ExxonMobil
Environmental Services

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Steve Trifiletti
Project Manager

July 27, 2010

Mr. Brian Davidson
New York State Department of Environmental Conservation
Remedial Bureau B
Division of Environmental Remediation
625 Broadway, 12th Floor
Albany, New York 12233-7016

Re: Supplemental Site Characterization Work Plan
Former Pratt Oil Works
Queens, New York

Dear Mr. Davidson:

ExxonMobil Oil Corporation ("ExxonMobil") is submitting for your review and comment the enclosed Supplemental Site Characterization Work Plan for the subject. Three hard copies and an electronic copy are provided per Section VIII of the Consent Order (D2-1002-12-07AM) executed between ExxonMobil and NYSDEC. This report has been prepared on behalf of ExxonMobil by Kleinfelder of Bohemia, New York.

Please do not hesitate to contact me at (718) 383-7374 if you have any questions.

Very truly yours,

Steve Trifiletti
Project Manager

Enclosure

Via FEDEX Overnight

cc: S. Caruso (NYSDEC – electronic copy only)
L. Forte (A&L Cesspool Ser./Co. – hard copy only)
J. Kaplan (Waste Management of New York LLC – electronic and hard copy)
K. Lumpe (Steel Equities – hard copy only)
N. Sherman (HP Sherman Co. Inc. – hard copy only)
G. Werwaiss (Werwaiss Realty co. – hard copy only)
J. Wolf (Kleinfelder)

KLEINFELDER
Bright People. Right Solutions.

DELIVERED VIA ELECTRONIC MAIL

July 27, 2010

Mr. Steve P. Trifiletti
ExxonMobil Environmental Services Company
Global Remediation - Major Projects
400 Kingsland Avenue
Brooklyn, New York 11222

Re: Supplemental Site Characterization Work Plan
Former Pratt Oil Works
The Inland Parcels (Tract I)
The Waterfront Parcels (Tract II)
Long Island City, New York
NYSDEC Case No. 07-07418 (Parcel A)
NYSDEC Case No. 08-13060 (Parcel B)
NYSDEC Case No. 08-13060 (Parcel C)
NYSDEC Case No. 09-04539 (Parcel D)
NYSDEC Case No. 09-03356 (Parcel E)
NYSDEC Case No. 09-03488 (Parcel G)
NYSDEC Case No. 09-03616 (Parcel H)
NYSDEC Case No. 09-03287 (Parcel I)
Consent Order Case No. D2-1002-12-07AM
NYSDEC Remedial Tracking No. S241115

Dear Mr. Trifiletti:

Enclosed, please find a Supplemental Site Characterization Work Plan (Work Plan) prepared by Kleinfelder East, Inc. (Kleinfelder) on behalf of ExxonMobil Environmental Services Company (ExxonMobil) for the Inland (Inland Project Area) and Waterfront Parcels (Waterfront Project Area) listed above, which compose Tract I and II (collectively referred to as the Project Area) of the Former Pratt Oil Works (FPOW). This Work Plan was prepared based on the results of the *Interim Site Characterization Reports* for the Waterfront and Inland Project Areas dated August 10, 2009 and March 11, 2010 respectively. The Work Plan proposes supplemental site characterization in an effort to further investigate the horizontal and vertical extent of light non-aqueous phase liquids (LNAPL) detected at the Project Area. In addition, further investigation of a low pH condition detected in monitoring well MW-3 is proposed.

If you have questions or comments, please contact the undersigned at (631) 218-0612.

Very truly yours,
Kleinfelder East, Inc.

John E. Wolf
Senior Project Manager

Michael Meyerhoefer
Project Manager

Enclosure

Copy: Jeffrey Hale CPG, Kleinfelder
Eric Henry, Kleinfelder
File (16)

SUPPLEMENTAL SITE CHARACTERIZATION WORK PLAN

Former Pratt Oil Works
The Inland Parcels (Tract I)
The Waterfront Parcels (Tract II)
Parcel A - 38-30, 38-50 and 38-80 Newtown Creek, and 38-40 Railroad Avenue
Parcel B - 38-42 and 39-14 Review Avenue
Parcel C - 38-70 Review Avenue
Parcel D - 38-84 Railroad Avenue
Parcel E - 38-50 Review Avenue and 38-54 Railroad Avenue
Parcel F - 38-98 Review Avenue
Parcel G - 38-78 review Avenue
Parcel H - 39-30 Review Avenue
Parcel I – 38-20 Review Avenue
Parcel J - 37-88 Review Avenue and
Parcel K - 38-60 Review Avenue
Long Island City, New York

NYSDEC Case No. 07-07418 (Parcel A)
NYSDEC Case No. 08-13060 (Parcel B)
NYSDEC Case No. 08-13060 (Parcel C)
NYSDEC Case No. 09-04539 (Parcel D)
NYSDEC Case No. 09-03356 (Parcel E)
NYSDEC Case No. 09-03488 (Parcel G)
NYSDEC Case No. 09-03616 (Parcel H)
NYSDEC Case No. 09-03287 (Parcel I)

Consent Order Case No. D2-1002-12-07AM
NYSDEC Remedial Tracking No. S241115

July 27, 2010

Prepared by:

Kleinfelder East, Inc.
One Corporate Drive, Suite 201
Bohemia, New York 11716
(631) 218-0612

Prepared for:

ExxonMobil Environmental
Services Company
400 Kingsland Avenue
Brooklyn, New York 11222
(718) 383 7374

SUPPLEMENTAL SITE CHARACTERIZATION WORK PLAN

Former Pratt Oil Works
The Inland Parcels (Tract I)
The Waterfront Parcels (Tract II)
Long Island City, New York

ENGINEERING CERTIFICATION

This report has been reviewed by Kleinfelder Engineering, P.C. for accuracy, content and quality of presentation. The Education Law of the State of New York prohibits any person from altering anything in the report in anyway unless it is under the direction of the licensed professional engineer. Where such alterations are made, the professional engineer must sign, seal, date and describe the full extent of the alteration (NYS Education Law Section 7209-2).

JUSTIN R. MOSES
NO. 077926

7/27/10
Date

Justin R. Moses, P.E.
Vice President and Secretary
Kleinfelder Engineering, P.C.

SUPPLEMENTAL SITE CHARACTERIZATION WORK PLAN

Former Pratt Oil Works
The Inland Parcels (Tract I)
The Waterfront Parcels (Tract II)
Long Island City, New York

QUALITY ASSURANCE/QUALITY CONTROL

The following personnel have reviewed this report for accuracy, content, and quality of presentation:

John E. Wolf
Project Manager

7/27/10
Date

Michael Meyerhoefer
Work Assignment Manager

7/27/10
Date

for
Jeffrey Hale, CPG
Technical Director

7/27/10
Date

FOR
Scott E. Strom
Field Supervisor

7/27/10
Date

LIST OF TABLES, FIGURES AND APPENDICES

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TABLES

FIGURES

APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

µg/L	-	micrograms per liter
Accutest	-	Accutest Laboratories
AST	-	aboveground storage tank
ASP	-	analytical services protocol
ASTM	-	American Society for Testing and Materials
BDL	-	below instrument detection limit
BRL	-	below laboratory reporting limits
CAMP	-	Community Air Monitoring Plan
CO	-	Carbon Monoxide
DO	-	dissolved oxygen
DRO	-	Diesel Range Organics
DSNY	-	New York City Department of Sanitation
DTB	-	depth to bottom
DTW	-	depth to water
DUSR	-	Data Usability Summary Report
ELAP	-	Environmental Laboratory Approval Program
EM	-	electromagnetic
USEPA	-	United States Environmental Protection Agency
eV	-	electron Volt
Fbg	-	feet below grade
ft/d	-	feet per day
ft/ft	-	feet per foot
FPOW	-	Former Pratt Oil Works
FVD	-	fluorescence intensity versus depth
g/mL	-	grams per milliliter
GC/FID		gas chromatography/flame ionization detector
GC/MS	-	gas chromatography/mass spectrometry
GRO	-	Gasoline Range Organics
HASP -	-	Health and Safety Plan
H_2S	-	hydrogen sulfide
IDW	-	investigation-derived wastes

LIST OF ACRONYMS AND ABBREVIATIONS

LEL	-	lower explosive limit
LIF	-	Laser Induced Fluorescence
LIRR	-	Long Island Railroad
LNAPL	-	light non-aqueous phase liquid
LCS	-	Laboratory control sample
MDL	-	method detection limit
mg/L	-	milligrams per liter
mg/m^3	-	milligrams per cubic meter
ML	-	milliliter
MS	-	Matrix spike
MSD	-	Matrix spike duplicate
msl	-	mean sea level
mS/cm	-	milliSiemens per centimeter
MTBE	-	Methyl tertiary-butyl ether
mV	-	millivolts
NAPL	-	non-aqueous phase liquid
nm	-	nanometer
NTU	-	Nephelometric Turbidity Units
NYSDEC	-	New York State Department of Conservation
NYSDOH	-	New York State Department of Health
ORP	-	oxidation reduction potential
PAH	-	polycyclic Aromatic Hydrocarbons
PELs	-	Permissible exposure limits
PIANO	-	paraffin, isoparaffin, aromatics, napthenes, and olefins
PID	-	photoionization detector
pDR-1000	-	MIE Personal Data RAM
PPE	-	personal protective equipment
ppm	-	parts per million
ppm$_v$	-	parts per million by volume
PTS	-	PTS Laboratories
QA	-	quality assurance

LIST OF ACRONYMS AND ABBREVIATIONS

QAO	-	Quality Assurance Officer
QAPP	-	Quality Assurance Project Plan
QC	-	quality control
RSCOs	-	Recommended Soil Cleanup Objectives
SOCONY	-	Standard Oil Company of New York
SOP	-	Standard Operating Procedures
su	-	standard unit
SVOCs	-	semi-volatile organic compounds
TAL	-	Target Analyte List
TAGM	-	Technical and Administrative Guidance Memorandum
TCL	-	Target Compound List
TOGS	-	*Technical and Operational Guidance Series*
TPH	-	Total Petroleum Hydrocarbons
USDOT	-	United States Department of Transportation
USEPA	-	United States Environmental Protection Agency
USGS	-	United States Geologic Survey
UST	-	underground storage tank
UV	-	UltraViolet
UVOST®	-	UltraViolet Optical Screening Tool
VOCs	-	volatile organic compounds
VRae	-	VRae multi-gas meter
WMC	-	Waste Management Corporation
WQS	-	water quality standards

1.0 INTRODUCTION

ExxonMobil Environmental Services Company (ExxonMobil) on behalf of ExxonMobil Oil Corporation contracted Kleinfelder East, Inc. (Kleinfelder) to prepare this *Supplemental Site Characterization Work Plan* (Work Plan), for the Inland (Inland Project Area) and Waterfront Parcels (Waterfront Project Area), which compose Tract I and II (collectively referred to as the Project Area) of the Former Pratt Oil Works (FPOW). This Work Plan was prepared based on the results and findings of *Interim Site Characterization Reports* for the Waterfront and Inland Project Areas prepared by Kleinfelder dated August 10, 2009 and March 11, 2010, respectively.

This Work Plan supplements previous work plans, addendums and site characterization reports including the following:

- *Site Characterization Work Plan For The Waterfront Parcels, Former Pratt Oil Works Site*, prepared by Parsons, dated May 2008.
- *Site Characterization Work Plan For The Inlands Parcels, Former Pratt Oil Works Site*, prepared by Parsons, dated August 2008.
- *Site Characterization Work Plan Addendum,* prepared by Kleinfelder, dated October 8, 2008.
- *Site Characterization Work Plan Addendum,* prepared by Kleinfelder, dated November 21, 2008.
- *Interim Site Characterization Report* for the Waterfront Parcels prepared by Kleinfelder, dated August 10, 2009 ; and
- *Interim Site Characterization Report* for the Inland Parcels prepared by Kleinfelder, dated March 11, 2010.

This Work Plan proposes using laser induced fluorescence (LIF) technology/Ultraviolet Optical Screening Tool (UVOST®) in an effort to further investigate the horizontal and vertical extent of light non-aqueous phase liquids (LNAPL) previously detected. A LIF/ UVOST® soil boring program is proposed in an effort to better characterize horizontal and vertical distribution of LNAPL observed and to minimize disruption to surrounding businesses. In addition to the LIF borings, drilling of additional soil borings in the vicinity of monitoring well MW-3, using direct push technology, is proposed for the collection of soil and groundwater samples. The purpose of the additional soil borings is to further investigate the horizontal extent of a low pH condition identified, while minimizing worker exposure and waste generation.

This Work Plan is proposed in accordance with Item Nos. 1 and 2 of a Corrective Action Plan (CAP) included in Consent Order Case No. D2-1002-12-07AM which was executed between ExxonMobil Oil Corporation and the New York State Department of Environmental Conservation (NYSDEC) on July 15, 2008. The location of the FPOW is illustrated on Figure 1.

The Project Area was determined to have been owned by a predecessor of ExxonMobil prior to 1949 (Parsons, 2008). The parcels that constitute the Project Area have changed ownership over the years. A discussion of the ownership is provided in Section 2 of this Work Plan. The addresses which compose the Project Area, as well as current property owners, are listed in table below:

Inland Parcels

Parcel	Address	Current owner
Parcel A	38-40 Railroad Avenue	Waste Management of New York
Parcel C	38-70 Review Avenue	Keane Realty LLC
Parcel D	38-84 Railroad Avenue	A&L Cesspool Ser./Co. DBA A&L Recycling
Parcel E	38-50 Review Avenue and 38-54 Railroad Avenue	HP Sherman Co. Inc. & William E. Williams Valve Corp.
Parcel F	38-98 Review Avenue	DG Properties LLC
Parcel G	38-78 Review Avenue	Werwaiss Realty Co.
Parcel H	39-30 Review Avenue	Pepatoba Corp.
Parcel I	38-20 Review Avenue	Review Associates

Inland Parcels

Parcel	Address	Current owner
Parcel J	37-88 Review Avenue	Up From the Ashes, Inc.
Parcel K	38-60 Review Avenue	Renari LLC

Waterfront Parcels

Parcel	Address	Current owner
Parcel A	38-30, 38-50 and 38-80 Newtown Creek	Waste Management of New York
Parcel B	38-42 and 39-14 Review Avenue	Apollo Steel

1.1 Regulatory History

The following subsections summarize the regulatory history with the NYSDEC for the Site.

1.1.1 Consent Order

ExxonMobil Oil Corporation and the NYSDEC signed Consent Order Case No. D2-1002-12-07AM on July 15, 2008 by which ExxonMobil voluntarily agreed to perform a site characterization of the current environmental conditions of the Project Area. ExxonMobil Oil Corporation voluntarily agreed to perform a site characterization of the Project Area, subject to an express reservation of rights and without admission of liability, despite several decades of industrial and petroleum-related operations unrelated to ExxonMobil Oil Corporation, that both pre- and post-dated ExxonMobil Oil Corporation's predecessor's discrete presence in the Project Area (Parsons, 2008).

1.1.2 NYSDEC Spill Numbers

NYSDEC case numbers for the Site and the vicinity include the following:

Parcel A : NYSDEC generated case No. 07-07418 on October 5, 2007 for 38-50 Review Avenue, Maspeth, Queens.

Parcel B : NYSDEC generated case No. 08-13060 on March 5, 2009 for 39-14 Review Avenue, Long Island City, Queens in response to VOCs detected during the preclearance of monitoring well MW-9.

Parcel C: NYSDEC generated case No. 07-07417 on October 5, 2007 for 38-70 Review Avenue, Maspeth, Queens.

Parcel D: NYSDEC generated case No. 09-04539 on July 19, 2009 for 38-84 Railroad Avenue, Long Island City.

Parcel E: NYSDEC generated case No. 09-03356 on June 22, 2009 for 38-54 Railroad Avenue in response to VOCs detected while field screening soil samples collected during the preclearance of monitoring well MW-17.

Parcel G: NYSDEC generated case No. 09-03488 on June 24, 2009 for 38-78 Review Avenue, Long Island City, Queens in response to odors detected in a soil sample collected during the drilling of soil boring SB-15.

Parcel H: NYSDEC generated case No. 09-03616 on June 27, 2009 for 39-30 Review Avenue, Long Island City, Queens in response to odors detected in a soil sample collected during the drilling of monitoring well MW-21 on the south sidewalk of Review Avenue.

Parcel I: NYSDEC generated case No. 09-03287 on June 20, 2009 for 38-20 Review Avenue, Long Island City, Queens in response to petroleum odors detected in a soil sample collected during the drilling of monitoring well MW-20 on the south sidewalk of Review Avenue.

2.0 SITE DESCRIPTION AND HISTORY

The following subsections provide a site description and summarize historic and current property uses and previous environmental activities performed at the Site.

2.1 Site Description

The Project Area encompasses approximately 18.5 acres located adjacent to Newtown Creek. The Project Area has been subdivided into 16-lots of Block 312 since 1949. The Project Area is divided north and south by the Long Island Rail Road (LIRR) train tracks. Properties north of the LIRR are the Inland Project Area (Tract I) and properties south of the LIRR are the Waterfront Project Area (Tract II). Each tract is further subdivided into parcels (Parcels A through K) based on property ownership. Therefore, each parcel may have more than one address based on property ownership. ExxonMobil currently has access agreements with Parcels A, B, C, D, E and G. A Site Plan illustrating pertinent site features including, but not limited to, block and lot, parcel identification, property boundaries, monitoring well locations, LIRR and current buildings and structure layouts is provided as Figures 2. A 2006 aerial photo illustrating pertinent site features is provided as Figure 3.

The Project Area is located approximately 1,000 feet southeast of the Greenpoint Avenue Bridge. Public utilities servicing the Project Area include underground water, electric and telecommunication lines. Sanitary waste is stored on each parcel in what appear to be septic tanks; however, the construction of the structures was not confirmed. The results of a survey of the property boundaries and pertinent site features of the Project Area are provided on Figure 2.

There are currently 25 monitoring wells on the Project Area (MW-1 through MW-3, MW-4S, MW-4D, and MW-5 through MW-24) including 14 monitoring wells (MW-1, MW-2, MW-3, MW-4S, MW-4D and MW-5 through MW-13) on the Waterfront Project Area and 11 monitoring wells (MW-14 through MW-24) on the Inland Project Area. In general, the groundwater monitoring well screens span the water table, with the exception of monitoring wells MW-4D, MW-5, and MW-6. Monitoring well MW-4D is screened beneath an approximate 2-foot organic peat layer beneath the potentiometric surface. Monitoring wells MW-5 and MW-6 are screened beneath a silty clay, semi-confining layer beneath the potentiometric surface.

2.2 Current Property Use

The Project Area is located in an industrial business zone. Below is a description of current property use per parcel:

- Parcel A (Waterfront) is currently owned by Waste Management Corporation (WMC) and operates as a New York City Department of Sanitation (DSNY) waste transfer station.

- Parcel A (Inland) is owned by WMC and used for parking by A&L Recycling.
- Parcel B is owned by Apollo Steel (Steel Equities) and leased to several warehouse facilities.
- Parcel C is owned by Keane Realty LLC and used for vehicle storage associated with V.I.P. Towing Inc.
- Parcel D is owned by A&L Cesspool Services Company and currently operates as A&L Recycling which specializes in restaurant oil and grease recovery and recycling, as well as cesspool services (http://aandlrecycling.com).
- Parcel E is owned by HP Sherman Co. Inc. and operates as William E. Williams Valve Corporation which designs and manufactures valves for industrial and commercial applications (http://www.williamsvalve.com/).
- Parcel F is owned by DG Properties LLC and operates as J&S Supply Corporation, a wholesale stocking distributor of residential and commercial building insulation, insulation-foam boards, insulation accessories, sheets and board products, roofing materials, coatings and adhesives (www.jandssupply.com/).
- Parcel G is owned by Werwaiss Realty Company and operates as United Refrigeration Inc., a commercial refrigeration supply distributor (www.uri.com).
- Parcel H operates as American Cleaning Solutions, a division of American Wax Co., who manufactures and sells cleaning and maintenance products (http://www.cleaning-solutions.com/).
- Parcel I is owned by Review Associates and includes a warehouse building partially occupied by Lenoble Lumber on the east side. Lenoble Lumber is a retail lumber and building supply distribution facility (www.lenoblelumber.com). On the west side of the warehouse is National Van Equipment Company Inc., a manufacturer of furniture pads and moving equipment (www.nationalvanequip.com).
- Parcel J is owned by Up from the Ashes, Inc. and occupied by Phoenix Beverage Inc., a wholesale beverage distributor.
- Parcel K is owned by Renari Realty LLC.

2.3 Surrounding Property Use

The Project Area is bound to the northeast by Review Avenue. Further northeast is Calvary Cemetery. The Project Area is bordered to the northwest by a former Quanta Resources site (NYSDEC Superfund site #2-41-005, Quanta). Southwest of the Project Area is Newtown Creek. A former cement facility is located southeast of the Project Area.

2.4 Site History

The development of the property that became FPOW appears to have commenced in the early 1850's by the North American Kerosene Gas Lamp Company (Parsons, 2008). The Asphalt Mining and Kerosene Gas Company set up a factory along Newtown Creek, Long Island City in 1854. The company later changed names to North American Kerosene and Lighting Company (Dictionary of Canadian Biography).

On or about July 1876, Charles Pratt & Company acquired the property under the name of the Pratt Long Island Refinery (Pratt Oil Works). Historic information indicates a Queens County Oil Works was present at the property before the acquisition by Charles Pratt (Parsons, 2008). The FPOW operated primarily as a paraffin wax refinery. Standard Oil Company of New York (SOCONY) acquired the FPOW refinery in approximately 1892. SOCONY ceased operations in 1949 (Parsons, 2008).

2.5 Geology and Hydrogeology

The following subsections discuss the regional topography, surface water, geology, and hydrogeology, in the vicinity of the Project Area.

2.5.1 Topography

The Project Area is located within the United States Geological Survey (USGS) 7.5-Minute Topographic Map, Brooklyn, New York, Quadrangle (USGS, 1979). The Project Area is approximately 30 feet above mean sea level (msl) along Review Avenue and slopes to approximately six feet along the southern portions of the Project Area along Newtown Creek. Topography in the vicinity of the Project Area slopes to the southwest towards Newtown Creek. The topography of the Project Area is illustrated on the Locus Plan provided on Figure 1.

2.5.2 Site Geology

The Project Area geology observed in the samples collected is generally heterogeneous, consisting of deposits of sands, silt, peat, gravel, cobbles, and urban fill material. Bedrock was not encountered during the previous investigation. Urban fill was observed in samples throughout the Waterfront Project Area and the southern portion of the Inland Project Area (MW-15 and MW-18) to depths ranging from 1 to 18 feet below grade (fbg). A greater thickness of fill material associated with foundations, brick, and concrete debris was observed on Waterfront Parcel A (parcel presently owned by WMNY). The fill contains layers of material consisting of coal ash that extend through the northern portion of Waterfront Parcel A and Parcel B (parcel presently owned by Apollo Steel) and onto the central portion of the Inland Project Area. The coal ash ranges in thickness from 2 to 8 feet. Discontinuous coal ash material is also present on the southern portions of the Waterfront Project Area.

The deposits observed in soil samples beneath the Inland Project Area are predominantly composed of sand of unknown thickness, observed to the maximum depth of investigation (25 to 37 fbg). Fill material is absent from the northeastern portion of the Project Area. Sporadic lenses of silt, gravel and cobble were observed in borings on the Inland Project Area.

Heterogeneity of the subsurface deposits observed in samples increases from the center of the Inland Project Area towards Newtown Creek. A silt layer approximately 2 to 5 feet thick is present in the central portion of the Inland Project Area extending to the southwestern portion of the Waterfront Project Area. The silt layer appears to dip towards the southwest, with its highest observed elevation at approximately 10 feet above mean sea level (ft-msl) in the center of the Inlands Project Area (MW-24) and the lowest observed elevation approximately 18 ft-msl along Newtown Creek (MW-8). The silt is present throughout samples collected from the western portions of the Waterfront Project Area.

