace analyses and borehole permeability tests were conducted. In addition, pilot testing and remedial designs for soil and groundwater treatment were developed.

Associate-in-Charge, Former Apple Orchard. A 20-acre parcel of land was donated to a public service organization for their use. The parcel had been used for about 50 years as an apple orchard. The organization wished to develop the property for residential use. The nature and extent of pesticide contamination in soil and groundwater was assessed. Groundwater impact was not identified; however, lead, arsenic and DDT derivatives were found in site soils. Based on these findings, a health-based risk assessment was conducted to quantify the risks posed by the site to future residents.

Project Manager, Confidential Developer. Managed a pre-transaction site assessment of a 20-acre industrial complex with a history of use of metal working, fabric-dyeing, waste oil storage/transfer, machinery manufacture and commercial painting. Thorough background review, subsurface explorations and chemical testing, areas of substantial soil and groundwater contamination were identified.

Project Manager, Former Industrial Parcel, Large Investment Group. Several areas of heavily contaminated soil were discovered during the site assessment. The extent, nature, and degree of contamination by PCBs, metals, petroleum and solvents were determined and remedial plans developed. Remedial measures consisted mainly of soil removal and off-site disposal. Site clean-up costs exceeded $1 million.

ENVIRONMENTAL REMEDIATION

Licensed Environmental Professional, Former Automotive Repair and Painting Facility. Based on investigations conducted under Ms. Cyr's direction, soil contamination by petroleum products, and metals was identified and delineated. The firm assisted the Client in preparing Transfer Act Form filings, including an environmental condition assessment form. The CTDEP delegated the site to a CT. Licensed Environmental Professional. Ms. Cyr, acting as the site LEP directed the development of remedial plans, completed public notifications and supervised the remediation of site soils and removal of USTs and hydraulic lifts. With the exception of post-remediation groundwater monitoring, remediation of this empty brownfield site has been completed, a new multi-story residential structure has been constructed and the property has been returned to productive use.

Principal–in-Charge, Confidential Industrial Client, New England. Ms. Cyr directed the environmental investigations and UST removal for a medium sized New England industry which is a second tier manufacturer of products for the automotive and aircraft industries. During the environmental investigations, the presence of chlorinated hydrocarbons was identified in site soils and groundwater. The extent and degree of on-site contamination was delineated, and under Ms. Cyr's direction, a soil gas venting/groundwater sparging system was designed and pilot tested for source area remediation. The pilot was extremely successful. Full system installation, based on pilot testing results was completed in early 1998, resulting in a significant reduction in contaminant levels to date. Pulsed system operation and groundwater monitoring continue at this facility. Ms. Cyr currently acts as the Licensed Environmental Professional for investigation and remediation under the Connecticut Transfer Act requirements.

Principal-in-Charge, Former Optical Manufacturing Facility, Buffalo Area, New York. Ms. Cyr is responsible for technical oversight and project implementation during remediation of aromatic and chlorinated volatile organic compound contamination of soils and groundwater at a former manufacturing facility in upstate New York. The facility operations and waste storage practices resulted in high concentrations of contaminants in saturated and unsaturated soils as well as overburden and bedrock groundwater. In response to low permeability soil conditions, remedial systems consist of dual vacuum extraction of volatiles from soil and groundwater coupled with a pump and treat bedrock recovery system. The site, a New York Inactive Hazardous

Waste Site, is subject to oversight by the NYDEC. All technical plans and specifications for the system design and installation were developed by the firm and approved by NYSDEC. System installation is complete and system operation and monitoring are in-progress.

HAZARDOUS WASTE MANAGEMENT

Senior Technical Reviewer/Consultant, RCRA Remedial Facilities Investigation, TSD Facility. A RCRA Treatment/Storage/Disposal facility subject to Corrective Action under RCRA was ordered by Region I EPA to conduct an RFI including air, soil groundwater, surface water and sediment media. Ms. Cyr acted as technical quality assurance reviewer and senior consultant for the development of RFI Work Plans, RFI implementation and reporting.

Principal-in-Charge/Project Manager, Ten RCRA Facilities. Supervised groundwater assessment plan development, regulatory negotiation, and implementations under 40 CFR 265 requirements. RCRA Assessment techniques included soil gas surveys, geophysical methods (seismic and resistivity), fracture trace analysis, overburden/bedrock multi-level wells, and sampling and analysis of monitoring wells, private domestic wells, and surface water to assess extent, degree and nature of impact from various uncontrolled hazardous waste landfills and surface impoundment areas. At three of the sites shallow bedrock-controlled valleys complicated hydrogeologic conditions.

Associate-in-Charge/Project Manager, Various RCRA Facilities. Developed Closure/Post Closure Plans and Specifications for five RCRA regulated unlined hazardous waste disposal areas, three of which overlay municipal landfills. At each site, a program of controlled consolidation; RCRA capping and long-term monitoring was developed. After plan approvals by State Environmental Regulators and U.S. EPA, quality assurance testing and documentation were performed for closure activities at four of the sites.

ENVIRONMENTAL COMPLIANCE

Principal-in-Charge, Environmental Compliance Issues, Industrial Facility. A southern CT manufacturing facility was issued Notices of Violation and Orders to Correct from the CT DEP related to hazardous waste identification and handling practices. Under Ms. Cyr's direction, staff identified all facility waste streams, reviewed analytical data, audited disposal practices, and obtained supplemental waste stream analyses where appropriate. Waste streams were characterized and documented as part of Order compliance; and Waste Handling policies and procedures were developed for the facility. In addition, RCRA storage area closure procedures were developed and assistance was provided to the industry to upgrade paperwork and training methods and documentation.

Principal-in-Charge, Environmental Compliance Audit, Confidential Client, Midwestern USA. On behalf of the parent company of a Connecticut subsidiary, a regulatory compliance audit was conducted to evaluate compliance of the subsidiary with: RCRA Regulations for Waste Generators; state and federal permits for water and air discharges; state and federal regulations for underground storage tanks and PCB containing materials; and Community Right-to-Know issues. Detailed site visits and interviews were performed; manifests and material data sheets reviewed, and local and state agency files examined. In addition, waste stream sampling and analyses were conducted. A confidential report of findings documented existing conditions, noted areas of compliance and provided recommendations for corrective actions for noted deficiencies.

Principal-in-Charge, Pre-Transaction Compliance Audits, International Food Processor. On behalf of a multi-national company which processes and cans fruits and vegetables, Ms. Cyr directed multi-disciplinary teams auditing over 20 canning facilities in the mid-west and northwest. Audits included environmental and OSHA Compliance, including air, water, waste, EPCRA, TSCA and OSHA requirements. In addition, Phase I Assessments were completed. Confidential reports of findings provided conclusions, recommendations and order-of-magnitude estimates for quantifiable corrective actions.

Principal-in-Charge, Environmental Compliance Audits and Phase I Environmental Assessments. On behalf of a European Company, Ms. Cyr directed Regulatory Compliance Audits and Phase I Assessments at five facilities located in California (1), Texas (2), and Ohio (2). Ms. Cyr was also the lead Compliance Specialist for the two Texas sites. Services were performed on an expedited basis as part of a pre-transaction due diligence of a potential buyer. Issues were identified and qualified to assess potential financial and regulatory impacts. Services were completed on time and within budget, allowing the transaction process to continue.

LANDFILL SERVICES

Associate-in-Charge, Landfill Superfund Site. Managed Remedial Investigation (RI) at this site for a PRP group composed of a municipality and several industries under CERCLA/SARA requirements. The RI included development of scope of work and project operation plans; subsurface investigations; borings and monitoring well installation; sampling and analysis of groundwater, surface water, air, sediments and soils; soil gas assessment; geophysical testing; development of preliminary remedial alternatives; and baseline human health and ecological risk assessment.

Project Manager, Private Landfill, Chicopee, MA. The first phase of a two-phase process was a remedial investigation/hydrogeologic study. Technical responsibilities during this phase included selecting well locations, determining sampling parameters, employing geophysical methods, interpreting data results, directing field crews, and report writing. A glacial till valley was discovered which significantly affected groundwater flow patterns and contaminant migration. The second phase of the project involved managing the development of expansion plans to the existing landfill area. Project management responsibilities on this project included: scheduling; client meetings; regulatory agency meetings; technical oversight; billing coordination; problem resolution; interfacing with the owner, the Massachusetts Department of Environmental Quality Engineering (MA DEQE), and local town officials; and attending a public meeting during the second phase of the project. Directed all field activities and was primary author of the remedial investigation report and the operation and management plan.

LITIGATION SUPPORT

Litigation Support, Fortune 500 Company. On behalf of a Fortune 500 Client, litigation support, including depositions and federal court testimony was provided. The client was seeking cost recoveries from several insurance companies related to environmental contamination of soil and groundwater caused by practices occurring prior to 1965. Ms. Cyr completed several days of depositions and testimony at trial, which resulted in the client being awarded a multi-million dollar jury verdict. Ms. Cyr was issued a letter of commendation by the lead attorney for the Client for the quality of her litigation support.

Litigation Support, Industrial Property Owner. In a cost recovery suit for an industrial property owner, Ms. Cyr provided expert testimony in state court related to contamination of the property by a former tenant. Testimony focused on the nature, extent and degree of contaminants in the environment, impacts related to past site use, and regulatory requirements for remedial actions. The client was awarded cost recovery for environmental investigations and related activities completed at the property.

Litigation Support, Industrial Property Owner. Several years ago, Ms. Cyr directed environmental investigations of property used for over 20 years by an industrial tenant to identify environmental status and remedial needs for the property owner. The owner later sought cost recover from the industry under the terms of the leasing agreement. A dispute arose and Ms. Cyr was retained as an expert witness on the property owner's behalf. Ms. Cyr spent two days in state court under examination and cross-examination. The court case was settled favorably for the property owner prior to a court decision.

Litigation Support, Land Valuation Case. A former industrial property, which has under-utilized, was acquired via eminent domain by a local government agency as a brownfield re-development site. The former owner disputed the fair market value of the land utilized in the eminent domain taking. Ms. Cyr was retained on behalf of the governmental agency to provide assistance to legal counsel and expert witness testimony as to the environmental conditions of the property, the regulatory requirements related to site remediation and underground storage tank removal and use restrictions. Ms. Cyr provided depositions on two occasions, appeared as an expert witness in state court under examination and cross-examination, and attended depositions by others to support client counsel. The case is currently on going.

Litigation Support, Former Owner Liability, Multi-Site Support. Ms. Cyr provided technical expertise to Philadelphia Counsel related to current and historic contamination at operating facilities in three states. Counsel's client had owned and operated each of the facilities for three quarters of a century. Current owners/operators subsequently used the properties for similar purposes for almost three decades. Ms. Cyr reviewed available operating histories and environmental reports to assist Counsel in developing allocation strategies for investigation and where necessary remediation.

Professional Activities

Environmental Professionals' Organization of Connecticut, President: 1997-99, Executive Board: 1995-2000, Committee Member (Education, Membership, Scholarship): 1995-2002.
Society of Women Environmental Professionals, Executive Board: 1999-2002.
UCONN Engineering Alumni Society, Executive Board: 1993-99.
SACIA Environmental Health and Safety Forum, Executive Council :1994-98.
Connecticut Engineers in Private Practice, President: 1993-95, Executive Board: 1990-96.
Member, National Society of Professional Engineers since 1985; National Groundwater Association since 1981.

Publications

1. "A Method for Estimating the 7-Day, 10-Year Low Flow of Streams in Connecticut," Cervione, Melvin & Cyr, Connecticut Water Resources Bulletin No. 34, 1982.

2. "Halogenated Volatile Organic Compounds in a Glacial Till/Fractured Bedrock Hydrogeological Setting," Bellison-Clayman, Cluen & Cyr, Air and Waste Management Association Proceedings, 1992.

3. "Caution Required When Revitalizing Polluted Urban Sites", Cyr, Connecticut Environmental Compliance Update, June 1994.

Chunhua Liu
Doctor of Science, Senior Technical Specialist

RESUME

Education

B.E., 1992, Environmental Engineering, Tsinghua University, Beijing, China

M.E., 1995, Environmental Engineering, Tsinghua University, Beijing, China

M.S., 1998, Environmental Health, Harvard School of Public Health

D.S., 2000, Environmental Chemistry, Harvard School of Public Health

Areas of Specialization

Data Validation and Usability Evaluation

Project Quality Control and Assurance

Human Health Risk Assessment

Fate and Transport Modeling

Summary of Experience

Dr. Liu is a senior chemist with more than 15 years of experience in analytical chemistry, data validation and management, and quality control and quality assurance for remedial investigations and remedial actions. Her experience includes laboratory chemical analysis, EPA Region I and Region II data validation and data usability evaluation, data usability evaluation for Massachusetts Contingency Plan (MCP), sampling and analysis plan development in accordance with the NYSDEC Analytical Service Protocol and Massachusetts Compendium of Quality Assurance and Quality Control Requirements (QA/QC) and Performance Standards for Selected Analytical Methods, and quality control and quality assurance for Superfund and MCP projects.

Dr. Liu majored in environmental chemistry and during her doctoral study at Harvard School of Public Health, she researched analytical methods for sediment and evaluated metal fate and transport in sediment. Dr. Liu worked at Parsons for over seven years and at Gradient for one year before joining GZA. At Parsons, Dr. Liu led the quality control and assurance and data management efforts from developing Quality Assurance Project Plan (QAPP) to assuring implementation of QA/QC requirements and from field sampling preparation and arrangement to chemical data management. Dr. Liu was responsible for the QA/QC and data validation and data usability evaluation for a 10,000-acre BRAC and Superfund NPL site in New York and assisted in the successful transfer of over 8,000 acres of land. Dr. Liu performed data usability evaluation for various Massachusetts Contingency Plan sites at Gradient and GZA.

Relevant Project Experience

Senior Technical Specialist - Leads GZA data validation efforts for Superfund projects and heads data representativeness evaluations and data usability assessments for MCP projects. Dr. Liu has conducted Level I and Level II data validations for soil, groundwater, soil gas, and indoor and ambient air sample results in accordance with USEPA guidance. Dr. Liu has also reviewed and validated sample results based on laboratory QA/QC information for various MCP projects.

Technical Director - Directed preparation and submittal of the Site-Wide Sampling and Analysis Plan (SAP) and the Site-Wide Quality Assurance Project Plan (QAPP) for a 10,000-acre Superfund site in New York in accordance with the Department of Defense (DOD), NYSDEC ASP, EPA Region II and EPA guidance. Directed project field sampling and data management. Supervised data validation in accordance with EPA Region II SOPs and NYSDEC ASP based on the NYSDEC ASP Category B deliverables. Identified laboratories qualified for project chemical analyses and interfaced with various analytical laboratories to address analytical deficiencies. Submitted data summary report to EPA Region II on a quarterly basis.

Lead Chemist and Risk Assessor- Led data usability evaluation and supported the successful closure of a 125-acre Hingham Annex Guaranteed Fixed Price Remediation Project. Dr. Liu also led the risk assessment effort and the effort of evaluating pesticide fate and transport at the site and successfully demonstrated that the pesticide conditions at the site were related to the past normal use of pesticides and therefore were not associated with the release at the Site.

Technical Director - Directed preparation and submittal of the SAP and the QAPP for various Formerly Used Defense (FUD) Sites. Supervised field sampling and data validation in accordance with guidance from various EPA regions. Reviewed data validation and data usability report.

Technical Director – Directed data validation for various Superfund sites in EPA Region I and Region II in accordance with the EPA regional and state SOPs and the EPA Functional Guidelines. Led data validation for numerous MCP sites for various analytical analyses including metal, VOC, SVOC, pesticide, PCB, EPH, VPH, and TPH analyses..

Project Chemist – Evaluated different analytical methods for hexavalent chromium analysis. Compared analytical methods developed by NJDEP and EPA and identified the appropriate method for a CERCLA site in New Jersey.

Project Chemist – Evaluated quantitatively potential impacts to metal data usability by interference caused by common metals in environmental samples for a CERCLA site in New York.

Project Chemist – Performed data validation for indoor air samples for various CERCLA and MCP Sites to assist evaluation of potential vapor intrusion pathway.

Project Chemist – Performed Level IV data validation for a Superfund site in New York for various analytical analyses including metal, VOC, SVOC, pesticide, and PCB analyses. Reviewed TIC identification and quantitation and assessed chromatograms and mass spectrums for VOCs and SVOCs.

Project Chemist – Provided technical support, prepared QAPPs, established proper data quality objectives (DQOs) for various projects, maintained project quality control, trained junior scientists, coordinated project field sampling and laboratory analyses, addressed non-conformance issues associated with the data produced by the laboratory, conducted statistical analysis, and prepared data validation reports on numerous RCRA/CERCLA and MCP projects.

