REMEDIAL INVESTIGATION WORK PLAN

GREENPOINT MARINA
43-57 WEST STREET AND 2-24 OAK STREET
BROOKLYN, NEW YORK

NYSDEC BCP Site No. C224190

Prepared For:

24 Oak LLC and 57 West LLC
155 Water Street, 3rd Floor
Brooklyn, New York 11201

Prepared By:

Langan Engineering, Environmental, Surveying
and Landscape Architecture, D.P.C.
21 Penn Plaza
360 West 31st Street, 8th Floor
New York, New York 10001

Michael D. Burke, CHMM
Senior Associate / Vice President

March 2015
Langan Project No. 170267702

LANGAN

TABLE OF CONTENTS

CERTIFICATION **1**

1.0 INTRODUCTION **1**

2.0 SITE BACKGROUND **1**

2.1 Site Description 1
2.2 Surrounding Property Land Use 2
2.3 Site Physical Conditions 3
2.3.1 Topography 3
2.3.2 Geology 3
2.3.3 Hydrogeology 3
2.3.4 Wetlands 4
2.4 Summary of Previous Environmental Investigations 4
2.5 Areas of Concern 7

3.0 SCOPE OF WORK **9**

3.1 UST Survey 10
3.2 Geophysical Survey 10
3.3 Soil Investigation 11
3.4 Groundwater Investigation 11
3.5 Monitoring Well Survey 12
3.6 Soil Vapor Investigation 12
3.7 Sediment Sampling 13
3.8 Data Management and Validation 13
3.9 Management of Investigation-Derived Waste 14
3.10 Air Monitoring 14
3.10.1 Worker Air Monitoring 15
3.10.2 Community Air Monitoring Plan 15
3.11 Qualitative Human Health Exposure Assessment 16

4.0 REMEDIAL INVESTIGATION REPORT **17**

5.0 SCHEDULE **18**

TABLES

Table 1 Proposed Sample Summary

FIGURES

Figure 1 Site Location Map
Figure 2 Site Plan
Figure 3 Groundwater Contour Map
Figure 4 Previous Investigations Soil Sample Results Map
Figure 5 Previous Investigations Groundwater Sample Results Map
Figure 6 Previous Investigations Soil Vapor Sample Results Map
Figure 7 Proposed Investigation Sample Location Map

APPENDICES

Appendix A Previous Environmental Reports
Appendix B Health and Safety Plan
Appendix C Quality Assurance Project Plan

CERTIFICATION

I, Michael D. Burke, certify that I am currently a Qualified Environmental Professional, as defined in 6 NYCRR Part 375, and that this Remedial Investigation Work Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

_____

Michael D. Burke, CHMM
CHMM No. 15998
Vice President/Senior Associate

1.0 INTRODUCTION

This Remedial Investigation Work Plan (RIWP) was prepared on behalf of 24 Oak LLC and 57 West LLC (the "Participant"), for the Greenpoint Marina located at 43-57 West Street and 2-24 Oak Street, in Brooklyn, New York ("the site"). The Participant was accepted into the New York State Brownfield Cleanup Program (BCP) and a Brownfield Cleanup Agreement (BCA) was executed with the New York State Department of Environmental Conservation (NYSDEC) on September 12, 2014.

The objective of this RIWP is to investigate and characterize the nature and extent of environmental impacts at the site and to provide additional information to evaluate remedial actions, as required. This RIWP was developed in general accordance with the process identified in the NYSDEC Division of Environmental Remediation (DER)-10 Technical Guidance for Site Investigation and Remediation (May 2010).

2.0 SITE BACKGROUND

2.1 Site Description

The site is located at 43-57 West Street (Block 2567, Lot 1) and 2-24 Oak Street (Block 2570, Lot 36), in Brooklyn, New York. The site is bordered by Noble Street to the north; West Street to the east; a parking lot and lumber facility to the south; and the East River to the west. The site includes the upland portion of the above referenced lots, which spans approximately 4.67 acres (203,425 square feet). The remainder of the lots (about 192,500 square feet) extends into the East River and is not considered part of the site as it relates to the BCA. A Site location map is provided as Figure 1 and a Site Plan is provided as Figure 2.