A deposit of peat/organic silt, ranging in thickness from less than 1 foot to 4 feet, was observed in samples beneath the fill material throughout the northern section of Waterfront Parcel A and onto the western section of Parcel B. The peat/organic silt deposit is underlain by the aforementioned silt layer. A sand deposit of unknown thickness underlies the silt layer. On the northern portion of Waterfront Parcel B, where the peat/organic silt and silt are not present, the sand deposit is located immediately beneath the fill material. This is consistent with conditions on the eastern Inland Project Area. Lenses of silt and gravel are present sporadically throughout the northern portion of the Project Area.

2.5.3 Hydrogeology

The regional hydrogeologic unit beneath the Project Area is the Upper Glacial aquifer. The Project Area is located between a groundwater recharge area to the east (USGS, 2009) and Newtown Creek to the southwest (a regional groundwater discharge area). Regional groundwater flow is west towards Newtown Creek.

Groundwater is present beneath the Project Area in perched, water table, and semi-confined conditions. Monitoring wells MW-5 and MW-6 are screened beneath a semi-confining silty/clay layer and monitoring well MW-4D is screened beneath a peat layer. The water table is present beneath the Project Area at depths ranging from approximately 3.5 fbg along the southern portion of the Project Area (MW-13) to approximately 28.5 fbg in the northernmost portions of the Project Area (MW-22).

On January 22, 2010, a synoptic round of liquid level gauging was conducted on the monitoring well network, with the exception of monitoring wells MW-13 and MW-5.

Groundwater flow direction at the water table during the neap tide on January 22, 2010 was towards Newtown Creek. The corrected groundwater elevation ranged from -1.82 ft below msl in MW-2 to 6.64 ft above msl in MW-20. The average water table gradient between the northern and southern boundaries of the Project Area was calculated to be approximately 0.01 feet per foot (ft/ft).

2.6 Summary of Existing Environmental Data

The following subsections summarize the distribution of LNAPL detected and discuss the soil and groundwater quality beneath the Project Area.

2.6.1 Light Non-Aqueous Phase Liquid

LNAPL with specific gravity less than one has been detected in 15 of the 25 monitoring wells, with reported thickness ranging from 0.01 to 13 feet based on previous gauging data. Its spatial distribution is sparse and has been identified in multiple vertical horizons including the zone above the water table in the capillary fringe, at the water table, and below semi-confining stratigraphic layers, indicating that a combination of water table fluctuation and hydrostratigraphic framework may control the vertical distribution of LNAPL. The LNAPL has generally been detected throughout the Project Area, but no detections have been identified to the northernmost (MW-20), easternmost (MW-13, MW-10, and MW-21), and westernmost (MW-1) portions of the Project Area. LNAPL detections and thicknesses are summarized in Table 1. Ranges of specific gravity (density), kinematic viscosity, and dynamic viscosity are provided in Table 2.

2.6.2 Soil Quality

Chlorinated volatile organic compounds (VOCs) were detected in soil samples collected from the west and northwest portion of Parcel A, near the water table in proximity to where these compounds were detected in groundwater. Chlorinated VOCs were detected in soil samples near the water table in the eastern portion of Parcel A. In addition, chlorinated VOCs were detected in soil samples collected from MW-14, MW-17 and MW-21.

Benzene and, to a lesser extent, toluene, ethylbenzene and xylenes were detected in soil samples throughout Waterfront Parcel A above NYSDEC Recommended Soil Cleanup Objectives (RSCOs). Isopropylbenzene and acetone were detected in soil samples above RSCOs collected from the Waterfront Project Area. VOCs were not detected in soil samples collected from the Inland Project Area above RSCOs, with the exception of MW-17 (12.5-17 fbg).

With the exception of samples collected from SB-11, MW-16, MW-20, MW-22 and MW-24, semi-volatile organic compounds (SVOCs), in the form of polycyclic aromatic hydrocarbons (PAHs), were detected above RSCOs in the soil samples collected from the Project Area. In general, PAH concentrations were greater in samples collected from the Waterfront Project Area, compared to the Inland Project Area.

Metals were detected above RSCOs in soil samples collected from the Project Area. The majority of metals were detected in the fill material at or above the water table, such fill which pre-dates FPOW operations. The distribution of metals decreased in soil samples collected below the water table.

Soil samples collected from monitoring well MW-3 located in the south-central portion of Parcel A had pH values of <1 standard unit (su), suggesting the presence of an acidic compound.

2.6.3 Groundwater Quality

Chlorinated VOCs were detected in groundwater samples collected from monitoring wells MW-1, along the western portion of Parcel A, and monitoring wells MW-3, MW-4D and MW-21.

Benzene was sparsely detected in groundwater samples from the Waterfront Project Area. Benzene detections in groundwater samples were not consistently associated with benzene concentrations in soil samples collected. Methyl tertiary-butyl ether (MTBE) was detected in groundwater at the south-central portions of Parcels A and C.

SVOCs were minimally detected in groundwater throughout the Project Area, which appears consistent with the fact that SVOCs include high molecular weight hydrocarbons that tend to sorb to soils and have a low solubility in groundwater.

Distribution of metals was less in groundwater relative to distribution in soil.

The pH of a groundwater sample from monitoring well MW-3 was reported at 2.14 su (Note that pH was analyzed outside holding time). Concentrations of chloride (1,050 milligrams per liter [mg/L]) and sulfate (10,900 mg/L) were detected in a groundwater sample collected on October 29, 2009. In addition, six fatty acids were detected in the groundwater sample including acetic acid (14 mg/L), butyric acid (4.10 mg/L), i-pentanoic acid (0.96 mg/L), lactic acid & HBA (5.8 mg/L), propionic acid (3.7 mg/L), and pyruvic acid (2.3 mg/L).

3.0 PROPOSED SCOPE OF WORK

The following subsections describe the methods of the proposed supplemental site characterization specific to:

- Subsurface clearance;
- Equipment decontamination;
- Air monitoring;
- LIF/UVOST™ data collection;
- Monitoring well MW-3 soil boring investigation;
- Soil sampling;
- Soil sample laboratory analysis;
- Soil sample physical properties analysis and core photography,

- Groundwater sampling; and
- Groundwater laboratory analysis.

In addition, a description of the proposed LIF/UVOST™ technology is provided in Section 4.3.1.

3.1 Subsurface Clearance

Prior to initiating the subsurface investigation activities, including drilling soil borings, the following subsurface clearance process is proposed:

- Public utilities will be contacted through the New York City One Call Center in accordance with Industrial Code 53.
- A private utility locating contractor will be contracted to locate and mark out potential underground utilities or obstructions using geophysical methods including, but not limited to, ground-penetrating radar (GPR), electro magnetometer and utility locators. The locations of identified underground utilities will be spray painted on the ground surface using the American Public Works Association color code system. In addition, identified anomalies will be painted in pink.
- The locations of utilities, linear anomalies, underground structures and anomalies will be measured and recorded in the field on a site map.
- The proposed drilling locations will be reviewed with property owner representatives.
- Each drilling location will be hand-cleared or vacuum excavated to a minimum depth of approximately 5 fbg and a maximum depth of 8 fbg.

3.2 Equipment Decontamination

Temporary decontamination areas will be established during intrusive activities. The temporary decontamination areas may include areas constructed with wooden railroad ties or polyvinyl chlorinated (PVC) pipe and lined with a 6-mil thick polyethylene liner or may consist of an area with decontamination buckets on polyethylene plastic sheets. The following procedures are proposed to decontaminate equipment used during the supplemental site characterization activities:

- Drilling equipment, including, but not limited to; augers, bits, rods, tools, and split-spoon samplers will be cleaned with a high-pressure steam cleaning unit and Alconox® cleaning solution before use each day; between soil boring locations; and prior to leaving the site.
- Direct push and soil sampling equipment including, but not limited to, macro core® soil samplers, rods, and hand augers will be decontaminated between soil samples using an Alconox® cleaning solution, followed by a potable water rinse and a deionized water rinse.
- Direct push groundwater sampling equipment including, but not limited to, extractable screen and rods will be decontaminated between samples using an Alconox® cleaning solution, followed by a potable water rinse and a deionized water rinse.
- Tools, samplers and drill rods will be placed on polyethylene plastic sheets or on the drill rig racks following cleaning.

Rinseate collected from the decontamination activities will be transferred to 55-gallon drums. The drums will be stored and managed as described in Section 4.0, pending characterization and disposal.

3.3 Air Monitoring

Air monitoring is proposed within the work zones, and at the perimeter of the work zones during drilling activities, following the New York State Department of Health (NYSDOH) Generic Community Air Monitoring Plan (CAMP). The purpose of the air monitoring is to collect air quality data for fugitive dust and VOCs that may be generated during these activities. The Health and Safety Plan (HASP) defines the action levels, permissible exposure limits (PELs), engineering controls and personal protective equipment (PPE) to be employed if airborne contaminants are detected above action levels. Equipment readings will be recorded on Air Monitoring Data Observation Records. Data from equipment with data-logging capabilities will be downloaded weekly as applicable. Air monitoring will deviate from the CAMP by excluding community particulate monitoring based on previous air monitoring results and approval by NYSDEC in an e-mail dated June 8, 2009.

3.3.1 Worker Air Monitoring

Air monitoring of the worker breathing zone will be conducted continuously during drilling for worker respiratory protection.

The following equipment and methods will be used to perform work zone air monitoring:

- A MiniRae 2000 photoionization detector (PID), manufactured by RAE Systems or equivalent is proposed to monitor for the presence of VOCs. This direct-read instrument will be calibrated using 100 parts per million (ppm) isobutylene span gas to yield total VOCs in parts per million by volume (ppm_v) referenced to benzene prior to initiating intrusive activities at a location (pre-cleaning, soil boring etc.). In addition, a baseline reading will be recorded prior to the start of the intrusive activities at each location. Readings will be recorded in concentrations of parts per ppm_v at approximately 15 minute intervals throughout the duration of the intrusive activity.
- A VRae multi-gas meter (VRae), manufactured by RAE Systems or the equivalent is proposed to monitor the lower explosive limit (LEL), carbon monoxide (CO), oxygen, and hydrogen sulfide (H_2S) gas within the worker breathing zone, upwind and downwind from the intrusive activity. This direct-read instrument will be calibrated and a baseline reading recorded prior to the start of the intrusive activities at a location. Levels of LEL and

oxygen will be recorded as percentages (of total air) at approximately 15 minute intervals throughout the duration of the intrusive activity.

- A MIE Personal Data Ram 1000 portable aerosol monitor (pDR-1000), manufactured by Thermo Scientific or equivalent is proposed to monitor the respirable fraction of airborne dust, smoke, fumes and mist. Prior to initiating intrusive activities at a location, the aerosol monitor will be "zeroed" at which time it internally seeks agreement with factory calibration by checking its optical background during the zeroing sequence. This direct-read instrument is a passive air sampler that has data-logging capabilities. A baseline reading will be recorded prior to the initiating intrusive activities at each location. Levels of particulate dust and aerosols will be recorded in concentrations of milligrams per cubic meter (mg/m^3) at approximately 15 minute intervals throughout the duration of the intrusive activity. Data-logged information including peak and average concentration values, will be downloaded weekly as applicable.

3.3.2 Community Air Monitoring

Community air monitoring will be conducted in accordance with the CAMP, with the exception of particulate monitoring. Community air monitoring is proposed in an effort to protect the downwind community, if necessary, including occupants of the facilities located on the Project Area. Community air monitoring involves the periodic monitoring of the work zone for VOCs, during non-intrusive activities; and continuous monitoring at the perimeter of the work areas for VOCs during intrusive work activities. Prior to initiating intrusive activities at a location, the weather and wind direction will be recorded. Wind direction will be used to locate air monitoring equipment upwind and downwind of the work zone. Wind direction will be measured using a portable flag.

The following equipment and methods are proposed to conduct community air monitoring:

- A MiniRae 2000 PID, (see "worker air monitoring") or the equivalent is proposed to monitor for the presence of VOCs. This direct-read instrument will be calibrated using isobutylene span gas to yield total VOCs in ppm_v referenced to benzene and a baseline reading will be recorded prior to initiating intrusive activities at a location.

3.4 Soil Borings

The following subsections describe the proposed LIF/UVOST™ technology and discuss proposed soil boring locations and soil sampling analysis for laboratory analytical, and physical properties methods. Proposed soil boring locations are illustrated on a 2006 aerial photo (Figure 4) to show current building locations and access limitations. Figure 5 illustrates proposed soil boring locations on a 1949 aerial photo to show soil boring locations in relation to former structures and above ground storage tanks (ASTs) in the Project Area. Proposed soil boring locations on Parcel I are contingent upon access to the parcel. The Parcel I soil boring locations are proposed based on a 1996 Sanborn map illustrating a truck loading ramp and observations made from the sidewalk. The interior of the building has not been inspected to verify access to proposed soil boring locations. Therefore, the proposed boring locations may be relocated or omitted based on access agreement and/or physical access limitations.

3.4.1 LIF/UVOST™ Soil Boring Investigation

A LIF/UVOST™ soil boring program is proposed in an effort to better characterize the horizontal and vertical distribution of LNAPL observed in monitoring wells and samples collected from the Project Area. A LIF/UVOST™ soil boring program was selected based on the following:

- Near real-time data collection;
- Technology works via direct push; therefore, less access limitations and disruption to adjacent business than a drill rig;
- No permanent hardware installation required;

- Technology should visually display LNAPL thickness in-situ in a shorter period of time than conventional soil borings or drilled monitoring wells;
- Provides a better indication of actual in-situ LNAPL thickness as opposed to apparent thickness measured in monitoring wells, and
- Generates less waste than other drilling techniques.

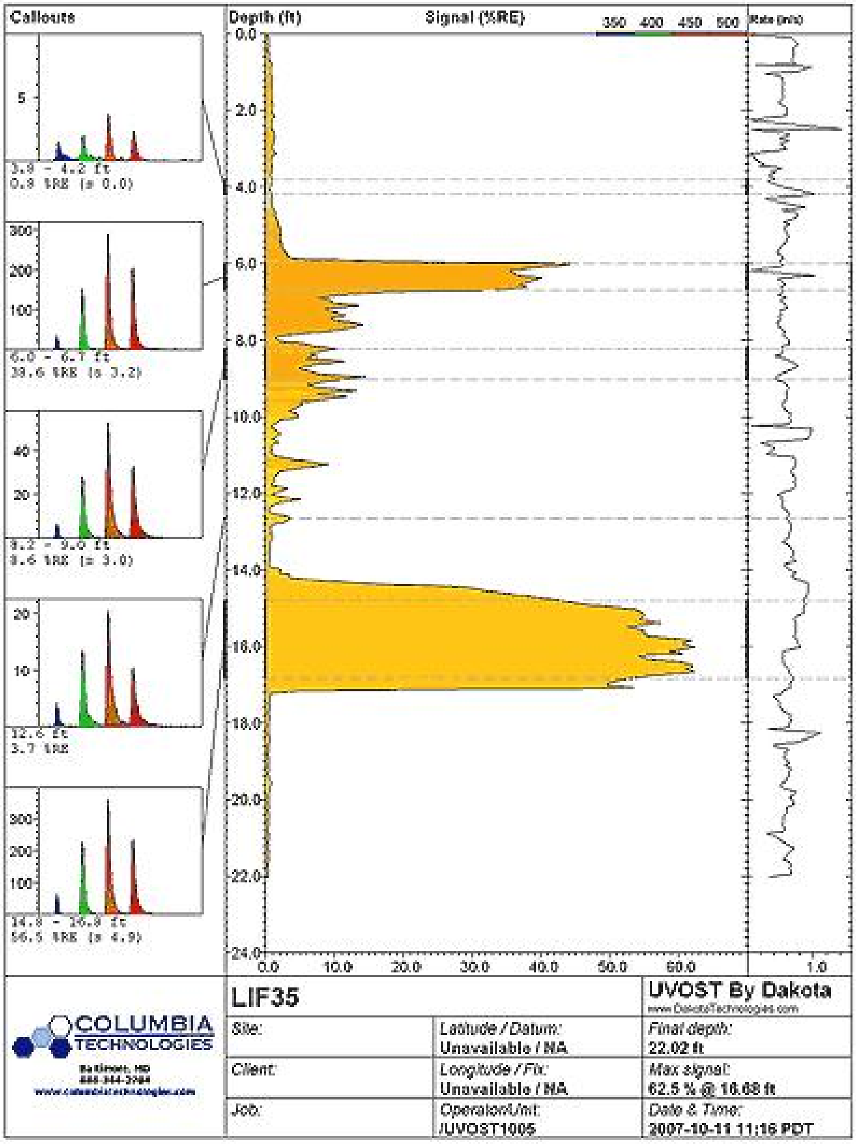
A LIF/UVOST™ sensor operates by using a laser to fluoresce hydrocarbons in the subsurface. More specifically, the sensor is deployed vertically using direct push rods into the subsurface. The sensor includes a transparent sapphire window mounted in the side. An optical fiber transmits intense pulses of ultra-violet (UV) light from a tunable laser source mounted in a logging vehicle to the sapphire window. The UV light induces two or three ring aromatic hydrocarbons including PAHs, and other naturally occurring fluorophores, to fluoresce. The fluorescent light is transmitted via a second optical fiber to a detector mounted in the logging vehicle that counts the incoming photons. The number of photons counted (i.e., the fluorescence intensity) is proportional to the amount of fluorophores in contact with the window (www.columbiatechnologies.com).

Since naturally occurring fluorophores within the soil (organic matter, caliche, calcite, fluorite, etc.) also fluoresce, some degree of background fluorescence is typically observed throughout the LIF/UVOST™ data. The presence of petroleum hydrocarbons is indicated by an increase of fluorescence intensity above the background level, along with a shift in the wavelength of the observed fluorescence. The level of fluorescence intensity above background is therefore a measure of the percentage of pore space occupied by aromatic hydrocarbons (www.columbiatechnologies.com/lif.php).

Since aromatic hydrocarbons are found in many types of petroleum fuels and lubricants, the fluorescence intensity is, in turn, related to petroleum hydrocarbon concentrations in soil. The emitted fluorescent intensity is measured at four wavelengths (350, 400, 450, and 500 nanometers [nm]) covering the emission range of a wide variety of petroleum hydrocarbons from light fuels through heavy fuels and lubricants, such as coal tar and bunker C fuel oil. The relative intensities of the four measured wavelengths provide an indication of the type of fluorophores detected (www.columbiatechnologies.com/lif.php).

The LIF/UVOST™ logs are in the form of a graph of fluorescence intensity versus depth (FVD). The graphed intensity represents the combined intensity of the four measured wavelengths, and is shown as a percentage of the intensity measured for a reference solution prior to the push. Along with the FVD graph, each log also shows "waveforms" for four selected data points. Each waveform shows the individual intensities of the four measured wavelengths, each represented by a different color. The intensity of each wavelength is represented by the peak of its respective colored band. For each data point, these colors are summed according to their relative intensity, with the resulting combined color displayed as a thin band for each data point on the FVD graph (www.columbiatechnologies.com/lif.php).

The following is an example LIF log from Columbia Technologies LLC. website http://www.columbiatechnologies.com/lif.php:



Gasoline produces higher fluorescence intensities near the 350 nm wavelength. Therefore, fluorescence caused by gasoline is generally indicated on the FVD graph by color bands with a larger percentage of blue. “Heavier” hydrocarbons (i.e., diesel fuel, lubricating, fuel, and crude oils, etc.) produce greater relative intensities at higher wavelengths. Therefore, fluorescence caused by “heavier” hydrocarbons is generally indicated on the FVD graph by color bands with a larger percentage of red and orange. Thus, the color bands in the FVD graph and the waveforms provide an indication of the type of hydrocarbons, or natural fluorophores generating the fluorescent response (www.columbiatechnologies.com).

The proposed LIF/UVOST™ tool will be advanced using direct push technology conducted by a licensed drilling contractor contracted by Kleinfelder. The LIF/UVOST™ tool operator will be contracted by Kleinfelder separately from the drilling contractor. The LIF soil borings will be advanced to approximately 10 feet below the encountered water-table to depths of approximately 20 to 30 fbg or once the LIF/UVOST™ response decreases close to background levels. LIF soil borings may be advanced shallower or deeper based on the LIF/UVOST™ response.

LIF/UVOST™ technology is proposed to first be pilot tested using LIF soil borings LIF-1, LIF-2 and LIF-3 in the vicinity of monitoring wells MW-9, MW-4 and MW-17 respectively, to evaluate the effectiveness of the technology in areas with previous detections of LNAPL and changes in geology. These borings were selected to test the LIF/UVOST™ technology in a real setting and to establish baseline analysis of subsurface conditions previously investigated. Monitoring wells MW-4, MW-9 and MW-17 have measurable LNAPL thicknesses for comparison. In addition, the geology observed in the three monitoring wells differs including coal ash, peat, silt and sands. This may aid in evaluating LIF/UVOST™ response to varying site geology.

If the pilot test is deemed favorable, then up to 58 primary LIF soil borings (LIF-1 through LIF-58) are proposed at the locations illustrated on Figures 4 and 5. These soil borings are proposed to investigate former AST locations based on the 1949 aerial photograph (Figure 5) and areas with known LNAPL detections. If, during the advancement of a primary LIF soil boring, the LIF/UVOST™ tool indicates the presence of LNAPL, additional secondary soil borings may be advanced for further delineation. Up to 24 additional secondary LIF soil borings (LIF-59 through LIF-82) may be advanced at the locations illustrated on Figures 4 and 5 to further investigate the horizontal and vertical extent of LNAPL, if detected, in the primary LIF soil borings.

The LIF soil boring identifications, locations, and number of soil borings may change as the LIF/UVOST™ investigation progresses based on the LIF/UVOST™ data collected. Secondary LIF soil boring locations may be adjusted in the field to better evaluate the extent of LNAPL detected based on primary soil boring LIF results. Soil boring locations are contingent upon obtaining the necessary access and may be adjusted or omitted due to, but not limited to, the presence of underground obstructions, overhead utilities, access limitations and/or refusal.

LIF soil borings will be grouted to the surface following completion and surface patched with concrete or asphalt patch.

Drill cuttings, PPE and disposable sample equipment will be managed following the methods described in Section 4.0.

3.4.2 MW-3 Soil Boring Investigation

Soil borings SB-16 through SB-20 are proposed in an effort to further investigate the horizontal extent of an acidic condition detected in soil and groundwater samples collected from monitoring well MW-3. The soil borings will be advanced using direct push technology for the collection of soil and groundwater samples as discussed in Sections 3.4.3 and 3.5. Select soil and groundwater samples will be submitted for laboratory analysis of Target Compound List (TCL) of VOCs and SVOCs, Target Analyte List (TAL) of metals, chloride, sulfate and pH as discussed in Sections 3.4.4 and 3.6. Soil borings SB-16 through SB-18 will be advanced at distances approximately 50-feet north, east and west of monitoring well MW-3, respectively. The pH of groundwater samples collected will be screened in the field using a flow through cell during groundwater sample collections. If the pH of groundwater samples collected from SB-16 and SB-18 is less than 4.0 su then soil borings SB-19 and SB-20 will be installed at their proposed locations. If the pH of samples collected from SB-16 and SB-18 is greater than 4.0 su, then soil borings SB-19 and SB-20 will be relocated approximately 25-feet north and east of MW-3, respectively. Figure 4 and 5 illustrates the proposed boring locations. Drill cuttings generated will be returned to each soil boring and the remainder of the borehole will be grouted to the surface following completion and surface patched with concrete or asphalt patch.

PPE and disposable sample equipment will be managed following the methods described in Section 4.0.

3.4.3 Soil Sampling

Soil samples are proposed for collection from up to 14 LIF soil borings in areas previously investigated and from five soil borings in the vicinity of monitoring well MW-3. Proposed soil sample locations include LIF-7, LIF-11, LIF-22, LIF27, LIF-28, LIF-29, LIF-31, LIF-32, LIF-38, LIF-42, LIF-45, LIF-47, LIF-53, LIF-56 and SB-16 through SB-20 for laboratory analysis. Continuous soil samples will be collected from the soil borings using a Geoprobe® rig and 4 or 5-foot long, 2-inch outside diameter macro-core® sampling device equipped with acetate liners from terminal depth of pre-clearing activities to a minimum of ten feet beneath the encountered water table. A representative soil core will be obtained by driving the assembled sampler into the subsurface. Upon retrieval, the liner and soil core will be removed. The sampler will be decontaminated, reassembled with a new liner and inserted back down the same hole to collect the next soil core. Soil samples will be collected as follows:

- One soil sample collected from the zone with the highest PID reading, staining or highest observed fluorescence from the LIF/UVOST™ investigation at or above the water table. In the absence of staining, PID readings above 10 ppm_v, or fluorescence, a soil sample will be collected from above the water table.