PROFESSIONAL ACTIVITIES

Member, LSP Association
Member, Society for Risk Analysis
Certified EIT in Massachusetts

Publications

1. Liu, C., J. Jay, T. Ford. Evaluation of Environmental Effects on Metal Transport from Capped Contaminated Sediment under Conditions of Submarine Groundwater Discharge. *Env. Sci. Tech.*. 2001 35: 4549-4555.
2. Liu, C., J. Jay, R. Ika, S. James, and T. Ford. Capping efficiency for metal-contaminated marine sediment under conditions of groundwater inflow. *Env. Sci. Tech.* 2001 35: 2334-2340.
3. Blanchet, R., Liu, C., Bowers, T. Summary of Available Freshwater and Marine Sediment Quality Guidelines and Their Use in North America. Abstract accepted at SEATEC Conference, November, 2001
4. Blanchet, R., Liu, C., Bowers, T. Estimation of Average Exposure Point Concentrations for Pesticides Assuming Accumulation and Degradation in the Environment. Abstract accepted at SEATEC Conference, November, 2001
5. Seeley, M.R., Schettler, S., Liu, C., Blanchet, R.J., Bowers, T.S. Assessing Cancer Risks Due to Use of Insecticides to Control the Mosquito-borne West Nile Virus: Use of the Margin of Exposure Approach. Abstract accepted at Society of Toxicology, 41st Annual Meeting, March 17-21, 2002.
6. Chunhua Liu, Jennifer Jay, Ravi Ika, Shine James, Timothy Ford. Capping Efficiency for Metal-Contaminated Marine Sediment under Conditions of Submarine Groundwater Discharge. Poster presentation at Conference on Dredged Material Management: Options and Environmental Considerations. December 3-6, 2000
7. Chunhua Liu, Jennifer Jay, Timothy Ford. Evaluation of Environmental Effects on Metal Transport from Capped Contaminated Sediment Under Conditions of Submarine Groundwater Discharge. Poster presentation at Conference on Dredged Material Management: Options and Environmental Considerations. December 3-6, 2000

8. Chunhua Liu, Jennifer Jay, Timothy Ford. Core analysis: Is it a good indicator of metal release and capping efficiency? Poster presentation at Conference on Dredged Material Management: Options and Environmental Considerations. December 3-6, 2000
9. Chunhua Liu. 2000. Capping Efficiency for Metal Contaminated Marine Sediment under Conditions of Submarine Groundwater Discharge. Doctoral Thesis. Harvard School of Public Health
10. Chunhua Liu, Ravi Ika, Tim Ford. 1998. Metal flux in near shore capping sites under conditions of submarine groundwater discharge. *In*: Fourth Marine & Estuarine Shallow Water Science & Management Conference. March 15-19, 1998
11. Wei Lin, Guowei Fu, Chunhua Liu. 1996. Study on allocating permissible pollutants discharge based on axioms system. *Chin. J. Environ. Sci.* **1996 17(3):**35-37
12. Wei Lin, Chunhua Liu, Guowei Fu. 1995. Environmental conflict analysis and its application in environmental planning and management: siting of public facilities. *Chin. J. Environ. Sci.* **1995 16(6)**: 36-39
13. Chunhua Liu, Yongfeng Nie, Wei Lin. 1995. Application prospects of landfill gas utilization technique in China. *Pollution Control Technology* **1995 8(3):** 143-145
14. Chunhua Liu. 1995. Evaluation of gas production from sanitary landfill. Master's thesis. Tsinghua University, Beijing, P.R.China
15. Wei Lin, Chunhua Liu. 1994. Rudimentary study on countermeasure to comprehensively control air pollution caused by motor vehicles in China. *Pollution Control Technology* **1994 7(4)**: 1-3
16. Xiurong Zhang, Chunhua Liu, Yanru Yang, Qingzhong Bai. 1993. Environmental impact report of wastewater treatment plant project in Xuanhua City, China.
17. Chunhua Liu, Yongfeng Nie. 1993. Water balance evaluation in Hongmei hazardous waste landfill. *In:* Environmental Impact Assessment of Hongmei Hazardous Waste Landfill: 25-33
18. Chunhua Liu. 1992. Modeling landfill leachate production and migration. Bachelor Thesis. Tsinghua University, Beijing, P.R.China
19. Chunhua Liu. 1991. A discussion with the author of "clean water extraction from ocean water". *Technology of Water Purification* **1991(1):** 39-41

APPENDIX H
QUALIFICATIONS

David M. Winslow, Ph.D., P.G.
Associate Principal

RESUME

Education

Ph.D., Geological Sciences, Lehigh University, 1995

M.S., Geological Sciences, Virginia Polytechnic Institute & State University, 1991

B.S., Geology, State University of New York, 1989

Professional Registrations

Professional Geologist, New Hampshire, # 677

NJ DHSS - Indoor Environmental Consultant/IEHA, #392

Areas of Specialization

Environmental Site Investigation

Site Remediation Design

Site Remediation

Hydrogeologic Testing

Hazardous Materials Surveys

Summary of Experience

Dr. Winslow is a geologist with professional experience in bedrock, soil and groundwater investigation and remedial design. He leads GZA's Green Remediation Initiative and has presented papers on the topic at national symposiums. Dr. Winslow has also conducted, managed and implemented QA/QC practices at hundreds of Phase I and Phase II Environmental Site Assessments/Investigations. He has extensive experience in the management of on-call and term contracts for public agencies. In addition, Dr. Winslow has experience managing environmental compliance and permitting tasks associated with building and infrastructure design and construction projects, including hazardous material surveys, spill prevention and spill response.

As District Office Manager of GZA's Northern New Jersey office since 2011, Dr. Winslow is responsible for the office's profit and loss, staff management, client development, and technical direction.

Relevant Project Experience

Principal-in-Charge, Kelley Drye & Warren, LLC/Historic Residence, Peapack-Gladstone New Jersey. In support of a real estate transaction, designed and managed the closure of a 1,000-gallon gasoline tank and 550-gallon fuel oil tank located on a residential property estate. The tanks were located beneath a retaining wall supporting a slope and adjacent to a gas line; therefore they were closed in place.

Principal-in-Charge, New York Life Investment Management, Various Properties, New Jersey. Designed and managed a due diligence program for the client who was acquiring a portfolio of nine industrial/warehouse properties. Provided advice regarding environmental liability and risk associated with each property. Prepared remedial cost estimates and prepared a program to take several sites into New Jersey's LSRP program.

Principal-in-Charge, New Brunswick Properties, LLC, New Brunswick, New Jersey. Assisted a trucking company with the acquisition of a truck depot. A previously undetected UST was located and removed. Soils were found to be contaminated with historic fill and trichloroethene (TCE) above impact to groundwater standards. The site was entered into New Jersey's LSRP program and historic fill was addressed through capping and a deed notice; no CEA was required. A groundwater investigation found that the TCE had not impacted groundwater and no further action was necessary.

Principal-in-Charge, PANYNJ On-Call Asbestos Material and Lead Paint Consulting Services Contract, various locations in New York and New Jersey. GZA is responsible for numerous, on-going projects involving investigation and remediation at operating ports, airports, and river crossings in the NY metropolitan area, addressing lead and asbestos issues.

Principal-in-Charge, PANYNJ On-Call Environmental Engineering Contract, various locations in New York and New Jersey. Designed and managed site assessments, site investigations and remedial design/implementation at PANYNJ facilities in New York and New Jersey such as a Phase I ESA on a 40 acre portion of Port Elizabeth, UST removals at JFK Airport and Newark Airport, and remedial investigations and remedial design specifications at LaGuardia Airport.

Consultant Reviewer, Township of Teaneck, NJ/Votee Park, Teaneck, New Jersey. Investigation of contaminated public park. Initially involved preparation of a Preliminary Assessment as prerequisite for NJ DEP Green Acres program funding for the installation of an Astroturf soccer field. Team then conducted Site Investigation per NJDEP Historic Fill Guidance Document.

Senior Project Manager, Hudson High Voltage Direct Current (HVDC) Converter Station/Siemens AG, Ridgefield, New Jersey. Evaluated the impacts to construction associated with contaminated soils and groundwater at the site in order for Siemens to determine that the developer completed all necessary environmental remediation in accordance with NJDEP regulations prior to construction of the facility. The site is being developed as part of a transmission project intended to convert the power between New Jersey's Public Service Electric & Gas (PSEG) 230 kV grid and New York's Con Edison 345 kVgrid.

Principal-in-Charge, National Resources Brownfield Development, Edgewater, New Jersey. Provided environmental consulting services during the purchase and redevelopment of a brownfield site contaminated with coal tar and arsenic. The site was the former location of Unilever, Inc.'s research and development facility and had housed industrial operations since 1910. It was found to be contaminated with tar, deposited on site by an adjacent roofing tar manufacturer. Designed and implemented a Phase I ESA, prepared a site conceptual model, and developed a remedial cost estimate in order to secure cost cap insurance and financing. Following the real estate transaction, GZA completed remediation of the site under NJ's Industrial Site Recovery Act (ISRA). Prepared and submitted a Remedial Investigation and Interim Remedial Measures Plan for review by the NJDEP.

The site was found to be impacted by coal tar derived roofing tar and fill material containing significantly elevated concentrations of arsenic. The main chemicals of concern were benzene and arsenic. Arsenic in soils was detected at concentrations as great as 30,000 ppm and 20,000 ppb in groundwater.

GZA negotiated site-specific cleanup standards for arsenic and for pitch material. Pitch material remediation was limited to soft fractions of pitch that were impacting groundwater. The arsenic standard of 600 ppm was derived imperially by comparing soil concentrations to groundwater. The approved remedial strategy consisted of institutional and engineered controls to limit exposure to contaminants, excavation and off-site removal of arsenic-impacted soils greater than 600 ppm, in-situ solidification and stabilization of pitch impacting groundwater, installation of a groundwater barrier wall to protect the Hudson River, and stabilization of a rip rap embankment to prevent pitch accumulation on the shore line.

Senior Project Manager, U-Haul, **Edison, New Jersey.** Conducted a remedial investigation on a U-Haul site characterized by MTBE and gasoline-contaminated groundwater. The contamination was commingled with two other properties' contaminant plumes. Using natural attenuation modeling, demonstrated that U-Haul's component of the contamination had only migrated 90 feet downgradient and would attenuate with time. Designed, permitted and constructed a dual phase high vacuum extraction system, installed under budget, to remediate the source of contamination on the U-Haul property.

ADDITIONAL BROWNFIELDS EXPERIENCE

Principal-in-Charge, Bay Park Brownfield Redevelopment, Coney Island, New York. Providing environmental services during rehabilitation and expansion of 1970s-era mixed use complex, which covers an area equivalent to three city blocks. GZA facilitated the Brownfield Cleanup Program (BCP) applications for two adjacent parcels within the complex: the first for an existing retail space formerly occupied by a dry cleaner; the second application is for an adjacent "historic" dry cleaner lot that had been razed as part of urban renewal in the 1960s. Previous site investigations had documented the presence of tetrachlorethene (PCE) in soil gas; GZA's Remedial Investigation Work Plan (RIWP) outlined work required to delineate the vertical and horizontal extent of the impacted soils, soil vapor and groundwater at both BCP sites. A Remedial Action Work Plan will be developed to address contaminated media. A subslab depressurization system will be designed to protect residential and retail tenants, in conjunction with source area treatments.

Principal-in-Charge, Silver Star Mercedes Brownfield Redevelopment, LIC, New York. Member of design team for the redevelopment of a former automobile services station/car dealership. Six-story building will house a Mercedes dealership, parking and affordable housing. Dr. Winslow consulted with the owner and design team regarding the (E) Designation and the feasibility of enrolling the Site in either the NYSDEC or the NYCOER Brownfield Program. Based upon the results of the Site Investigation the site was enrolled in the NYCOER Brownfield Program. A Remedial Action Plan was submitted to the NYCOER to remove impacted soils and install a vapor barrier liner.

Senior Project Manager, New York City Department of Housing Preservation and Development, NYSDEC Brownfield Program, Bronx, New York. Managed the remedial investigations on 11 brownfield sites undergoing redevelopment as affordable housing, known as Melrose Commons. The remedial investigations consisted of geophysical surveys, test pit excavations, soil gas surveys, soil and groundwater sampling, and monitoring well installation and sampling. Eleven remedial investigation reports/qualitative risk assessments were completed at these properties in a three month period. This data was used to produce remedial alternative analysis for each of the 11 sites.

Senior Project Manager, Meridian Development Partners, LLC – Former Ideal Forging, Southington, Connecticut. Designed and managed the investigation, conceptual remedial approach, and remedial cost estimate for a former forging plant, adjacent to a municipal drinking water well, to be redeveloped as a mixed-use residential and retail complex. The site's soil and groundwater were impacted by fuel oil and cutting oil releases. In addition, a portion of the site was located within the floodplain and a large retention basin was required in order to develop the site. Due to the large amount of earthwork required to accommodate civil engineering designs, the site civil construction and the remedial construction were combined to eliminate issues related to handling contaminated material. The remedial approach consisted of a combination of excavation, on-site treatment of soils, placing contaminated soils under building pads and roads to render them inaccessible, using treated soils as asphalt road-base, constructing a retaining wall that would also act as a barrier to free product migration, capping, installation of sub-slab depressurization systems beneath new buildings, and monitored natural attenuation. Assisted client with presentations to the planning board and wetlands commission.

Senior Project Manager, Nine Mall Investors, LLC – Nine Mall Plaza – Dry Cleaner, Wappingers Falls, New York. Designed and managed the investigation and remediation of tetrachloroethylene-impacted soils and groundwater associated with a dry cleaner. Performed due diligence investigations, prepared a NYSDEC Brownfield Cleanup Program (BCP) application, and aided the developer in successfully completing the BCP application process. Following some additional assessment, negotiated with the NYSDEC to submit a Remedial Investigation Report/Remedial Action Plan, thereby saving time and money associated with preparation and public comment related to a remedial investigation work plan. In addition, a remedial approach of enhanced bioremediation was proposed to complete the remedial actions already undertaken at the site, realizing further cost savings for client.

Senior Project Manager, National Resources, Brownfields, various locations nationwide. As Client Manager, assisted the development team in assessment, investigation and remediation planning at several Brownfield properties throughout the United States. Projects included due diligence services, document reviews, conceptual remedial plans and cost estimates for properties formerly operated as Manufactured Gas Plant Sites, Unilever Cosmetics and Edible Oils plant, IBM's Fishkill West Campus, former pharmaceutical sites, and former dry cleaning sites. Designed and implemented Site Investigations, Site Assessments, and remediation projects. Oversaw the design, operation, monitoring, and maintenance of a total fluids and air sparging remediation system targeted to remediate a chlorinated solvent plume at the former Smith Industry property in Grand Rapids, Michigan.

Senior Project Manager, Meridian Development Partners, LLC, Brownfields, North Carolina. Provided environmental consulting services during a proposed property transaction of a former electronics manufacturing site utilized by Channel Master to produce satellite dishes. GZA's services consisted of reviewing previous environmental reports, conducting a Phase II Environmental Site Investigation, conducting a Supplemental Phase II Environmental Site Investigation, and preparing remedial cost estimates to be used by the client during contract negotiation.

During the course of the document review it became apparent that the site had been impacted by releases of chlorinated solvents. While previous consultants had indicated that the release had resulted in minor impacts to soil and groundwater, review of available documents and local hydrogeologic conditions indicated that borings had not been properly located. Therefore, GZA recommended a Phase II Site Investigation.

The results of the investigation indicated that chlorinated solvent-impacted soil and groundwater were present in the vicinity of a former spill containment UST associated with a flammable liquids storage area. The solvents had impacted both the overburden and bedrock water bearing units. The initial investigation indicated that the contamination was not migrating off-site; however, the vertical and horizontal extent of contamination was unknown.

Dr. Winslow designed a rapid turnaround and cost effective study to assess the vertical and horizontal extent of contamination within the timeframe of the due diligence period in order to apply cost certainty to estimated remediation figures. GZA mobilized a Geoprobe direct push drill rig, field instruments, and an air rotary drill rig to complete the investigation within a two week period. The results of the investigation indicated that the bedrock water bearing unit had only minor impacts and the horizontal extent of the overburden contamination was limited to the area around the former spill containment UST. With this knowledge Dr. Winslow was able to design a conceptual approach to remediation and apply realistic cost estimates in order for the Client to make an informed decision regarding purchase of the brownfield site.

Project Manager, National Autoparts Retailer, Brooklyn, New York. Designed and oversaw the remediation of gasoline impacted soil and groundwater during redevelopment of site that was entered into the NYSDEC Voluntary Cleanup Program. The remediation consisted of the removal of eight 550-gallon gasoline USTs, the excavation of 2,200 tons of petroleum impacted soils, performance of high vacuum dual phase extraction, and the injection of Oxygen Release Compound (ORC) to accelerate attenuation following source area treatment. The remedial efforts resulted in a decrease of dissolved-phase contamination and expected closure of the case with the NYSDEC.