The site is currently used for equipment storage including scaffolding, garbage containers, cranes, HVAC equipment, granite, and flatbed trucks. Improvements to the site include asphalt- and concrete-paved areas in the southwestern and eastern portions of the site, and a rip-rap stabilized shoreline. The site was previously occupied by five separate buildings that were destroyed in a fire in 2006. The only remaining structure is a former coal silo located immediately north of the intersection of the projection of Oak Street and the East River.

2.2 Surrounding Property Land Use

The site is located in an industrial area characterized by industrial and warehouse buildings, as well as sparse commercial and residential properties. The following is a summary of surrounding property usage:

Direction	Adjoining Properties	Surrounding Properties
North	Noble Street followed by multiple-story mixed-use building	Multiple-story commercial, industrial and mixed-use buildings
South	Oak Street followed by parking lot and lumber facility	
East	West Street followed by partially constructed multi-story building	
West	East River	

Land use within a half mile of the site is urbanized and includes mixed use buildings, cross streets, subway tunnels, park land, and school facilities. The nearest ecological receptor is the East River, which adjoins the site to the west. Sensitive receptors, as defined in DER-10, located within a half mile of the site include those listed in the following table:

Number	Name (Approximate distance from Site)	Address
1	P.S. 31 Samuel F. Dupont School (0.25 miles southeast of the site)	75 Meserole Avenue, Brooklyn, NY 11222
2	Saint Anthony – Saint Alphonsus School (0.25 miles east of the site)	725 Leonard Street Brooklyn, NY 11222
3	P.S. 34 Oliver H. Perry (0.5 miles southeast of the site)	131 Norman Avenue Brooklyn, NY 11222
4	Green Bean Day Care & Learning Center (0.4 miles northeast of the site)	161 Greenpoint Avenue Brooklyn, NY 11222
5	The Gym Park (300 feet east of the site)	81 Oak Street Brooklyn, NY 11222

Due to the urban nature of the site, major infrastructure (storm drains, sewers, and underground utility lines) exist around the site.

2.3 Site Physical Conditions

2.3.1 Topography

According to the United States Geological Survey (USGS) Brooklyn Quadrangle 7.5-minute Series Topographic Map, the site generally sits at an elevation between 10 and 15 feet[1]. The topography of the site and surrounding area slope gently toward the East River, which adjoins the property to the west. Rip rap at the western end of the site slopes toward the River. Properties east of the site are considered up-gradient.

2.3.2 Geology

Based on soil borings and test pits completed during a Phase II Environmental Site Investigation (ESI), dated December 2013, the site is underlain by historic fill consisting of black to gray to brown, medium to fine grained sand with varying amounts of gravel, silt, brick fragments and cobbles and/or boulders. Fill extends to depths of up to about 10 feet below grade surface (bgs). Foundation remnants were observed beneath the surface in the western part of the site. Native material consisting of light brown to tan, fine- to medium-grained sand with trace silt and clay was observed beneath the fill layer in the eastern and western portions of the site. A layer of river sediment, consisting of grayish black organic clay and clayey silt, was encountered beneath the fill layer in the central and western portions of the site.

Geological surface features, such as rock outcroppings, were not observed at the site. Based on the USGS "Bedrock and Engineering Geologic Maps of New York County and Parts of Kings and Queens Counties, New York, and Parts of Bergen and Hudson Counties, New Jersey", the bedrock formation underlying the site is of the Harland formation and consists of schist and granite. Based on previous geotechnical investigations in the vicinity of the site, decomposed rock consisting of weathered micaceous gneiss is present at depths ranging from about 60 to 110 feet bgs. The assumed depth to component bedrock is about 80 to 110 feet below bgs.

2.3.3 Hydrogeology

Groundwater flow is typically topographically influenced, as shallow groundwater tends to originate in areas of topographic highs and flows toward areas of topographic lows, such as

[1] Elevations given in Brooklyn Highway Bureau Datum which is 2.547 feet above mean sea level U.S.C. & G.S., Sandy Hook

rivers, stream valleys, ponds, and wetlands. A broader, interconnected hydrogeological network often governs groundwater flow at depth or in the bedrock aquifer. Groundwater depth and flow direction are also subject to hydrogeologic and anthropogenic variables such as precipitation, evaporation, extent of vegetation cover, and coverage by impervious surfaces. Other factors influencing groundwater include depth to bedrock, the presence of artificial fill, and variability in local geology and groundwater sources or sinks.