- One soil sample collected from below the zone with the highest PID readings or staining above the saturated zone, if applicable.

Additional soil samples may be collected based on field observations. Upon recovery, soil samples will be segregated into three parts; one containerized for potential laboratory analysis; one containerized for field screening using a PID; and one to be visually classified for soil type, grain size, texture, moisture content, odor and visible evidence of staining or LNAPL, and logged in the field. The sample headspace will be field screened for the presence of VOCs using a PID equipped with a 10.6 electron volt (eV) lamp calibrated to an isobutylene span gas to yield total VOCs in ppm_v referenced to benzene. The PID screening values are for field screening, and may not be indicative of actual concentrations in soil, as determined by laboratory analysis. The soil samples will be placed in laboratory-supplied jars, subsequently placed in storage/transportation coolers, preserved with ice, and shipped following chain of custody procedures via overnight courier to appropriate laboratory described in section 3.4.4.

Excess sample, PPE and disposable sample equipment will be managed following the methods described in Section 4.0.

3.4.4 Soil Sample Laboratory Analysis

Selected soil samples collected from soil borings LIF-7, LIF-11, LIF-22, LIF27, LIF-28, LIF-29, LIF-31, LIF-32, LIF-38, LIF-42, LIF-45, LIF-47, LIF-53, LIF-56 and SB-16 through SB-20 will be submitted to Accutest Laboratories of Dayton, New Jersey (Accutest), a NYSDOH approved laboratory (Environmental Laboratory Approval Program [ELAP] No. 10983) for laboratory analysis of the following:

- TCL VOCs in accordance with United States Environmental Protection Agency (USEPA) Method 8260B;
- TCL SVOCs in accordance with USEPA Method 8270C;

- TCL SVOCs in accordance with USEPA Method 8270C;
- TAL metals including cyanide in accordance with USEPA Methods 6010B, 7471A and 335.4; and
- Total Petroleum Hydrocarbons (TPH) in accordance with USEPA Method 8015 for GC fingerprinting, Diesel Range Organics (DRO) and Gasoline Range Organics (GRO).

Soil samples collected from soil borings SB-16 through SB-20 in the vicinity of monitoring well MW-3 will be additionally analyzed for:

- Sulfate in accordance with USEPA Method SW846 9056;
- Chloride in accordance with USEPA Method SW846 9056; and
- pH in accordance with USEPA Method SW846 9045C.

Analyses of these samples are to be conducted in accordance with USEPA SW-846 methods and submitted under NYSDEC Analytical Services Protocol (ASP) Category B data deliverables. A summary of laboratory samples and analyses is provided as Table 3.

Decontamination water, PPE and disposable sample equipment will be managed following the methods described in Section 4.0.

3.4.5 Soil Physical Properties Sampling and Analysis

During the LIF/UVOST™ investigation, up to 10 soil samples are proposed for physical properties analysis. The purpose of the physical properties analysis is for LNAPL mobility and soil saturation evaluation. An additional five samples are proposed for grain size analysis.

Soil samples are proposed to be collected from soil borings LIF-1 to LIF-4, LIF-15, LIF-17, LIF-24, LIF-26, LIF-30, and LIF-54 for analysis. Saturated soil samples will be collected using a Geoprobe® rig and 4 or 5-foot long, 2-inch diameter macro-core® sampling device (2-inch outside diameter rods) equipped with an acetate liner. The samples will be collected at a depth with the highest observed fluorescence from the LIF/UVOST™ investigation at the LNAPL/water/soil interface. Sample locations and depths are contingent upon the results of the LIF/UVOST™ investigation. Following collection, the acetate liner will be removed and labeled using a permanent marker to indicate sample depths. Each end of the acetate liner will be capped and the samples will be shipped via overnight courier to PTS laboratories of Sante Fe Springs, California (PTS) for analysis including:

- grain size analysis,
- atterberg limits,
- soil classification,
- pore fluid saturation package,
- air/water drainage capillary pressure data,
- relative permeability from PC curve,
- Brooks-Corey,
- free product mobility package, and
- photolog^{tm} digital core photography.

Additional soil samples collected from LIF-27, LIF-45, LIF-47, LIF-53 and LIF-56 will be collected in 8 or 16 ounce jars for grain size analysis in accordance with American Society for Testing and Materials (ASTM) Methods D422 and D4464. A summary of proposed physical properties analysis listing the soil borings proposed for analysis and description of each physical property test is provided as Table 4.

3.5 Groundwater Sampling

Groundwater samples are proposed from soil borings SB-16 through SB-20 in the vicinity of monitoring well MW-3 using an approximately four-foot long stainless steel, expendable point, drawback-sampling screen following collection of soil samples. To collect a groundwater sample utilizing this device, a stainless steel screen is inserted threaded to the top. Once attached, the entire assembly is driven into the subsurface using the percussion of the Geoprobe® rig. Drive rods are added to the string of tools as the sampler is advanced to a depth of approximately 4-feet below the groundwater table. Once the desired depth is reached, stainless steel extension rods are inserted down the center of the drive rods to hold the expendable point in place, the drive rods are then retracted approximately 4 feet. With the stainless steel screen exposed and the water table surface intersecting the screen, the extension rods are removed.

Approximately three to five well volumes will be purged from the soil borings using a low flow groundwater sampling technique. Groundwater will be purged and sampled using a peristaltic pump equipped with 1/4-inch diameter polyethylene tubing and a Horiba® flow-through cell water quality meter. The groundwater sample flow rate will be maintained at approximately 0.5 liters per minute to minimize groundwater drawdown no greater than 0.33 ft during pumping. The following water quality parameters will be recorded every three to five minutes on a low-flow groundwater sampling record to monitor groundwater stabilization:

- Flow rate;
- Purge volume;
- pH recorded in su;
- Temperature recorded in degrees Celsius (°C);
- Conductivity recorded in milliSiemens per centimeter (mS/cm);
- Oxidation reduction potential (ORP) recorded in millivolts (mV);
- Dissolved oxygen (DO) recorded in milligrams per liter (mg/L);
- Turbidity recorded in Nephelometric Turbidity Units (NTU); and
- Salinity recorded in parts per thousand (ppth).

Groundwater samples will be collected after a minimum of three well volumes (if sufficient recharge) of water are purged and stabilization of groundwater quality parameters is observed. If the screen goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required volumes are removed, and sampled when it recovers sufficiently. Stabilization will be considered achieved after three consecutive readings within 0.1 pH, 3% conductivity, 10 mV for ORP, and 10% for turbidity and DO. Groundwater samples will be collected into appropriate laboratory-supplied bottleware. If the turbidity of a groundwater sample is measured greater than 50 NTU, then a field-filtered and unfiltered sample will be collected for metals analysis. The sample containers will be labeled, placed in a laboratory-supplied cooler and packed on ice. Chain of custody procedures will be followed as outlined in the QAPP. The cooler will be shipped overnight or delivered to the laboratory for analysis as discussed in Section 3.6.

Purge water, PPE and disposable sample equipment will be managed following the methods described in Section 4.0.

3.6 Groundwater Sample Laboratory Analysis

Groundwater samples collected will be submitted to Accutest for laboratory analysis under NYSDEC ASP Category B data deliverables. The following groundwater sample laboratory analyses are proposed:

- TCL VOCs in accordance with USEPA Method 8260B;
- TCL SVOCs in accordance with USEPA Method 8270C; and
- TAL metals, including cyanide, in accordance with USEPA Methods 6010B, 7471A and 335.4;
- Ammonia in accordance with Method SM20 4500NH3G
- Bromide, Chloride and sulfate in accordance with USEPA Method SW846 9056;
- Nitrate in accordance with USEPA Method 353.2;
- Total Kjeldahl nitrogen in accordance with USEPA Method 351.2;
- Chemical Oxygen Demand (COD) in accordance with SM20 5220C;
- Biological Oxygen Demand (BOD) in accordance with SM 5210B;
- pH in accordance with SM20 4500H B and;
- Volatile fatty acids in accordance with Microseeps Method AM23G.

In an effort to further identify and characterize the source of low pH, Accutest will engage the services of Microseeps, Inc., of Pittsburgh, Pennsylvania (ELAP No. 11815) to perform ion chromatography analysis using Microseeps Method AM23G. This methodology evaluates groundwater for the presence of a specific list of volatile fatty acids with low level detection capability (VFA-LL) in an aqueous sample matrix and provides concentrations for detected chemical constituents.

4.0 WASTE MANAGEMENT

Investigation-derived wastes (IDW) generated during the supplemental site characterization investigation will be containerized for removal. Anticipated waste generated and storage are summarized as follows:

- Soils generated from drilling activities will be placed in labeled 55-gallon United States Department of Transportation (USDOT) approved drums.
- Plastic sheeting, used adsorbent pads, and disposable used PPE will be consolidated in USDOT-approved drum(s).
- Fluids generated from decontamination activities and purge water will be stored in USDOT-approved fluid drums with closed tops.

The drums generated will be stored on the Project Area prior to waste characterization and disposal. A drum inventory will be maintained documenting the number of drums, drum identification, drum contents, and transport date.

5.0 LABORATORY ANALYSIS AND DATA VALIDATION

Laboratory analyses of soil and groundwater samples will be conducted by a NYSDOH ELAP approved laboratory certified for analyses using the most recent ASP. Laboratory analyses will be conducted in accordance with USEPA SW-846 methods and Category B deliverable format. Sample data deliverables will meet the requirements of the July 2005 NYSDEC ASP for Category B deliverables.

Table 1 summarizes the anticipated analytical methods and quality control samples required. Quality Assurance/Quality Control (QA/QC) procedures required by the SW-846 methods will be followed, including initial and continuing instrument calibrations, standard compound spikes, surrogate compound spikes, and analysis of other samples (blanks, laboratory control samples, matrix spikes/matrix spike duplicates, etc.). The laboratory will provide sample bottles, which have been pre-cleaned and preserved in accordance with the SW-846 methods. NYSDEC ASP holding times will be adhered to. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP will take precedence.

Data validation will be performed in accordance with USEPA Region II standard operating procedures (SOPs) for organic and inorganic data review. These validation guidelines are regional modifications to the National Functional Guidelines for organic and inorganic data review (USEPA 1999 and 2004). Validation will be conducted by the Quality Assurance Officer (QAO) and will include the following:

- Verification of 100% of quality control (QC) sample results (both qualitative and quantitative);
- Verification of the identification of 100% of sample results (both positive hits and non-detects);
- Re-calculation of 10% of investigative sample results; and
- Preparation of a Data Usability Summary Report (DUSR) by the QAO.

Data reduction, validation, and reporting procedures are provided in the QAPP (Appendix A).

6.0 REPORT OF FINDINGS

Following completion of supplemental site characterization activities proposed within this Work Plan and receipt of associated laboratory analytical results, a Supplemental

Site Characterization Report (SSCR) will be prepared. The SSCR will include, but not be limited to, the follow sections:

- An introduction section summarizing the purpose of the investigation and regulatory history.
- A site description and history section summarizing the Project Area location; historic and current property use; and previous investigations.
- A geology and hydrogeology section summarizing the topography, geology and hydrogeology of the Project Area.
- An investigation methods section summarizing the investigation methods and deviations from the Work Plan, if applicable.
- A findings and results section describing the findings and results of the investigation including, but not limited to, LIF/UVOST™ results, distribution of LNAPL, soil and groundwater quality analysis, and physical properties analysis.
- A summary and conclusions section summarizing the purpose and results of the investigation.
- A recommendations section to propose additional investigation or remediation, if applicable.

7.0 PROJECT MANAGEMENT

The following subsections summarize the project team and provide a tentative project schedule.

7.1 Organization and Staffing

The following is a summary of the key members of the project team and their responsibilities:

ExxonMobil		
Key Position	**Contact Name**	**Responsibilities**
Project Manager	Steve Trifiletti Telephone: (718) 387-7374 E-mail: Steve.p.trifiletti@exxonmobil.com	ExxonMobil's Project Manager is responsible for managing the project within ExxonMobil and for ensuring that the consultant completes the work in accordance with the Work Plan.

ExxonMobil's Consultant (Kleinfelder)		
Key Position	**Contact Name**	**Responsibilities**
Project Manager	John E. Wolf Telephone: (631) 218-0612 E-mail: jwolf@kleinfelder.com	The Kleinfelder Project Manager (KPM) is responsible for project execution and will be the primary contact with ExxonMobil on technical and scheduling issues.
Work Assignment Manager	Michael Meyerhoefer Telephone: (631) 218-0612 E-mail: MMeyerhoefer @kleinfelder.com	The Work Assignment Manager will be responsible for working with the Field Supervisor to coordinate, oversee, and ensure that requirements are followed with regard to field activities.
Field Supervisor	Scott Strom Telephone: (631) 218-0612 E-mail: sstrom@kleinfelder.com	The Field Supervisor will be responsible for working with the Work Assignment Manager to ensure that requirements are followed with regard to field activities.
Technical Director	Jeffrey. R. Hale P.G. Telephone: (724) 772-7072 E-mail: JHale@kleinfelder.com	The Technical Director will provide technical support and overall quality assurance for the project.
Quality Assurance Officer (QAO)	Eric Henry Telephone: (860) 683-4200 E-mail: EHenry@kleinfelder.com	The QAO will review the data validation, and DUSR, and ensure that the QAPP is implemented.
Health and Safety Officer (HSO)	Raymond Fitzpatrick Telephone: (631) 218-0612 E-mail: rfitzpatrick@kleinfelder.com	The HSO will prepare the HASP, ensure that the HASP is properly implemented, and ensure that personnel and subcontractor Site personnel are trained in accordance with the Site-specific project health and safety requirements, as well as those of ExxonMobil. In addition, the HSO will act as a field liaison to the QAO to inspect that procedures outlined in the QAPP are implemented.

Subcontractors		
Key Position	**Contact Name**	**Responsibilities**
Data Validator	Lori A. Beyer L.A.B. Validation Corp. Telephone: (516) 523-7891 E-mail: LABValidation@aol.com	The Data Validator will perform the data validation and prepare the DUSR.
Driller	To be determined	Drilling of soil borings.
LIF Contractor	To be determined	Operate LIF/UVOST™ probe tools.
Analytical Laboratory	Accutest Laboratories Dayton, New Jersey NYSDOH Lab ID No.: 10983	Conduct laboratory analysis of soil and water samples in accordance with the QAPP.
Physical Parameters Laboratory	PTS Laboratories, Inc. Santa Fe Springs, California	Conduct physical properties analysis of soil samples.

7.2 Project Schedule

ExxonMobil and Kleinfelder request NYSDEC review and written approval of this Work Plan. The proposed scope of work included in the Work Plan is planned to be implemented as follows:

- Supplemental site characterization activities will be initiated within 60 days of NYSDEC approval to allow for subcontractor procurement, scheduling, access negotiations and communication with property owners. The proposed scope of work is contingent upon, but not limited to, permits, access, drilling conditions (refusal, heave, etc.), and weather conditions.
- The field activities to complete the supplemental site characterization are anticipated to take approximately seven weeks to complete.
- The findings of the investigation will be included in a Supplemental Site Characterization Report to be submitted to the NYSDEC within 120 days following receipt of laboratory analytical results.

The proposed scope of work included in this Work Plan will be implemented according to the schedule discussed above, assuming no unforeseen circumstances or additional activities are required by the NYSDEC. If additional work is required by the NYSDEC for this Site during the same time frame described above, the implementation of said additional work, as well as the activities listed above, will be completed on a revised schedule to be agreed upon by ExxonMobil and the NYSDEC.

8.0 REFERENCES

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TABLES

TABLE 1
GROUNDWATER GAUGING AND FIELD PARAMETERS SUMMARY

Former Pratt Oil Works
Long Island City, New York

April, 2009 through April 21, 2010

		Gauging Data						Field Parameters								
Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-1 (6-18)	4/7/2009	13.49	ND	9.51	ND	NA	3.98	0.4	6.57	11.78	0.68	-302	NA*	530	NM	
	4/17/2009	13.49	ND	9.43	ND	NA	4.06	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	13.49	ND	8.56	ND	NA	4.93	0.6	7.02	17.97	0.57	-231	2.64	0.37	NM	
	10/26/2009	13.49	ND	8.08	ND	NA	5.41	NM	6.72	18.59	2.00	-324	0.00	7.20	0.08	
	1/22/2010	13.49	ND	8.36	ND	NA	5.13	0.2	6.76	11.50	0.58	-295	0.69	5.80	0.03	
MW-2 (2-17)	4/7/2009	6.56	ND	5.45	ND	NA	1.11	80.9	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	6.56	7.72	7.81	0.09	0.89**	-1.17	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.56	7.78	8.88	1.10	0.89**	-1.34	0.5	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	6.56	6.72	8.09	1.37	0.89**	-0.31	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	6.56	8.19	9.93	1.74	0.89**	-1.82	NM	NM	NM	NM	NM	NM	NM	NM	
MW-3 (3-18)	4/7/2009	7.95	NM	NM	NM	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	7.95	NM	NM	NM	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	7.95	NM	NM	NM	0.9386	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	7.95	8.15	9.70	1.55	0.9386	-0.30	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	7.95	8.20	8.22	0.02	0.9386	-0.25	5.5	NM	NM	NM	NM	NM	NM	NM	
MW-4 (5-22)	4/7/2009	8.87	6.59	9.65	3.06	0.8908	1.95	135	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	8.87	6.52	11.55	5.03	0.8908	1.80	NS	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	8.87	6.00	10.95	4.95	0.8908	2.33	7.6	NM	NM	NM	NM	NM	NM	NM	Well abandoned
MW-4S (4-9)	10/26/2009	8.81	6.31	7.20	0.89	0.8908	2.40	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	8.81	6.50	7.27	0.77	0.8908	2.23	161.0	NM	NM	NM	NM	NM	NM	NM	
MW-4D (13.5-18.5)	10/26/2009	8.57	ND	6.95	ND	NA	1.62	NM	6.68	18.10	1.05	-119	0.00	17.00	0.05	
	1/22/2010	8.57	ND	7.72	ND	NA	0.85	4.9	6.78	15.92	1.07	-136	0.66	59.50	0.08	
MW-5 (13-21)	4/7/2009	9.62	7.14	18.82	11.68	0.8952	1.26	23.0	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	9.62	7.32	18.66	11.34	0.8952	1.11	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	9.62	6.99	20.00	13.01	0.8952	1.27	4.7	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	9.62	7.69	18.05	10.36	0.8952	0.84	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	9.62	NM	NM	NM	0.8952	NM	NM	NM	NM	NM	NM	NM	NM	NM	Passive Bailer

TABLE 1
GROUNDWATER GAUGING AND FIELD PARAMETERS SUMMARY

Former Pratt Oil Works
Long Island City, New York

April, 2009 through April 21, 2010

		Gauging Data						Field Parameters								
Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-6	4/7/2009	11.80	9.09	12.18	3.09	0.8944	2.38	68.7	NM	NM	NM	NM	NM	NM	NM	
(18-23)	4/17/2009	11.80	9.35	12.55	3.20	0.8944	2.11	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	11.80	8.79	12.82	4.03	0.8944	2.58	2.9	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	11.80	9.08	15.55	6.47	0.8944	2.04	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	11.80	9.22	18.00	8.78	0.8944	1.65	42.7	NM	NM	NM	NM	NM	NM	NM	
MW-7	4/7/2009	6.54	4.82	5.18	0.36	0.9129	1.69	211	NM	NM	NM	NM	NM	NM	NM	
(1-15)	4/17/2009	6.54	7.74	8.42	0.68	0.9129	-1.26	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.54	7.80	9.30	1.50	0.9129	-1.39	0.0	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	6.54	7.07	7.70	0.63	0.9129	-0.58	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	6.54	6.04	7.62	1.58	0.9129	0.36	40.0	NM	NM	NM	NM	NM	NM	NM	
MW-8	4/7/2009	5.80	ND	4.09	ND	NA	1.71	0.0	7.59	8.07	37.40	-140	3.7	74.9	2.31	
(1-13)	4/17/2009	5.80	ND	7.54	ND	NA	-1.74	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	5.80	ND	7.50	ND	NA	-1.70	0.0	7.68	28.95	27.40	-330	0.26	1.4	NM	
	10/26/2009	5.80	ND	6.83	ND	NA	-1.03	NM	7.10	16.32	32.40	-327	0.00	2.90	2.01	
	1/22/2010	5.80	ND	6.59	ND	NA	-0.79	0.0	7.04	7.15	35.20	-238	1.94	148	2.14	
MW-9	4/7/2009	9.76	8.40	17.70	9.30	0.9074	0.50	106	NM	NM	NM	NM	NM	NM	NM	
(3-18)	4/17/2009	9.76	8.28	17.51	9.23	0.9074	0.63	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	9.76	8.35	17.90	9.55	0.9074	0.53	5.3	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	9.76	8.84	17.90	9.06	0.9074	0.08	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	9.76	9.85	18.20	8.35	0.9074	-0.86	9.8	NM	NM	NM	NM	NM	NM	NM	
MW-10	4/7/2009	10.56	ND	8.74	ND	NA	1.82	1.8	6.90	12.32	0.478	-143	0.0	95.4	0.02	
(3-13)	4/17/2009	10.56	ND	8.64	ND	NA	1.92	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	10.56	ND	8.10	ND	NA	2.46	0.0	6.94	18.44	0.54	-135	5.47	0.0	NM	
	10/26/2009	10.56	ND	8.20	ND	NA	2.36	NM	6.71	17.93	0.78	-180	0.00	5.50	0.04	
	1/22/2010	10.56	ND	8.63	ND	NA	1.93	0.0	6.51	14.69	1.54	-196	0.70	3.70	0.08	

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Former Pratt Oil Works
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April, 2009 through April 21, 2010

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Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-11 (2-17)	4/7/2009	6.98	ND	5.73	ND	NA	1.25	0.0	4.62	10.54	29.6	-242	0.00	77.1	NM	
	4/17/2009	6.98	ND	8.72	ND	NA	-1.74	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.98	ND	7.98	ND	NA	-1.00	0.0	6.87	18.76	26.60	-221	5.49	6.9	NM	
	10/26/2009	6.98	ND	8.15	ND	NA	-1.17	NM	6.71	17.88	30.90	-291	0.00	0.00	1.94	
	1/22/2010	6.98	ND	8.18	ND	NA	-1.20	0.0	6.42	11.58	28.70	-254	1.34	3.20	1.75	
MW-12 (2-16)	4/7/2009	6.67	ND	8.26	ND	0.91**	-1.59	0.0	NM	NM	NM	NM	NM	NM	NM	
	4/17/2009	6.67	8.40	8.41	0.01	0.91**	-1.73	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	6.67	ND	NM	ND	0.91**	NM	NM	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	6.67	7.81	7.95	0.14	0.91**	-1.15	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	6.67	7.80	7.81	0.01	0.91**	-1.13	0.0	NM	NM	NM	NM	NM	NM	NM	
MW-13 (1-8)	4/7/2009	7.82	ND	NM	NM	NA	NM	0.0	8.43	9.68	1.14	-155	0.00	102	0.05	
	4/17/2009	7.82	ND	3.64	ND	NA	4.18	NM	NM	NM	NM	NM	NM	NM	NM	
	7/29/2009	7.82	ND	3.51	ND	NA	4.31	0.0	7.22	20.84	1.40	-131	4.18	0.0	NM	
	10/26/2009	7.82	ND	3.59	ND	NA	4.23	NM	6.87	15.90	1.34	-76	0.0	10.50	0.07	
	1/22/2010	7.82	ND	NM	NM	NA	NM	NM	NM	NM	NM	NM	NM	NM	NM	Inaccessible
MW-14 (7.5-27.5)	7/29/2009	22.92	20.65	26.80	6.15	0.9086	1.71	10.9	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	22.92	21.31	26.50	5.19	0.9086	1.14	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	22.92	21.70	26.98	5.28	0.9086	0.74	NM	NM	NM	NM	NM	NM	NM	NM	
MW-15 (5.5-20.5)	7/29/2009	13.05	ND	10.59	ND	NA	2.46	0.0	7.05	19.48	0.78	-104	0.32	786	NM	
	10/26/2009	13.05	ND	11.32	ND	NA	1.73	NM	6.41	13.60	216.00	-138	8.11	990	0.10	
	1/22/2010	13.05	ND	11.91	ND	NA	1.14	3.8	6.79	15.32	0.89	-121	1.27	122	0.04	
MW-16 (10.5-30.5)	7/29/2009	24.12	20.91	21.00	0.09	0.91**	3.20	0.2	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	24.12	21.25	21.27	0.02	0.91**	2.87	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	24.12	21.52	21.95	0.43	0.91**	2.56	5.9	NM	NM	NM	NM	NM	NM	NM	