ADDITIONAL TERM CONTRACT EXPERIENCE

Principal-in-Charge, New York City School Construction Authority (NYC SCA) IEH Hazardous Materials Consulting Services Contract, New York, New York. Serves as the Principal-in-Charge and Program Manager for the NYCSCA IEH Hazardous Materials Consulting Contract. Under this Contract, Dr. Winslow is responsible for client management, technical quality and financial success of work related to site assessments, site investigations and remedial design/implementation at existing and proposed New York City Schools throughout the five boroughs.

Principal-in-Charge, DASNY Environmental Contract, New York, New York. Oversaw environmental investigation, remedial design and remediation oversight projects at construction projects managed by the Dormitory Authority of the State of New York (DASNY) at New York City hospitals and educational facilities, including: a No. 6 fuel oil release investigation and remediation at Brooklyn College; UST upgrades and leak detection installation at Kingsborough Community College; site investigations, remedial design and remediation at Gouverneur Hospital; storm water sewer installation at Bronx Community College; and contaminated soil and dewatering management at Harlem Hospital. Responsible for coordination with DASNY Project Managers and overall quality assurance on DASNY projects.

Senior Project Manager, NYCDDC, Corridor Investigations, Five Boroughs. As part of the Environmental Term Contract with the New York City Department of Design and Construction (NYCDDC), designed and implemented subsurface investigations at areas targeted for infrastructure (storm water and sanitary sewers) improvement and installation. Designed and managed Corridor Assessments and Investigation to identify potential environmentally impacted soil and groundwater as part of the design-phase of the infrastructure project. The results of the investigations were incorporated into the design bid specifications. Helped develop the NYCDDC's approach toward Corridor Investigations within the City of New York as well as the NYCDDC's standard contaminated materials handling, transportation and disposal specification package. Dr. Winslow managed more than 20 Corridor Investigations on behalf of the NYCDDC.

Senior Project Manager, New York City School Construction Authority (NYC SCA), New York, New York. Responsible for coordination, proposals, and design of due diligence investigations at proposed New York City school sites in the five boroughs of New York. In addition, managed several UST removals at existing schools and prepared design specifications for UST removal and soil management.

PUBLIC PARKS

Principal-in-Charge, Fort Washington Park EIS (with Stantec), New York, New York. As part of the NYC Environmental Quality Review (CEQR) Act, oversaw the hazardous materials assessment portion of the Environmental Impact Assessment for the 160-acre Fort Washington Park. This NYC Department of Parks and Recreation parkland is located adjacent to the east bank of the Hudson River on the far Upper West Side of Manhattan from 135th Street in the south to Spuyten Duyvil in the north. Evaluated the potential for contaminated materials in the soil, groundwater or building materials to be disturbed during reconstruction and excavation activities. The preliminary contaminated materials assessment identified 73 potential sources of contamination and recommended additional investigations at 14 of these areas. Designed and oversaw the subsurface investigations to assess the potential sources of contamination in areas associated with proposed construction. The contamination was found to be consistent with urban fill; a combination of existing vegetative caps and proposed impervious caps were recommended as the remedial strategy.

Principal-in-Charge, Soundview Park (with MKW Architects), Bronx, New York. Responsible for the subsurface investigation of the areas of park that would be impacted by a proposed bicycle and pedestrian greenway path, connecting inland areas to the Greenway Path Project along the Bronx River's edge. Previous environmental assessments and investigations within Soundview Park, which is built on a former landfill, indicated the presence of contaminated soils and buried wastes. Dr. Winslow designed and oversaw the investigation of shallow soils that would be impacted by the project, evaluating composite soils samples for assessment of health and safety concerns for workers, the community and for disposal purposes during construction. Discreet interval shallow soil samples were collected to evaluate impacts to public health associated with soils to remain in place. As part of the investigation, the suitability of the existing vegetative cover was evaluated as a potential soil cap. Soils contamination was found to be consistent with urban fill and construction and demolition material. Recommendations were provided concerning handling, management, disposal, and capping of this material during construction.

NEW YORK CITY (E) DESIGNATED SITES

Principal-in-Charge, Highline Development Corp, West 29th Street, New York, New York. Managed CEQR (E) designated site requirements associated with the redevelopment of seven parcels with industrial histories for use as a hotel and residential building, all under a tight time schedule. Following NYCDEP's acceptance of the Site Investigation Work Plan, GZA advanced 32 soil borings, collected 64 soil samples, and installed 15 groundwater monitoring wells; a Site Investigation Report was submitted in combination with a Remedial Action Plan in order to save time for the client. The site was found to be contaminated with chlorinated solvents. GZA proposed a remedial action which coincided with the proposed redevelopment of the parcels. The remedial design consisted of excavation of soils to bedrock to accommodate the foundation design of the proposed building. Soil samples were collected in a grid across the site at multiple depths to further characterize VOC-contaminated soils, historic fill material and native soils, for disposal purposes. This identification of "cells" of soil that could be transported to different facilities resulted in significant cost savings to the client. In addition, GZA recommended a soil vapor barrier and post excavation groundwater monitoring. Both the NYCDEP and the NYSDEC approved the work plans.

Senior Project Manager, Horrigan Development Partners, North 9th Street, Williamsburg, New York. Managed CEQR (E) designated site requirements associated with the redevelopment of a former industrial building for reuse as a residential building. Following NYCDEP's acceptance of Site Investigation Work Plan, conducted a Site Investigation and submitted a Site Investigation Report combined with a Remedial Action Plan in order to save time for the client. When the site was found to be contaminated with chlorinated solvents, proposed a remedial action which coincided with the proposed redevelopment of the parcels. The remedial design consisted of excavation of soils to bedrock to accommodate the foundation design of the proposed building. Soil samples were collected in a grid across the site at multiple depths to further characterize VOC contaminated soils, historic fill material and native soils, for disposal purposes. This identification of "cells" of soil that could be transported to different facilities resulted in significant cost savings to the client. In addition, GZA recommended a soil vapor barrier and post excavation groundwater monitoring. Both the NYCDEP and the NYSDEC approved the work plans.

CIVIL CONSTRUCTION SUPPORT SERVICES

Principal-in-Charge, NYCSCA- PS-312 (with Leon d DeMatteis Construction Corp.), Queens, New York. Managed construction support services related to soil management and community air monitoring associated with the construction of a New York City school complex and associated utility corridors on a high-profile NYSDEC Brownfield Site. The site had a long industrial history, was contaminated with petroleum products and historic fill, and the redevelopment was being closely scrutinized by the community and NYSDEC. GZA prepared Excavated Material Disposal Plans, reviewed potential disposal facilities, conducted waste characterization soil sampling, prepared a Community Air Monitoring Plan, and conducted community air monitoring using three stations that continuously monitored volatile organic compounds and particulates.

Principal-in-Charge, NYCSCA- Metropolitan High School (with Leon d DeMatteis Construction Corp.), New York, New York. Managed construction support services related to soil management and community air monitoring associated with the construction of a New York City school complex and associated utility corridors. The site was a former Inactive Hazardous Waste Site contaminated with chlorinated solvents and historic fill. GZA prepared Excavated Material Disposal Plans, reviewed potential disposal facilities, conducted waste characterization soil sampling, prepared a Community Air Monitoring Plan, and conducted community air monitoring using three stations that continuously monitored volatile organic compounds and particulates.

Senior Project Manager, NYCDEP- Catskill Delaware Ultra Violet Light Disinfection Facility Site Preparation Contract (Granite Halmar). As part of one of the largest Water Treatment construction projects in the country, Dr. Winslow managed the environmental and compliance portions of the project for the contractor. The projected involved the excavation of a shaft to a depth of 90 feet below ground surface in order to access the Catskill Aqueduct. GZA's services included preparation and implementation of an In-Situ Soil Sampling and Analysis Plan, preparation of an Excavation, Transportation and Disposal Plan, preparation of a Storm Water Pollution Prevention Plan and Erosion Control Plan, and preparation of a Construction Waste Management Plan.

Senior Project Manager, NJTA - TransHudson Express Tunnel-Manhattan Segments (Judlau-Halcrow Joint Venture), New York, New York. As part of the design-build project for the Manhattan Tunnels Project, designed and oversaw the soil and rock characterization of the soils and rock within the shaft and starter tunnels at 29th Street and 12th Avenue. The project involved the excavation of a shaft to a depth of 130 feet below ground surface in order to allow access by the tunnel boring machine. GZA's services included preparation of an In-Situ Soil Sampling and Analysis Plan, a Field Sampling Plan, collection of 190 composite soils samples representing 500 cubic yard cells at five foot lifts, preparation of a field summary report, and recommendations to the contractor on materials disposal.

MANUFACTURED GAS PLANTS (MGP) AND COAL TAR SITES

Project Manager, National Autoparts Retailer, Former MGP Site Redevelopment, Staten Island, New York. Conducted environmental due diligence studies on a former natural gas storage site targeted for redevelopment for commercial interests. A Phase I Environmental Site Assessment and a Phase II Site Investigation were performed prior to purchase of the property. The site had previously been utilized by Brooklyn Union Natural Gas as a natural gas storage site; the site had been listed as a potential MGP site operating in the late 1800s and early 1900s. Performed a remedial investigation under the supervision of the NYSDEC, including a remedial investigation work plan, the advancement of 20 soil borings, the installation of 10 temporary well points, regulatory interfacing, laboratory services, and a remedial action plan. It was determined that a concrete vault housing piping had been filled with condensate-contaminated debris during site closure. All contaminated material was confined to within the concrete vault. No other contaminants were detected above applicable guidance values. The contaminated material was excavated from the concrete vault; no groundwater had been impacted by the presence of the contaminated material. The NYSDEC granted a no further action letter, and the site was developed as a retail autoparts store.

Senior Project Manager, National RE/Sources, Former MGP Site Redevelopment, Tarrytown, New York. Prepared a conceptual remedial action plan and provided cost estimates to remediate a site that had operated as an MGP until the 1930s. The site had two areas of MGP-contaminated soil and groundwater as well as three areas of diesel-contaminated soil and groundwater. The conceptual remedial action consisted of a combination of containment, encapsulation, excavation, on-site thermal treatment, and product recovery. Land use restrictions were incorporated into the conceptual remedial action plan to allow for less stringent cleanup standards. Dr. Winslow provided cost estimates for the remedial actions, which were used by the developer to determine the feasibility of implementing the remediation.

ADDITIONAL REMEDIATION PROJECTS

Senior Project Manager, New York Presbyterian Hospital, New York, New York. Conducted assessment of a PCB-bearing transformer to be removed as part of a construction project. The transformer was found to have leaked, resulting in impacts to the concrete pad and soils. Designed and oversaw a remediation program to remove the transformer, concrete pad and impacted soils. The case was closed with the NYSDEC.

Senior Project Manager, ConocoPhillips, various projects in New York and New Jersey. Prime contract under which GZA provided environmental consulting services for the operation and maintenance of remediation systems, groundwater monitoring and reporting, site investigation and remedial design service, as well as closure and upgrades of stations and fueling systems.

Senior Project Manager, The General Consulate of the People's Republic of China, New York, New York. Performed a review of past investigations and remediation conducted by the NYSDEC in relation to a No. 6 Fuel Oil Release at the site of the Chinese Consulate; determined that previous remedial efforts had reached a point of diminishing returns. Designed an investigation to determine if any additional source of product remained beneath the slab of the building; based on results, prepared a Site Investigation Report and Exposure Assessment for submittal to the NYSDEC. The report recommended that all remedial efforts be suspended and the site be monitored for one year to assess product rebound. If product levels remained similar, GZA would recommend no further action. The NYSDEC accepted the proposal.

Senior Project Manager, Hertz Rent-A-Car, **LaGuardia Airport, Queens, New York.** Designed and implemented a Site Investigation to delineate the extent and magnitude of separate-phase product, petroleum vapors and dissolved-phase petroleum contamination/MTBE emanating from the current and former fueling operations at the Hertz facility. Following characterization, designed a cost-effective, receptor-based remediation system to mitigate separate-phase product and control petroleum vapors.

Project Geologist, NYSDEC, **Region I and II, various locations throughout New York State.** Supervised construction and operation of several groundwater remediation systems at petroleum-contaminated gasoline service stations. These remediation systems included technologies such as pump and treat, air sparging, vapor extraction, vacuum enhanced recovery, and bioremediation using the injection of proprietary bacteria and nutrient solutions. Conducted and assessed remedial selection investigations including slug tests, pump tests, sparge tests, vapor extraction tests and enhanced fluid recovery tests.

Senior Project Manager, U-Haul, Bronx, New York. Designed and implemented the remediation of a U-Haul Moving Center in the Kingsbridge section of the Bronx. The site formerly contained three separate fueling areas. Two of the fueling areas contained low levels of dissolved phase contamination; the NYSDEC closed these areas of concern based upon natural attenuation modeling and a risk based approach. The third area of fueling was characterized by free-phase product. The area of saturated soils was excavated and transported off-site for treatment. The excavation was then lined with oxygen release compound (ORC) prior to backfilling. ORC was then injected into dissolved contamination plume to promote biodegradation downgradient of the former tank pit. The leading edge of the plume was allowed to attenuate following source removal. The NYSDEC closed the case within one year of the commencement of remedial action and the project was completed under budget.

Senior Project Manager, U-Haul, Staten Island, New York. Conducted a Site Investigation at the U-Haul facility located on Bay Street in Staten Island, New York. The results of the Site Investigation indicated that soil and groundwater in the vicinity of the former UST area and fuel dispensers were contaminated with gasoline compounds. Conducted a Remedial Investigation and prepared a Remedial Action Plan for submittal to the NYSDEC. Due to fluctuations of seasonal water table elevations and a thick zone of adsorbed-phase contamination, a total fluid extraction system was recommended and installed to address dissolved phase and adsorbed phase contamination.

Senior Project Manager, Mystic Transportation Inc., Mount Vernon, New York. Designed and supervised the construction of a No. 4 fuel oil recovery system at a residential building where, due to an overfill, a 5,000-gallon AST had ruptured and spilled 6,600-gallons of fuel oil. Eight hundred gallons of fuel oil were released into the groundwater beneath the building and into the Bronx River. Following emergency response and cleanup of fuel oil in the basement of the building, a product recovery system and water treatment system were installed. Total fluids were recovered from each recovery trench and routed to an oil/water separator and carbon treatment system housed in the basement of the building. In addition, several sumps were impacted by the fuel oil release. The effluent water from these sumps was also routed to the treatment system prior to discharge to the municipal storm water system. Within approximately eight months, product levels had decreased to trace amounts in all but one well.

TRANSPORTATION EXPERIENCE

Principal-in-Charge, Beacon Station Transit Oriented Development (with AECOM), Beacon, New York. Designed and oversaw the environmental assessment, site investigations and conceptual remedial approach in support of the proposed Transit Oriented Development (TOD) at Metro-North Railroad's (MNR) Beacon Station. MNR was preparing a preliminary design for a TOD for inclusion in a request for proposals to developers. Dr. Winslow designed a Site Assessment program to identify and quantify the environmental liabilities associated with the development. The study included compilation of existing environmental data on five parcels (including a coal tar impacted parcel), a Phase I Environmental Site Assessment on five parcels, a Site Investigation to evaluate data gaps, preparation of a conceptual remedial approach, and preparation of remedial cost estimates. The information was designed to be used in the RFP process to reduce uncertainties in the development proposal process.

ENERGY PROJECTS

Principal-in-Charge, TransCanada – Ravenswood Power Generating Station, L.I.C., New York. Designed and oversaw the spill response investigation following the discovery of a 25,000 gallon kerosene release from an underground fuel oil line connecting a gas turbine generator with the 6,000,000 gallon aboveground storage tank. Within one week of notification of the release, GZA was on-site conducting a subsurface investigation to delineate the vertical and horizontal extent of kerosene associated with the release. In addition, GZA installed several recovery sumps to initiate product recovery during the investigation period. Dr. Winslow developed a Conceptual Site Model (CSM) that was continuously revised and updated as data became available. The initial CSM projected that kerosene would migrate vertically to the water table and then flow west towards the East River. However, once investigative activities and data review commenced it became evident that anthropogenic features (old foundation elements and utility conduits) were complicating kerosene migration. In addition, shallow bedrock at the release area resulted in migration of kerosene to the north, south, and west from the release area. The investigation IRM was completed within three months of mobilization to the Site and included the installation of over 30 soil borings, 14 monitoring wells and four recovery sumps, and design of an interim product recovery system. Within the first four months of the release 5,000 gallons of kerosene were recovered. A product recovery system was designed and installed to continue product recovery past the emergency response stage. In a subsequent project at the site, oversaw team responsible for asbestos surveys and sampling of suspect materials throughout the power plant, including the 10-story boilers and roof.