Groundwater elevations recorded during the December 2013 Phase II ESI range from elevation (el) 2.14 to el -1.73 feet[2] or about 5 to 7 feet bgs and appeared to flow west towards the East River. Groundwater contours are shown on Figure 3. Underground utilities, such as sewer, water and steam pipes, and other subsurface, constructed objects might impede and redirect the natural groundwater flow.

Groundwater in New York City is not used as a potable water source. Potable water provided to the City of New York is derived from surface impoundments in the Croton, Catskill, and Delaware watersheds.

2.3.4 Wetlands

Wetlands on or near the site were evaluated by reviewing the National Wetlands Inventory and NYSDEC regulated wetlands map. The East River (a Littoral Zone) adjoins the site to the west.

2.4 Summary of Previous Environmental Investigations

Previous environmental reports were reviewed as part of this RIWP. These reports are summarized below and are included in Appendix A.

Phase I Environmental Site Assessment (ESA) for 43-57 West Street and 2-24 Oak Street, Brooklyn, New York, dated December 2013, prepared by Langan

The Phase I ESA was conducted in accordance with the American Society for Testing Materials (ASTM) Practice E1527-05 and E1527-13 (Standard Practice for ESA: Phase I ESA Process), and the United States Environmental Protection Agency's (USEPA) All Appropriate Inquiry (AAI) Rule needed to qualify for the bona fide prospective purchaser liability protections available under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA). The objective of the Phase I ESA was to identify the presence or likely presence, use, or

[2] Elevations herein given in Brooklyn Highway Bureau Datum which is 2.547 feet above mean sea level U.S.C. & G.S., Sandy Hook

release on the site of hazardous substances or petroleum products as defined in ASTM E1527-13 as a recognized environmental condition (REC).

The Phase I ESA identified the following Recognized Environmental Concerns (RECs):

- Historic use of the site: Leaks or spills of petroleum products, solvents, and/or other hazardous materials used in association with the historic site uses including milling, manufacturing, coal storage and use as a shipyard and machine shop, may have adversely impacted soil, groundwater and/or soil vapor;

- On-site petroleum bulk storage: A review of Sanborn maps identified seven buried oil tanks, with capacity ranging from 1,600 to 13,500 gallons, located on the western end of Oak Street between 1942 and 2006. In addition, records indicate that an oil pump house and oil tanks were located in the northwest corner of the site from 1905-1915. Leakage of petroleum products may have impacted soil, soil vapor, and/or groundwater.

- Black staining on surface soil: An approximately 25 square foot area of black staining and petroleum-like odors was observed near a fuel oil delivery truck in the north-central portion of the site. The leak may have impacted groundwater and soil vapor in addition to surface soil.

- Adjoining and surrounding property uses and spills: Adjoining or surrounding properties have historically been, or are currently, occupied by manufacturing facilities, a gasoline filling station, and an auto repair facility. Solvents, petroleum products, or other hazardous substances used at these facilities may have leaked and adversely impacted groundwater and/or soil vapor.

Phase II ESA for 43-57 West Street and 2-24 Oak Street, Brooklyn, New York, dated December 2013, prepared by Langan

The purpose of the Phase II was to evaluate potential subsurface impacts from RECs identified in the Phase I ESA. The Phase II investigation was completed between October 23 and November 19, 2013. The field investigation included a geophysical survey, advancement of 10 soil borings and 17 test pits, installation of 8 monitoring wells and 8 soil vapor points, and collection of 38 grab soil samples, 7 groundwater samples, and 8 soil vapor samples.

Subsurface observations revealed that the site is underlain by historic fill consisting of black to gray to brown, medium- to fine-grained sand with varying amounts of gravel, silt, brick fragments, slag, ash, cobbles, and boulders. Fill extended to depths of 3 to 10 feet bgs.

Foundation remnants were observed beneath the surface in the western part of the site. Native material consisting of light brown to tan, fine- to medium-grained sand with trace silt and clay was observed beneath the fill layer in the eastern and western portions of the site. A layer of river sediment, consisting of grayish black organic clay and clayey silt, was encountered beneath the fill layer in the central and western portions of the site. Groundwater elevations ranged from about elevations 2.14 to -1.73, which correspond to about 5 to 7 feet bgs. Groundwater appeared to flow west toward the East River.

The following findings and conclusions were provided in the Phase II ESI:

- USTs: The geophysical survey identified anomalies consistent with several USTs. The UST-like anomalies appeared to straddle the northern border of 2-24 Oak Street with the majority of the anomalies located beneath the southern half of Oak Street.