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Long Island City, New York

April, 2009 through April 21, 2010

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Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-17	7/29/2009	16.81	14.76	22.20	7.44	0.9122	1.40	3.5	NM	NM	NM	NM	NM	NM	NM	
(8.5-25.5)	10/26/2009	16.81	15.44	23.0	7.56	0.9122	0.71	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	16.81	16.02	22.35	6.33	0.9122	0.23	1.4	NM	NM	NM	NM	NM	NM	NM	
MW-18	9/24/2009	23.55	ND	20.92	ND	NA	2.63	NM	6.50	27.67	1.98	-144	0.40	33.50	NM	
(17.5-37.5)	10/26/2009	23.55	ND	21.32	ND	NA	2.23	NM	6.59	14.84	1.63	-126	0.0	159	0.08	
	1/22/2010	23.55	ND	21.28	ND	NA	2.27	0.5	6.63	14.45	2.00	-133	1.29	47.50	0.10	
MW-19	9/24/2009	24.85	21.95	22.55	0.60	0.9087	2.85	NM	NM	NM	NM	NM	NM	NM	NM	
(11.5-31.5)	10/26/2009	24.85	22.00	23.05	1.05	0.9087	2.75	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	24.85	22.24	23.15	0.91	0.9087	2.53	7.9	NM	NM	NM	NM	NM	NM	NM	
MW-20	7/29/2009	28.63	ND	21.03	ND	NA	7.60	0.1	6.93	19.35	1.43	-94	0.00	189	NM	
(9.5-29.5)	10/26/2009	28.63	ND	21.61	ND	NA	7.02	NM	6.24	16.43	1.14	0.44	0.00	83.20	0.06	
	1/22/2010	28.63	ND	21.99	ND	NA	6.64	0.0	6.53	13.86	1.53	0.99	0.50	98.00	0.08	
MW-21	7/29/2009	16.63	ND	14.37	ND	NA	2.26	0.0	6.96	18.45	1.22	190	4.93	17.8	NM	
(10.5-25.5)	10/26/2009	16.63	ND	14.10	ND	NA	2.53	NM	6.61	5.76	1.07	144	1.07	12.70	0.05	
	1/22/2010	16.63	ND	14.61	ND	NA	2.02	0.0	6.60	13.92	1.25	92	4.04	10.5	0.06	
MW-22	7/29/2009	29.36	25.79	27.20	1.41	0.9092	3.44	0.0	NM	NM	NM	NM	NM	NM	NM	
(14.5-34.5)	10/26/2009	29.36	26.15	28.40	2.25	0.9092	3.01	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	29.36	26.35	28.44	2.09	0.9092	2.82	5.8	NM	NM	NM	NM	NM	NM	NM	
MW-23	7/29/2009	19.05	17.09	23.85	6.76	0.9094	1.35	0.0	NM	NM	NM	NM	NM	NM	NM	
(10.5-24.5)	10/26/2009	19.05	17.76	23.82	6.06	0.9094	0.74	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	19.05	18.39	23.65	5.26	0.9094	0.18	7.9	NM	NM	NM	NM	NM	NM	NM	

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Well ID (screen Interval)	**Date**	**Top of Casing Elevation** (feet)	**Depth to LNAPL** (feet)	**Depth to Water** (feet)	**LNAPL Thickness** (feet)	**Specific Gravity** (g/cm3)	**Corrected GW Elevation** (feet)	**PID Reading** (ppmv)	**pH** (s.u.)	**Temp-erature** (ºC)	**Conductivity** (mS/cm)	**Oxidation-Reduction Potential** (mV)	**Dissolved Oxygen** (mg/L)	**Turbidity** (ntu)	**Salinity** (ppt)	**Comments**
MW-24 (5.5-25.5)	7/29/2009	17.56	15.20	24.10	8.90	0.9034	1.50	0.0	NM	NM	NM	NM	NM	NM	NM	
	10/26/2009	17.56	15.79	24.25	8.46	0.9034	0.95	NM	NM	NM	NM	NM	NM	NM	NM	
	1/22/2010	17.56	16.31	24.75	8.44	0.9034	0.43	NM	NM	NM	NM	NM	NM	NM	NM	

Notes:

~ - no standard or guidance value exists
<1.0 - Not detected at or above the laboratory reporting limit shown
ºC - degrees Celsius
F - degrees Fahrenheit
Corrected GW Elevation - calculated using the following formula:
(top of casing elevation - depth to water) + (LNAPL thickness * LNAPL specific gravity)
Depth to Water - measured in feet below land surface from top of casing
GW - Groundwater
LNAPL - Light non-aqueous phase liquid
mg/L - milligrams per liter (parts per million)
mS/cm - milliSiemens per centimeter
mV - millivolts
N/A - Not applicable
NA - Not analyzed
ND - Not detected
NM - Not monitored
NS - Not sampled
NSVD - Not surveyed to vertical datum
ntu - nephelometric turbidity units
ppmv - parts per million by volume
ppt - parts per thousand
s.u. - standard units
* - equipment malfunction
** - estimated value based on surrounding wells
Field Parameters - Measured from monitoring wells without LNAPL detections during groundwater sampling.
Date on table may not reflect actual measurement date.

Table 2
NAPL VISCOSITY AND SPECIFIC GRAVITY SUMMARY

Former Pratt Oil Works
Long Island City, New York

Sample ID	Sample Date	Temperature (F)	Kinematic Viscosity (cst)	Dynamic Viscosity mPas	Specific Gravity (Density) (g/mL)
SB-10	3/16/2009	100	16.78	14.88	0.8866
		77	28.96	25.92	0.8951
		50	64.67	58.53	0.9051
TP-8	4/1/2009	100	32.47	29.20	0.8992
		77	61.77	56.06	0.9076
		50	158.71	145.59	0.9174
MW-3(3-18)	8/7/2009	100	97.64	92.67	0.9491
		77	226.67	217.03	0.9575
		68**	490.51	471.55	0.9614
MW-4(5-22)	1/2/2009	100	7.27	6.35	0.8737
		77	10.97	9.68	0.8824
		50	20.05	17.90	0.8928
MW-5(13-21)	1/8/2009	100	15.97	14.12	0.8845
		77	27.49	24.55	0.893
		50	61.37	55.42	0.903
MW-6(18-23)	4/17/2009	100	16.47	14.60	0.8862
		77	28.60	25.58	0.8947
		50	64.57	58.42	0.9047
MW-7(1-15)	4/17/2009	100	27.17	24.57	0.9044
		77	49.97	45.62	0.913
		50	122.22	112.79	0.9229
MW-9(3-18)	3/24/2009	100	19.32	17.19	0.8899
		77	34.15	30.68	0.8984
		50	79.23	71.97	0.9083
MW-14(7.5-27.5)	7/13/2009	100	18.36	16.27	0.8863
		77	32.31	28.93	0.8956
		50	74.57	67.56	0.906
MW-17(8.5-25.5)	7/13/2009	77*	31.45	28.15	0.8949
		60	51.49	46.40	0.9012
		50	71.61	64.80	0.9048
MW-19(11.5-31.5)	9/28/2009	100	21.23	18.91	0.8903
		77	38.41	34.53	0.8988
		50	92.18	83.76	0.9087
MW-22(14.5-34.5)	7/13/2009	100	16.38	14.52	0.8861
		77	28.52	25.51	0.8946
		50	64.78	58.60	0.9046
MW-23(10.5-24.5)	7/13/2009	100	18.00	15.96	0.8866
		77	31.36	28.08	0.8951
		50	71.59	64.80	0.9051
MW-24(5.5-25.5)	7/30/2009	100	17.39	15.42	0.8866
		77	30.59	27.38	0.8951
		50	70.36	63.68	0.905

Notes:

F - degrees fahrenheit
cst - centistokes
NAPL - Non-aqueous phase liquid
mPas - Millipascal
g/mL - grams per milliliter
* Sample run with modified temperature profile due to volatility at 100F
** Sample run with modified temperature profile due to waxing at 50F and 60F

Table 3
SUMMARY OF PROPOSED SAMPLES AND LABORATORY ANALYSES

Former Pratt Oil Works
Long Island City, New York

Soil Sample Analysis

Sample IDs	Parameter	Analytical Method	Lab	Field Samples				QC Blanks			Total
				Field Samples	Field Duplicates (1/20)	MS/MSD (Total) (1/20)	Subtotal	Equipment Blanks (1/20)	Field Blanks (1/20)	Trip Blanks	
LIF-7, LIF-11, LIF-22, LIF-27, LIF-28, LIF-29, LIF-31, LIF-32, LIF-38, LIF-42, LIF-45, LIF-47, LIF-53, LIF-56, and SB-16 to SB-20	TCL VOCs	USEPA SW846 8260B	Accutest	19	1	1/ 1	22	1	1	1	25
	TCL SVOCs	USEPA SW846 8270C		19	1	1/ 1	22	1	1	0	24
	TAL Metals & CN	USEPA SW846 6010B, 7470A, 335.4		19	1	1/ 1	22	1	1	0	24
	TPH DRO, GRO and GC Fingerprinting	USEPA SW846 8015		19	1	1/ 1	22	1	1	0	24
	TOC	USEPA SW846 9060M		19	1	1/ 1	22	1	1	0	24
SB-16 to SB-20	Chloride	USEPA SW846 9056		5	1	1/ 1	8	1	1	0	10
	Sulfate	USEPA SW846 9056		5	1	1/ 1	8	1	1	0	10
	pH	SW846 9045C		5	1	1/ 1	8	1	1	0	10

Table 3
SUMMARY OF PROPOSED SAMPLES AND LABORATORY ANALYSES

Former Pratt Oil Works
Long Island City, New York

Groundwater Sample Analysis											
Sample IDs	**Parameter**	**Analytical Method**	**Lab**	**Field Samples**				**QC Blanks**			**Total**
				Field Samples	**Field Duplicates** (1/20)	**MS/MSD (Total)** (1/20)	**Subtotal**	**Equipment Blanks** (1/20)	**Field Blanks** (1/20)	**Trip Blanks**	
SB-16 to SB-20	TCL VOCs	USEPA SW846 8260	Accutest	5	1	1/ 1	8	1	1	1	11
	TCL SVOCs	USEPA SW846 8270B		5	1	1/ 1	8	1	1	0	10
	TAL Metals & CN	USEPA SW846 6010B, 7470A, 335.4		5	1	1/ 1	8	1	1	0	10
	Ammonia	SM20 4500NH3G		5	1	1/ 1	8	1	1	0	10
	Chloride	USEPA SW846 9056		5	1	1/ 1	8	1	1	0	10
	Bromide	USEPA SW846 9056		5	1	1/ 1	8	1	1	0	10
	Nitrate	USEPA 353.2		5	1	1/ 1	8	1	1	0	10
	Total Kjeldahl nitrogen	USEPA 351.2		5	1	1/ 1	8	1	1	0	10
	Sulfate	USEPA SW846 9056		5	1	1/ 1	8	1	1	0	10
	pH	SM20 4500H B		5	1	1/ 1	8	0	0	0	8
	Chemical Oxygen Demand (COD)	SM20 5220C		5	1	1/ 1	8	1	1	0	10
	Biological Oxygen Demand (BOD)	SM5210B		5	1	1/ 1	8	1	1	0	10
	Volatile Fatty Acids	AM23G	Microseeps	5	0	1/ 1	7	1	1	0	9

Table 3
SUMMARY OF PROPOSED SAMPLES AND LABORATORY ANALYSES

Former Pratt Oil Works
Long Island City, New York

Notes:

CN - Cyanide
DRO - Diesel Range Organics
FID - Flame ionization detector
GC - gas chromatography
GRO - Gasoline Range Organics
Matrix spike (MS) / matrix spike duplicate (MSD) for organic analyses; matrix spike and laboratory duplicate for inorganic analysis
N A - not applicable
NAPL - Non-aqueous phase liquid
PAH - polyaromatic hydrocarbons
PCBs - Polychlorinated biphenyls
QC- quality control
SVOCs - semi-volatile organic compounds
TAL - Target Analyte List
TCL - Target Compound List
TOC - Total Organic Carbon
TPH - Total Petroleum Hydrocarbons
USEPA - United States Environmental Protection Agency
VOCs - volatile organic compounds

Table 4
SUMMARY OF PROPOSED SAMPLES AND PHYSICAL PROPERTIES ANALYSES

Former Pratt Oil Works
Long Island City, New York

Soil Sample Physical Properties Analysis

Sample IDs	Description	Method
LIF-1 to LIF-4, LIF-15, LIF-17, LIF-24, LIF-26, LIF-27, LIF-30, LIF-45, LIF-47, LIF-53, LIF-54, and LIF-56	**Grain Size Analysis:** Laser or sieve method; includes tabular data, statistical sorting and graphics in Excel format.	ASTM D422 ASTM D4464
LIF-1 to LIF-4, LIF-15, LIF-17, LIF-24, LIF-26, LIF-30, and LIF-54	**Atterberg Limits**	ASTM D4318
	Soil Classification: Engineering USCS (requires Particle Size and Atterberg Limits)	ASTM D2487
	Pore Fluid Saturation Package: Dean-Stark Method: Includes initial pore fluid saturations, total porosity, air-filled porosity, grain density, dry bulk density and moisture content	API RP 40
	Air/Water Drainage Capillary Pressure Data: Centrifugal Method; Includes initial and residual fluid saturations, water production vs. capillary pressure, total porosity, dry bulk density, air permeability and hydraulic conductivity.	API RP 40 ASTM D6836 EPA 9100
	Relative Permeability from Pc Curve: Relative permeability calculated from Air/Water capillary pressure curve; includes van Genuchten parameters.	Curve Fitting Van Genuchten Mualem
	Brooks-Corey: Calculated from Air/Water capillary pressure curve (requires van Genuchten curve fit).	Curve Fitting Brooks-Corey
	Free Product Mobility Package: Applied centrifugal force demonstrates product mobility. Includes initial and residual pore fluid saturations, total porosity, grain density and dry bulk density.	Modified ASTM D425

Table 4
SUMMARY OF PROPOSED SAMPLES AND PHYSICAL PROPERTIES ANALYSES

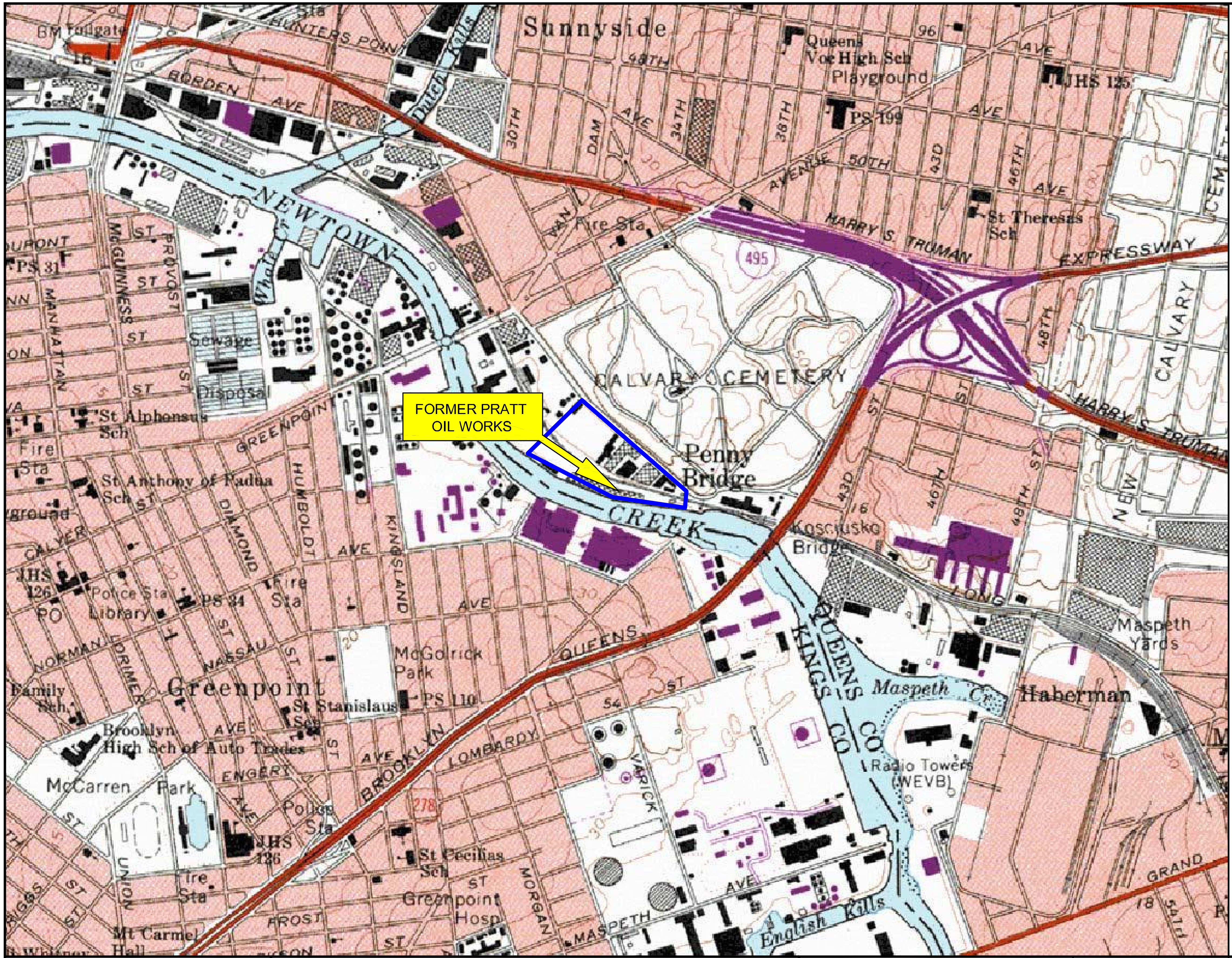
Former Pratt Oil Works
Long Island City, New York

Soil Sample Core Photography		
Sample IDs	**Description**	**Method**
LIF-1 to LIF-4, LIF-15, LIF-17, LIF-24, LIF-26, LIF-30, and LIF-54	**Core Slabbing and Preparation:** Core cryogenically sliced open for viewing/photography using a diamond segmented horizontal bandsaw; 1/3 x 2/3 or 1/4 x 3/4 sections.	Cryogenic
	PhotoLog™ Digital Core Photography: color (white light) plus ultra violet, full-scale strip format.	Proprietary

Notes:

ASTM - American Society for Testing and Materials
API RP 40 - American Petroleum Institute Recommended Practice
USCS - Unified Soil Classification system
EPA - United States Environmental Protection Agency

FIGURES



0 500 1,000 2,000
SCALE (feet)

APPROXIMATE LOCATION OF FORMER PRATT OIL WORKS

N

LATITUDE:	40° 43' 47.32" N
LONGITUDE:	73° 56' 08.26" W

SOURCE:
USGS 7.5' SERIES TOPOGRAPHIC MAP,
"BROOKLYN, NY QUADRANGLE
PHOTOREVISED 1979"

QUADRANGLE
LOCATION

BOHEMIA, NY

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PROJECT NO.	108988
DRAWN:	04/08/2010
DRAWN BY:	JR
CHECKED BY:	
FILE NAME:	

LOCUS PLAN

FORMER PRATT OIL WORKS
THE INLAND PARCELS (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
1

LEGEND

	APPROXIMATE BOUNDARY OF FORMER PRATT OIL WORKS
— — —	PROPERTY LINE
—o—	CHAINLINK / ALUMINUM FENCE LINE
—X—	STOCKADE FENCE LINE
—OHL—	OVERHEAD UTILITY LINES
—S—	UNDERGROUND SEWER LINE
—SD—	UNDERGROUND STORM DRAIN LINE
—ELEC—	UNDERGROUND ELECTRIC LINES
—V—	UNDERGROUND WATER SUPPLY LINE
—GAS—	UNDERGROUND GAS LINE
—PP—	PETROLEUM PIPELINE
⊕	MONITORING WELL LOCATION
⊕	ABANDONED/DESTROYED MONITORING WELL LOCATION
●	SOIL BORING LOCATIONS
☐ ○	TEST PIT LOCATION
	10,000-GALLON UST (HOLDING TANK)
	AREA LIGHT
	UTILITY POLE
Ⓢ	SANITARY MANHOLE
Ⓦ	WATER METER
⋈	WATER VALVE
	FIRE HYDRANT
Ⓔ	ELECTRIC VAULT
	ELECTRIC VAULT
●	UTILITY MANHOLE
X 11.88	TEST PIT ELEVATION
- 7.55	TEST PIT ELEVATION
UST	UNDERGROUND STORAGE TANK
C/O	CLEAN OUT
TOC	TOP OF CASING ELEVATION
RIM	MANHOLE/SURFACE ELEVATION
LSA	LANDSCAPED AREA

NOTES:

SURVEY ELEVATIONS RELATIVE TO NORTH AMERICAN VERTICAL DATUM (NAVD) 1988

SOURCE:

CONTROL POINT ASSOCIATES, INC.
BOUNDARY, LOCATION & UTILITY SURVEY
MARCH 6, 2009, DRAWING 1 OF 1 AND BOUNDARY,
LOCATION AND UTILITY SURVEY NEWTON CREEK AND
REVIEW AVENUE LOTS 349, 362, 500, 1362, AND 1367
BLOCK 312 SECTION Z. JULY 6, 2009

THE EDUCATION LAW OF THE STATE OF NEW YORK PROHIBITS ANY PERSON ALTERING ANYTHING ON THESE DRAWINGS AND/OR THE ACCOMPANYING SPECIFICATIONS, UNLESS IT IS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. WHERE SUCH ALTERATIONS ARE MADE, THE PROFESSIONAL ENGINEER MUST SIGN, SEAL, DATE AND DESCRIBE THE FULL EXTENT OF THE ALTERATION ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS. (NYS EDUCATION LAW SECTION 7209-2)

NO.	REVISION	BY	DATE
1			

KLEINFELDER ENGINEERING P.C.
ONE CORPORATE DRIVE
BOHEMIA, NEW YORK
PH. (631) 218-0612 FAX. (631) 218-0787
www.kleinfelder.com

PROJ. NO.	108988
ACAD FILE:	FPOW SITE PLAN WATERFRONT.dwg
DRAWN BY:	JR
CHECKED BY:	-
DESIGNED BY:	-

SITE PLAN

FORMER PRATT OIL WORKS
THE INLAND PARCELS (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FOR REDUCED PLANS:
ORIGINAL IN INCHES
0 0.5 1.0 1.5 2.0

DATE: 05/28/2010

SCALE: 1" = 60'