Senior Project Manager, Enercon Inc. – Indian Point Energy Center, Buchanan, New York. Designed and implemented a site investigation to delineate and determine the source of tritium, strontium and cesium detected in groundwater as a result of a leak in spent fuel storage pool and process piping at the Indian Point Nuclear Plant. The investigation consisted of a thorough review of construction drawings, historic hydrogeologic data and historic groundwater chemistry data to prepare a conceptual site model for the release. In order to verify the conceptual site model, GZA advanced 42 bedrock and overburden borings at the site to supplement the site's existing 18 groundwater monitoring wells. The borings were advanced using a combination of drive and wash techniques and rotary coring techniques. Rock cores were characterized for the presence of water bearing fractures as well as lithology. All bedrock borings were subject to downhole geophysical borehole logging consisting of acoustic televiewer, optical televiewer, temperature, conductivity, and heat pulse flow meter. Hydraulic conductivity was evaluated using a combination of extraction packer testing and sustain yield pump tests. Wells were completed using multilevel sampling systems resulting in 127 sample intervals. GZA then completed an organic dye tracer test to confirm contaminant flow paths and groundwater velocities. GZA was able to delineate the extent of horizontal and vertical groundwater contamination, determine the sources of the contamination and the post release flow paths. GZA then recommended a long term monitoring plan to be implemented at the site to assess long term plume reductions as well as monitor potential releases from other SSCs.

Principal-in-Charge, SUEZ Energy Generation NA, LLC, Astoria, New York. Designed and managed an environmental investigation to characterize soils and groundwater as part of the pre-construction design phase of the Astoria Energy Phase II project. The proposed power plant was situated on a former major oil storage facility and was characterized by approximately 10 feet of historic fill material and petroleum contaminated soils and groundwater. The investigation consisted of collecting soils samples in a grid fashion in areas proposed for grubbing, excavation of structures and overhead and subsurface transmission lines in order to characterize soils for proper handling and disposal. In addition, groundwater samples were collected to evaluate the necessity for treatment of dewatering effluent. Then prepared a Site Investigation Report and a Construction Contaminant Management Plan to be used by the contractor for proper health and safety, handling, transportation and disposal of contaminated media. During construction, GZA conducted waste characterization soil sampling for disposal of contaminated material.

VAPOR INTRUSION

Principal-in-Charge, POKO Management, LLC, Brooklyn, New York. Provided environmental due diligence services during real estate transaction and renovation. The Phase I ESA identified a former dry cleaning operation at the site. Initial investigations found no soil contamination, however, groundwater downgradient of the dry cleaner was found to be impacted. Additional investigations found that groundwater was only marginally impacted, however, subslab soil gas PCE concentrations were as high as 11,000 ug/m3. GZA proposed a remedy consisting of a subslab depressurization system to address potential vapor intrusion and monitored natural attenuation to address the groundwater condition. Dr. Winslow prepared design specifications for construction of SSDS at the site.

Principal-in-Charge, i.park Edgewater, LLC, Edgewater, New Jersey. As part of this mixed use Brownfield development project, Dr. Winslow, conducted a Vapor Intrusion Study at the site which resulted in the requirement for all existing buildings and new construction to incorporate passive subslab depressurization systems with the ability to be converted to active systems. Designed systems for 10 separate buildings. In addition, developed a program to evaluate the effectiveness of each passive system to determine if active depressurization would be required. The program was accepted by the NJDEP.

ADDITIONAL HAZARDOUS MATERIAL CONSULTING

Senior Project Manager, United States Postal Service, Farley Building, New York, New York. Assisted in a hazardous materials survey and soil characterization project associated with the proposed redevelopment of the Farley Building as the new Pennsylvania Station. The survey consisted of multiple reconnaissances of the portions of Amtrak located below the Farley Building which would be impacted by proposed renovations. The survey identified PCB bearing equipment, mercury bearing equipment, asbestos containing materials, lead-based paint, miscellaneous chemicals and petroleum products, as well as non-hazardous-materials-contaminated soils. The information was utilized to prepare demolition specifications and a soil management plan.

Senior Project Manager, Memorial Sloan Kettering Cancer Center (with Granary Associates), New York. Designed and coordinated a pre-demolition laboratory and hazardous material survey. The survey included an evaluation and inventory of all hazardous chemicals, waste and biohazards associated with each laboratory. Once the hazard assessment was completed, a survey was designed to determine impacts from use of building materials in light of planned demolition activities. Areas such as storage cabinets, duct work, fume hoods, bench tops and plumbing were evaluated for presence of hazardous substances. In addition, a lead-based paint survey and a universal waste survey were conducted. Laboratory decontamination and hazardous material specifications were created and a contractor was selected. GZA personnel coordinated and oversaw the decommissioning and abatement.

RELEVANT GEOLOGIC EXPERIENCE

Dr. Winslow has conducted structural geologic field mapping to evaluate locations of folding, faulting and lithologic contacts in both the western and eastern United States, as well as overseas in the Pakistan Himalaya. The results of the geologic mapping have been used to assess regional scale tectonic relationships as well as local scale mineral resources. In the Pakistan Himalaya, Dr. Winslow was able to map an active tectonic fault which accommodated kilometers of uplift in one of the most tectonically active areas of the world.

Dr. Winslow has utilized remote sensing, photolineament analysis, and structural/petrographic techniques to evaluate the pressure, temperature and time history of rocks associated with tectonic faulting. This information has included field scale structural analysis, petrographic thin section analysis, fluid inclusion analysis, major cation (thermobarometric analysis) chemistry, and thermochronological analysis of rocks from several tectonic complexes. This information has been used to evaluate the movement and uplift history along major tectonic faults.

EXPERT TESTIMONY

Senior Project Manager, New York City School Construction Authority (NYC SCA), Corona, Queens, New York. Provided expert testimony in a condemnation case regarding impacts to the site from lead contamination associated with historic fill at the site. In some instances lead concentrations were sufficient to classify soils as hazardous waste. Provided testimony concerning the nature and extent of the contamination, as well as typical remedial solutions to this issue and costs associated with the remediation. Remediation costs were estimated for residential usage vs. usage as a public school in order to determine what the environmental remediation costs would be under the highest and best use of the site.

Senior Project Manager, Medi-Ray Inc., Tuckahoe, New York. Provided expert testimony concerning contaminant fate transport of lead in the environment in conjunction with a "whistle blower" case. The former employee charged that he was fired because he intended to report to the authorities the mismanagement and dumping of lead into the environment. Dr. Winslow provided testimony concerning background concentration of lead in the environment, contaminant fate and transport properties of lead, the potential to create a substantial and material threat to public health and the environment, and critique of the conclusions of the opposing witnesses.

Senior Project Manager, Toys-R-Us, Yonkers, New York. Provided factual testimony concerning site investigation and remediation efforts during the development of a Babies "R" Us store on a site that had been previously filled in the 1950s. During excavation to construct the store, evidence of commercial and industrial waste was detected in the fill material. This included fill with chemical odors, buried drums, and cinders. Once this material was identified it could no longer be disposed of as construction and demolition debris. Laboratory analysis indicated that the fill material contained metals and organic compounds above standards. Babies "R" Us sent the site owner a bill for the remedial efforts. The site owner disputed whether the fill material required special handling and whether the remediation was conducted in accordance with industry standards and state regulations.

Professional Activities

Program Committee Member, Urban Land Institute (ULI)/Northern New Jersey Chapter
Member, National Groundwater Association

Professional Development

OSHA 40-hour Health and Safety Training Certification - 1995
8-hour Site Supervisor Certification - 1995
OSHA Confined Space Entry Training Certification - May 1995
ASTM Risk Based Corrective Action for Petroleum Contaminated Sites – 1998

Ph.D. Dissertation

Pressure Temperature Time History of Nanga Parbat-Haramosh Massif, Pakistan Himalaya. Lehigh University, 1995.

Professional Papers

Winslow, D. M., Zeitler, P.K., Chamberlain, C.P., and Williams, I.S., 1996, Geochronologic Constraints on Syntaxial development in the Nanga Parbat Region, Pakistan, Tectonics.

Winslow, D.M., Chamberlain, C. Page, Zeitler, P.K. 1995, Metamorphism and Melting of the Lithosphere Due to Rapid Denudation, Nanga Parbat Massif Himalaya, Journal of Geology.

Winslow, D.M., Zeitler, P.K., Chamberlain, C. Page, Hollister, L.S., 1994, Direct Evidence of a Steep Geotherm Under Conditions of Rapid Denudation, Western Himalaya, Pakistan, Geology.

Craw, D., Koons, P.O., Winslow, D., Chamberlain, C.P., Zeitler, P.K., 1994, Boiling Fluids in a Region of Rapid Uplift, Nanga Parbat Massif, Pakistan, Earth and Planetary Science Letters.

Winslow, D.M., Bodnar, R.J., Tracy, R.J., 1993, Fluid Inclusion Evidence for a Counterclockwise P-T Path in CMT of Central Massachusetts. Journal of Metamorphic Geology.

Presentations

Bench Scale In-situ Solidification/Stabilization Treatability Tests Using ANSI 16.1., Banff, Alberta, Environmental Services Association of Alberta (ESAA)/Remediation Technologies Symposium 2012 (RemTech 2012), October, 2012

Green Remediation at a LEED Silver Brownfield Site, The Environmental Institute, Green Remediation Conference, Amherst, MA, June 2010.

Characterization of Tritium and Strontium Releases and Hydrogeology at the Indian Point Nuclear Power Plant, Buchanan, New York, Northeast Geological Society of America, March 2007

Integration of Investigative Methods to Assess a Porous Media vs. Fracture Flow Approach in Fractured Bedrock Systems, 2007, U.S. EPA/NGWA Fractured Rock Conference, September 2007.

RESUME

Education

B.S., 2001, General Geology, University of Kansas

M.S., 2006, Groundwater Studies University of Kansas

Professional Registration

Professional Geologist, California, License No. 8554

Registered Geologist, Kansas, License No. 718

Areas of Specialization

Site Characterization

Conceptual Site Models

Hydrogeologic Investigations

Groundwater Modeling

Brett Engard, P.G.
Project Manager

Summary of Experience

Mr. Engard possesses extensive hydrogeologic knowledge and expertise in groundwater flow and contaminant plume characterization. He has experience in the development of conceptual site models, has designed, performed and interpreted aquifer tests (pumping and tracer), conducted tidal influence studies, and can execute a wide array of hydrogeologic data collection activities in support of remediation planning, design and implementation. These skills have been applied to numerous sites with complex stratigraphy and geologic structure.

Remediation projects in which he is involved have benefited greatly from the assimilation of geologic information and the application of quantitative evaluations of hydrogeologic problems. He also has a firm grasp of the local, state and national regulations pertaining to environmental impacts and assessments.

Relevant Project Experience

Project Manager, Brooklyn Bay Center, Remedial Action Implementation and Oversight of Beneficial Use Determination (BUD) Material, Brooklyn, New York. Oversight and management of the remedial activities and re-use of BUD material at a historic industrial and illegal solid waste dump on the edge of Gravesend Bay. Remedial activities included the discovery and abandonment of 19 underground storage tanks (USTs), remedial excavation of three areas with petroleum-impacted surface soils and four arsenic-containing soil areas, remedial excavation of impacted soils from off-site sources of light non-aqueous phase liquids (LNAPL), remedial excavation of solid waste with elevated semi-volatile organics and metals, and the excavation, sorting and disposal of solid waste from BUD material. Lead reporting efforts documenting the remedial actions, spill closure activities, and BUD re-use.

Project Manager, 57 East 90th Street Petroleum Release, New York, New York. During the construction/renovation of a three-façade brownstone home in the upper eastside of Manhattan, petroleum like odors and fluids were encountered. Specifically, during the excavation of subgrade levels into bedrock, light non-aqueous phase liquids were emanating from a bedrock fracture. The material appeared to be weathered No. 2 Fuel Oil from an unknown source, and a NYSDEC spill case was opened. Assisted the client with excavation and disposal of impacted soil and groundwater from the Site, sealing the bedrock fracture with hydraulic cement (prior to the placement of waterproofing and the structural slab), and navigation through the regulatory process to obtain spill closure from the NYSDEC.

Project Manager, Otto Pehle Park, Bergen County Health Department, Paramus, New Jersey. As part of on-call contract for remediation of contamination on County-owned properties, managed project at Otto Pehle Park where a 1986 leaking UST impacted groundwater. Designed a comprehensive soil and groundwater investigation utilizing surface and direct push geophysical methods, as well as conventional soil and groundwater sampling, for remedial design. Direct push cone penetration testing (CPT) was coupled with laser induced fluorescence (LIF) and membrane interface probe (MIP) tooling to gather stratigraphic data, Light Non-Aqueous Phase Liquid (LNAPL) presence, and dissolved phase constituent distribution. Laboratory groundwater and soil grab samples were collected adjacent to the geophysical borings for correlation with the field data. Additional groundwater samples were collected to assess monitored natural attenuation (MNA) and remedial design parameters; including heterotrophic plate count of microbial activity.

Project Manager, 2142 Amsterdam Avenue Petroleum Release, New York, New York. After the demolition of two historic homes, in the upper west side of Manhattan, petroleum impacted soils were discovered under the basement structural slab. The material appeared to be weathered No. 2 Fuel Oil from former boiler and above ground storage tank (AST) in one of the residences; a NYSDEC spill case was opened. Assisted the client with excavation and disposal of impacted soil and groundwater from the Site, and navigation through the regulatory process to obtain spill closure from the NYSDEC.

Hydrogeologist, Church of St. Mary-Archdiocese of Newark, **Hydraulic Investigation and Recommendations, Rutherford, New Jersey**. Developed a Site Conceptual Model to describe groundwater intrusion issues, estimated aquifer properties through aquifer testing, and built and implemented a groundwater flow model (MODFLOW), and presented the client with action items and option to mitigate groundwater intrusion. Utilized MODFLOW to assess the applicability of a potential groundwater pumping system to locally lower the water table below subsurface structures of the Church to address groundwater intrusion issues. Also provided passive groundwater intrusion mitigation recommendations.

Assistant Project Manager, iPark Edgewater Brownfield Redevelopment, Edgewater, New Jersey. Responsible for the coordination and implementation of the final delineation investigation of arsenic contaminated soils as part of the regulatory-approved remedial action work plan for the brownfield site. The site was the former location of Unilever, Inc.'s research and development facility and had housed industrial operations since 1910. The investigation consisted of the advancement of 250 soil borings to delineate the vertical and horizontal extent of arsenic impacted soils prior to remedial excavation and off-site soil disposal. The use of a portable XRF allowed for rapid delineation of contamination during one mobilization while confirmatory laboratory samples were analyzed at an off-site fixed laboratory. Correlation regressions between laboratory results and field screening results indicated a correlation factor of 0.9. In addition, during the investigation soil samples were collected for waste characterization purposes to minimize the need to remobilize to the field to characterize the waste prior to remediation.

Hydrogeologist, TransCanada – Ravenswood Power Generating Station, Soil and Groundwater Investigation and Groundwater Pump and Treat System, Long Island City, New York. Participated in emergency spill response and remediation following the discovery of a 25,000 gallon kerosene release from an underground fuel oil line connecting a gas turbine generator with the 6,000,000 gallon aboveground storage tank. Developed a comprehensive Conceptual Site Model (CSM), that was continuously revised and updated as information became available, predict contaminant pathways while designing the Interim Remedial Measures and the Remedial Investigation Work Plans. Performed the remedial system startup, optimization, and compliance sampling. Oversee site groundwater sampling and reporting events for Monitored Natural Attenuation of former Manufactured Gas Plant residual products, sampling required for the Major Oil Storage Facility (MOSF) Permit and for migration monitoring of the 2010 kerosene spill.

Assistant Project Manager, Seward Park Development, Environmental Site Characterization (Phase II), Manhattan, New York. Based on data gathered from a Phase I Environmental Site Assessment (ESA) for this site on Manhattan's Lower East Side, GZA was retained to perform a Phase II ESA and geotechnical foundation design. The site is to be redeveloped into affordable housing, high-rise buildings. Implemented the field drilling, well installation, and soil and groundwater sampling program for the Phase II ESA designed to target potential hazards and construction management of historical fill material and several former petroleum bulk storage tanks (PBSTs). Based on the sampling results, GZA was able to provide design recommendations for disposal of soils and protection of worker and public health during construction.