- Soil Quality
    - LNAPL, petroleum-impacted soil, and an oily sheen on groundwater were observed in the southwestern portion of the site, in the vicinity of the USTs identified beneath Oak Street during a geophysical survey. The NYSDEC was notified of this condition on November 7, 2013 and NYSDEC Spill No. 1308069 was assigned.

    - Concentrations of metals and polycyclic aromatic hydrocarbons (PAHs) exceeding NYSDEC Part 375 Restricted Residential Use Soil Cleanup Objectives (SCOs) were detected in soil samples. Concentrations were primarily indicative of historic fill except for atypically high concentrations of PAHs in soil samples collected from the north-central portion of the Site. In addition, semi-volatile organic compounds (SVOCs) detected near the southwest corner of the site also coincide with LNAPL associated with NYSDEC Spill No. 1308069 and may be associated with the release.

- Groundwater Quality
    - SVOCs found in groundwater exceed the NYSDEC Division of Water Technical and Operation Guidance Series (TOGS) 1.1.1 Ambient Water Quality Standards (AWQS) and Guidance Values for Class GA (drinking water) and are likely a result of the overlying quality of the fill material.

  - Metal concentrations in groundwater exceed their respective TOGS Class GA AWQS and Guidance Values; however, the exceeding concentrations were attributed to sample turbidity or regional groundwater conditions.

- Soil Vapor Quality
  - 1,1,1-trichloroethane (1,1,1-TCA) was detected at concentrations requiring monitoring and/or mitigation based on New York State Department of Health (NYSDOH) Guidance for Soil Vapor Intrusion Decision Matrix 2. Tetrachloroethene (PCE) was also detected in soil vapor, but not at concentrations requiring monitoring or mitigation according to the NYSDOH Decision Matrices. An on-site source of chlorinated solvents in soil vapor was not identified.

  - Several other volatile organic compounds (VOCs) were detected in soil vapor samples; however, there are no regulatory standards established for the other detected VOCs. Potential on-site sources of VOCs in soil vapor include black staining on soil adjacent to a tanker truck in the north-central portion of the site and open NYSDEC Spill No. 1308069.

Soil, groundwater, and soil vapor results from the previous Phase II investigation are presented in Figures 4 through 6, respectively. Copies of previous environmental investigations are included as Appendix A.

2.5 Areas of Concern

Based on site observations, the site development history, and the findings of the previous environmental reports, the areas of concern (AOCs) to be further investigated by this RIWP are as follows:

AOC 1: Petroleum Impacts Related to Spill No. 1308069

AOC 1 represents petroleum impacts (black staining, petroleum-like odors, light non-aqueous phase liquid (LNAPL)) observed in the southwest part of the site in the vicinity of seven USTs beneath Oak Street. An oily sheen was also observed on groundwater in this portion of the site and petroleum-related SVOCs were detected in soil samples collected in this portion of the site during Langan's Phase II ESI.

AOC 2: Black Staining in North-Central Portion of the Site

AOC 2 represents an approximately 25-square-foot area of black staining and petroleum-like odors which were noted on soil near a fuel oil tanker truck in the north-central portion of the site during Langan's Phase I ESA. During Langan's Phase II ESI, concentrations of PAHs were detected in soil samples collected in this portion of the site which exceeded the NYSDEC Part 375 Restricted Residential Use SCOs.

AOC 3: Previously Identified Chlorinated VOCs in Soil Vapor

AOC 3 represents the chlorinated VOC impacts identified in soil vapor. The chlorinated VOC 1,1,1-trichloroethane (1,1,1-TCA) was detected at concentrations requiring monitoring and/or mitigation based on New York State Department of Health (NYSDOH) Guidance for Soil Vapor Intrusion Decision Matrix 2. Tetrachloroethene (PCE) was also detected in soil vapor, but not at concentrations at which monitoring or mitigation is recommended, according to the NYSDOH Decision Matrices. A source of chlorinated solvents in soil vapor was not identified.

AOC 4: Historic Fill

AOC 4 represents a layer of historic fill identified between ground surface and about 10 feet bgs. This fill layer contains SVOC and metal concentrations in excess of NYSDEC Part 375 Restricted Residential Use SCOs.