FIGURE
2

3 of 28 sheets

N

0 40 80
Feet
1 inch equals 80 feet

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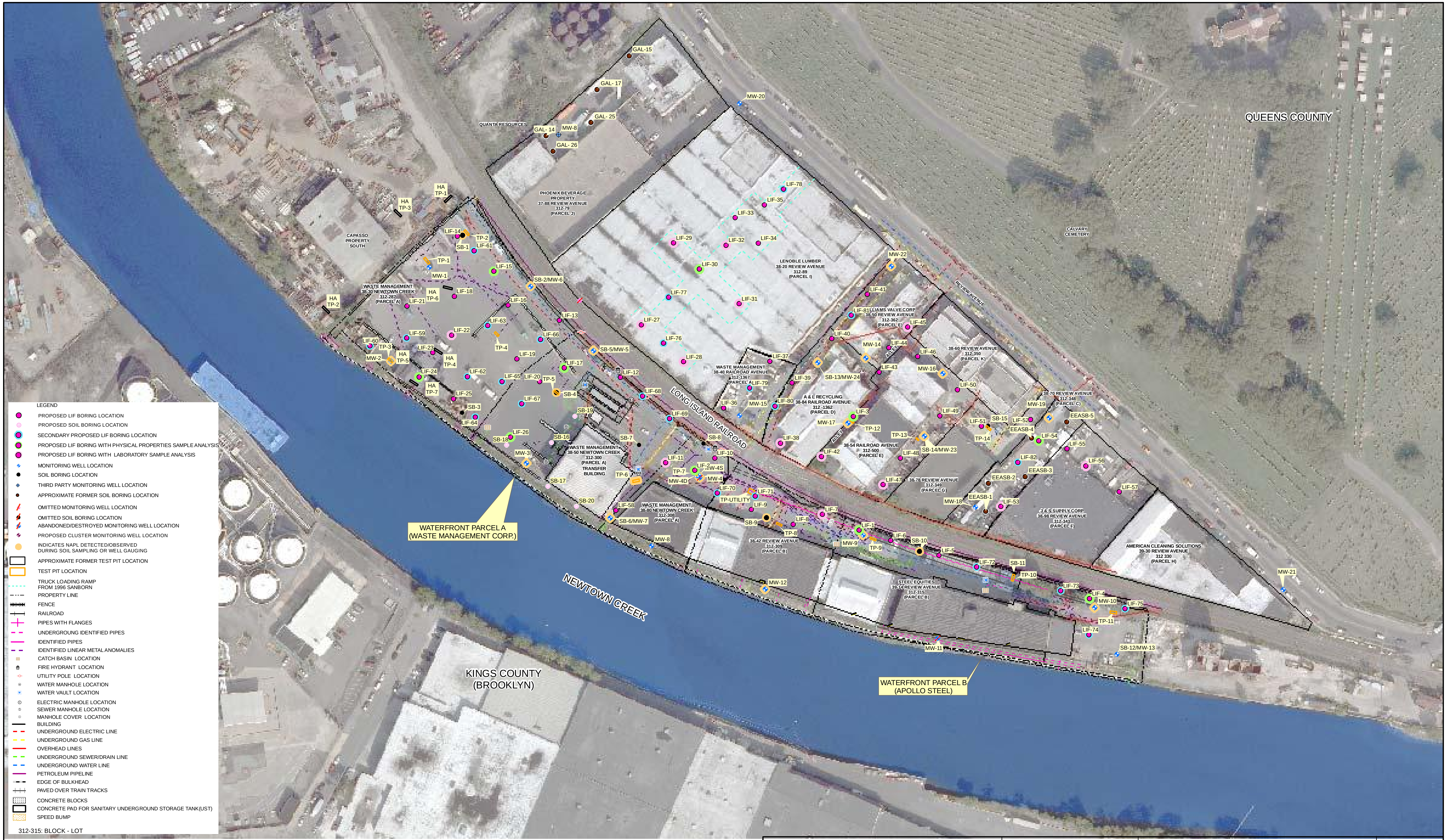
PROJECT NO.	108988
DRAWN:	04/08/2010
DRAWN BY:	J.R.
CHECKED BY:	J.W.
FILE NAME:	

AERIAL PLAN

FORMER PRATT OIL WORKS
THE INLAND PARCELS (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
3



SOURCE: MICROSOFT AERIAL IMAGERY 2006

N

0 40 80
Feet
1 inch = 80 feet

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PROJECT NO.	108988
DRAWN:	07/19/2010
DRAWN BY:	J.R.
CHECKED BY:	J.W.
FILE NAME:	

AERIAL PLAN WITH PROPOSED SOIL BORING LOCATIONS

FORMER PRATT OIL WORKS
THE INLANDS PARCEL (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
4

SOURCE: MICROSOFT AERIAL IMAGERY 2006

N

0 40 80
Feet

1 inch = 80 feet

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PROJECT NO. 108988
DRAWN: 07/19/2010
DRAWN BY: J.R.
CHECKED BY: J.W.
FILE NAME:

AERIAL PLAN WITH PROPOSED
SOIL BORING LOCATIONS - 1949

FORMER PRATT OIL WORKS
THE INLANDS PARCEL (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
5

APPENDIX A

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN FOR SUPPLEMENTAL SITE CHARACTERIZATION

Former Pratt Oil Works
The Inland Project Area (Tract I)
The Waterfront Project Area (Tract II)
Long Island City, New York

NYSDEC Case No. 07-07418 (Parcel A)
NYSDEC Case No. 08-13060 (Parcel B)
NYSDEC Case No. 08-13060 (Parcel C)
NYSDEC Case No. 09-04539 (Parcel D)
NYSDEC Case No. 09-03356 (Parcel E)
NYSDEC Case No. 09-03488 (Parcel G)
NYSDEC Case No. 09-03616 (Parcel H)
NYSDEC Case No. 09-03287 (Parcel I)

Consent Order Case No. D2-1002-12-07AM
NYSDEC Remedial Tracking No. S241115

July 27, 2010

Prepared by:

Kleinfelder East, Inc.
One Corporate Drive, Suite 201
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(631) 218-0612

Prepared for:

ExxonMobil Environmental
Services Company
400 Kingsland Avenue
Brooklyn, New York 11222
(718) 389-3052

QUALITY ASSURANCE PROJECT PLAN FOR SUPPLEMENTAL SITE CHARACTERIZATION

Former Pratt Oil Works
The Inland Project Area (Tract I)
The Waterfront Project Area (Tract II)
Long Island City, New York

Quality Assurance Project Plan Identification and Approval

The attached Quality Assurance Project Plan for Supplemental Site Characterization is hereby recommended for approval and commits the participants of the program to follow the elements described within.

Signature: John E Wolf Date: 7/27/10
Project Manager, Kleinfelder,
John Wolf

Signature: Michael Meyerhoefer Date: 7/27/10
Work Assignment Manager, Kleinfelder,
Michael Meyerhoefer

Signature: John E Wolf for Date: 7/27/10
Quality Assurance Officer, Kleinfelder,
Eric Henry

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF TABLES AND FIGURES

TABLES

FIGURES

FOREWORD

This Quality Assurance Project Plan (QAPP) describes the quality assurance and control activities to be implemented to ensure that the data generated during the Supplemental Site Characterization are of appropriate quality to meet the data quality objectives (DQOs). The field component involves sampling and analysis in an effort to further evaluate the extent of light non-aqueous phase liquid (LNAPL) beneath the Project Area and low pH conditions in the southern portion of Waterfront Parcel A. Data from this sampling and analysis effort will be used to assess risks posed to human health or the environment by potential former releases. This QAPP provides a guide and overall approach for sample collection, sample analyses and report preparation.

LIST OF ACRONYMS AND ABBREVIATIONS

Accutest	Accutest Laboratories of Dayton, New Jersey
°C	degrees Celsius
%C	percent complete
COC	chain-of-custody
CVFAA	cold vapor flame atomic absorption
DQOs	data quality objectives
DUSR	Data Usability Summary Report
ELAPP	Environmental Laboratory Approval Program
ExxonMobil	ExxonMobil Environmental Services Company
FPOW	Former Pratt Oil Works
GC/MS	gas chromatography/mass spectrometry
HASP	Health and Safety Plan
ICP	inductively-coupled plasma emission spectroscopy
Kleinfelder	Kleinfelder East, Inc.
LCS	laboratory control sample
LIF	laser induced fluorescence
LIRR	Long Island Rail Road
LNAPL	light non-aqueous phase liquids
MDL	method detection limit
ml	milliliter
MS	matrix spike
MSD	matrix spike duplicate
NIST	National Institute of Standards
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
ORD	Office of Research and Development
PARCC	precision, accuracy, representativeness, completeness, and comparability
PID	photo-ionization detector
QAPP	Quality Assurance Project Plan
QA	quality assurance
QAO	Quality Assurance Officer
QC	quality control
%R	percent recovery
RPD	relative percent difference
SDG	sample delivery group
SOP	standard operating procedure
SVOCs	semi-volatile organic compounds
TAGM	Technical and Administrative Guidance Memorandum
TAL	target analyte list
TCL	target compound list
TSA	Technical System Audit
TOGS	Technical and Operational Guidance Series
UVOST®	Ultraviolet Optical Screening Tool
USEPA	United States Environmental Protection Agency
VFA-LL	volatile fatty acids with low level detection capability
VOA	volatile organic analysis
VOC	volatile organic compound

1.0 INTRODUCTION

ExxonMobil Environmental Services Company (ExxonMobil) on behalf of ExxonMobil Oil Corporation contracted Kleinfelder East, Inc. (Kleinfelder) to prepare this Quality Assurance Project Plan (QAPP), for the Inland (Inland Project Area) and Waterfront Parcels (Waterfront Project Area), which compose Tract I and II (collectively referred to as the "Project Area") of the Former Pratt Oil Works (FPOW). This QAPP describes the objectives and quality assurance/quality control (QA/QC) protocols to be used to achieve the data quality objectives (DQOs) established for the Supplemental Site Characterization Work Plan (Work Plan) prepared by Kleinfelder and dated July 27, 2010. The location of the Project Area is illustrated on Figure 1.

1.1 Scope and Project Objectives

The activities to be performed at the Project Area for which this QAPP has been developed include the additional investigation of light non-aqueous phase liquids (LNAPL) using laser induced fluorescence (LIF)/Ultraviolet Optical Screening Tool (UVOST®) technology and the drilling of additional soil borings in the vicinity of monitoring well MW-3, using direct push technology. The objective of the LIF/UVOST® investigation is in an effort to further characterize horizontal and vertical distribution of LNAPL in soil, if present. The objective of the additional soil and groundwater sampling in the vicinity of well MW-3 is in an effort to further investigate the horizontal extent of a low pH condition.

1.2 Site Description

The Project Area encompasses approximately 18.5 acres located adjacent to Newtown Creek. The Project Area has been subdivided into 16-lots of Block 312 since 1949. The Project Area is divided north and south by the Long Island Rail Road (LIRR) train tracks. Properties north of the LIRR are the Inland Project Area (Tract I) and properties south of the LIRR are the Waterfront Project Area (Tract II). Each tract is further subdivided into parcels (Parcels A through K) based on property ownership. Therefore, each parcel may have more than one address based on property ownership. A Site Plan illustrating pertinent site features including, but not limited to, block and lot, parcel identification, property boundaries, LIRR and current buildings and structure layouts is provided on Figures 2 and 3.

The Project Area is located approximately 1,000 feet southeast of the Greenpoint Avenue Bridge. Public utilities servicing the Project Area include underground water, electric, gas and telecommunication lines. Sanitary waste is stored on each parcel in what appear to be septic tanks; however, the construction of the structures was not confirmed. The results of a survey of the property boundaries and pertinent site features of the Project Area are provided on Figure 2.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

The supplemental site characterization will require the integration of personnel from the organizations identified below, referred to as the Project Team. A detailed description of the responsibilities of each member of the project team is presented below.

2.1 New York State Department of Environmental Conservation (NYSDEC)

The NYSDEC responsibilities and duties include:

- Overall direction of the supplemental site characterization activities;
- Review of Kleinfelder work products, including data, memoranda, letters, reports, and all documents transmitted; and
- Assure corrective actions are taken for deficiencies cited during audits of sampling/analytical activities.

2.2 Kleinfelder

Kleinfelder has overall responsibility for the supplemental site characterization activities. Kleinfelder will perform the screening, site assessment, sampling and disposal characterization described in the Work Plan. Additionally, Kleinfelder will be responsible for evaluating the resulting sampling data and preparing required data submittals. In general, Kleinfelder's responsibilities and duties include contractor coordination (e.g., driller, analytical laboratory, data validator, etc.), field oversight, stakeholder communications, and summary report preparation. The duties of the Kleinfelder team members are more thoroughly described below.

2.2.1 Project Manager

The Project Manager will direct Kleinfelder's overall work effort, communicate with the NYSDEC, and ensure that the work is conducted in accordance with the Work Plan and QAPP. John Wolf will serve as the Project Manager and his responsibilities will be as follows:

- Manage aspects of the project as defined in the site-specific work instructions with an emphasis on adhering to the objectives of the Work Plan;
- Ensure that staff conform to the QA requirements for training and experience;
- Ensure that the project is appropriately organized with effective lines of communication;
- Distribute and enforce the Work Plan and QAPP among staff and contractors;
- Consult with the NYSDEC on proposed deviations from the Work Plan and QAPP;
- Report program status, problems, and corrective actions as required by the contract and the QAPP;
- Review and approve work products and technical reports to ensure that QA goals are met; and
- Review QA reports from the Quality Assurance Officer.

2.2.2 Work Assignment Manager

The Work Assignment Manager will coordinate the field activities associated with the Work Plan and will be responsible for assuring the Project Manager that the work is conducted in accordance with the QA requirements. Michael Meyerhoefer will serve as the Work Assignment Manager and his responsibilities will be as follows:

- Ensure the effective and timely completion of sampling and analysis tasks so that project deadlines are met;

- Manage day-to-day investigation and sampling activities;
- Ensure that project responsibilities and authorities for making critical decisions are clearly understood by the field staff and contractors;
- Develop, establish, and maintain files on investigation and sampling activities;
- Review data from the investigation and sampling activities;
- Assure corrective actions are taken for deficiencies cited during audits of investigation and sampling activities;
- Monitor overall QA/QC activities of the portions of the field assessment;
- Review field records and logs;
- Instruct personnel working on investigation and sampling activities;
- Coordinate field and laboratory schedules pertaining to investigation and sampling activities;
- Request sample bottles from the laboratory;
- Review the field instrumentation, maintenance, and calibration to meet QAPP requirements;
- Prepare sections of reports pertaining to relevant assessment activities; and
- Maintain field and laboratory files of field forms and logs, data reductions and calculations.

2.2.3 Quality Assurance Officer (QAO)

The QAO is responsible for keeping the Project Manager and Work Assignment Manager informed of the QA/QC compliance status of project activities and of QA/QC problems. Eric Henry will serve as the QAO and his responsibilities will be as follows:

- Ensure that field staff are informed of the project QA requirements;
- Review sampling procedures and analytical method requirements with the Work Assignment Manager to ensure that program QA requirements are addressed;
- Conduct performance and data audits of sampling and analysis activities to assess compliance of sample collection, analysis and handling procedures;
- Report audit results, along with problems and corrective action requests, to the Work Assignment Manager and Project Manager;
- Review proposed deviations from the QAPP with the Project Manager and Work Assignment Manager;
- Review laboratory data packages; and
- Review work products and reports to ensure that QA goals are met.

The QAO will be independent of the unit generating the data.

2.2.4 Health and Safety Officer (HSO)

The HSO will be responsible for overseeing that Kleinfelder personnel and contractors engaged in sample collection are properly trained for field work in accordance with applicable health and safety requirements. Ray Fitzpatrick will serve as the HSO and his responsibilities will be as follows:

- Ensure that field personnel have the proper training and health and safety equipment required for the project;
- Maintain and update the site-specific Health and Safety Plan (HASP) to ensure that applicable hazards and potential contaminants are appropriately addressed;
- Conduct safety audits of field activities to assess compliance with the HASP;
- Report safety audit results along with problems and corrective action requests to the Work Assignment Manager and Project Manager; and
- Investigate site-related emergencies, including accidents, illness or personal exposure to hazardous substances.

2.2.5 Field Team

The Field Team will conduct the on-site sampling activities and be responsible for compliance with the QA and safety requirements. Field Team members have had a 40-hour training course on hazardous waste sampling conducted in accordance with 29 Code of Federal Regulations (CFR) 191 0.120 and have participated in annual 8-hour refresher courses. Field Team duties will include the following:

- Prepare sample labels and field paperwork;
- Perform field procedures as detailed in the Work Plan and in accordance with the QAPP;
- Perform field analyses and collect QA samples;
- Propose and justify required deviations from the QAPP and obtain approval for deviations from the Work Assignment Manager and Project Manager;
- Calibrate, operate, and maintain field instrumentation equipment;
- Maintain sample custody; and
- Complete field records and logs and provide copies to the Work Assignment Manager.

2.3 Contract Analytical Laboratory

In general, the Contract Analytical Laboratory, Accutest Laboratories of Dayton New Jersey (Accutest), will be charged with the analysis and data reporting of samples collected in accordance with the Work Plan and QAPP. The Contract Analytical Laboratory will work directly with the Project Manager and QAO and will have the following responsibilities:

- Receive samples and maintain custody of the samples and documentation;
- Analyze samples according to the methodology specified in the Work Plan and QAPP;
- Provide data deliverables packages as requested;
- Inform Project Manager and QAO of changes or alterations necessary to achieve quantitation of analytes at the concentration level required by the QAPP;
- Adhere to requirements and protocols specified in the Work Plan and QAPP and immediately notify the Project Manager and QAO of modifications or deviations;
- Inform the Project Manager and QAO of sample delivery, storage, QC or analytical problems; and
- Verify the final analytical data prior to transmittal to Kleinfelder.

2.4 Data Validator

Data validation will be performed by L.A.B. Validation Corporation in accordance with United States Environmental Protection Agency (USEPA) Region II standard operating procedures (SOPs) for organic and inorganic data review. These validation guidelines are regional modifications to the National Functional Guidelines for Organic and Inorganic data review (USEPA 1999 and 2004). Validation will include the following:

- Verify 100% of QC sample results (both qualitative and quantitative);
- Verify the identification of 100% of sample results (both positive hits and non-detects);
- Re-calculate 10% of investigative sample results; and
- Prepare a Data Usability Summary Report (DUSR) for each sample delivery group (SDG).

3.0 SAMPLING PROGRAM

The primary objective of the sampling program outlined in this QAPP is to obtain representative samples that yield results of consistent quality. The use of proper sampling techniques, sampling equipment, strict sampling controls in the field, and appropriate custody procedures will reduce the potential for non-representative samples and unreliable analytical data. QA/QC objectives pertinent to proper sampling procedures are outlined in this Section.

3.1 Sampling Design

The data generated by the supplemental site characterization will be used in an effort to evaluate the extent of LNAPL distribution and soil and groundwater quality. Up to 19 soil samples will be collected during the supplemental site characterization for laboratory analysis based on photo-ionization detector (PID) response, LIF response, observed staining, and/or depth relative to the apparent water table. Up to five groundwater samples will be collected from selected soil boring locations and submitted for laboratory analysis. A summary and rationale for the proposed sampling locations, sample types, sample analysis, and sample frequency are presented in the Work Plan. Also included in the Work Plan are detailed descriptions of activities planned for the supplemental site characterization.

3.2 Decontamination Procedures

Temporary decontamination areas will be established during intrusive activities. The temporary decontamination areas may include proximate areas constructed with wooden railroad ties or poly vinyl chloride (PVC) pipes and lined with a 6-ml thick polyethylene liner (or similar liner) or consist of an area with decontamination buckets on polyethylene plastic sheets. The following procedures are proposed to decontaminate equipment used during the supplemental site characterization activities:

- Drilling equipment, including, but not limited to; augers, bits, rods, tools, and split-spoon samplers will be cleaned with a high-pressure steam cleaning unit and Alconox® cleaning solution before use each day; between soil boring locations; and prior to leaving the site.

- Direct push and soil sampling equipment including, but not limited to, macro core soil samplers, rods, and hand augers will be decontaminated between soil samples using an Alconox® cleaning solution, followed by a potable water rinse and a deionized water rinse.
- Direct push groundwater sampling equipment including, but not limited to, extractable screen and rods will be decontaminated between samples using an Alconox® cleaning solution, followed by a potable water rinse and a deionized water rinse.
- Tools, samplers and drill rods will be placed on polyethylene plastic sheets or on the drill rig racks following cleaning.

Rinseate collected from the decontamination activities will be transferred to 55-gallon drums. The drums will be stored and managed as described in Section 4.0 of the Work Plan pending characterization and disposal.

3.3 Sample Containers, Preservation and Holding Times

The sample containers will be supplied by the contract laboratory for analysis by the specified analytical methods. The containers will be cleaned and QC-tested by the contract laboratory in accordance with the appropriate USEPA methods prior to shipping the containers to the field sampling team. Preservatives, when required, will be added to the sample container by the laboratory before shipment to the field. Sample containers with caps (e.g., glass jars, volatile organic analysis [VOA] vials, amber bottles, or polyethylene bottles) will be shipped to the user with sample coolers in protective cardboard cartons or other wrapping. Glass containers (including VOA vials) will be provided with Teflon®-lined caps or Teflon septa, and polyethylene containers will be provided with polypropylene closures.

The sampler must use the appropriate sample container as specified by the analytical method for each sample type. Table 1 lists the USEPA method, type of container, preservative, and the holding time requirements for the analytical parameters.

3.4 Sampling Procedures

The proposed sampling procedures are detailed in the Work Plan and summarized in the sections below.

3.4.1 Soil Samples

Soil samples will be collected using a Geoprobe® macro-core® sampling device lined with an acetate sleeve. Soil samples will be collected from the terminal depth of pre-clearing to a minimum depth of 10 feet into the apparent water table. A representative soil sample will be obtained by driving the macro-core® sampling device into the subsurface. Upon retrieval, the acetate liner and soil core will be removed then the sampler will be decontaminated, reassembled with a new liner and returned to the borehole to collect the next soil core. Field QC samples to be collected as part of this investigation are discussed in Section 3.9.

3.4.2 Groundwater Samples

Groundwater samples will be collected from the soil borings using an approximately four-foot long stainless steel sampling screen following collection of soil samples. To collect a groundwater sample, the stainless steel screen will be inserted inside a stainless steel sheath, and a drive head will be attached to the sheath. An expendable steel point will then be attached to the end of the sheath and the assembly will be driven approximately 4-feet into the groundwater table using the Geoprobe® rig. When the desired depth is reached, the sheath will be retracted to expose the stainless steel screen and approximately three to five screen volumes of groundwater will be purged using disposable polyethylene tubing and a peristaltic pump. If the screen goes dry before the required volumes are removed, then it will be allowed to recover, purged a second time until dry or until the required volumes are removed, then sampled when it recovers sufficiently. Field QC samples to be collected as part of this investigation are discussed in Section 3.9.

3.5 Sample Handling and Shipment

After the soil and groundwater samples are collected, they will be prepared for transportation (as soon as practicable) to the project laboratory for analysis. Field personnel will use the following procedures when packing and transporting samples to the laboratory:

- Use waterproof plastic insulated coolers for samples;
- Check samples for proper labeling and sample information per Section 3.6.3;
- Wrap each glass container in "bubble wrap" or similar material;
- Package wet ice or a combination of wet ice and/or “blue ice” in re-sealable bags and place a “layer” of ice bags at the bottom of the cooler;
- Place two sheets of cushion material, such as "bubble wrap", on the top of the layer of ice bags;
- Package samples in individual re-sealable bags prior to placement in the cooler;
- Package wet ice or a combination of wet ice and “blue ice” in re-sealable bags and place ice bags around and on top of the samples;
- Put paperwork (i.e., associated custody records) in a re-sealable bag and tape it to the inside lid of the sample shipment container;
- Tape and secure the container with fiber-reinforced tape; and
- Place signed custody seals on the cooler before the custody of the cooler is relinquished to the overnight carrier or courier.

Sample shipments will be transported by courier or overnight delivery (e.g.., Federal Express) to the project laboratories.

3.6 Field Documentation and Chain-of-Custody

Field documentation and sample chain-of-custody (COC) are important elements of generating acceptable and defensible data. Each sample or field measurement must be properly documented to facilitate timely, correct, and complete analysis and to support use of field and laboratory data. The documentation system provides the means to identify, track, and monitor each sample from the point of collection through final data reporting. The Field Supervisor will be responsible for sample custody and documentation of field activities. Sample custody will require: (1) knowledge of the location and condition of sampling equipment and supplies; (2) that sampling media are cared for before, during, and after sampling; and (3) that samples are properly documented on COC forms, packaged for shipment to the correct project laboratory, and delivered to an appropriate carrier for shipment. The following Standard Operating Procedures (SOPs) address field logbooks, sample labels, custody seals, and COC forms.