Assistant Project Manager, Soundview Park Greenway Path Project, Soil Investigation and Recommendations, Bronx, New York. Soundview Park is a, partially developed, public park built on a former landfill along the Bronx River's edge. Previous environmental assessments and investigations within Soundview Park indicated the presence of contaminated soils and buried wastes. A shallow subsurface investigation was conducted in areas of Soundview Park which would be impacted by the construction of a bicycle and pedestrian path as part of the Greenway Path Project. Shallow composite soils samples were collected to assess of the health and safety of construction workers exposed to the shallow soils, the community to fugitive dust from the construction Site and for soil disposal purposes during construction. Discreet interval shallow soil samples were also collected to evaluate impacts to long-term public health associated with soils to remain in place. The existing vegetative cover was also evaluated as a soil cap. Soils contamination was found to be consistent with urban fill, and observed debris at the surface was consistent with construction and demolition material. Recommendations were provided in a Site Investigation Report for the handling, management, disposal, and capping of material during construction.

Hydrogeologist, Willets Point Redevelopment Project, Hydraulic Testing, Analysis and Estimates of Construction Dewatering Rates, Flushing, New York. Provided hydrogeologic consulting for this project located near the New York Mets' Citi Field, at the edge of Flushing Bay. The project consisted of geotechnical engineering for the installation of a large diameter storm water sewer and the related discharge outfalls. Designed and implemented a field hydraulic testing program, and provided estimates of hydraulic properties in the construction area. Based on the hydraulic testing, provided estimates of the potential groundwater flux to construction excavations and the potential construction dewatering flow rates using a simple box model an verified using MODFLOW. These estimates helped the client to obtain the necessary discharge permits and to procure the appropriate pumping and treatment equipment.

Hydrogeologist, Memorial Sloan-Kettering Cancer Center (MSKCC), Foundation Engineering, Subsurface Exploration and Construction Dewatering Estimates, Manhattan, New York. Provided hydrogeologic consulting and testing for the proposed demolition and the construction of a new 13-story high-rise building. The proposed plan included the construction of a three level below grade super structure excavated into bedrock. The construction also required the removal of environmentally impacted unconsolidated soils and groundwater, as well as fractured bedrock. Designed a drilling program to install testing and monitoring wells, a, performed aquifer pumping tests, and groundwater sampling to characterize the site geology, and hydrogeology. Provided the client with construction dewatering estimates, the necessary information to design a groundwater treatment system, and applied for the appropriate sewer discharge permits.

Assistant Project Manager, New York University (NYU) Bulk Petroleum Storage Tank Audit, New York New York. Performed a regulatory compliance audit of 30 individual properties identified by NYU, which included: 24 above ground storage tanks (ASTs), three underground storage tanks (USTs) and 21 ASTs associated with emergency generators (EGs). Made recommendations to the client as to the deficiencies of those tanks relative to the appropriate federal, state and local laws; as-well-as industry best management practices. Provided a comprehensive data set and helped build a searchable database to make informed managerial decisions. The client is currently utilizing that data set to amend deficiencies and convert fuel oil systems to No. 2, ultra-low sulfur No.4 or natural gas systems. GZA developed a 5 year, prioritized plan for conversion and upgrade of tanks in accordance with New York City Local Law 43; NYCDEP Chapter 2 of Title 15, and changes in the integrity testing requirements in the federal SPCC regulations.

Assistant Project Manager, TransCanada – Ravenswood Power Generating Station, Repowering Study, Long Island City, New York. Member of GZA team that evaluated the environmental, geotechnical and permitting considerations of a repowering project at TransCanada's Ravenswood Generating Station which is a former MGP site. The repowering study included partial plant demolition, environmental remediation and construction of up to 700 Mega Watts in new power generation infrastructure. The study focused on seven potential redevelopment areas on the Long Island City site. Reviewed the available third party reports and prepared a succinct summary describing the hydrogeologic setting as well as the nature and existence of environmental constituents of concern. More specifically, developed a site conceptual model to describe soil and groundwater conditions, contaminant distribution, and the feasibility of remedial action during construction. Duties also included costs associated with conceptual remedial actions to obtain regulatory closure and to develop the new infrastructure.

Assistant Project Manager, Bay Park Brownfield Redevelopment, Coney Island, Brooklyn, New York. Provided environmental services during the rehabilitation and expansion of a 1970s-era mixed-use complex, which covers an area equivalent to three city blocks. Facilitated the Brownfield Cleanup Program (BCP) applications for two adjacent parcels within the complex: a "historic" dry cleaner lot that had been razed as part of urban renewal in the 1970s, the other for an existing retail space formerly occupied by a dry cleaner. Site investigations performed had documented the presence of tetrachlorethene (PCE) in soil gas and was delineated over three separate structural slabs in commercial and residential space utilizing a mobile laboratory. Due to Hurricane Sandy, the displacement of residents and the required rebuilding, it was an opportune time to install a sub-slab depressurization system during the total gut-renovation. GZA's Remedial Investigation Work Plan (RIWP) outlined work required to delineate the vertical and horizontal extent of the impacted soils, soil vapor and groundwater at both BCP sites. The system was designed with below slab suction pits, remote sensing vacuum monitoring points, and a variable frequency drive blower tied into the monitoring points for optimization and power savings.

Assistant Project Manager, Silver Star Mercedes Brownfield Redevelopment, Long Island City, New York. Member of the design team for the redevelopment of a former automobile services station and car dealership into a six-story multi-use building. Enrolled the (E) Designation Site in the NYCOER Brownfield Program. Designed and lead a Site Investigation to sample soils, groundwater and soil gas for the protection of construction workers and future tenants. Based upon the results of the Site Investigation a narrow off-Site PCE plume was identified to migrate onto the client's property. A Remedial Action Plan was submitted to the NYCOER to remove impacted soils and install a vapor barrier liner.

Assistant Project Manager, Interim Remedial Measures, The Children's Aid Society, Bronx, New York. Designed and implemented interim remedial measures to address a petroleum contamination at a historic retail gas station. Vacuum enhanced fluid recovery (VEFR) and groundwater sampling was conducted at the Site. VEFR was conducted to address light non-aqueous phase liquids (LNAPL) and dissolved phase organics impacting groundwater, and to volatize organics in the unsaturated soil column. Field and laboratory samples of vapor effluent were collected to monitor and assess the effectiveness of VEFR. Groundwater monitoring for organics provided additional metrics of VEFR effectiveness and regulatory compliance; additional natural and biodegradation parameters provided additional remedial design criteria. Part of the design team to install a multi-phase extraction and treatment system for longer-term Site remediation.

Hydrogeologist, Lightolier, Edison, New Jersey. Contaminated PCB soils were detected during the closure and decommissioning of a leaking hydraulic press pit. Conducted interviews with historic site personnel to ascertain the construction and instillation details of the press pit. Designed and implemented a groundwater study, with specific capacity and slug tests, to obtain aquifer parameters and developed conceptual site model (CSM). Provided oversight of a direct push contractor, located borings, collected soil and groundwater samples, recorded all field activities, and logged boreholes. Ultimately the New Jersey Department of Environmental Protection (NJDEP) closed the regulatory case based on the CSM and new Site data.

Assistant Project Manager, PS-27K, - Dewatering Permits, Brooklyn, New York. As part of construction waterproofing work, to mitigate intrusion of No 6 Fuel Oil into the basement at the public school, performed a site investigation and hydraulic testing to determine dewatering pumping rates rates. Pumping rates of up to 90 gallons per minute were estimated for dewatering which would nicessitate a Long Island well permit. Due to the high flow rates internal, versus external, waterproofing was selected as the remedy.

Assistant Project Manager, Stop and Shop (former landfill site), Raritan, New Jersey. The retail grocery store was constructed on top of the closed Raritan Landfill in Raritan, N.J. Managed the quarterly maintenance and calibration events of the in-store methane monitoring system. Reviewed and updated the Store #864 Methane Alarm Emergency Response Plan required by the landfill disruption permit. Provided annual training to Stop and Shop department and store managers on the function of the methane monitoring system and the alarm response protocols. Reviewed the historic plans and performed Site visit to understand the details of the 1980's sub-slab soil gas and methane extraction system. Provided recommendations to up-grade and repair the extraction system for continued operation and efficiency.

Assistant Project Manager, New York Power Authority, Vernon Boulevard Peaking Plan Remedial Cost Estimate, Long Island City, New York. Provided third party review of remedial estimates, prepared by another New York engineering company representing the potential buyer, as part of a proposed real estate transaction. The property is along the East River in Long island City, New York which was a former industrial area undergoing revitalization and redevelopment. The potential buyer sought large compensation to the purchase price based on soil and groundwater remediation, and handling during redevelopment. Based on the alternatives that GZA presented, the third party lowered their estimate from $30.2M to $8.3M in our client's benefit.

MSKCC York Ambulatory Surgery Subsurface Exploration and Construction Dewatering Estimates, Manhattan, New York. Provided hydrogeologic and environmental consulting for the demolition of an existing building and the construction of a new 13-story high-rise building, with a three level below grade super structure, on a former manufactured gas plant (MGP) gas holder tank. The construction required the removal of environmentally impacted unconsolidated soils, groundwater, fractured bedrock and a bulk petroleum underground storage tank. Designed a drilling program to characterize the geology, and the environmental impacts to soil for construction and disposal purposes. Three soil waste streams were identified as a result: 1) petroleum impacted soils, 2) soils impacted by MGP products, and 3) historic urban fill material Performed groundwater sampling and hydraulic testing, to provide the client with construction dewatering estimates, the necessary information to design a groundwater treatment system and to obtain the appropriate sewer discharge permits.

Former Florig Equipment, Limited Phase II Environmental Site Assessment (ESA), Ronkonkoma, New York. Designed and implemented a limited Phase II ESA at a former equipment and motor repair facility and part of a realty transaction and due diligence. Conducted a historical records search at the Suffolk County Building Department to identify potential subsurface structures. Provided oversight of a geophysical survey of the property to identify the subsurface limits of cesspools and an UST, and to map additional Site features such as the septic tank. Performed a GeoProbe investigation and a UST cesspools and collected soil samples to assess any potential impacts from former Site operations. Provided the client with a detailed findings and recommendation letter.

Brixmore Rockland Plaza Vapor Intrusion Study and Sub-Slab Depressurization System Design, Nanuet, New York. Designed a sub-slab vapor delineation, vapor intrusion, and vapor extraction study at a former dry cleaner at a commercial retail space. A geophysical survey and a mapping exercise was conducted to determine the building construction characteristics and an indoor drilling program was implemented to assess potential source areas soils. Indoor and outdoor air quality samples, a parts per billion photoionizaton detector (PID) survey, and a building materials inventory was conducted as part of an indoor air quality and vapor intrusion survey. Designed, built, installed and conducted a vapor extraction pilot test with a temporary suction pit and blower apparatus. Data collected during the test included effluent TO-15 laboratory samples for organics, air velocity, relative percent humidity, vacuum influence with radial distance, and continuous effluent PID readings. Designed and provided the client with specification for a sub-slab depressurization system.

Fiat of Manhattan Spill Prevention Control and Countermeasures (SPCC) Plan and Training, Manhattan, New York. Designed and prepared a SPCC plan for the Fiat of Manhattan service center. Due to below average material handling, the franchise owner and the parent company were under litigation from the property owner; in short an SPCC plan and materials handling training was required. Prepared and implemented a materials handling, SPPC and best management practices training session for the Site automobile technicians.

Hydrogeologist, Greenpoint Station/National Grid Hydraulic Testing, Brooklyn, New York. Designed and implemented hydraulic testing and provided dewatering estimates at a National Grid facility for the installation of new infrastructure. Hydraulic testing included pneumatic and solid slug testing and groundwater extraction testing. The dewatering estimates were included in the National Grid request for proposal and specification documentation released to potential bidders.

Additional Relevant Project Experience, Prior to GZA

Hydrogeologist, Former Whittaker Corporation Ordinance Facility, Groundwater Containment and Pump and Treat System, Hollister, California. Provided geological consultation to the remediation team addressing impacted off-site domestic and irrigation groundwater production wells at complex site located near the junction of the Calavaras and San Andreas Faults. Contaminant fate and transport is greatly affected by compartmentalization of hydrogeologic units as a result of site scale faulting. Revised the existing Conceptual Site Model (CSM) to explain complex site and regional geology as well as groundwater behavior and plume development. The CSM assisted the remediation team with the siting of groundwater extraction wells to optimize plume containment and ground water treatment. Also developed performance monitoring procedures for the site groundwater contaminant plume containment system.

Hydrogeologist, Former Gaylord Container Facility, PCE groundwater contamination, Sacramento Delta, Antioch, California. Provided hydrogeological consulting at facility located along the Sacramento Delta with tidal cycles which greatly influence groundwater behavior. Remediation of tetrachloroethene (PCE) at the site was done via in-situ chemical oxidation (ISCO) which, like many remediation methods, relies on the effective and efficient delivery of reagents and best implemented with a working Conceptual Site Model (CSM). Conducted a tidal study, groundwater extraction and injection tests, and a de-ionized water tracer test to estimate aquifer parameters, degree of heterogeneity, and substrate travel times. Placed the observed site conditions into the regional hydrogeologic framework to develop a comprehensive CSM which was critical to the design of the ISCO pilot test and the monitoring network to assess oxidant delivery, treatment effectiveness and related secondary water quality issues.

Hydrogeologist, Union Pacific Railroad/Purity Oil, Former Rail-Yard and Used Oil Recycling Facility, Sacramento, California. Assisted UPRR in development of soil compliance criteria for the protection of groundwater at the Purity Oil site, as mandated by the California Department of Toxic Substance Control (DTSC) to. Percolating recharge leached contaminant mass from the soil column and transported it to groundwater. Used site-specific data, a simple conceptual model and the Hydrus modeling program to develop regulatory-approved soil compliance criteria. Based on these recommendations the regulatory agency and UPRR reached a strategy for additional site characterization and the implementation of the soil compliance criteria.

Hydrogeologist, Union Pacific Railroad, Derailment Location, Storrie, California. Performed a hydrogeologic investigation in regards to contaminant (ethanol) migration in fractured bedrock. Estimated the contaminant flux to the Feather River, adjacent to the Site, based on contaminant concentrations and seasonal variations in groundwater and river stage. Also performed groundwater slug testing and long term groundwater extraction pumping tests to estimate hydraulic conductivity and fracture connectivity. This work aided the remediation team in determining an appropriate mitigation strategy.

Geologist, Union Pacific Railroad (UPRR), Former Redwood Bulk Oil Lease Facility, Active Railroad and Utility Corridor, Auburn, California. Provided hydrogeological consulting services to the UPRR when it was directed by the California Regional Water Quality Control Board (RWQCB) to determine the migration of contaminants through groundwater and soil vapors from the subject property to nearby residential properties, and to review existing Site data and the existing Site Conceptual Model (CSM). Reviewed the existing data for the property and the existing CSM. Refined the CSM, identified groundwater monitoring wells that may have been acting as preferential pathways between units, and wells which were not properly installed based on current State of California regulations. Designed and implemented a soil and bedrock sonic drilling program to evaluate soil, bedrock and fracture properties which can control the migrations of soil gas and groundwater.

Geologist, Union Pacific Railroad (UPRR), Former Rail Maintenance and Rail Yard Facility, Tracy, California. Provided hydrogeological consulting services to the UPRR when it was directed by the state's Department of Toxic Substances Control (DTSC) to delineate elevated concentrations of metals and petroleum hydrocarbons in soils and groundwater. Implemented a delineation strategy utilizing cone penetration tests (CPT) and soil and groundwater grab sampling. UPRR was able to perform focused remedial excavation of soils with elevated metal concentrations and to install clean fill as a protective cap. Also performed remedial confirmation soil sampling and community air monitoring for particulates during remediation.

Hydrogeologist, Romic Chemical Recycling Facility, San Francisco Bay, East Palo Alto, California. As part of a corrective measures study, estimated the time that various alternative remediation strategies would require to meet groundwater compliance goals for the site; where in-situ reduction zone (IRZ) remediation was already being employed. Utilized the CXTFit modeling program to determine advective transport and dual domain porosity effects as related to future constituent of concern (COC) flux and remediation effectiveness at a sensitive site-boundary. Model outputs were used to project remedial time frames and to manage project stakeholders' expectations on the rate of site cleanup.

Hydrogeologist, United Stated Navy, Naval Amphibious Base-Coronado, San Diego, California. Assisted the Navy as it addressed regulatory requirements mandating development of a working Conceptual Site Model

(CSM) and a strategic groundwater sampling plan for the Coronado Island facility. Coronado Island is a barrier island that forms the San Diego Bay; groundwater on the island is heavily influenced by recharge and tidal influences. Compiled regional and site-specific data, including geophysical and transient potentiometric surfaces, to develop a CSM. The CSM described groundwater flow directions, predicted conditions when constituent-of-concern-laden groundwater would discharge to the bay, and identified optimal times to collect representative samples. Under the guide of the new model, the Navy sought site closure from the USEPA.