AOC 5: Historic Uses of the Site

AOC 5 represents potential adverse effects to soil, soil vapor and groundwater due to the historical uses of the site, including a shipyard, coal storage, machine shop, manufacturing, milling operations, a trucking facility, and a testing laboratory. Inadvertent releases of solvents, petroleum products, metals, PCBs and/or other chemicals used during these operations may have adversely impacted soil, groundwater, and/or soil vapor.

3.0 SCOPE OF WORK

The objective of this RIWP is the "investigation and characterization of the nature and extent of the contamination within the boundary of the site", per Environmental Conservation Law Article 27, Title 14 (Brownfield Legislation). The field investigation will include the tasks listed below to supplement the data and findings of previous investigations. The rationale for each investigation point in relation to the AOCs is provided in Table 1. These tasks are discussed in more detail in the following sections.

- Uncover and Survey USTs – USTs beneath Oak Street will be uncovered and tank extents will be surveyed.
- Geophysical Survey – An additional geophysical survey will be completed to clear sample locations of underground utilities and scan previously inaccessible areas for anomalies consistent with USTs.
- Soil Borings and Sampling
    - Advancement of 15 soil borings (SB-10 – SB-24) to approximately 15 feet bgs.
    - Collection of at least two soil samples from each soil boring location. If visibly impacted soil is identified, an additional sample will be collected to characterize the nature of the impact. In addition, quality assurance/quality control [QA/QC] sampling will be performed.
- Monitoring Well Installation and Sampling
    - Installation of 15 monitoring wells (MW-10 – MW-24) at soil boring locations.
    - Collection of one groundwater sample from seven preexisting monitoring wells, and from the 15 new monitoring wells, for a total of 22 groundwater samples (plus QA/QC sampling).
    - Survey and synoptic gauging of monitoring wells to evaluate flow direction.
- Sediment Sampling
    - Collect five sediment samples from the eastern bank of the East River (plus QA/QC samples).
- Soil Vapor Probe Installation and Sampling
    - Advancement of 10 temporary soil vapor probes (SV-8 – SV-17) to approximately 3 feet bgs.
    - Collection of a soil vapor sample from each soil vapor location for a total of 10 soil vapor samples (plus quality assurance/quality control [QA/QC] sampling).

Modifications to this scope of work may be required: 1) due to site operations, equipment or restrictions; 2) in the event that unexpected contamination is detected and additional analytical data is needed; and 3) to attempt to confirm that impacts are adequately characterized and delineated in compliance with the Brownfield Law, regulations and applicable investigation guidance documents (e.g., DER-10).

The field investigation work will be completed in accordance with the procedures specified in Langan's Health and Safety Plan (HASP) and Quality Assurance Project Plan (QAPP) provided in Appendices B and C, respectively.

Names, contact information and roles of the principal personnel who will participate in the investigation including the project manager, contractor and subcontractor contacts are listed below. Resumes for each person are provided in the QAPP (Appendix C).

Personnel	Investigation Role	Contact Information
Michael D. Burke, CHMM Langan Engineering	Project Director	Phone – 212-479-5413 Email – mburke@langan.com
Jennifer Armstrong Langan Engineering	Project Manager	Phone – 212-479-5537 Email – jarmstrong@langan.com
Tony Moffa, CHMM Langan Engineering	Langan Health & Safety Officer	Phone – 215-491-6500 Email – tmoffa@langan.com
Bill Bohrer Langan Engineering	Field Safety Officer	Phone – 410-984-3068 Email – wbohrer@langan.com
Tosin Adesegha Langan Engineering	Field Team Leader	Phone – 917-655-7494 Email – tadesegha@langan.com
Michael Burke, CHMM Langan Engineering	Quality Assurance Officer	Phone – 212-479-5413 Email – mburke@langan.com
Scott Hamarich Eastern Environmental	Drilling Contractor	Phone – 631-727-2700 Email – sotthamarich@easternenviro.com
Rich August York Analytical	Laboratory Contractor	Phone – 203-325-1371 Email –raugust@yorklab.com
Emily Strake Langan Engineering	Data Validation	Phone – 215-4916526 Email – estrake@langan.com

3.1 UST Survey

We will excavate the UST area in Oak Street to uncover USTs and survey their extents.

3.2 Geophysical Survey

An additional geophysical survey will be completed to clear sample locations of underground utilities and scan previously inaccessible areas for anomalies consistent with USTs.