3.6.1 Field Logbooks and Records

Logbooks will be used to record field observations and measurements to provide a permanent record of daily field activities. The logbooks will contain various forms for this purpose, including daily field reports, sampling records, and photo documentation.

Entries will be legible and written in indelible ink. Corrections will consist of line-out deletions that will be initialed and dated by the person making the correction. Entries will be signed and dated, and the remaining space on each page will be crossed out. Other forms used to record field safety and health-related data will not be bound into field logbooks, but will instead be maintained in project files and folders.

3.6.2 Photographs

Photographs will be taken of the sample locations to show the surrounding area and objects used to locate the site. The photographs will be used to provide backup documentation for procedures and to depict unusual conditions encountered, as well as to depict general sampling locations. Photographs will be taken at each sampling location and will be described in the field logbook. Photographs should include 2 or more reference points to allow relocation of the sampling point at a later time. After the photographs are digitally transferred to the project file, they will be labeled for cross-referencing with other field data.

3.6.3 Sample Labeling

For soil and groundwater samples, sample labels will be affixed to each individual sample container. All samples will be stored on ice, and placed in a cooler at a temperature of four degrees Celsius (°C) ± 2°C. The Field Supervisor will pre-label sample containers and be responsible for care and custody of the samples until they are transported to the project laboratory for analysis. Sample labels will indicate the following information:

- project name and number,
- sampling location,
- sampling date and time (using 24-hour notation),
- analysis to be performed,
- preservative type (if applicable) and
- field sampler's name or initials.

3.6.4 Chain-of-Custody Records

The COC record documents the transfer of sample custody from the time of sampling to laboratory receipt. The COC records will be completed by the sampler, and will accompany the samples from the field to the analytical laboratory.

The COC record will be completed using waterproof ink. All corrections will be made by drawing a line through, initialing, and dating the error, and then entering the correct information. Erasures are not permitted. Applicable information on the COC record, including signatures, will be filled out. Unused space (rows) for sample/analysis information will be crossed out, initialed, and dated. If samples are to be delivered to the laboratory by an overnight carrier, the air bill number will be recorded.

Custody seals will be used to detect tampering between sample collection and analysis. The seal will be placed so that it must be broken in order to open the sample container. After samples are placed into coolers, or shipping containers, custody seal(s) will be placed on the outside of the shipping container or cooler prior to shipment through an overnight carrier or courier. Each custody seal affixed to sample containers and sample coolers will be signed and dated by the field sampler.

3.7 Laboratory Sample Custody and Documentation

The contract laboratory will be required to designate a sample custodian. Upon receipt of the samples, the sample custodian will sign the COC and record the date and time received. The sample custodian will then check cooler temperature, compare the COC to the each of the labeled sample containers to verify correctness and traceability, and conduct a qualitative assessment of each sample container for anomalies, breakage, or leakage. In the event of discrepancies or other anomalies, the sample custodian will contact the Project Manager or Work Assignment Manager as part of the corrective action process.

The samples will be stored in a secured area at a temperature of approximately 4°C until analyses commence. A laboratory tracking record will accompany the sample(s) or sample fraction(s) through final analysis for control purposes. A copy of the tracking record will accompany the laboratory report and will become a permanent part of the custody record.

3.8 Corrections to Documentation

Original, field recorded data shall be written in waterproof ink. No field documents will be discarded, even if they are illegible or contain inaccuracies that require a replacement document. If an error is made on a field document assigned to an individual, that individual shall make corrections by making a line through the error, initialing the error, and entering the correct information. Subsequent errors discovered on a document shall be corrected, initialed, and dated by the person who made the entry.

3.9 Field QC Samples

The QC samples are used to assess data quality in terms of precision and accuracy, and to verify that sampling procedures, decontamination, packaging, and shipping are not introducing variables into the sampling chain that could compromise the validity of sample data. Such QC samples are regularly prepared in the field so that phases of the sampling process are monitored. The types of field QC samples to be collected during the project are discussed in the following subsections.

3.9.1 Blanks

A variety of QC blank samples will be used to assess the potential for sample contamination during the sampling and analysis processes. Four types of field QC blanks: trip blanks, temperature blanks, equipment blanks, and field blanks, will be used as described as follows.

- Trip blanks are a required quality control element for volatile organic compound (VOC) sampling and analysis. A trip blank is a sample of contaminant-free water collected in the same type of container that is required for the analytical test. It is prepared by the laboratory, transported from the laboratory to the sampling site, and returned to the laboratory unopened. A trip blank is used to document contamination attributable to shipping and field handling procedures (i.e., diffusion of volatile organics through the septum during shipment and storage). One trip blank per SDG will be provided by the laboratory and returned for analysis of target compound list (TCL) VOCs in accordance with USEPA Method 8260B.
- A temperature blank is a 500 ml plastic bottle filled with de-ionized water. The temperature blank will be packed in with samples as close to the center of the cooler as possible in order to obtain a fair representation of sample temperature upon laboratory receipt. The contract laboratory will provide temperature blanks with each cooler as a standard procedure.
- An equipment blank is a sample of contaminant-free water that has been passed through (or over) recently decontaminated, non-disposable or non-dedicated, field sampling equipment. The equipment blank is used to assess the adequacy of the equipment decontamination process, as well as contaminant effects from handling, storage, shipment, and analysis. Equipment blanks will be prepared by the Field Team at a frequency of one per 20 samples and submitted for laboratory analysis of the same parameters as the related field samples.
- Field blanks are samples of contaminant-free water taken into the same type of container (preserved as appropriate) as actual field samples. Field blanks are prepared at or near the location of actual sampling and are analyzed for potential contaminants from the ambient air. One field blank will be collected at a frequency of one per 20 samples and submitted for laboratory analysis of the same parameters as the related field samples.

The QC criterion for trip, field, and equipment blanks is that no target compound should be present at or above the laboratory method detection limit (MDL). The QC criterion for temperature blanks is 4°C ± 2°C. Data that do not meet the criteria will be carefully evaluated and a decision will be made as to whether or not the associated data is suitable for its intended use.

3.9.2 Duplicates

Field duplicates are two samples of the same matrix, collected simultaneously at one sampling location. The same sampling techniques and analytical methods are performed on both samples. Analysis of field duplicates provides a quantitative measure of the precision of the overall sampling and analysis process, the precision of the sampling process, and the analytical method(s). One coded, field duplicate will be collected at a frequency of one per 20 samples and submitted for laboratory analysis of the same parameters as the related field sample.

Duplicate water samples shall exhibit relative percent difference (RPD) less than 30% and soil samples shall exhibit RPD less than 50%. Data that do not meet the RPD criteria will be considered to be estimated values. The data will then be carefully evaluated with respect to whether or not the data is suitable for its intended use.

3.9.3 Spikes

Matrix spike (MS) and matrix spike duplicate (MSD) samples will be collected to assess matrix interference for the site. Sufficient sample volumes will be provided to the laboratory to enable the analysis of three samples, e.g., original sample, MS, and MSD. One MS/MSD set will be included with each SDG of up to 20 samples and submitted for laboratory analysis of the same parameters as the related field sample.

The percent recovery (%R) and the RPD will be evaluated for MS and MSD data and compared with the acceptance criteria as stated in the appropriate USEPA analytical method. Data that do not meet the %R and/or RPD criteria will be carefully evaluated and a decision will be made as to whether or not the original sample is suitable for its intended use. Tables 2 through 4 present the frequency of MS/MSD analyses for each applicable matrix and parameter.

3.10 Field Equipment

Field equipment will be thoroughly inspected on a daily basis. Equipment deficiencies will be noted and remedied prior to leaving for the Project Area. Equipment found not to be in good working order will be repaired or replaced as necessary. No equipment will be returned to field use unless found to be in good working order after repair. The Field Team will be responsible for assuring replacement equipment is available in case of equipment malfunction. In the event of equipment malfunction, replacement equipment in good working order will be transported to the Project Area.

Critical spare parts for field equipment will be in stock prior to the start of the project. After the project begins, the inventory of spare parts will be replenished as needed by the Field Team. Field equipment maintenance will be performed according to the instrument instruction manual. Calibration standards for field equipment will be purchased as certified by the manufacturer or their representative. Calibration of field equipment and instrumentation will be in accordance with the relevant manufacturer's specifications. Specific procedures for performing and documenting calibration and maintenance for the field equipment will be provided in the site-specific work instructions prepared by the Work Assignment Manager. Field equipment, frequency of calibration, and calibration standards are provided in Table 5.

4.0 DATA QUALITY INDICATORS

This section defines the data quality indicators that will be measured in the field and parameters that will be analyzed in the laboratory as part of the supplemental site characterization. The PARCC criteria will be the indicators of data quality because the objective of the QAPP is to provide data that are precise, accurate, representative, complete, and comparable to actual site conditions. The PARCC criteria are defined below.

4.1 Precision

Precision is a measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions. Precision is determined for analytical results using field and laboratory duplicates and duplicate matrix spike samples. It is typically expressed in terms of the RPD as follows:

$$RPD = \frac{|C_1 - C_2|}{(C_1 + C_2)/2} \times 100$$

Where, C_1 = concentration of sample or MS and C_2 = concentration of duplicate or MSD

Sampling precision will be evaluated by analyzing coded, field duplicate samples for the same analytical parameters, and then, during data validation, calculating the RPD of the duplicate results. Analytical precision will be assessed by the laboratory by calculating the RPD of MS/MSD pairs and laboratory duplicates. The acceptance limits for analytical precision are presented in Table 6.

4.2 Accuracy

Accuracy is the degree of agreement of a measurement (or an average of the same measurement type), with an accepted reference or true value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material, and is expressed as the percent of the known quantity which is measured (recovered). The concentration of an analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement, e.g., results close to the method detection limit are less accurate because they are more susceptible to instrument "noise". Accuracy of analytical determinations will be measured using laboratory QC analyses, such as laboratory control samples (LCS), MS, and surrogate spikes. Accuracy is typically measured by evaluating the QC result against the concentration known to be added, expressed as percent recovery (%R) as follows:

$$\%R = \frac{S-U}{C_{sa}} \times 100$$

Where, S = spiked sample result, U = unspiked sample result, and C_{sa} = spike concentration

Sampling accuracy will be evaluated using the analytical results of trip, equipment, and field blanks. Analytical accuracy will be assessed by examining the recoveries of surrogate compounds for organic analytes and spiked compounds in the MS and LCS. Analytical accuracy will also be evaluated by verifying that the instrument calibrations are within the QC limits. The acceptance limits for analytical accuracy are presented in Table 6.

4.3 Representativeness

Representativeness is the reliability with which a measurement or measurement system reflects the true conditions under investigation. Representativeness is influenced by the number and location of the sampling points, sampling timing and frequency of monitoring efforts, and the field and laboratory procedures. The sampling locations and procedures described in the Work Plan consider the representativeness of the environmental media.

Sampling and analytical procedures will be completed in a manner that ensures that the derived data represents the in-place quality of the material sampled. Every effort will be made to ensure that chemical compounds are not introduced to samples in the field or laboratory. Field decontamination procedures will be performed in accordance with the Work Plan.

Blanks will be used to monitor for potential sample contamination from field and laboratory procedures. Sampling representativeness will be evaluated using field blanks, equipment blanks, and trip blanks. Analytical representativeness will be assessed using method blanks.

The assessment of representativeness will also consider the degree of heterogeneity in the sampled media. Heterogeneity will be evaluated using coded, field duplicate samples for the same analytical parameters, and then, during data validation, calculating the RPD of the duplicate results. The contract laboratory will be required to appropriately homogenize the sample prior to obtaining an aliquot for analysis to ensure representativeness.

Chain of custody procedures will be followed to document sample integrity during container preservation, shipment, and sampling. Chain-of-custody procedures are described in Sections 3.6 and 3.7.

4.4 Completeness

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 correct normal conditions. Data validation and data quality assessment will determine which data are valid and which data are rejected.

Completeness will be defined as the percentage of measurements made which are judged to be valid (percent completeness (%C)) as follows:

$$\%C = \frac{V}{T} \times 100$$

Where, V = number of valid measurements, and T = total number of measurements

The %C objective for this project will be 90% for project data.

4.5 Comparability

Comparability is an expression of the confidence with which one data set can be compared to another based on using standardized techniques and procedures (i.e., USEPA-approved procedures and methods), standard reference materials, QC samples and surrogates, etc., as well as by reporting each data type in consistent units. Analytical methods employed will be the same or equivalent for the rounds of sampling. The comparability of data collected for this project will be ensured by:

- Using standard testing/analytical methods for sampling and analysis
- Requiring traceability of analytical standards and/or source materials to the USEPA or National Institute of Standards (NIST)
- Requiring that calibrations be verified with an independently prepared standard from a source other than that used for calibration
- Using standard reporting units and reporting formats, including the reporting of QC data
- Performing a complete data validation on a representative fraction of the analytical results, including the use of data qualifiers where appropriate
- Requiring that validation qualifiers be used any time an analytical result is used for any purpose

5.0 LABORATORY ANALYTICAL METHOD AND QA/QC PROGRAM

The analytical methods to be performed were selected based on the results of the previous investigations conducted at the Project Area, and Kleinfelder's understanding of the project objectives. The analytical reporting limits have been evaluated in accordance with the Technical and Administrative Guidance Memorandum (TAGM) No. 4046, Determination of Soil Cleanup Objectives and Cleanup Levels (NYSDEC, 1994), Technical and Operational Guidance Series (TOGS) and Ambient Water Quality Standards and Guidance Values (NYSDEC, 1998 and 2000). The analytical methods chosen have MDLs at or below the action level (to the extent practicable). It should be noted that, regardless of the specified MDL, the actual quantitation limit is sample-specific, especially in the case of soil samples, samples having complex matrices, or samples containing analytes at varying concentration ranges. Laboratory analysis will provide sample-specific data using one or more of the USEPA-approved analytical methods described below.

5.1 Analytical Methods

Selected soil samples collected from soil borings LIF-7, LIF-11, LIF-22, LIF-27, LIF-28, LIF-29, LIF-31, LIF-32, LIF-38, LIF-42, LIF-45, LIF-47, LIF-53, LIF-56 and SB-16 through SB-20 will be submitted to Accutest, a New York State Department of Health (NYSDOH) approved laboratory (Environmental Laboratory Approval Program [ELAP] No. 10983) for laboratory analysis of the following:

- TCL VOCs in accordance with USEPA Method 8260B;
- TCL semi-volatile organic compounds (SVOCs) in accordance with USEPA Method 8270C;
- Target analyte list (TAL) metals including cyanide in accordance with USEPA Methods 6010B, 7471A and 335.4; and,
- Total Petroleum Hydrocarbons (TPH) in accordance with USEPA Method 8015 for GC fingerprinting, Diesel Range Organics (DRO) and Gasoline Range Organics (GRO).

Soil samples collected from soil borings SB-16 through SB-20 will also be analyzed for:

- Chloride and sulfate in accordance with USEPA Method SW846 9056; and
- pH in accordance with USEPA Method SW846 9045C.

Groundwater samples collected from SB-16 to SB-21 will be submitted to Accutest for laboratory analysis of the following:

- TCL VOCs in accordance with USEPA Method 8260B;
- TCL SVOCs in accordance with USEPA Method 8270C;
- TAL metals including cyanide in accordance with USEPA Methods 6010B, 7471A and 335.4;
- Bromide, chloride and sulfate in accordance with USEPA Method SW846 9056;
- Total Kjeldahl nitrogen in accordance with USEPA Method 351.2;
- Nitrate in accordance with USEPA Method 353.2;
- Ammonia in accordance with Standard Method for the Examination of Water and Wastewater (SM) 4500NH3G;

- Biological Oxygen Demand (BOD) in accordance with SM 5210B;
- Chemical Oxygen Demand (COD) in accordance with SM 5220C; and
- pH in accordance with SM 4500-H^+.

Additionally, in an effort to further characterize the source of low pH, Accutest will engage the services of Microseeps, Inc., of Pittsburgh, Pennsylvania (ELAP No. 11815), to perform ion chromatography analysis using Microseeps Method AM23G. This methodology evaluates groundwater for the presence of a specific list of volatile fatty acids with low level detection capability (VFA-LL) in an aqueous sample matrix and provides concentrations for detected chemical constituents.

5.2 Sample Preparation Methods

The following subsections describe the sample preparation methods.

5.2.1 Method 3050B

Method 3050B is an acid digestion procedure used to sample for analysis by inductively-coupled plasma emission spectroscopy (ICP). A sample is digested in nitric acid and hydrogen peroxide. The digestate is then refluxed with either nitric acid or hydrochloric acid, depending on the type of analysis to be performed. A separate sample shall be dried for a total solids determination.

5.2.2 Method 3540C

Method 3540C is a procedure for extracting nonvolatile and SVOCs from solids, such as soils, sludge, and wastes. The soxhlet extraction process maintains intimate contact between the sample matrix and the extraction solvent. Extraction is accomplished by mixing the solid sample with anhydrous sodium sulfate and extracting it for 16 to 24 hours with an appropriate solvent in the Soxhlet extractor. The extract is then dried, concentrated with a Kuderna-Danish apparatus and then treated using a cleanup method, or analyzed directly by the appropriate measurement technique. This method is applicable to the isolation and concentration of water insoluble and slightly water-soluble organic compounds in preparation for a variety of chromatographic procedures.

5.2.3 Method 3550B

Method 3550B is a procedure for extracting SVOCs from solids such as soils, sludge, and wastes. The sonication process maintains intimate contact between the sample matrix and the extraction solvent. An aliquot of the sample is grounded and mixed with the extraction media, then dispersed into the solvent using sonication. The extract is then dried with anhydrous sodium sulfate and concentrated with a Kuderna-Danish apparatus. The resulting solution may then be cleaned up or analyzed directly using the appropriate technique.

5.3 Sample Analytical Methods

The following subsections describe the sample analytical methods. Tables 5 through 7 summarize QA/QC requirements and performance standards for TCL VOCs, TCL SVOCs and TAL metals respectively.

5.3.1 Method 8260B

Method 8260B will be used to investigate the presence of VOCs. Volatile compounds in gas or low-level contaminated solids can be separated and quantified by gas chromatography and mass spectrometry (GC/MS) after being purged and desorbed onto a trap. The identification of specific VOCs depends upon the production of ions followed by separation based on the charge-to-mass ratio and the measurement of ions produced. The output is a mass spectrum that is characteristic of a compound that is compared to a mass spectra library that has been established. GC/MS is particularly effective in the analysis of organic compounds and provide a high level of confidence in compound identification.

5.3.2 Method 8270C

Method 8270C will be used to investigate the presence of SVOCs. Following the preparation of the sample, the extract is introduced to the GC/MS for analysis. The identification of specific SVOCs depends upon the production of ions, followed by separation based on the charge-to-mass ratio and the measurement of ions produced. The output is a mass spectrum that is characteristic of a compound that is compared to a mass spectra library that has been established. GC/MS is particularly effective in the analysis of organic compounds and provides a high level of confidence in compound identification.

5.3.3 Method 6020B

Method 6020B will be used to investigate the presence of metals by ICP analysis, which requires digestion of the sample by nitric acid. Following digestion, the metals (or trace elements) are simultaneously or sequentially determined using ICP. The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. The identification of specific elements depends on production of ions, followed by separation based on the charge-to-mass ratio and the measurement of ions produced. The output is a mass spectrum that is characteristic of a compound that is compared to a mass spectra library that has been established. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis.

5.3.4 Methods 7470A and 7471A

Methods 7470A and 7471A will be used to investigate the presence of mercury using cold vapor flame atomic absorption (CVFAA). The CVFAA is a technique based on the absorption of radiation by mercury vapor. Mercury is reduced to its elemental state and aerated from solution in a closed system. The mercury vapor passes through a cell positioned in the light path of an atomic absorption spectrophotometer. Mercury concentration is measured as a function of absorbance.

5.3.5 Method 8015

Method 8015 will be used to quantify TPH levels in soil. This method reports the concentration of purgeable and extractable hydrocarbons which are also sometimes referred to as gasoline and diesel range organics (i.e., GRO and DRO) because the boiling point ranges of the hydrocarbon in each roughly corresponds to that of gasoline (i.e., C_6 to $C_{10\text{-}12}$) and diesel fuel (i.e., $C_{8\text{-}12}$ to $C_{24\text{-}26}$), respectively. Purgeable hydrocarbons are measured by purge-and-trap GC analysis using a flame ionization detector (FID), while the extractable hydrocarbons are analyzed by GC following extraction with a solvent and subsequent concentration of the extract by evaporation. While more detailed information is generated by this method (e.g., GC chromatograms), the results are most frequently reported as single numbers for purgeable and extractable hydrocarbons.

5.3.6 Method 9056

Method 9056 will be used to determine the concentrations of select anions in soil and groundwater samples. This method addresses the sequential determination of the anions chloride, fluoride, bromide, nitrate, nitrite, phosphate, and sulfate in water samples. A small volume of water sample is injected into an ion chromatograph to flush and fill a constant volume sample loop. The sample is then injected into a stream of carbonate-bicarbonate eluent of the same strength as the collection solution or water sample.

5.3.7 Method 9045C

Method 9045C will be used to measure the pH of soil samples. This method is an electrometric procedure applicable to wastes, solids, sludges, or non-aqueous liquids. If water is present, it must constitute less than 20% of the total volume of the sample. The sample is mixed with reagent water, and the pH of the resulting aqueous solution is measured. Samples with very low or very high pH may give incorrect readings on the meter. For samples with a true pH of >10, the measured pH may be incorrectly low.

This error can be minimized by using a low-sodium-error electrode. Strong acid solutions, with a true pH of <1, may give incorrectly high pH measurements.

5.3.8 Method 351.2

Method 351.2 will be used to determine total Kjeldahl nitrogen in groundwater samples. The procedure converts nitrogen components of biological origin such as amino acids, proteins and peptides to ammonia, but may not convert the nitrogenous compounds of some industrial wastes such as amines, nitro compounds, hydrazones, oximes, semicarbazones and some refractory tertiary amines. The sample is heated in the presence of sulfuric acid for 2.5 hours. The residue is cooled, diluted to 25 ml and analyzed for ammonia. This digested sample may also be used for phosphorus determination. Total Kjeldahl nitrogen is the sum of free-ammonia and organic nitrogen compounds which are converted to ammonium sulfate, under the conditions of digestion described. Organic Kjeldahl nitrogen is the difference obtained by subtracting the free ammonia value from the total Kjeldahl nitrogen value.

5.3.9 Method 353.2

Method 351.2 will be used to determine nitrate in groundwater samples. A filtered sample is passed through a column containing granulated copper-cadmium to reduce nitrate to nitrite. The nitrite (that was originally present plus reduced nitrate) is determined by diazotizing with sulfanilamide and coupling with N-(1-naphthyl) ethylenediamine dihydrochloride to form a highly colored azo dye which is measured colorimetrically. Separate, rather than combined nitrate-nitrite, values are readily obtained by carrying out the procedure first with, and then without, the Cu-Cd reduction step.

5.3.10 SM 4500NH3G

SM 4500NH3G will be used to determine the concentration of ammonia in groundwater. Phenol solution, sodium nitroprusside solution, and oxidizing solution are added sequentially to the sample and thoroughly mixed after each addition. The sample is then covered with plastic wrap or paraffin wrapper film and color is developed at room temperature in subdued light for at least one hour. A blue compound, indophenol, is formed by the reaction, and then measured using a spectrophotometer set at an absorbance of 640 nanometers (nm).

5.3.11 SM 5210B

SM 5210B will be used to measure BOD in groundwater samples. This BOD test is performed by incubating a sealed wastewater sample (or a prepared dilution) for the standard five-day period and then determining the change in dissolved oxygen content. The BOD value is then calculated from the results of the dissolved oxygen tests. Note that the BOD test is of limited value in measuring the actual oxygen demand because temperature change, biological population, oxygen concentration, and other environmental factors cannot be reproduced accurately in the laboratory.