NYU Bulk Petroleum Storage Tank Audit, Completed Project, New York New York. Performed a regulatory compliance audit for approximately 30, underground and above ground, petroleum bulk storage tanks and emergency generator day tanks and various properties owned and operated by the client. Provided recommendations to the client as to the deficiencies of those tanks relative to the appropriate federal, state and local laws; as-well-as industry best management practices. Provided a comprehensive data set and helped build a searchable database to make informed managerial decisions. The client is currently utilizing that data set to amend deficiencies and convert fuel oil systems to No. 2, ultra low sulfur No.4 or natural gas systems.

Hydrogeologist, PG&E Gas Compressor Station with Hexavalent Groundwater Contamination, Hinkley, California. Provided hydrogeological consulting for PG&E's implementation of an in-situ reduction zone (IRZ) groundwater recirculation method to treat a developed and expansive hexavalent chromium plume. Performed groundwater extraction and injection tests, packer tests, slug tests and groundwater dye tracer tests in the source area to estimate aquifer parameters, the degree of heterogeneity, and reagent travel times. Helped refine the site stratigraphy using conventional drilling logs and cone penetration test (CPT) logs. Information gathered from the drilling logs, well construction and groundwater sampling events were imported into RockWorks for subsurface data management, analysis and 2D/3D visualization. The resulting, improved understanding of aquifer communication and reagent delivery allowed PG&E to optimize the amount of remedial infrastructure needed to provide treatment over a large footprint.

Hydrogeologist, Del Monte Shopping Center, IRZ Treatment of TCE Plume, Monterey, California. Performed organic carbon substrate injections to remediate trichloroethylene (TCE) contamination through in-situ reduction zone (IRZ) technology. The IRZ proved to have inconsistently effective results. To ascertain subsurface controls on substrate delivery, designed and implemented 2-Dimensional (2-D), 3D and 4D surficial electrical resistivity tests. Also conducted dye tracer tests to determine groundwater flow paths, mobile porosities and reagent delivery times. These tests resulted in better design and delivery of substrate, improved TCE reduction, satisfying the client and the governing regulatory agency, the California Regional Water Quality Control Board (RWQCB).

Professional Experience Prior to GZA

April 2006-January 2009: Hydrogeologist, ARCADIS-US, San Francisco, California. Member of the groundwater, Conceptual Site Modeling (CSM), and the geophysical methods technical disciplines which supported soil and groundwater remedial projects. Groundwater studies and testing included: extraction and injection pumping tests, tracer testing, development of groundwater containment systems, fracture analysis, and subsequent analysis and modeling. Mr. Engard's Site CSM experience ranges from contaminant transport in fractured bedrock (Sierra Nevada Mountains), tidal estuaries (San Francisco Bay and the Sacramento River Delta) to the heavily faulted unconsolidated sediments of central California near the bifurcation of the San Andreas Fault and the Calaveras Fault. Geophysical techniques implemented include; cone penetration testing (CPT), and two- and three-dimensional transient electrical resistivity testing. Mr. Engard attended internal In-Situ Reductive Dechlorination Zone (IRZ) training, as well as Groundwater Plume Containment System Design and Assessment training given by the State of California's Regional Water Quality Control Board (RWQCB) and the Department of Toxic Substance Control (DTSC).

August 2004-February 2006: Research Assistant, University of Kansas, Department of Geology, Lawrence, Kansas. Mr. Engard conducted well installation, and electrical conductivity profiling with direct push drilling unit. He designed and built custom packer and pressure transducer apparatus for field experiments, and conducted high-resolution slug testing and oscillatory pulse tests to estimate hydrogeological parameters.

September 2003-December 2005: Lab/Shop/Field Technician, Kansas Geological Survey, Lawrence, Kansas. Mr. Engard assisted the Exploration Services and the Hydrogeology groups with geophysical seismic surveys, drilling projects, and other field activities. He also participated in the annual High Plains (Ogallala) Aquifer Study by measuring irrigation wells throughout Kansas. Mr. Engard operated a direct push drilling unit for shallow groundwater projects.

February 2002-August 2004: Environmental Geologist, SCS Engineers, Kansas City, Missouri. Mr. Engard designed, installed, sampled and authored reports on groundwater monitoring systems, Preliminary Site Investigations, and Phase I and II environmental site assessments in Kansas, Iowa, Missouri and Nebraska. He also supervised the installation of soil vapor extraction and air sparge remediation systems and oversaw remedial excavation activities. Mr. Engard conducted sampling for numerous contaminates of concern in soils, sediments, surfaces (wipe sampling), surface water and ground water. He conducted historical document searches, solicited sub-contractor bids, prepared proposals, and assisted with contractual and budgetary duties. Mr. Engard was certified in the Sate of Nebraska as a licensed monitoring well sampling technician.

June 2001-February 2002: Field Geologist, Drilling Assistant, and Soils Lab Technician, Kruger Technologies, Inc. Olathe, Kansas. Mr. Engard's duties included geotechnical soil boring, wash boring, conventional and wire-line bedrock coring, split spoon sampling, well installation, drill logging and surveying. He operated Simco 2100 and Boart-Longyear bk-51 rotary drilling rigs and other heavy machinery. In addition, he performed field and laboratory geotechnical testing of concrete and soil properties.

September 2000-May 2001: Field Geologist, Tank Management Services, Topeka, Kansas. Mr. Engard gauged and sampled groundwater monitoring wells at Leaking Underground Storage Tank (LUST) sites regulated by the Kansas Department of Health and Environment (KDHE) throughout the state. He also prepared groundwater flow and iso-concentration contour maps for reporting and attended KDHE Risk Based Corrective Actions (RBCA) training.

Professional Development

GZA 2012 Project Management Training
GZA Manhattan Office Health and Safety Coordinator (2011-2013)
USGS MODFLOW Training
RockWorks by RockWare Training
OSHA 40-hour Health and Safety Training Certification
10-hour Construction Safety Training
Smith System Defensive Driving
Loss Prevention System Training
8-hour Site Supervisor Certification
Transportation Workers Identification Card (TWIC) Holder
US DOT/IATA Training
CPR/First Aid/AED Training
CSX and UPRR Railroad Safety Training and Certification

Kathleen A. Cyr, P.E., LEP, P.G.
Associate Principal

RESUME

Education

B.S., 1978, Geology,
University of Connecticut
B.S., 1979, Civil Engineering,
University of Connecticut
M.B.A., 1994, Business Administration,
University of Connecticut

Professional Registrations

1983, Professional Engineer,
Connecticut, #13037
1989, Professional Engineer,
New Jersey, #34078
1990, Professional Engineer,
New York, #067143
1997, Licensed Environmental
Professional, Connecticut, #125
2002, Professional Geologist,
New Hampshire, #296

Areas of Specialization

Environmental Investigation
Environmental Remediation
Hazardous Waste Management
Environmental Compliance
Landfill Services
Litigation Support

Summary of Experience

Ms. Cyr has managed over 1000 environmental investigations for sites throughout the US. In addition, she has extensive experience in remedial planning, design, and implementation as they relate to industrial contaminants. She has supervised numerous geohydrologic studies for surface and groundwater contamination from industrial and commercial development and uncontrolled hazardous and solid waste disposal sites. Relevant project experience includes:

Relevant Project Experience

ENVIRONMENTAL INVESTIGATION

Principal-in-Charge, Shelton Economic Development Corporation, a Municipal Redevelopment Agency. Several parcels of land used by a variety of heavy industrial manufacturers were underutilized and in disrepair. The parcels had been developed for over 100 years. In anticipation of brownfield redevelopment, Ms. Cyr was responsible for environmental investigations designed to identify major environmental issues and preliminary remedial costs. Investigation techniques included geophysical and soil gas surveys, boring and well installations, and soil, sediment, groundwater and surface water screening and analyses for a variety of constituents. Results indicated impact by metals, petroleum product and solvents, including the likely presence of dense non-aqueous phase solvents in groundwater. Order of magnitude remedial estimates were provided for urban planning purposes.

Subsequently, Ms. Cyr directed supplemental (Phase III) investigations to refine contaminant extent and degree estimates and develop remedial plans and specifications for UST removal, excavation, on-site soil placement/capping, off-site disposal and in-situ treatment. The firm, under Ms. Cyr's direction, acted as client Representative overseeing environmental remediation as part of site redevelopment.

Principal-in-Charge, Licensed Environmental Professional, Danbury, CT. As a result of a transfer of Establishment as defined by Connecticut Regulation, a former industry owner was obligated to perform property investigations in accordance with prevailing standards and guidelines and remediation of releases from the Establishment in accordance with Remediation Standard Regulations. Ms. Cyr was retained by the former Industry Owner to act as LEP to develop Conceptual Site Modeling, complete investigations, identify needed remediation and achieve compliance with RSR criteria. Investigations included sampling of soil, groundwater and/or soil gas in ten Areas of Concern, including areas below an existing building. Investigations were complicated by upgradient sources of chlorinated organics with associated impact to groundwater.

Principal-in-Charge, A Regional Hospital. As part of due diligence requirements for CHEFA refinancing, Ms Cyr directed activities to perform an Environmental Compliance Audit for regulatory issues, and a Phase I Environmental Assessment to identify the presence of Areas of Concern. Re-financing subsequently occurred. To full-fill re-financing requirements, Ms. Cyr directed staff during environmental testing in

Areas of Concern at the property, and preparation of SPCC Plans. She also assisted the Hospital to identify and obtain wastewater discharge permits, and managed training to Hospital staff.

Principal-in-Charge, Sewer Line Construction. During installation of new sewer mains through an industrialized area, the contractor noted gasoline-type odors within excavations. Work was temporarily suspended as a result. Acting on behalf of the Town, Ms. Cyr managed a program of field monitoring and testing to identify types and degree of contaminants along the remainder of the construction project to protect workers and evaluate options to manage excavation wastes. The project was completed with no additional delays.

Principal-in-Charge, Pre-Transaction Site Evaluation. As part of pre-transaction due diligence conducted on behalf of a property owner, The firm performed a Phase I Environmental Assessment, identified over a dozen Areas of Concern, performed Phase II and Phase II investigations and developed conceptual remedial alternatives and cost estimates. The project was completed under Ms. Cyr's direction on an expedited basis within tight time constraints dictated by the purchase and sale agreement. In order to facilitate information transfers, Ms. Cyr and staff completed weekly status reports, provided daily client communication and performed real time data evaluation to identify resulting data gaps. As a result of the work conducted, 12 of 14 Areas of Concern were identified as requiring no or little additional action. Two Areas of Concern were qualified and preliminary remedial technologies and costs were identified. Constituents of concern initially included aromatic and chlorinated hydrocarbons, petroleum products, semi-volatile organic compounds, metals, and PCBs. Final constituents of concern for remedial action and/or future monitoring included petroleum products, chlorinated VOCs, arsenic and PCBs.

Principal-in-Charge, Pre-Transaction Site Evaluations, New York & Connecticut. A large wholesale distributor planned on opening new facilities in Westbury, NY, and Fairfield, CT. Prior to property purchase and construction, the client required environmental site assessments to identify and characterize environmental impacts from historical land use practices. Acting within rigorous schedule requirements, Ms. Cyr managed both projects. Each required background file reviews, subsurface explorations and chemical testing. At the Westbury site, volatile organic compounds were documented in groundwater and an off-site source area was identified. Heavy metals, volatile organic compounds, petroleum products and PCBs contaminated the Fairfield site, a historic metal casting facility. Working with the client, construction contractor and State and local regulatory bodies, remedial actions plans were developed, approved and initiated to proceed on time and as planned. Remedial actions included limited soil removals, capping procedures and installation of passive oil recovery and barrier systems to protect adjacent wetlands and waterways.

Principal-in-Charge, Private Industrial Client, Long Island, NY. Managed a multi-phase investigation of soil, sediment and groundwater contamination at an operating shipyard. The shipyard, which had operated for decades at the same location, had impacted soils and sediments with lead paint residues, oil and grease and volatile organic compounds above remedial requirements. Remedial action plans were developed and implemented under Ms. Cyr's direction. Remedial actions included removal of hazardous soils for off-site disposal and on-site fixation of soils containing organic contaminants.

Principal-in-Charge, Connecticut Department of Transportation. As a subcontractor to a major Engineering Company, managed environmental site investigation associated with the reconstruction of an 18-acre railroad maintenance and storage facility to assess known petroleum and PCB contamination in soil and groundwater. During the investigations, field and laboratory screening were used extensively to cost-effectively delineate PCB-contaminated areas. A floating layer of PCB-contaminated petroleum product was also found and delineated. Remedial plans and cost estimates were prepared for an *in situ* oil recovery system for groundwater and off-site disposal of soils. In addition, pre-demolition asbestos surveys were conducted in buildings and plans and specifications for asbestos abatement were developed. During the construction/remediation phase, Ms. Cyr directed on-site mobile laboratory and sampling services to provide real-time PCB, TPH and VOC screening resulting in significant cost and time savings to the project.

Associate-in-Charge, Industrial Facility. Due to a history of solvent discharge to the land (overburden and bedrock) in an area served by private water supply wells, the client was required by State Order to conduct investigations and install treatment facilities to address these issues. Soil gas surveys subsurface investigations and testing, fracture trace analyses and borehole permeability tests were conducted. In addition, pilot testing and remedial designs for soil and groundwater treatment were developed.

Associate-in-Charge, Former Apple Orchard. A 20-acre parcel of land was donated to a public service organization for their use. The parcel had been used for about 50 years as an apple orchard. The organization wished to develop the property for residential use. The nature and extent of pesticide contamination in soil and groundwater was assessed. Groundwater impact was not identified; however, lead, arsenic and DDT derivatives were found in site soils. Based on these findings, a health-based risk assessment was conducted to quantify the risks posed by the site to future residents.

Project Manager, Confidential Developer. Managed a pre-transaction site assessment of a 20-acre industrial complex with a history of use of metal working, fabric-dyeing, waste oil storage/transfer, machinery manufacture and commercial painting. Thorough background review, subsurface explorations and chemical testing, areas of substantial soil and groundwater contamination were identified.

Project Manager, Former Industrial Parcel, Large Investment Group. Several areas of heavily contaminated soil were discovered during the site assessment. The extent, nature, and degree of contamination by PCBs, metals, petroleum and solvents were determined and remedial plans developed. Remedial measures consisted mainly of soil removal and off-site disposal. Site clean-up costs exceeded $1 million.

ENVIRONMENTAL REMEDIATION

Licensed Environmental Professional, Former Automotive Repair and Painting Facility. Based on investigations conducted under Ms. Cyr's direction, soil contamination by petroleum products, and metals was identified and delineated. The firm assisted the Client in preparing Transfer Act Form filings, including an environmental condition assessment form. The CTDEP delegated the site to a CT. Licensed Environmental Professional. Ms. Cyr, acting as the site LEP directed the development of remedial plans, completed public notifications and supervised the remediation of site soils and removal of USTs and hydraulic lifts. With the exception of post-remediation groundwater monitoring, remediation of this empty brownfield site has been completed, a new multi-story residential structure has been constructed and the property has been returned to productive use.

Principal–in-Charge, Confidential Industrial Client, New England. Ms. Cyr directed the environmental investigations and UST removal for a medium sized New England industry which is a second tier manufacturer of products for the automotive and aircraft industries. During the environmental investigations, the presence of chlorinated hydrocarbons was identified in site soils and groundwater. The extent and degree of on-site contamination was delineated, and under Ms. Cyr's direction, a soil gas venting/groundwater sparging system was designed and pilot tested for source area remediation. The pilot was extremely successful. Full system installation, based on pilot testing results was completed in early 1998, resulting in a significant reduction in contaminant levels to date. Pulsed system operation and groundwater monitoring continue at this facility. Ms. Cyr currently acts as the Licensed Environmental Professional for investigation and remediation under the Connecticut Transfer Act requirements.

Principal-in-Charge, Former Optical Manufacturing Facility, Buffalo Area, New York. Ms. Cyr is responsible for technical oversight and project implementation during remediation of aromatic and chlorinated volatile organic compound contamination of soils and groundwater at a former manufacturing facility in upstate New York. The facility operations and waste storage practices resulted in high concentrations of contaminants in saturated and unsaturated soils as well as overburden and bedrock groundwater. In response to low permeability soil conditions, remedial systems consist of dual vacuum extraction of volatiles from soil and groundwater coupled with a pump and treat bedrock recovery system. The site, a New York Inactive Hazardous

Waste Site, is subject to oversight by the NYDEC. All technical plans and specifications for the system design and installation were developed by the firm and approved by NYSDEC. System installation is complete and system operation and monitoring are in-progress.