3.3 Soil Investigation

An environmental drilling subcontractor will advance 15 soil borings (designated SB-10 through SB-24). The purpose of these borings is to further investigate AOCs identified in Section 2.5 and supplement the Phase II ESI dated December 2013. A plan showing the proposed boring locations is provided as Figure 7. A Langan engineer, geologist, or scientist will document the work, screen the soil samples for environmental impacts, and collect samples for laboratory analyses. Work will comply with the safety guidelines outlined in the HASP (Appendix B).

The soil borings will be advanced below the observed groundwater depth and fill layer to the organic clay native soil (approximately 15 feet bgs) using direct push drilling methods. Soil will be screened continuously to the boring termination depth for organic vapors with a photoionization detector (PID) equipped with a 10.6 electron volt (eV) bulb, and for visual and olfactory indications of environmental impacts (e.g., staining and odor) and evidence of petroleum release. Soil descriptions will be recorded in a field log.

A minimum of two grab soil samples will be collected for laboratory analysis from each boring location; one from historic fill (top two feet) and one from native soil below historic fill/at the groundwater interface. An additional sample will be collected from the interval where evidence of a chemical or petroleum release is most apparent, if encountered. Non-disposable, down-hole drilling equipment and sampling apparatus will be decontaminated between sample locations with Alconox® and water.

The samples will be collected in laboratory-supplied containers and will be sealed, labeled, and placed in a cooler containing ice (to maintain a temperature of approximately four degrees Celsius) for delivery to a New York State Department of Health (NYSDOH) Environmental Laboratory Approval Program (ELAP)-certified analytical laboratory. Soil samples will be analyzed for 6 NYCRR Part 375 VOCs via USEPA Method 8260, SVOCs via USEPA Method 8270, pesticides via USEPA Method 8081A, PCBs via USEPA Method 8082, and metals via USEPA Method 6010. If free product is encountered, representative samples of the product will be collected for laboratory fingerprint analysis. QA/QC procedures to be followed are described in the QAPP provided as Appendix C.

3.4 Groundwater Investigation

Each of the 15 RI soil borings will be converted into permanent groundwater monitoring wells (proposed locations are shown on Figure 7). Wells will be constructed using 2-inch diameter PVC riser pipe with 0.02-inch slotted screens. 10-foot well screens will be set to straddle the observed groundwater table. The well annulus will be backfilled with No. 2 Morie sand. A

bentonite seal will be installed above the sand, and the borehole annulus will be grouted to the surface with bentonite/cement slurry. The wells will be finished with flush-mounted metal manhole covers or installed as stickup wells if site conditions allow.

Following installation, the wells will be developed by surging a weighted bailer across the well screen to agitate and remove fines. The bailer will be surged across the well screen in 2- to 3-foot increments for approximately 2 minutes per increment. After surging, the well will be purged via pumping until the water becomes clear (having turbidity less than 50 Nephelometric Turbidity Units [NTU]). The well will then be allowed to sit for a minimum of one week.

One groundwater sample will be collected from each of the15 new wells (MW-10 – MW-24) and from each of the 7 previously installed wells. Prior to sampling, the monitoring wells will be gauged for static water levels and each well will be purged. Purging will consist of pumping, at minimum, the stabilized drawdown volume plus the pump's tubing volume, and waiting until the physical and chemical parameters (e.g., pH, conductivity, temperature, dissolved oxygen, oxygen reduction potential, turbidity) stabilize within the ranges specified in the USEPA's Low Stress Purging and Sampling Procedure for the Collection of Groundwater Samples From Monitoring Wells, Dated July 30, 1996 and Revised January 19, 2010. Samples will be collected with a submersible monsoon pump and dedicated polyethylene tubing. The pump will be decontaminated with Alconox® and water between each sample location. Development and purge water will be containerized for off-site disposal.

Groundwater samples will be analyzed for Target Compound List (TCL)/Part 375 VOCs via USEPA Method 8260, SVOCs via USEPA Method 8270, pesticides via USEPA Method 8081A, PCBs via USEPA Method 8082, and metals via USEPA Method 6010 (total and dissolved). QA/QC procedures are described in the QAPP provided as Appendix C.

3.5 Monitoring Well Survey

Langan will survey the location and elevation of the groundwater monitoring wells (top of casing elevations). This data will be used with the groundwater well gauging data to prepare an updated groundwater contour map and document the direction of groundwater flow. Vertical control will be established by surveying performed relative to the Borough President of Brooklyn Highway Datum (BPBHD) by a NYS-licensed land surveyor. Elevations of the top of monitoring well casings and protective well casings will be surveyed to the nearest 0.01 foot.