5.3.12 SM 5220C

SM 5220C will be used to measure COD in groundwater samples. The sample is heated for two hours with a strong oxidizing agent, potassium dichromate. Oxidizable organic compounds react, reducing the dichromate ion to green chromic ion. Colorimetric measurement is then used to define the oxygen consumed in mg per liter of sample.

5.3.13 SM 4500-H^+

SM 4500H^+ will be used to determine the pH of groundwater samples. A combination pH electrode is used to measure hydrogen ion concentration (activity) by developing an electrical potential at the glass/liquid interface. At a constant temperature, this potential varies linearly with the pH of the solution being measured.

5.4 Analytical Reporting Limits

The reporting limits will be based on the concentration of the lowest standard in the initial calibration, taking into account the sample weight/volume, sample introduction method, and moisture content. The analytical parameters, recommended methods and recommended reporting limits are presented in Table 7.

5.5 Laboratory QA/QC

The project laboratories will maintain a Quality Assurance Plan, and have the appropriate current state accreditations, such as the NYSDOH ELAP accreditation.

5.5.1 Method Blanks

A method blank will be analyzed with every batch of 20 or fewer samples to measure laboratory contamination. The method blank will consist of ultra pure air, and will be carried through the entire preparation and analysis procedure. Acceptance criteria for method blanks must conform to reference method requirements when specified. Generally, corrective action is required if target compound concentrations in the method blank are greater than the MDL. Corrective action, including data flagging, is required when method blank concentrations are greater than the reporting detection limit, and the samples must be reprocessed if sample target compound/analyte concentrations are not greater than 10 times the method blank concentrations.

5.5.2 Laboratory Control Sample

An LCS or blank spike set will be analyzed with every batch containing 20 samples or less to measure accuracy. The LCS or blank spike will consist of a method blank spiked with a known amount of analyte, and it will be carried through the entire preparation and analysis procedure. The control limits for precision and accuracy listed in Table 6 will be used by the contract laboratory. If control limits are exceeded, the analysis will be stopped and the problem corrected. Samples associated with the out-of-control LCS will be re-analyzed in another batch, unless documented evidence is presented to show that associated samples were not affected.

5.5.3 Laboratory Duplicate

A laboratory duplicate will be analyzed for one out of every 20 samples to measure precision. If the RPD does not meet the required acceptance limits, the problem will be investigated and corrected. Any affected samples will be re-analyzed in a separate batch. Acceptance limits for precision in Table 6 will be used.

5.5.4 Surrogates

Surrogates are compounds which are unlikely to occur under natural conditions that have properties similar to the analytes of interest. This type of control is primarily used for organic samples analyzed by GC/MS and GC methods and is added to the sample prior to extraction. The surrogate spike is utilized to provide broader insight into the proficiency and efficiency of an analytical method on a spike-specific basis. Data that do not meet the %R criteria for surrogate recovery will be carefully evaluated and a decision will be made as to whether or not the associated data is suitable for its intended use. Surrogate compounds will be selected utilizing the guidance provided in the analytical methods summarized in Table 7.

5.6 Laboratory QC Checks

Laboratory checks will include the following procedures:

- The reagents, gases, and standards required by a method will use the highest quality standards available. Materials and procedures will be recorded in a logbook to document complete traceability to a certified reference standard and source such as the National Institute of Standards and Technology.

- Instruments will be calibrated according to the manufacturer's instructions and as required by the USEPA analytical method. Where there are no specifications for each parameter, a five-point calibration curve will be implemented.
- Calibration of instruments will be documented in a bound logbook, and records will be maintained.
- Continuing calibration standards will be analyzed and documented in a logbook for each analytical method during sample analysis as required by the method.
- The percent recovery and percent difference criteria for inorganics and organics continuing calibration shall be within the QC criteria of the requested method.
- Laboratory method blanks will be included in every preparation batch or analytical batch at a frequency of at least one per 20 samples.
- An analysis of one blank spike sample will be made for every 20 samples and will be fortified with representative compounds for each analytical method performed.

5.7 Instrument Calibration

The contract laboratory is required to document calibration procedures, and will be consistent with specified method requirements.

5.8 Preventive Maintenance

The contract laboratory will perform and maintain records of preventive maintenance on instruments used for analysis of project samples. Preventive maintenance documentation is incorporated into laboratory accreditation requirements, and is an element of the laboratory QA plan.

6.0 DATA REDUCTION, REVIEW AND REPORTING

After field and laboratory data are obtained, the data will be subject to the following:

- Reduction or manipulation mathematically or otherwise into meaningful and useful forms;
- Review;
- Organization, interpretation, and reporting; and

- External data review.

The following subsections present descriptions of the data reduction, review, and reporting activities that will be conducted in the field and laboratory as part of the supplemental site characterization.

6.1 Field Data Reduction

Information collected in the field through visual observation, manual measurement and/or field instrumentation will be recorded in field forms. The Work Assignment Manager will review such data for adherence to the site-specific work instructions and for consistency. Concerns identified as a result of this review will be discussed with the field personnel, corrected if possible, and, as necessary, incorporated into the data evaluation process.

6.2 Field Data Review

Field data calculations, transfers, and interpretations will be conducted by field personnel and reviewed for accuracy by the Work Assignment Manager. Logs and documents will be checked for:

- General completeness;
- Readability;
- Usage of appropriate procedures;
- Appropriate instrument calibration and maintenance;
- Reasonableness in comparison to present and past data collected;
- Correct sample locations; and
- Corrected calculations and interpretations.

6.3 Laboratory Data Reduction

The calculations used for data reduction are specified in each of the analytical methods referenced previously. Whenever possible, analytical data is transferred directly from the instrument to a computerized data system. Raw data is entered into permanently bound laboratory notebooks. The data entered are sufficient to document factors used to arrive at the reported value. Concentration calculations for chromatographic analyses (e.g. VOCs, SVOCs) are based on response factors. Quantitation is performed using internal or external standards.

6.4 Laboratory Data Review

Data will be subject to review by the laboratory. The analyst will review the data and enter it into the computer. The department manager will review the data and send it to the laboratory information management system to be printed. The laboratory QA officer will perform a final review of the final reports. The laboratory director will perform a final review prior to releasing data.

6.5 Laboratory Data Reporting

The laboratory is responsible for preparing standard laboratory reports for samples analyzed. Data will be tabulated by sample and method, with reference to both field and laboratory identifications. In addition, the laboratory will provide documentation backup (laboratory calculation sheets, chain-of-custody, etc.).

6.6 Data Validation

The data validation process consists of a systematic assessment and verification of data quality through independent review. Validation will be performed by Lori Beyer of L.A.B. Validation Corporation. Ms. Beyer is not associated with the collection and analysis of samples, interpretation of sample data, or with any decision-making process within the scope of this particular investigation. Data validation procedures will be in accordance with USEPA protocols and criteria set forth in the functional guidelines for evaluating organic and inorganic analyses (EPA 1999, 2002). The data values for routine and QC samples will be assumed to be correctly reported by the laboratory.

Data usability will be assessed by comparing the QC parameters listed above to the appropriate criteria (or limits) as specified in the project QAPP, or by method-specific requirements (e.g., SW-846). The data validation process will consist of a technical review of the analytical data generated by the laboratory, and provide information on the analytical limitations of data based on specific QC criteria. The data validation process will be used to assess and document the performance of the field sampling process and the analytical process. Data validation will be performed on the analytical laboratory data in accordance with EPA CLP *National Functional Guidelines for Organic Data Review* (EPA, October 1999) and *National Functional Guidelines for Inorganic Data Review* (EPA, July 2002) and the following parameters will be reviewed:

- Technical holding times;
- Initial and continuing calibration;
- Laboratory and field blanks;
- Laboratory duplicate or field duplicate samples;
- Surrogate compounds;
- LCS or blank spikes;
- Compound identification; and
- Compound quantitation and sample reporting limits.

Criteria to provide data integrity during laboratory and reporting activities include oral and written communication between consultnat, data validator and the contract laboratory. Analytical data that will be collected for the project will be scientifically sound data. Scientifically sound data are of known and documented quality, and meet the DQOs of the Work Plan. The verified or validated data, if they meet the QA criteria, can then be used in risk assessment, site characterization, alternative evaluation, engineering design, and monitoring during implementation.

6.7 Data Usability Assessment

The data usability assessment process will be completed by L.A.B. Validation Corporation to assess and document the usability of the data by considering quality objectives (e.g., PARCC), and whether the data are suitable as a basis for the decision. All data types are relevant to the usability assessment. The assessment will consider each type of data, the relationship to the entire data set, and the adequacy of the data to fulfill the data quality goals of the project. Data sets are assessed for completeness and compliance to method-specific or project-specific QA/QC requirements, including the results of the independent data validation process. The data usability assessment process evaluates data quality in terms of the PARCC criteria and determines data usability for the intended purpose(s). DUSRs will be prepared for each SDG by L.A.B. Validation Corporation in accordance with *Technical Guidance for Site Investigation and Remediation* (NYSDEC, 2009).

7.0 PERFORMANCE AND SYSTEM AUDITS

A Technical System Audit (TSA) shall be performed by the Work Assignment Manager or person designated by the Work Assignment Manager shortly after commencing work activities. The purpose of the TSA is to ensure that facilities, personnel, training, procedures and record keeping are in accordance with the QAPP. Performing the TSA this early in the project provides opportunity for corrective action if necessary.

7.1 Audit of Data Quality

An audit of data quality will be performed by the project management team prior to final reporting. This will serve to reveal how the data were handled, what judgments were made, and whether uncorrected mistakes were made.

7.2 Performance Audits

The Work Assignment Manager, or a designated person, will monitor field performance. Field performance audit summaries will contain an evaluation of field measurements and field meter calibration to verify that measurements are taken according to established protocols. The QAO will review field reports and communicate concerns to the Project Manager and/or Work Assignment Manager.

7.3 Internal System Audits

A field internal system audit is a qualitative evaluation of components of field QA/QC. The system audit compares scheduled QA/QC activities from this document with actual QA/QC activities completed.

7.4 Laboratory Audits

The analytical laboratory will perform internal audits consistent with applicable regulations. USEPA and/or NYSDEC may reserve the right to conduct an on-site audit of the laboratory prior to start of analyses for the project.

8.0 REFERENCES

In order to prepare this QAPP, Kleinfelder referenced the guidance provided in the following documents:

Supplemental Site Characterization Work Plan, Former Pratt Oil Works, Kleinfelder East, Inc., July 27, 2010.

Technical Guidance for Site Investigation and Remediation (DER-10), NYSDEC, November 2009.

Quality Assurance Project Plan for the Characterization of the Inland Parcels, Former Pratt Oil Works Site, Parsons, August 2008.

Field Quality Control Guidance, Maine Department of Environmental Protection LUST Program, February 2007.

Guidance for Quality Assurance Project Plans (EPA G-5), United States Environmental Protection Agency (USEPA) Office of Research and Development (ORD), EPA/240/R-02/009, December 2002.

Guidance on Choosing a Sampling Design for Environmental Data Collection (EPA G-5S), EPA/240/R-02/005, USEPA ORD, December 2002.

EPA Requirements for Quality Assurance Project Plans (QA/R-5), EPA/240/B-01/003, USEPA ORD, March 2001.

National Functional Guidelines for Organic and Inorganic Data Review, USEPA, 1999 and 2004.

Technical and Operational Guidance Series (TOGS), Ambient Water Quality Standards and Guidance Values, NYSDEC, 1998 and 2000.

Technical and Administrative Guidance Memorandum No. 4046, Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, 1994.

Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW-846), USEPA Office of Solid Waste, November 1986.

Quality Assurance, North Carolina Department of Environment and Natural Resources, Division of Water Quality web-site, http://h2o.enr.state.nc.us/lab/qa/tripblank.pdf.

Sample Shipping, Cooler Shipping Procedures, Accutest Laboratories web-site, http://www.accutest.com/technicalinfo/sampleshipping.htm.

TABLES

Table 1
Required Containers, Preservatives, and Analytical Holding Times

Former Pratt Oil Works
Long Island City, New York

Analyte	Matrix	Container[1]	Preservative	Holding Time
TCL VOCs per USEPA Method 8260B	Soil and Sediment Samples	At a minimum all samples must be collected in containers with a Teflon lined septum and cooled to 4°C ±2°C.	Cool to 4°C ±2°C in field	10 days
	Aqueous Samples No chlorine present	2 x 40mL VOC vials with Teflon lined screw caps	Adjust to pH <2 with either HCI or sodium bisulfate at time of collection[2]. Cool to 4°C ±2°C.	14 days
	Aqueous Samples Chlorine present	2 x 40mL VOC vials with Teflon lined screw caps	Neutralize chlorine with either 25 mg ascorbic acid or 3 mg sodium thiosulfate. Adjust to pH <2 with either HCI or sodium bisulfate at time of collection[2]. Cool to 4°C ±2°C.	14 days
TCL SVOCs per USEPA Method 8270C	Soil and Sediment Samples	250 mL amber glass jar with Teflon lined cap	Cool to 4°C ±2°C	14 days to extraction. 40 days from extraction to analysis.
	Aqueous Samples No chlorine present	1 liter amber glass bottle with Teflon lined cap	Cool to 4°C ±2°C	7 days to extraction. 40 days from extraction to analysis.
	Aqueous Samples Chlorine present	1 liter amber glass bottle with Teflon lined cap	Neutralize chlorine with either 25 mg ascorbic acid or 3 mg sodium thiosulfate. Cool to 4°C ±2°C.	7 days to extraction. 40 days from extraction to analysis.

Table 1
Required Containers, Preservatives, and Analytical Holding Times

Former Pratt Oil Works
Long Island City, New York

Analyte	Matrix	Container[1]	Preservative	Holding Time
TAL metals per USEPA Method 6010B	Soil and Sediment Samples	250 mL plastic or glass jar with Teflon or plastic lined cap	Cool to 4°C ±2°C	180 days[3]
	Aqueous Samples[4]	1 liter plastic or glass[5]	Nitric Acid to pH <2	180 days[3]
TPH by USEPA Method 8015 GRO	Soil and Sediment Samples	1 x 40 mL VOC vial with Teflon lined screw cap	Methanol Cool to 4°C ±2°C	14 days
TPH by USEPA Method 8015 DRO	Soil and Sediment Samples	300 mL plastic or glass	Cool to 4°C ±2°C	14 days to extraction. 40 days from extraction to analysis
Anions per USEPA Method 9056	Soil and Sediment Samples	100 mL plastic or glass	Cool to 4°C ±2°C	28 days
	Aqueous Samples	300 mL plastic or glass	Cool to 4°C ±2°C	28 days
pH per USEPA Method 9045C	Soil and Sediment Samples	300 mL plastic or glass	Cool to 4°C ±2°C	Immediate
Total Kjeldahl nitrogen per USEPA Method 351.2	Aqueous Samples	50 ml plastic or glass	Sulfuric Acid to pH <2 Cool to 4°C ±2°C	28 days
Nitrate per USEPA Method 353.2	Aqueous Samples	50 ml plastic or glass	Sulfuric Acid to pH <2 Cool to 4°C ±2°C	28 days
Ammonia per SM 4500NH3G	Aqueous Samples	200 ml plastic or glass	Sulfuric Acid to pH <2 Cool to 4°C ±2°C	28 days
BOD per SM 5210B	Aqueous Samples	500 ml plastic or glass	Cool to 4°C ±2°C	48 hours

Table 1
Required Containers, Preservatives, and Analytical Holding Times

Former Pratt Oil Works
Long Island City, New York

Analyte	Matrix	Container[1]	Preservative	Holding Time
COD per SM 5220C	Aqueous Samples	50 ml plastic or glass	Sulfuric Acid to pH <2 Cool to 4°C ±2°C	28 days
pH per SM $4500H^+$	Aqueous Samples	100 ml plastic or glass	Cool to 4°C ±2°C	Immediate

Notes:

[1] The number of sample containers shall be negotiated with the laboratory. Laboratories should supply enough containers to allow for reanalysis or breakage.

[2] If samples effervesce upon addition of HCl or sodium bisulfate, samples must be collected unpreserved and stored at 4 ±2°C. Holding time is 7-days from collection.

[3] Holding time for mercury is 28 days.

[4] For dissolved metals samples must be filtered within 24 hours of collection through a 0.45 μm membrane filter prior to acidification.
[5] Plastic bottles must be acid rinsed and constructed of either high-density polyethylene or Teflon.

Table 2
Field Instrumentation Calibration

Former Pratt Oil Works
Long Island City, New York

Field Equipment	Calibration Check[1]	Calibration Standards[2]	Initial Calibration Frequency
Water Level Meter	Prior to use daily	100’ engineers’ tape	Initial factory calibration and whenever calibration check no longer meets QC requirements
pH Meter	Prior to use daily	pH =4.0, pH =7.0, and pH =10.0 or as directed by owner’s manual	Initial factory calibration and whenever calibration check no longer meets QC requirements
Conductivity Meter	Prior to use daily	1,000 mg/L NaC1 or as directed by owner’s manual	Initial factory calibration and whenever calibration check no longer meets QC requirements
Turbidity Meter	Prior to use-daily	0.5 NTU or as directed by owner’s manual	Initial factory calibration and whenever calibration check no longer meets QC requirements
Dissolved Oxygen	Prior to use-daily	Atmospheric air or as directed by owner’s manual	Initial factory calibration and whenever calibration check no longer meets QC requirements
Organic Vapor Meter	Prior to use daily	100 ppm isobutylene	Initial factory calibration and whenever calibration check no longer meets QC requirements

Notes:

[1] Intermittent calibration checks will be performed on field instrumentation whenever significant measurement spikes and/or percent differences greater than background are encountered. Intermittent calibration checks may also be performed when significant changes in temperature occur or other circumstances which may affect the performance of the instrumentation. Intermittent calibration checks will be documented in the field paperwork.

[2] Specific standard concentrations may be selected based on the objective(s) of the monitoring activity.

NTU - nephelometric turbidity units.

mg/L - milligrams per liter.

ppm - parts per million.

QC - quality control.

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	Method	Aqueous			Soil		
				MS/MSD %R	**MS/MSD RPD**	**LCS %R**	**MS/MSD %R**	**MS/MSD RPD**	**LCS %R**
Volatile Organic Compounds (VOCs)									
67-64-1	Acetone	VOC	8260B	44-157	20	51-151	26-178	32	45-168
71-43-2	Benzene	VOC	8260B	38-139	13	75-122	41-136	24	78-120
74-97-5	Bromochloromethane	VOC	8260B	70-129	11	78-124	45-135	23	76-123
75-27-4	Bromodichloromethane	VOC	8260B	70-135	13	77-128	37-150	23	76-129
75-25-2	Bromoform	VOC	8260B	53-139	13	67-141	31-153	24	70-141
74-83-9	Bromomethane	VOC	8260B	44-150	18	53-152	4-154	32	57-142
78-93-3	2-Butanone (MEK)	VOC	8260B	58-140	14	64-130	32-159	28	59-140
75-15-0	Carbon disulfide	VOC	8260B	34-136	21	59-140	27-148	28	64-140
56-23-5	Carbon tetrachloride	VOC	8260B	50-161	18	75-148	27-165	26	66-151
108-90-7	Chlorobenzene	VOC	8260B	65-128	12	76-124	33-140	26	80-117
75-00-3	Chloroethane	VOC	8260B	41-151	18	54-147	5-151	33	60-142
67-66-3	Chloroform	VOC	8260B	66-132	14	77-124	44-135	24	75-122
74-87-3	Chloromethane	VOC	8260B	35-149	22	46-144	27-149	27	56-140
110-82-7	Cyclohexane	VOC	8260B	29-158	18	62-127	15-165	28	60-138
96-12-8	1,2-Dibromo-3-chloropropane	VOC	8260B	58-141	14	64-134	24-154	27	65-136
124-48-1	Dibromochloromethane	VOC	8260B	67-134	12	76-132	35-154	23	76-136
106-93-4	1,2-Dibromoethane	VOC	8260B	69-130	11	75-130	41-140	23	81-124
95-50-1	1,2-Dichlorobenzene	VOC	8260B	65-128	12	74-125	20-146	29	77-117
541-73-1	1,3-Dichlorobenzene	VOC	8260B	63-128	13	73-124	19-147	30	77-116
106-46-7	1,4-Dichlorobenzene	VOC	8260B	63-126	13	71-123	19-143	30	76-113

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	Method	Aqueous			Soil		
				MS/MSD %R	MS/MSD RPD	LCS %R	MS/MSD %R	MS/MSD RPD	LCS %R
75-71-8	Dichlorodifluoromethane	VOC	8260B	24-170	24	42-152	17-170	25	46-156
75-34-3	1,1-Dichloroethane	VOC	8260B	59-132	15	72-124	45-135	24	73-124
107-06-2	1,2-Dichloroethane	VOC	8260B	59-153	15	66-150	44-143	23	75-137
75-35-4	1,1-Dichloroethene	VOC	8260B	41-144	17	61-132	32-149	26	66-130
156-59-2	cis-1,2-Dichloroethene	VOC	8260B	57-131	13	71-119	42-135	25	73-121
156-60-5	trans-1,2-Dichloroethene	VOC	8260B	55-131	15	71-123	37-140	25	74-123
78-87-5	1,2-Dichloropropane	VOC	8260B	67-125	12	75-120	45-136	23	78-121
10061-01-5	cis-1,3-Dichloropropene	VOC	8260B	68-126	13	77-124	37-143	26	81-124
10061-02-6	trans-1,3-Dichloropropene	VOC	8260B	68-134	13	75-132	34-148	26	78-130
123-91-1	1,4-Dioxane	VOC	8260B	52-148	22	57-147	36-170	33	54-157
100-41-4	Ethylbenzene	VOC	8260B	37-143	13	77-124	28-147	27	81-121
76-13-1	Freon 113	VOC	8260B	33-159	19	58-149	25-162	28	56-152
591-78-6	2-Hexanone	VOC	8260B	53-145	17	58-136	19-169	31	56-147
98-82-8	Isopropylbenzene	VOC	8260B	48-141	15	60-136	19-157	30	67-136
79-20-9	Methyl Acetate	VOC	8260B	46-147	18	57-139	40-177	29	59-149
108-87-2	Methylcyclohexane	VOC	8260B	36-156	18	73-130	11-167	30	68-137
1634-04-4	Methyl Tert Butyl Ether	VOC	8260B	53-139	14	72-127	48-135	22	75-124
108-10-1	4-Methyl-2-pentanone(MIBK)	VOC	8260B	57-141	14	63-135	31-158	26	64-142
75-09-2	Methylene chloride	VOC	8260B	59-129	12	69-122	39-138	24	69-123
100-42-5	Styrene	VOC	8260B	60-135	13	78-126	23-156	29	79-127
79-34-5	1,1,2,2-Tetrachloroethane	VOC	8260B	62-126	13	66-125	35-136	25	71-123

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	Method	Aqueous			Soil		
				MS/MSD %R	MS/MSD RPD	LCS %R	MS/MSD %R	MS/MSD RPD	LCS %R
127-18-4	Tetrachloroethene	VOC	8260B	48-145	15	70-136	27-164	28	73-134
108-88-3	Toluene	VOC	8260B	44-141	14	76-126	32-145	26	79-122
87-61-6	1,2,3-Trichlorobenzene	VOC	8260B	54-137	14	62-132	9-150	35	54-133
120-82-1	1,2,4-Trichlorobenzene	VOC	8260B	59-135	13	67-132	10-155	34	67-127
71-55-6	1,1,1-Trichloroethane	VOC	8260B	55-149	18	77-136	36-150	24	72-136
79-00-5	1,1,2-Trichloroethane	VOC	8260B	70-127	12	75-123	37-147	23	76-123
79-01-6	Trichloroethene	VOC	8260B	53-141	15	79-126	34-149	25	80-124
75-69-4	Trichlorofluoromethane	VOC	8260B	35-169	23	56-154	25-160	27	55-152
75-01-4	Vinyl chloride	VOC	8260B	34-151	20	56-146	29-152	26	59-145
-	m,p-Xylene	VOC	8260B	32-146	13	77-125	22-150	29	79-121
95-47-6	o-Xylene	VOC	8260B	46-141	12	76-126	26-151	27	79-122
1330-20-7	Xylene (total)	VOC	8260B	36-144	13	77-125	24-150	28	80-121
Semi-volatile Organic Compounds (SVOCs)									
95-57-8	2-Chlorophenol	SVOC	8270C	32-102	33	41-102	41-106	24	55-107
59-50-7	4-Chloro-3-methyl phenol	SVOC	8270C	38-126	30	52-117	39-122	27	57-116
120-83-2	2,4-Dichlorophenol	SVOC	8270C	33-116	34	47-113	40-115	27	54-116
105-67-9	2,4-Dimethylphenol	SVOC	8270C	30-128	32	43-122	40-130	27	55-127
51-28-5	2,4-Dinitrophenol	SVOC	8270C	20-151	29	32-138	1-121	39	14-139
534-52-1	4,6-Dinitro-o-cresol	SVOC	8270C	31-135	29	47-122	1-123	40	28-131
95-48-7	2-Methylphenol	SVOC	8270C	26-111	33	36-100	38-112	26	53-109
-	3&4-Methylphenol	SVOC	8270C	26-111	33	31-98	37-114	27	52-111