HAZARDOUS WASTE MANAGEMENT

Senior Technical Reviewer/Consultant, RCRA Remedial Facilities Investigation, TSD Facility. A RCRA Treatment/Storage/Disposal facility subject to Corrective Action under RCRA was ordered by Region I EPA to conduct an RFI including air, soil groundwater, surface water and sediment media. Ms. Cyr acted as technical quality assurance reviewer and senior consultant for the development of RFI Work Plans, RFI implementation and reporting.

Principal-in-Charge/Project Manager, Ten RCRA Facilities. Supervised groundwater assessment plan development, regulatory negotiation, and implementations under 40 CFR 265 requirements. RCRA Assessment techniques included soil gas surveys, geophysical methods (seismic and resistivity), fracture trace analysis, overburden/bedrock multi-level wells, and sampling and analysis of monitoring wells, private domestic wells, and surface water to assess extent, degree and nature of impact from various uncontrolled hazardous waste landfills and surface impoundment areas. At three of the sites shallow bedrock-controlled valleys complicated hydrogeologic conditions.

Associate-in-Charge/Project Manager, Various RCRA Facilities. Developed Closure/Post Closure Plans and Specifications for five RCRA regulated unlined hazardous waste disposal areas, three of which overlay municipal landfills. At each site, a program of controlled consolidation; RCRA capping and long-term monitoring was developed. After plan approvals by State Environmental Regulators and U.S. EPA, quality assurance testing and documentation were performed for closure activities at four of the sites.

ENVIRONMENTAL COMPLIANCE

Principal-in-Charge, Environmental Compliance Issues, Industrial Facility. A southern CT manufacturing facility was issued Notices of Violation and Orders to Correct from the CT DEP related to hazardous waste identification and handling practices. Under Ms. Cyr's direction, staff identified all facility waste streams, reviewed analytical data, audited disposal practices, and obtained supplemental waste stream analyses where appropriate. Waste streams were characterized and documented as part of Order compliance; and Waste Handling policies and procedures were developed for the facility. In addition, RCRA storage area closure procedures were developed and assistance was provided to the industry to upgrade paperwork and training methods and documentation.

Principal-in-Charge, Environmental Compliance Audit, Confidential Client, Midwestern USA. On behalf of the parent company of a Connecticut subsidiary, a regulatory compliance audit was conducted to evaluate compliance of the subsidiary with: RCRA Regulations for Waste Generators; state and federal permits for water and air discharges; state and federal regulations for underground storage tanks and PCB containing materials; and Community Right-to-Know issues. Detailed site visits and interviews were performed; manifests and material data sheets reviewed, and local and state agency files examined. In addition, waste stream sampling and analyses were conducted. A confidential report of findings documented existing conditions, noted areas of compliance and provided recommendations for corrective actions for noted deficiencies.

Principal-in-Charge, Pre-Transaction Compliance Audits, International Food Processor. On behalf of a multi-national company which processes and cans fruits and vegetables, Ms. Cyr directed multi-disciplinary teams auditing over 20 canning facilities in the mid-west and northwest. Audits included environmental and OSHA Compliance, including air, water, waste, EPCRA, TSCA and OSHA requirements. In addition, Phase I Assessments were completed. Confidential reports of findings provided conclusions, recommendations and order-of-magnitude estimates for quantifiable corrective actions.

Principal-in-Charge, Environmental Compliance Audits and Phase I Environmental Assessments. On behalf of a European Company, Ms. Cyr directed Regulatory Compliance Audits and Phase I Assessments at five facilities located in California (1), Texas (2), and Ohio (2). Ms. Cyr was also the lead Compliance Specialist for the two Texas sites. Services were performed on an expedited basis as part of a pre-transaction due diligence of a potential buyer. Issues were identified and qualified to assess potential financial and regulatory impacts. Services were completed on time and within budget, allowing the transaction process to continue.

LANDFILL SERVICES

Associate-in-Charge, Landfill Superfund Site. Managed Remedial Investigation (RI) at this site for a PRP group composed of a municipality and several industries under CERCLA/SARA requirements. The RI included development of scope of work and project operation plans; subsurface investigations; borings and monitoring well installation; sampling and analysis of groundwater, surface water, air, sediments and soils; soil gas assessment; geophysical testing; development of preliminary remedial alternatives; and baseline human health and ecological risk assessment.

Project Manager, Private Landfill, Chicopee, MA. The first phase of a two-phase process was a remedial investigation/hydrogeologic study. Technical responsibilities during this phase included selecting well locations, determining sampling parameters, employing geophysical methods, interpreting data results, directing field crews, and report writing. A glacial till valley was discovered which significantly affected groundwater flow patterns and contaminant migration. The second phase of the project involved managing the development of expansion plans to the existing landfill area. Project management responsibilities on this project included: scheduling; client meetings; regulatory agency meetings; technical oversight; billing coordination; problem resolution; interfacing with the owner, the Massachusetts Department of Environmental Quality Engineering (MA DEQE), and local town officials; and attending a public meeting during the second phase of the project. Directed all field activities and was primary author of the remedial investigation report and the operation and management plan.

LITIGATION SUPPORT

Litigation Support, Fortune 500 Company. On behalf of a Fortune 500 Client, litigation support, including depositions and federal court testimony was provided. The client was seeking cost recoveries from several insurance companies related to environmental contamination of soil and groundwater caused by practices occurring prior to 1965. Ms. Cyr completed several days of depositions and testimony at trial, which resulted in the client being awarded a multi-million dollar jury verdict. Ms. Cyr was issued a letter of commendation by the lead attorney for the Client for the quality of her litigation support.

Litigation Support, Industrial Property Owner. In a cost recovery suit for an industrial property owner, Ms. Cyr provided expert testimony in state court related to contamination of the property by a former tenant. Testimony focused on the nature, extent and degree of contaminants in the environment, impacts related to past site use, and regulatory requirements for remedial actions. The client was awarded cost recovery for environmental investigations and related activities completed at the property.

Litigation Support, Industrial Property Owner. Several years ago, Ms. Cyr directed environmental investigations of property used for over 20 years by an industrial tenant to identify environmental status and remedial needs for the property owner. The owner later sought cost recover from the industry under the terms of the leasing agreement. A dispute arose and Ms. Cyr was retained as an expert witness on the property owner's behalf. Ms. Cyr spent two days in state court under examination and cross-examination. The court case was settled favorably for the property owner prior to a court decision.

Litigation Support, Land Valuation Case. A former industrial property, which has under-utilized, was acquired via eminent domain by a local government agency as a brownfield re-development site. The former owner disputed the fair market value of the land utilized in the eminent domain taking. Ms. Cyr was retained on behalf of the governmental agency to provide assistance to legal counsel and expert witness testimony as to the environmental conditions of the property, the regulatory requirements related to site remediation and underground storage tank removal and use restrictions. Ms. Cyr provided depositions on two occasions, appeared as an expert witness in state court under examination and cross-examination, and attended depositions by others to support client counsel. The case is currently on going.

Litigation Support, Former Owner Liability, Multi-Site Support. Ms. Cyr provided technical expertise to Philadelphia Counsel related to current and historic contamination at operating facilities in three states. Counsel's client had owned and operated each of the facilities for three quarters of a century. Current owners/operators subsequently used the properties for similar purposes for almost three decades. Ms. Cyr reviewed available operating histories and environmental reports to assist Counsel in developing allocation strategies for investigation and where necessary remediation.

Professional Activities

Environmental Professionals' Organization of Connecticut, <u>President</u>: 1997-99, <u>Executive Board</u>: 1995-2000, Committee Member (Education, Membership, Scholarship): 1995-2002.
Society of Women Environmental Professionals, <u>Executive Board</u>: 1999-2002.
UCONN Engineering Alumni Society, <u>Executive Board</u>: 1993-99.
SACIA Environmental Health and Safety Forum, <u>Executive Council</u> :1994-98.
Connecticut Engineers in Private Practice, <u>President</u>: 1993-95, <u>Executive Board</u>: 1990-96.
Member, National Society of Professional Engineers since 1985; National Groundwater Association since 1981.

Publications

1. "A Method for Estimating the 7-Day, 10-Year Low Flow of Streams in Connecticut," Cervione, Melvin & Cyr, Connecticut Water Resources Bulletin No. 34, 1982.

2. "Halogenated Volatile Organic Compounds in a Glacial Till/Fractured Bedrock Hydrogeological Setting," Bellison-Clayman, Cluen & Cyr, Air and Waste Management Association Proceedings, 1992.

3. "Caution Required When Revitalizing Polluted Urban Sites", Cyr, Connecticut Environmental Compliance Update, June 1994.

Chunhua Liu
Quality Assurance Officer

RESUME

Education

B.E., 1992, Environmental Engineering, Tsinghua University, Beijing, China

M.E., 1995, Environmental Engineering, Tsinghua University, Beijing, China

M.S., 1998, Environmental Health, Harvard School of Public Health

D.S., 2000, Environmental Chemistry, Harvard School of Public Health

Summary of Experience

Dr. Liu is a senior chemist with more than 10 years of experience in analytical chemistry, data validation and management, and quality control and quality assurance for remedial investigations and remedial actions. Her experience includes laboratory chemical analysis, EPA Region I and Region II data validation and data usability evaluation, data usability evaluation for Massachusetts Contingency Plan (MCP), sampling and analysis plan development in accordance with the NYSDEC Analytical Service Protocol and Massachusetts Compendium of Quality Assurance and Quality Control Requirements (QA/QC) and Performance Standards for Selected Analytical Methods, and quality control and quality assurance for Superfund and MCP projects.

Dr. Liu majored in environmental chemistry and during her doctoral study at Harvard School of Public Health, she researched analytical methods for sediment and evaluated metal fate and transport in sediment. Dr. Liu worked at Parsons for over seven years and at Gradient for one year before joining GZA. At Parsons, Dr. Liu led the quality control and assurance and data management efforts from developing Quality Assurance Project Plan (QAPP) to assuring implementation of QA/QC requirements and from field sampling preparation and arrangement to chemical data management. Dr. Liu was responsible for the QA/QC and data validation and data usability evaluation for a 10,000-acre BRAC and Superfund NPL site in New York and assisted in the successful transfer of over 8,000 acres of land. Dr. Liu performed data usability evaluation for various Massachusetts Contingency Plan sites at Gradient and GZA.

Relevant Project Experience

Senior Technical Specialist - Leads GZA human health risk assessment efforts for federal and state level superfund and MCP projects. Dr. Liu is also responsible for data usability evaluation for various projects.

Technical Director - Directed preparation and submittal of the Site-Wide Sampling and Analysis Plan (SAP) and the Site-Wide Quality Assurance Project Plan (QAPP) for a 10,000-acre Superfund site in New York in accordance with the Department of Defense (DOD), NYSDEC ASP, EPA Region II and EPA guidance. Directed project field sampling and data management. Supervised data validation in accordance with EPA Region II SOPs and NYSDEC ASP based on the NYSDEC ASP Category B deliverables. Identified laboratories qualified for project chemical analyses and interfaced with various analytical laboratories to address analytical deficiencies. Submitted data summary report to EPA Region II on a quarterly basis.

Lead Chemist and Risk Assessor- Led data usability evaluation and supported the successful closure of a 125-acre Hingham Annex Guaranteed Fixed Price Remediation Project. Dr. Liu also led the risk assessment effort and the effort of evaluating pesticide fate and transport at the site and successfully demonstrated that the pesticide conditions at the site were related to the past normal use of pesticides and therefore were not associated with the release at the Site.

Technical Director - Directed preparation and submittal of the SAP and the QAPP for various Formerly Used Defense (FUD) Sites. Supervised field sampling and data validation in accordance with guidance from various EPA regions. Reviewed data validation and data usability report.

Technical Director – Directed data validation for various Superfund sites in EPA Region I and Region II in accordance with the EPA regional and state SOPs and the EPA Functional Guidelines. Led data validation for numerous MCP sites for various analytical analyses including metal, VOC, SVOC, pesticide, PCB, EPH, VPH, and TPH analyses..

Project Chemist – Evaluated different analytical methods for hexavalent chromium analysis. Compared analytical methods developed by NJDEP and EPA and identified the appropriate method for a CERCLA site in New Jersey.

Project Chemist – Evaluated quantitatively potential impacts to metal data usability by interference caused by common metals in environmental samples for a CERCLA site in New York.

Project Chemist – Performed data validation for indoor air samples for various CERCLA and MCP Sites to assist evaluation of potential vapor intrusion pathway.

Project Chemist – Performed Level IV data validation for a Superfund site in New York for various analytical analyses including metal, VOC, SVOC, pesticide, and PCB analyses. Reviewed TIC identification and quantitation and assessed chromatograms and mass spectrums for VOCs and SVOCs.

Project Chemist – Provided technical support, prepared QAPPs, established proper data quality objectives (DQOs) for various projects, maintained project quality control, trained junior scientists, coordinated project field sampling and laboratory analyses, addressed non-conformance issues associated with the data produced by the laboratory, conducted statistical analysis, and prepared data validation reports on numerous RCRA/CERCLA and MCP projects.

Professional Activities

Member, LSP Association
Member, Society for Risk Analysis
Certified EIT in Massachusetts

Publications

Liu, C., J. Jay, T. Ford. Evaluation of Environmental Effects on Metal Transport from Capped Contaminated Sediment under Conditions of Submarine Groundwater Discharge. *Env. Sci. Tech.*. 2001 35: 4549-4555.

Liu, C., J. Jay, R. Ika, S. James, and T. Ford. Capping efficiency for metal-contaminated marine sediment under conditions of groundwater inflow. *Env. Sci. Tech.* 2001 35: 2334-2340.

Blanchet, R., Liu, C., Bowers, T. Summary of Available Freshwater and Marine Sediment Quality Guidelines and Their Use in North America. Abstract accepted at SEATEC Conference, November, 2001

Blanchet, R., Liu, C., Bowers, T. Estimation of Average Exposure Point Concentrations for Pesticides Assuming Accumulation and Degradation in the Environment. Abstract accepted at SEATEC Conference, November, 2001

Seeley, M.R., Schettler, S., Liu, C., Blanchet, R.J., Bowers, T.S. Assessing Cancer Risks Due to Use of Insecticides to Control the Mosquito-borne West Nile Virus: Use of the Margin of Exposure Approach. Abstract accepted at Society of Toxicology, 41st Annual Meeting, March 17-21, 2002.

Chunhua Liu, Jennifer Jay, Ravi Ika, Shine James, Timothy Ford. Capping Efficiency for Metal-Contaminated Marine Sediment under Conditions of Submarine Groundwater Discharge. Poster presentation at Conference on Dredged Material Management: Options and Environmental Considerations. December 3-6, 2000

Chunhua Liu, Jennifer Jay, Timothy Ford. Evaluation of Environmental Effects on Metal Transport from Capped Contaminated Sediment Under Conditions of Submarine Groundwater Discharge. Poster presentation at Conference on Dredged Material Management: Options and Environmental Considerations. December 3-6, 2000

Chunhua Liu, Jennifer Jay, Timothy Ford. Core analysis: Is it a good indicator of metal release and capping efficiency? Poster presentation at Conference on Dredged Material Management: Options and Environmental Considerations. December 3-6, 2000

Chunhua Liu. 2000. Capping Efficiency for Metal Contaminated Marine Sediment under Conditions of Submarine Groundwater Discharge. Doctoral Thesis. Harvard School of Public Health

Chunhua Liu, Ravi Ika, Tim Ford. 1998. Metal flux in near shore capping sites under conditions of submarine groundwater discharge. *In*: Fourth Marine & Estuarine Shallow Water Science & Management Conference. March 15-19, 1998

Wei Lin, Guowei Fu, Chunhua Liu. 1996. Study on allocating permissible pollutants discharge based on axioms system. *Chin. J. Environ. Sci.* **1996 17(3):**35-37

Wei Lin, Chunhua Liu, Guowei Fu. 1995. Environmental conflict analysis and its application in environmental planning and management: siting of public facilities. *Chin. J. Environ. Sci.* **1995 16(6)**: 36-39

Chunhua Liu, Yongfeng Nie, Wei Lin. 1995. Application prospects of landfill gas utilization technique in China. *Pollution Control Technology* **1995 8(3):** 143-145

Chunhua Liu. 1995. Evaluation of gas production from sanitary landfill. Master's thesis. Tsinghua University, Beijing, P.R.China

Wei Lin, Chunhua Liu. 1994. Rudimentary study on countermeasure to comprehensively control air pollution caused by motor vehicles in China. *Pollution Control Technology* **1994 7(4)**: 1-3

Xiurong Zhang, Chunhua Liu, Yanru Yang, Qingzhong Bai. 1993. Environmental impact report of wastewater treatment plant project in Xuanhua City, China.