3.6 Soil Vapor Investigation

A soil vapor investigation consisting of 10 investigation points, designated SV-8 to SV-17 will be completed. Proposed soil vapor sampling point locations are shown on Figure 7. Vapor sampling will be conducted in accordance with the October 2006 Guidance for Evaluating Soil

Vapor Intrusion in the State of New York. An environmental driller will install each point to a depth of approximately 3 feet bgs, which is at least 2-feet above the depth to groundwater. Each soil vapor sample location will consist of a new, dedicated stainless-steel screen implant connected to polyethylene or Teflon tubing that will extend to a depth at least 2 feet above the water table. Approximately one foot of clean sand filter pack will be placed around the screen implant. The remaining annular space will be backfilled to grade with hydrated bentonite. The seal on the vapor points will be checked with a helium tracer gas test both before and after sample collection. Proposed soil vapor sample locations are shown on Figure 7.

Prior to sampling, three well volumes will be purged from the point using a MultiRAE multi-gas monitor at a rate of less than 0.2 liters per minute. The multi-gas monitor will also be used to screen the soil vapor for the presence of VOCs. Following purging, each soil vapor point will be sampled using laboratory-provided, 6-Liter air canisters equipped with 2-hour sample interval flow controllers. Soil vapor samples will be analyzed for VOCs by EPA Method TO-15. QA/QC procedures to be followed are described in the QAPP provided as Appendix C. Prior to sampling, soil vapor sample points will undergo a leak check using helium tracer gas.

3.7 Sediment Sampling

Five sediment samples will be collected with a hand auger from the eastern bank of the East River during low tide. Proposed sediment sample locations are shown on Figure 7. Samples will be collected from 0 to 6 inches below the surface and will be placed into laboratory-provided sample jars. The auger will decontaminated between sample locations. Sediment samples will be analyzed for NYSDEC CP-51 VOCs via USEPA Method 8260 and SVOCs via USEPA Method 8270.

3.8 Data Management and Validation

Laboratory analyses of soil, groundwater, and soil vapor samples will be conducted by a NYSDOH, ELAP-approved laboratory. Laboratory analyses will be conducted in accordance with USEPA SW-846 methods and NYSDEC Analytical Services Protocol (ASP) B deliverable format. Environmental data will be reported electronically using the database software application EQuIS as part of NYSDEC's Environmental Information Management System (EIMS).

Table 1 summarizes the anticipated samples and analytical methodology. We will follow the QA/QC procedures required by the NYSDEC ASP and SW-846 methods, including initial and continuing instrument calibrations, standard compound spikes, surrogate compound spikes, and analysis of other samples (blanks, laboratory control samples, and matrix spikes/matrix spike duplicates). The laboratory will provide sample bottles, which have been pre-cleaned and

preserved in accordance with the SW-846 methods. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP shall take precedence.

We will perform data validation in accordance with the United State Environmental Protection Agency (USEPA) validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of QC sample results (both qualitative and quantitative).
- Verification of sample results (both positive hits and non-detects).
- Recalculation of 10% of all investigative sample results.
- Preparation of Data Usability Summary Report (DUSR).

The DUSR will be prepared and reviewed by the Program Quality Assurance Monitor (PQAM) before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each sample delivery group (SDG) will follow. Additional details on the DUSR are provided in the QAPP in Appendix C.

3.9 Management of Investigation-Derived Waste

The following investigation-derived wastes (IDW) will be containerized in separate 55-gallon, United Nations (UN)/Department of Transportation (DOT) approved drums and disposed properly at an off-site facility upon receipt of laboratory analysis:

- Soil cuttings
- Well development and purge water
- Decontamination water
- Personal protective equipment and contaminated supplies

All drums will be properly labeled, sealed, and waste characterized as necessary. The drums will be staged in a secure area onsite, pending disposal to an appropriate disposal facility upon receipt of analytical results.

3.10 Air Monitoring

Air monitoring will be conducted for site workers and the community (Community Air Monitoring Program). We will record air monitoring results in the field book during the investigation activities.

Fugitive particulate (dust) generation that could affect site workers or the public is not expected for the following reasons:

- Most of the work area and the boring locations are paved with asphalt or concrete; therefore, vehicle movement will not generate dust.
- Intrusive work is limited to boring, monitoring well, and vapor point installation, which does not generate large volumes of soil cuttings.