Chunhua Liu, Yongfeng Nie. 1993. Water balance evaluation in Hongmei hazardous waste landfill. *In:* Environmental Impact Assessment of Hongmei Hazardous Waste Landfill: 25-33

Chunhua Liu. 1992. Modeling landfill leachate production and migration. Bachelor Thesis. Tsinghua University, Beijing, P.R.China

Chunhua Liu. 1991. A discussion with the author of "clean water extraction from ocean water". *Technology of Water Purification* **1991(1):** 39-41

Arsheen Ehtesham
Environmental Scientist I

RESUME

Education

M.S., 2010, Environmental Science, Rutgers University

B.S., 2008, Ecology, Ohio State University

B.A., 2008, Geological Sciences, Ohio State University

Professional Registrations

New Jersey Indoor Environmental Consultant/IEHA, #425

Areas of Specialization

Phase I/Environmental Assessment

Phase II/Site Investigation

UST Closure/Assessment

Summary of Experience

Ms. Ehtesham brings solid educational experience in environmental science, ecology and geological sciences to her projects. She has participated in the completion of many Phase I Environmental Site Assessments and Phase II Site Investigations. She has been responsible for project research; soil, groundwater and air sampling; project closure tasks; and report and proposal preparation. Her projects have included parks, day care centers, and commercial/industrial sites.

Prior to GZA, as an intern with the Ohio Agriculture Research & Development Center (OARDC) in Wooster, OH, she worked with local farmers, the USDA, and the OARDC's Office of Plant Pathology in the early Soybean Rust detection program. Her responsibilities included inspecting agriculture plots and sampling leaves for disease and pest identification, and culturing and isolating various soybean diseases.

Relevant Project Experience

NATURAL RESOURCE PLANNING AND PERMITTING

Environmental Scientist. Preferred Freezer-Bayway, Wetlands Permitting, Elizabeth, New Jersey. Member of GZA team providing services on a 20-acre brownfield/portfield site. Responsibilities included compiling data for freshwater wetlands permit application; researching endangered/threatened species of plants, fish and wildlife; preparing work plans; and submitting of permit application to NJDEP Division of Land Use Regulation Program.

Environmental Scientist, PQ Corporation, Rahway, New Jersey. Member of GZA team providing environmental services for specialty chemical manufacturer at large ISRA site, where soil and groundwater contamination includes metals (silver, copper and zinc), PCBs, and petroleum. Conducted surface water sampling; evaluated benthic invertebrate community; assessed impact to groundwater at site; and designed and prepared contamination summary maps for client and NJDEP meetings.

ENVIRONMENTAL CONSULTING

Environmental Scientist, Confidential Utility/former MGP sites, multiple locations, Southern New Jersey. Document review to support LSRP of Record in attaining Response Action Outcome (RAO).

Environmental Scientist, Passaic County Community College, Paterson, New Jersey. As part of on-call contract to provide environmental consulting services to the College, conducted subsurface activities to delineate potential contamination at a daycare center formerly occupied by leaking USTs. Remedial activities also included implementation of institutional controls (i.e., Deed Notice) and attainment of applicable Remedial Action permits.

Environmental Scientist, Passaic County Community College, Paterson, New Jersey. As part of on-call contract to provide environmental consulting services to the College, conducted Indoor Air Quality (IAQ) assessments at three PCCC campuses. Activities included sample collection, data reduction and report preparation.

Environmental Scientist, Post Graduate Center for Mental Health, multiple sites, Bronx, New York. As part of due diligence for property transaction, conducted two Phase I Environmental Site Assessments, including site walk-through and assessment; historic document review; local and state file review; and preparation of Phase I ESA report.

Environmental Scientist, The Salvation Army (TSA), multiple sites in New York City. As part of GZA's Environmental Property Management contract with TSA, conducted Phase I Environmental Site Assessments at TSA sites in support of property transactions. Building types include single-family residences and multi-story commercial buildings.

Environmental Scientist, Fischer Property Group/Hotel Sites, various locations, California. Conducted three quick turn-around Phase I Environmental Site Assessments as part of due diligence activities required for property transaction.

Project Manager, Regional Bank Property, Morristown, New Jersey. Participated in an ISRA project involving the remediation of chlorinated solvents in groundwater at former industrial property for which a regional bank is responsible. Conducted soil and groundwater sampling as part of Remedial Investigation to address PCE contamination found in groundwater on and off-site. Remediation employed an innovative technology using a blend of remediation additives. GZA injected Zero Valent Iron (ZVI) and an organic carbon source for abiotic destruction of PCE; post remedial monitoring indicated 91-99% reduction in PCE concentrations after 18 months. Prior to remediating groundwater, GZA conducted a Vapor Intrusion Survey and received approval for its Vapor Intrusion Investigation Workplan. When soil gas and indoor air were found to have unacceptable PCE levels, an Immediate Environmental Concern (IEC) was declared. Installed portable air purification filters in occupied portions of the building for immediate mitigation and designed and installed a sub-slab depressurization system (SSDS) to protect occupant health.

Environmental Scientist, numerous Day Care Centers throughout New Jersey. Assisted Licensed Site Remediation Professional (LSRP) conducting numerous Preliminary Assessments (PAs) of day care centers as part of the re-licensing process required by the New Jersey Department of Health and Senior Services. Responsibilities included site assessment; data review; compilation of asbestos, radon and lead screening; and report preparation.

Environmental Scientist, numerous Phase I Environmental Site Assessments throughout New Jersey. Sites have included auto dealerships, residences, vacant lots, and industrial/commercial sites. Responsibilities have included site walk-through and assessment; historic document review; local and state file review; and preparation of Phase I ESA report.

Environmental Scientist, Tappan Zee Bridge Replacement, Tarrytown and South Nyack, New York. Conducted a subsurface investigation consisting of the collection of composite soil samples to characterize 60,000 CY of soils for waste disposal parameters and areas to be disturbed by the new highway alignment for the approaches to the bridge.

Environmental Scientist, Chrysler Dealership, Manhattan, New York. Conducted a Phase II ESA on the former Chrysler Manhattan property to document baseline conditions after Chrysler's lease ended and prior to new tenants occupying the lease space. Work consisted of collection of soil gas, soil and groundwater samples and report preparation.

Environmental Scientist, Chrysler Dealership, Butler, New Jersey. As part of due diligence for property transaction, conducted a Phase I Environmental Site Investigation and Phase II Site Investigation. Activities included Phase I walk-through, Phase II soil sampling, and report preparation for Phase I and Phase II activities.

Environmental Scientist, Wyman-Gordon, Rockleigh, New Jersey. Compiled and digitized data for receptor evaluations for this former commercial and industrial site. Conducted remedial investigation that included soil and groundwater sampling. Negotiated with surrounding property owners for access for off-site investigations. Conducted potable well sampling in four neighboring residences and assessed potential immediate environmental concern.

Environmental Scientist, Preferred Freezer-Bayway, Elizabeth, New Jersey. Member of GZA team providing services on a 20-acre brownfield/portfield site. Responsibilities included Remedial Investigation, compilation of data for Deed Notice, preparation of Remedial Action Report, and document preparation to support RAO. Several remediation technologies were employed, including injection of oxygen-releasing compounds (ORC) and excavation. Site's proximity to PSEG high-pressure gas line required communication with PSEG throughout project.

Environmental Scientist, PQ Corporation, Rahway, New Jersey. Member of GZA team providing environmental services for specialty chemical manufacturer at large ISRA site, where soil and groundwater contamination includes metals (silver, copper and zinc), PCBs, and petroleum. Assessed impact to groundwater at site. Designed and prepared contamination summary maps for client and NJDEP meetings.

Environmental Scientist, Township of Teaneck, NJ/Votee Park. Part of GZA team providing environmental services at contaminated, 40-acre public park. Conducted Site/Remedial Investigation of historic fill. Assisted in preparations for public presentations, prepared reports to township and NJDEP.

Environmental Scientist, Bathgate Gardens Urban Farm, Bronx, New York. Completed Phase II Environmental Site Investigation/Remedial Investigations for the New York Restoration Project, required to transform vacant lot into an urban farm. Completed soil and groundwater sampling and wrote report. Remedial Investigation Report (RIR) submitted to New York City Office of Environmental Remediation (NYC OER) oversight.

Environmental Scientist, Kelley, Drye & Warren, LLP/Historic Residence, Peapack-Gladstone, New Jersey. Conducted a Limited UST Assessment and will conduct UST closure of a 1,000-gallon gasoline tank and 550-gallon fuel oil tank located on the site of a 100+ year old residential property, as part of a real-estate transaction. The tanks were located beneath a retaining wall supporting a slope and adjacent to a gas line; therefore, they were abandoned in place.

Environmental Scientist, Commercial Office Building, Newark, New Jersey. Conducted a Limited Phase II Environmental Site Investigation as part of due diligence for property transaction. Completed soil and groundwater sampling at site.

Environmental Scientist, Commercial Building, Berkeley Township, New Jersey. Conducted a Phase II Environmental Site Investigation as part of due diligence for property transaction. Completed soil, groundwater and air sampling at site. Prepared reports for submittal to multiple stakeholders.

Environmental Scientist, New York Life Investment Management, Warehouse Facilities, Edison, Elizabeth and Bayonne, New Jersey. Conducted Phase II Environmental Site Investigations at three separate sites as part of due diligence for property transaction. Completed soil, groundwater and soil gas sampling at each site. Prepared reports for submittal to multiple stakeholders. Project was completed on very short turnaround time

Environmental Scientist, Thomas Electronics, Wayne, New Jersey. Participated in Preliminary Assessment and Phase II Site Investigation at eight-acre site at which cessation of electronics plant manufacturing operations triggered ISRA. Activities included soil sampling, drain cleaning, and SI Report preparation.

Environmental Scientist, Liberty Street, Passaic, New Jersey. Member of team that completed a Phase I Environmental Site Assessment and Phase II Site Investigation for property transaction of trucking/garage facility site. Conducted a Phase II Site Investigation of an undisclosed UST and a subsurface investigation of anomalies discovered in the Phase I. Prepared Deed Notice and acquired Remedial Action Permit for contaminated soils.

Environmental Scientist, Multiwall Packaging, Newark, New Jersey. Member of team that completed a Phase I Environmental Site Assessment and Phase II Site Investigation of 2.5-acre manufacturing site. ISRA triggered due to property transaction requiring environmental investigation. Activities included soil sampling and SI Report preparation.

Professional Activities

Member, Society for Ecological Restoration International
Member, Society for Women Environmental Professionals

Presentations/Awards

Professional Practice Award, GZA Professional Technical Conference, 2012. Project team presentation on brownfield redevelopment.

Professional Development

40-Hour OSHA HAZWOPER; 8-Hour Refresher
10-Hour OSHA Construction Safety and Health
USDOT/IATA Shipping and/or Transportation of Hazardous Materials
Mold Inspection and Assessment Training; Environmental Solutions Association
New York City Mayor's Office of Environmental Remediation (NYC OER), TurboTraining 2012

RESUME

Education

1996, Environmental Training, Newark, NJ

H.S. Diploma, 1977, Architectural Drafting, Don Bosco

Professional Registrations

NJ DHSS Lead Inspector/Risk Assessor, # 2568

NJ DHSS/SSPC Lead Supervisor – Commercial Buildings & Superstructures, # 21408

NYS DOL/AHERA Asbestos Air Sample Technician, Inspector, Project Monitor, #96-17816

Radiation Safety – RMD-1 XRF Certified

T.W.I.C./Transportation Worker Identification Credential

Veetroot Leak Detection System Training

OSHA Construction Safety & Health

OSHA Hazmat Supervisor Certification

OSHA Confined Space Entry

OSHA Hazard Communication

Amtrack Track Safety Certification

MTA/NYCTA Track Safety Certification

Areas of Specialization

Asbestos Building Inspections

Lead Based Paint Inspector

Environmental Remediation

Soil, Groundwater and Air Sampling

James Restaino

Project Technician

Summary of Experience

Mr. Restaino has extensive experience conducting asbestos surveys, lead paint inspections, air monitoring, and fieldwork and sampling related to abatement, Phase II Site Investigations, remedial actions, groundwater monitoring, tank closures, and chemical oxidation. He also has experience overseeing subsurface investigations, underground storage tank (UST) closures, installation/decommissioning/operation and maintenance (O&M) of soil and groundwater remediation systems and remedial action activities, soil excavations and transportation and disposal.

Relevant Project Experience

Port Authority New York New Jersey. Mr. Restaino conducted asbestos and lead based paint sampling at PANYNJ facilities.

Engineering Technician, DeMatteis Construction Company, PS-312 - Queens, New York. Mr. Restaino conducted air monitoring services during the construction of a new public school on a New York State Department of Environmental Conservation Brownfield Site. Mr. Restaino also was responsible for documenting that all soil and water management practices were in compliance with the Site Management Plan.

Engineering Technician, Ravenswood Generating Station, Queens, New York. Mr. Restaino perfomed an asbestos survey of of the Unit 40 roof at the Ravenswood Generating Station prior to scheduel repairs to the roofing membrane. Following receipt of laboratory results Mr. Restaino conducted abatement air monitoring and project monitoring during the abatement of the roofing material.

Engineering Technician, DeMatteis Construction Company, Metropolitan High School - Queens, New York. Mr. Restaino conducted oversight and coordination of the removal of 90,000 CY of contaminated historic fill material during the construction of a New York City High School. He also operated and maintained perimeter air monitoring during all intrusive construction activities. Mr. Restaino directed the contractors in dust suppression requirements as required based upon the air monitoring work plan.

Engineering Technician, Turner Construction, New York, New York. Mr. Restaino was responsible for the sampling of hazardous materials within the armory and in confined spaces.

Engineering Technician, Gowanus Houses, New York, New York. Mr. Restaino conducted visual assessments and dust wipe samples during two pilot programs designed to evaluate the effectiveness of engineering controls during abatement and renovation projects.

Engineering Technician, Board of Education – 41 Infant/Toddler Day Care Centers, New York. Mr. Restaino conducted XRF testing to determine the presence or absense of lead-based paint. Potable water sampling was collected as part of the lead assessment/testing program.

Engineering Technician, TransCanada-Ravenswood Power Generating Station - Queens, New York. Mr. Restaino conducted contractor oversight during emergency response, investigation and remediation of a 24,000 gallon kerosene spill from an underground pipe line.

Engineering Technician, i.Park Edgewater, LLC, 45 River Road, Edgewater, New Jersey. Mr. Restaino conducted oversight and coordination of the removal of 3,000 CY of arsenic and coal-tar contaminated soils at a Brownfield Redevelopment Site. In addition, Mr. Restaino conducted soil waste characterization sampling in accordance with several waste facility requirements. He also operated and maintained perimeter air monitoring during intrusive construction activities.

Engineering Technician, Gouverneur Hospital, New York, New York. Mr. Restaino conducted oversight and coordination of the removal of petroleum impacted soils during the construction of an addition to the Gouverneur Hospital. He also operated and maintained perimeter air monitoring during all intrusive construction activities.

Engineering Technician, AMERCO- UHaul, New Jersey New York. Mr. Restaino conducted quarterly groundwater sampling at petroleum contamianted Sites under regulatory oversight. Mr. Restaino utilized EPA Low Flow Sampling techniques to obtain groundwater samples. Mr. Restaino also completed operation and maintenance services on high vacuum dual phase extraction remediation systems at these Sites.

Engineering Technician, ConocoPhillips, New Jersey/ New York. Mr. Restaino conducted quarterly groundwater sampling at petroleum contamianted Sites under regulatory oversight. Mr. Restaino utilized EPA Low Flow Sampling techniques to obtain groundwater samples. Mr. Restaino also conducted remediation system operations and maintenance at these Sites. Mr. Rerstaino also collected soil samples during subusrface investigations at petroleum-contaminated Sites.

Engineering Technician, Various Gasoline Stations, New Jersey. Mr. Restanio oversaw construction crews, surveying and budget analysis for constuction projects related to the installation of gasoline USTs, dispensing units, leak detection systems and vapor recovery systems.

Engineering Technician, Mega Contracting, Bronx, New York. Mr. Restaino performed soil remediation oversight services including contractor management and air monitoring services for the removal of 10,000 tons of historic fill material.

Engineering Technician, AutoZone, New Jersey and New York. Mr. Restaino was responsible for groundwater sampling at contaminated facilities, conducted dual phase extraction events with a vacuum truck and collected data to evaluate the effectiveness of dual phase extraction treatments; and oversaw the injection of oxygen release compounds through soil borings into contaminated groundwater.

Engineering Technician, U-Haul Street and Edison, New Jersey and New York. Mr. Restaino was the project technician for the installation of a High Vacuum Dual Phase Extraction System and performed O&M services for a groundwater treatment system. Mr. Restaino also collected air samples at the facility.

Engineering Technician, NYC Housing Preservation and Development, New York, New York. Mr. Restaino performed surface XRF testing of suspected lead-based paint as a follow-up to HPD field inspections identifying damaged surfaces and collected paint chip samples.