3.10.1 Worker Air Monitoring

We will conduct air monitoring of the breathing zone periodically during all drilling and sampling activities to document health and safety protection for the work team. We will monitor VOCs with a PID, MultiRAE Plus PGM-50, or equivalent, in accordance with the HASP (Appendix B). If air monitoring during intrusive operations identifies the presence of VOCs, we will follow the guidelines outlined in the HASP, regarding action levels, permissible exposure, engineering controls, and personal protective equipment. If the action level for VOCs is exceeded, work will cease and the work location will be evacuated. Monitoring will be continued until the levels drop to safe limits. At that time, work can resume with continued monitoring. If high levels persist, field activities will be halted and the work relocated to another area. If dust emissions are observed, work will stop and dust suppression measures will be used.

3.10.2 Community Air Monitoring Plan

In addition to air monitoring in the worker breathing zone, we will conduct community air monitoring in compliance with the NYSDOH Generic Community Air Monitoring Plan (CAMP). The CAMP is addressed in the HASP (Appendix B).

Periodic monitoring for VOCs will be performed during non-intrusive activities, such as the collection of groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a location, when opening a monitoring well cap, when bailing/purging a well, as well as upon departure from the location. In addition, monitoring for VOCs will be conducted during ground intrusive activities (i.e., soil boring and monitoring well installation). Upwind concentrations will be measured at the start of each workday, and periodically thereafter, to establish background concentrations. VOCs will also be measured at the downwind perimeter of the work zone, which will be established at a point on the site where the general public or site employees may be present. Monitoring will be conducted with a PID equipped with a 10.6 eV lamp. VOC community air monitoring requirements will be conducted until it is determined that the site is not a source of organic vapors.

Dust emissions will be monitored 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 (e.g., DustTrak). If dust emissions are observed, work will stop and dust suppression measures will be used.

3.11 Qualitative Human Health Exposure Assessment

A Qualitative Human Health Exposure Assessment will be conducted in accordance with Appendix 3B of the NYSDEC DER-10, Technical Guidance for Site Investigation and Remediation. The assessment will be submitted in the Remedial Investigation Report.

4.0 REMEDIAL INVESTIGATION REPORT

Following completion of the RI and receipt of analytical data, a Remedial Investigation Report (RIR) will be prepared. The report will include: 1) a summary of the site history and previous investigations; 2) description of site conditions and this remedial investigation; 3) evaluation of the results and findings; and 4) conclusions and recommendations. Additionally, the Standards, Criteria, and Guidance (SCGs) which pertain to the site location and contaminants, as well as potential remedial action objectives, will be identified in the report. The soil boring and well construction logs, sampling logs, and laboratory analytical reports will be appended to the report. Conclusions and recommendations will be provided that: 1) summarize the nature and extent of potential impact for each areas of concern; 2) identify unacceptable exposure pathways (as determined through a Qualitative Human Health Exposure Assessment); and 3) recommend future work or remedial actions, as required.

The sampling results that exceed unrestricted soil SCGs, the groundwater standards or other applicable unrestricted SCGs will be summarized in tables (organized by areas of concern). The tables will include sample location, media sampled, sample depth, field/laboratory identification numbers, analytical results and the applicable unrestricted SCG for comparison. Scaled site maps will be used to show the boring, monitoring well, and soil vapor point locations, SCG exceedances, groundwater elevation contours, groundwater flow direction, and, if appropriate, groundwater contaminant concentration contours. Electronic Data Deliverables (EDDs), in NYSDEC-format will also be provided to NYSDEC after data validation.

5.0 SCHEDULE

The table below presents an estimated schedule for the proposed remedial investigation and reporting. If the schedule changes, it will be updated and submitted to NYSDEC.

ACTIVITY	April 2015				May 2015				June 2015				July 2015			
	WEEK															
			1	2	3	4	5	6	7	8	9	10	11	12	13	14
Coordinate/Contact Driller and Laboratory and Obtain Permits																
Geophysical Survey																
Install Soil Borings and Collect Soil and Sediment Samples																
Install Monitoring Wells																
Install Soil Vapor Points and Collect Soil Vapor Samples																
Gauge Wells and Collect Groundwater Samples																
Receipt of Laboratory Results																
Data Validation																
Preparation and Submission of Remedial Investigation Report																