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	Method	Aqueous			Soil		
				MS/MSD %R	MS/MSD RPD	LCS %R	MS/MSD %R	MS/MSD RPD	LCS %R
88-75-5	2-Nitrophenol	SVOC	8270C	29-116	35	44-114	28-118	28	52-117
100-02-7	4-Nitrophenol	SVOC	8270C	10-123	35	16-76	13-136	39	17-136
87-86-5	Pentachlorophenol	SVOC	8270C	34-133	26	35-122	13-124	28	18-125
108-95-2	Phenol	SVOC	8270C	14-85	37	15-62	35-109	27	48-108
58-90-2	2,3,4,6-Tetrachlorophenol	SVOC	8270C	45-123	26	54-116	36-116	29	45-118
95-95-4	2,4,5-Trichlorophenol	SVOC	8270C	44-121	26	56-115	43-114	26	57-114
88-06-2	2,4,6-Trichlorophenol	SVOC	8270C	41-119	28	54-113	43-117	26	57-115
83-32-9	Acenaphthene	SVOC	8270C	37-114	31	46-110	38-116	26	54-113
208-96-8	Acenaphthylene	SVOC	8270C	33-108	31	42-103	34-111	24	48-107
98-86-2	Acetophenone	SVOC	8270C	25-127	35	46-113	35-119	26	54-115
120-12-7	Anthracene	SVOC	8270C	48-125	26	57-123	35-127	28	55-120
1912-24-9	Atrazine	SVOC	8270C	40-133	27	55-127	33-121	27	49-121
100-52-7	Benzaldehyde	SVOC	8270C	9-151	37	31-130	4-142	33	5-148
56-55-3	Benzo(a)anthracene	SVOC	8270C	48-127	26	56-125	26-135	30	52-121
50-32-8	Benzo(a)pyrene	SVOC	8270C	48-128	26	57-125	30-131	30	52-122
205-99-2	Benzo(b)fluoranthene	SVOC	8270C	41-133	29	49-130	24-135	33	42-128
191-24-2	Benzo(g,h,i)perylene	SVOC	8270C	42-134	27	55-129	30-129	29	51-120
207-08-9	Benzo(k)fluoranthene	SVOC	8270C	45-133	30	53-132	27-131	33	47-132
101-55-3	4-Bromophenyl phenyl ether	SVOC	8270C	47-123	28	55-121	41-122	25	53-124
85-68-7	Butyl benzyl phthalate	SVOC	8270C	47-137	27	55-132	38-130	27	52-127
92-52-4	1,1'-Biphenyl	SVOC	8270C	36-113	32	43-107	42-118	25	58-114

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	Method	Aqueous			Soil		
				MS/MSD %R	MS/MSD RPD	LCS %R	MS/MSD %R	MS/MSD RPD	LCS %R
91-58-7	2-Chloronaphthalene	SVOC	8270C	35-110	32	39-108	42-113	24	52-116
106-47-8	4-Chloroaniline	SVOC	8270C	22-98	36	34-103	14-91	34	16-93
86-74-8	Carbazole	SVOC	8270C	54-127	26	63-122	40-126	26	55-122
105-60-2	Caprolactam	SVOC	8270C	1-103	43	Jan-99	22-135	32	40-128
218-01-9	Chrysene	SVOC	8270C	49-125	25	57-123	27-135	30	53-120
111-91-1	bis(2-Chloroethoxy)methane	SVOC	8270C	33-116	36	43-119	35-120	25	50-120
111-44-4	bis(2-Chloroethyl)ether	SVOC	8270C	24-124	34	36-124	29-124	27	40-127
108-60-1	bis(2-Chloroisopropyl)ether	SVOC	8270C	31-104	35	40-106	34-110	24	47-111
7005-72-3	4-Chlorophenyl phenyl ether	SVOC	8270C	42-119	28	50-117	40-119	24	52-120
121-14-2	2,4-Dinitrotoluene	SVOC	8270C	45-129	28	56-124	31-123	28	51-125
606-20-2	2,6-Dinitrotoluene	SVOC	8270C	46-132	29	55-128	35-128	27	54-126
91-94-1	3,3'-Dichlorobenzidine	SVOC	8270C	17-119	36	42-116	12-113	35	28-113
53-70-3	Dibenzo(a,h)anthracene	SVOC	8270C	45-136	27	55-133	35-129	28	51-125
132-64-9	Dibenzofuran	SVOC	8270C	44-114	30	53-109	36-125	26	54-118
84-74-2	Di-n-butyl phthalate	SVOC	8270C	49-134	26	58-130	39-124	25	55-122
117-84-0	Di-n-octyl phthalate	SVOC	8270C	46-140	25	55-133	33-135	27	50-132
84-66-2	Diethyl phthalate	SVOC	8270C	46-123	27	52-123	41-116	25	53-118
131-11-3	Dimethyl phthalate	SVOC	8270C	39-123	32	44-126	42-116	25	55-116
117-81-7	bis(2-Ethylhexyl)phthalate	SVOC	8270C	49-141	27	57-134	35-140	30	51-130
206-44-0	Fluoranthene	SVOC	8270C	46-127	27	56-124	24-133	34	50-119
86-73-7	Fluorene	SVOC	8270C	44-121	29	53-118	37-124	27	54-119

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	Method	Aqueous			Soil		
				MS/MSD %R	MS/MSD RPD	LCS %R	MS/MSD %R	MS/MSD RPD	LCS %R
118-74-1	Hexachlorobenzene	SVOC	8270C	46-120	27	54-119	40-116	24	51-123
87-68-3	Hexachlorobutadiene	SVOC	8270C	15-99	39	11-100	31-122	26	40-130
77-47-4	Hexachlorocyclopentadiene	SVOC	8270C	4-124	39	5-120	1-127	37	24-145
67-72-1	Hexachloroethane	SVOC	8270C	16-86	39	13-88	26-108	25	41-118
193-39-5	Indeno(1,2,3-cd)pyrene	SVOC	8270C	43-137	28	55-131	32-130	29	51-124
78-59-1	Isophorone	SVOC	8270C	33-117	36	43-120	35-117	25	50-117
91-57-6	2-Methylnaphthalene	SVOC	8270C	22-117	37	33-103	29-130	28	44-127
88-74-4	2-Nitroaniline	SVOC	8270C	37-135	29	48-132	33-133	30	44-137
99-09-2	3-Nitroaniline	SVOC	8270C	34-115	28	48-115	24-108	31	33-106
100-01-6	4-Nitroaniline	SVOC	8270C	36-128	30	51-125	25-117	31	44-122
91-20-3	Naphthalene	SVOC	8270C	22-106	35	33-98	32-116	28	49-112
98-95-3	Nitrobenzene	SVOC	8270C	30-116	37	41-114	32-120	26	48-118
621-64-7	N-Nitroso-di-n-propylamine	SVOC	8270C	32-118	35	41-121	30-124	25	46-121
86-30-6	N-Nitrosodiphenylamine	SVOC	8270C	42-145	27	54-136	38-143	27	59-130
85-01-8	Phenanthrene	SVOC	8270C	45-127	27	57-119	26-135	33	53-118
129-00-0	Pyrene	SVOC	8270C	45-129	26	56-123	23-139	33	52-120
95-94-3	1,2,4,5-Tetrachlorobenzene	SVOC	8270C	23-131	18	18-130	24-146	19	36-152
Metals, Anions, and General Chemistry									
7429-90-5	Aluminum	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-36-0	Antimony	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-38-2	Arsenic	MET	6010B	75-125	20	80-120	75-125	20	80-120

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	Method	Aqueous			Soil		
				MS/MSD %R	MS/MSD RPD	LCS %R	MS/MSD %R	MS/MSD RPD	LCS %R
7440-39-3	Barium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-41-7	Beryllium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-43-9	Cadmium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-70-2	Calcium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-47-3	Chromium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-48-4	Cobalt	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-50-8	Copper	MET	6010B	75-125	20	80-120	75-125	20	80-120
7439-89-6	Iron	MET	6010B	75-125	20	80-120	75-125	20	80-120
7439-92-1	Lead	MET	6010B	75-125	20	80-120	75-125	20	80-120
7439-95-4	Magnesium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7439-96-5	Manganese	MET	6010B	75-125	20	80-120	75-125	20	80-120
7439-97-6	Mercury	MET	7470A	75-125	20	80-120	75-125	20	80-120
7440-02-0	Nickel	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-09-7	Potassium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7782-49-2	Selenium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-22-4	Silver	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-23-5	Sodium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-28-0	Thallium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-62-2	Vanadium	MET	6010B	75-125	20	80-120	75-125	20	80-120
7440-66-6	Zinc	MET	6010B	75-125	20	80-120	75-125	20	80-120
7664-41-7	Ammonia	AN	SM 4500NH3G	44-153	27	80-120	-	-	-

Table 3
Precision and Accuracy Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	**Analyte**	**Type**	**Method**	**Aqueous**			**Soil**		
				MS/MSD %R	**MS/MSD RPD**	**LCS %R**	**MS/MSD %R**	**MS/MSD RPD**	**LCS %R**
7726-95-6	Bromide	AN	9056	80-120	20	90-110	-	-	-
7773-52-6	Chloride	AN	9056	80-120	20	90-110	80-120	20	90-110
57-12-5	Cyanide	AN	9010A	43-104	28	90-110	20-159	37	90-110
84145-82-4	Nitrate	AN	353.2	58-134	47	90-110	-	-	-
18785-72-3	Sulfate	AN	9056	80-120	20	90-110	80-120	20	90-110
-	pH	General	SM 4500-H^+	NA	5	NA	-	-	-
-	pH	General	9045C	-	-	-	NA	10	NA
-	BOD	General	SM 5210B	NA	43	NA	-	-	-
-	COD	General	SM 5220C	57-134	38	90-110	-	-	-
-	Total Kjeldahl nitrogen	General	351.2	58-141	47	90-110	-	-	-

Notes:
“-“ multiple CAS numbers
AN - anion
CAS - Chemical Abstracts Service
LCS - laboratory control sample
MET - metal
MS/MSD - matrix spike/matrix spike duplicate
NA - not applicable
%R - percent recovery
RPD - relative percent difference
SM - Standard Method for the Examination of Water and Wastewater
SVOC - semi-volatile organic compound
VOC - volatile organic compound

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
Volatile Organic Compounds (VOCs)							
67-64-1	Acetone	VOC	8260B	10	µg/L	10	µg/kg
71-43-2	Benzene	VOC	8260B	1	µg/L	1	µg/kg
74-97-5	Bromochloromethane	VOC	8260B	5	µg/L	5	µg/kg
75-27-4	Bromodichloromethane	VOC	8260B	1	µg/L	5	µg/kg
75-25-2	Bromoform	VOC	8260B	4	µg/L	5	µg/kg
74-83-9	Bromomethane	VOC	8260B	2	µg/L	5	µg/kg
78-93-3	2-Butanone (MEK)	VOC	8260B	10	µg/L	10	µg/kg
75-15-0	Carbon disulfide	VOC	8260B	2	µg/L	5	µg/kg
56-23-5	Carbon tetrachloride	VOC	8260B	1	µg/L	5	µg/kg
108-90-7	Chlorobenzene	VOC	8260B	1	µg/L	5	µg/kg
75-00-3	Chloroethane	VOC	8260B	1	µg/L	5	µg/kg
67-66-3	Chloroform	VOC	8260B	1	µg/L	5	µg/kg
74-87-3	Chloromethane	VOC	8260B	1	µg/L	5	µg/kg
110-82-7	Cyclohexane	VOC	8260B	5	µg/L	5	µg/kg
96-12-8	1,2-Dibromo-3-chloropropane	VOC	8260B	10	µg/L	10	µg/kg
124-48-1	Dibromochloromethane	VOC	8260B	1	µg/L	5	µg/kg
106-93-4	1,2-Dibromoethane	VOC	8260B	2	µg/L	1	µg/kg
95-50-1	1,2-Dichlorobenzene	VOC	8260B	1	µg/L	5	µg/kg
541-73-1	1,3-Dichlorobenzene	VOC	8260B	1	µg/L	5	µg/kg
106-46-7	1,4-Dichlorobenzene	VOC	8260B	1	µg/L	5	µg/kg
75-71-8	Dichlorodifluoromethane	VOC	8260B	5	µg/L	5	µg/kg

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
75-34-3	1,1-Dichloroethane	VOC	8260B	1	µg/L	5	µg/kg
107-06-2	1,2-Dichloroethane	VOC	8260B	1	µg/L	1	µg/kg
75-35-4	1,1-Dichloroethene	VOC	8260B	1	µg/L	5	µg/kg
156-59-2	cis-1,2-Dichloroethene	VOC	8260B	1	µg/L	5	µg/kg
156-60-5	trans-1,2-Dichloroethene	VOC	8260B	1	µg/L	5	µg/kg
78-87-5	1,2-Dichloropropane	VOC	8260B	1	µg/L	5	µg/kg
10061-01-5	cis-1,3-Dichloropropene	VOC	8260B	1	µg/L	5	µg/kg
10061-02-6	trans-1,3-Dichloropropene	VOC	8260B	1	µg/L	5	µg/kg
123-91-1	1,4-Dioxane	VOC	8260B	130	µg/L	130	µg/kg
100-41-4	Ethylbenzene	VOC	8260B	1	µg/L	1	µg/kg
76-13-1	Freon 113	VOC	8260B	5	µg/L	5	µg/kg
591-78-6	2-Hexanone	VOC	8260B	5	µg/L	5	µg/kg
98-82-8	Isopropylbenzene	VOC	8260B	2	µg/L	5	µg/kg
79-20-9	Methyl Acetate	VOC	8260B	5	µg/L	5	µg/kg
108-87-2	Methylcyclohexane	VOC	8260B	5	µg/L	5	µg/kg
1634-04-4	Methyl Tert Butyl Ether	VOC	8260B	1	µg/L	1	µg/kg
108-10-1	4-Methyl-2-pentanone(MIBK)	VOC	8260B	5	µg/L	5	µg/kg
75-09-2	Methylene chloride	VOC	8260B	2	µg/L	5	µg/kg
100-42-5	Styrene	VOC	8260B	5	µg/L	5	µg/kg
79-34-5	1,1,2,2-Tetrachloroethane	VOC	8260B	1	µg/L	5	µg/kg
127-18-4	Tetrachloroethene	VOC	8260B	1	µg/L	5	µg/kg
108-88-3	Toluene	VOC	8260B	1	µg/L	1	µg/kg

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
87-61-6	1,2,3-Trichlorobenzene	VOC	8260B	5	µg/L	5	µg/kg
120-82-1	1,2,4-Trichlorobenzene	VOC	8260B	5	µg/L	5	µg/kg
71-55-6	1,1,1-Trichloroethane	VOC	8260B	1	µg/L	5	µg/kg
79-00-5	1,1,2-Trichloroethane	VOC	8260B	1	µg/L	5	µg/kg
79-01-6	Trichloroethene	VOC	8260B	1	µg/L	5	µg/kg
75-69-4	Trichlorofluoromethane	VOC	8260B	5	µg/L	5	µg/kg
75-01-4	Vinyl chloride	VOC	8260B	1	µg/L	5	µg/kg
-	m,p-Xylene	VOC	8260B	1	µg/L	2	µg/kg
95-47-6	o-Xylene	VOC	8260B	1	µg/L	1	µg/kg
1330-20-7	Xylene (total)	VOC	8260B	1	µg/L	2	µg/kg
Semi-volatile Organic Compounds (SVOCs)							
95-57-8	2-Chlorophenol	SVOC	8270C	5	µg/L	170	µg/kg
59-50-7	4-Chloro-3-methyl phenol	SVOC	8270C	5	µg/L	170	µg/kg
120-83-2	2,4-Dichlorophenol	SVOC	8270C	5	µg/L	170	µg/kg
105-67-9	2,4-Dimethylphenol	SVOC	8270C	5	µg/L	170	µg/kg
51-28-5	2,4-Dinitrophenol	SVOC	8270C	20	µg/L	670	µg/kg
534-52-1	4,6-Dinitro-o-cresol	SVOC	8270C	20	µg/L	670	µg/kg
95-48-7	2-Methylphenol	SVOC	8270C	2	µg/L	67	µg/kg
-	3&4-Methylphenol	SVOC	8270C	2	µg/L	67	µg/kg
88-75-5	2-Nitrophenol	SVOC	8270C	5	µg/L	170	µg/kg
100-02-7	4-Nitrophenol	SVOC	8270C	10	µg/L	330	µg/kg
87-86-5	Pentachlorophenol	SVOC	8270C	10	µg/L	330	µg/kg

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
108-95-2	Phenol	SVOC	8270C	2	µg/L	67	µg/kg
58-90-2	2,3,4,6-Tetrachlorophenol	SVOC	8270C	5	µg/L	170	µg/kg
95-95-4	2,4,5-Trichlorophenol	SVOC	8270C	5	µg/L	170	µg/kg
88-06-2	2,4,6-Trichlorophenol	SVOC	8270C	5	µg/L	170	µg/kg
83-32-9	Acenaphthene	SVOC	8270C	1	µg/L	33	µg/kg
208-96-8	Acenaphthylene	SVOC	8270C	1	µg/L	33	µg/kg
98-86-2	Acetophenone	SVOC	8270C	2	µg/L	170	µg/kg
120-12-7	Anthracene	SVOC	8270C	1	µg/L	33	µg/kg
1912-24-9	Atrazine	SVOC	8270C	5	µg/L	170	µg/kg
100-52-7	Benzaldehyde	SVOC	8270C	5	µg/L	170	µg/kg
56-55-3	Benzo(a)anthracene	SVOC	8270C	1	µg/L	33	µg/kg
50-32-8	Benzo(a)pyrene	SVOC	8270C	1	µg/L	33	µg/kg
205-99-2	Benzo(b)fluoranthene	SVOC	8270C	1	µg/L	33	µg/kg
191-24-2	Benzo(g,h,i)perylene	SVOC	8270C	1	µg/L	33	µg/kg
207-08-9	Benzo(k)fluoranthene	SVOC	8270C	1	µg/L	33	µg/kg
101-55-3	4-Bromophenyl phenyl ether	SVOC	8270C	2	µg/L	67	µg/kg
85-68-7	Butyl benzyl phthalate	SVOC	8270C	2	µg/L	67	µg/kg
92-52-4	1,1'-Biphenyl	SVOC	8270C	1	µg/L	67	µg/kg
91-58-7	2-Chloronaphthalene	SVOC	8270C	2	µg/L	67	µg/kg
106-47-8	4-Chloroaniline	SVOC	8270C	5	µg/L	170	µg/kg
86-74-8	Carbazole	SVOC	8270C	1	µg/L	67	µg/kg
105-60-2	Caprolactam	SVOC	8270C	2	µg/L	67	µg/kg

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
218-01-9	Chrysene	SVOC	8270C	1	µg/L	33	µg/kg
111-91-1	bis(2-Chloroethoxy)methane	SVOC	8270C	2	µg/L	67	µg/kg
111-44-4	bis(2-Chloroethyl)ether	SVOC	8270C	2	µg/L	67	µg/kg
108-60-1	bis(2-Chloroisopropyl)ether	SVOC	8270C	2	µg/L	67	µg/kg
7005-72-3	4-Chlorophenyl phenyl ether	SVOC	8270C	2	µg/L	67	µg/kg
121-14-2	2,4-Dinitrotoluene	SVOC	8270C	2	µg/L	67	µg/kg
606-20-2	2,6-Dinitrotoluene	SVOC	8270C	2	µg/L	67	µg/kg
91-94-1	3,3'-Dichlorobenzidine	SVOC	8270C	5	µg/L	170	µg/kg
53-70-3	Dibenzo(a,h)anthracene	SVOC	8270C	1	µg/L	33	µg/kg
132-64-9	Dibenzofuran	SVOC	8270C	5	µg/L	67	µg/kg
84-74-2	Di-n-butyl phthalate	SVOC	8270C	2	µg/L	67	µg/kg
117-84-0	Di-n-octyl phthalate	SVOC	8270C	2	µg/L	67	µg/kg
84-66-2	Diethyl phthalate	SVOC	8270C	2	µg/L	67	µg/kg
131-11-3	Dimethyl phthalate	SVOC	8270C	2	µg/L	67	µg/kg
117-81-7	bis(2-Ethylhexyl)phthalate	SVOC	8270C	2	µg/L	67	µg/kg
206-44-0	Fluoranthene	SVOC	8270C	1	µg/L	33	µg/kg
86-73-7	Fluorene	SVOC	8270C	1	µg/L	33	µg/kg
118-74-1	Hexachlorobenzene	SVOC	8270C	1	µg/L	67	µg/kg
87-68-3	Hexachlorobutadiene	SVOC	8270C	1	µg/L	33	µg/kg
77-47-4	Hexachlorocyclopentadiene	SVOC	8270C	20	µg/L	670	µg/kg
67-72-1	Hexachloroethane	SVOC	8270C	2	µg/L	170	µg/kg
193-39-5	Indeno(1,2,3-cd)pyrene	SVOC	8270C	1	µg/L	33	µg/kg

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
78-59-1	Isophorone	SVOC	8270C	2	µg/L	67	µg/kg
91-57-6	2-Methylnaphthalene	SVOC	8270C	1	µg/L	67	µg/kg
88-74-4	2-Nitroaniline	SVOC	8270C	5	µg/L	170	µg/kg
99-09-2	3-Nitroaniline	SVOC	8270C	5	µg/L	170	µg/kg
100-01-6	4-Nitroaniline	SVOC	8270C	5	µg/L	170	µg/kg
91-20-3	Naphthalene	SVOC	8270C	1	µg/L	33	µg/kg
98-95-3	Nitrobenzene	SVOC	8270C	2	µg/L	67	µg/kg
621-64-7	N-Nitroso-di-n-propylamine	SVOC	8270C	2	µg/L	67	µg/kg
86-30-6	N-Nitrosodiphenylamine	SVOC	8270C	5	µg/L	170	µg/kg
85-01-8	Phenanthrene	SVOC	8270C	1	µg/L	33	µg/kg
129-00-0	Pyrene	SVOC	8270C	1	µg/L	33	µg/kg
95-94-3	1,2,4,5-Tetrachlorobenzene	SVOC	8270C	2	µg/L	170	µg/kg
Metals, Anions, and General Chemistry							
7429-90-5	Aluminum	MET	6010B	200	µg/L	20	mg/kg
7440-36-0	Antimony	MET	6010B	6	µg/L	2	mg/kg
7440-38-2	Arsenic	MET	6010B	8	µg/L	2	mg/kg
7440-39-3	Barium	MET	6010B	200	µg/L	20	mg/kg
7440-41-7	Beryllium	MET	6010B	1	µg/L	0.5	mg/kg
7440-43-9	Cadmium	MET	6010B	3	µg/L	0.5	mg/kg
7440-70-2	Calcium	MET	6010B	5000	µg/L	500	mg/kg
7440-47-3	Chromium	MET	6010B	10	µg/L	1	mg/kg
7440-48-4	Cobalt	MET	6010B	50	µg/L	5	mg/kg

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
7440-50-8	Copper	MET	6010B	10	µg/L	2.5	mg/kg
7439-89-6	Iron	MET	6010B	100	µg/L	10	mg/kg
7439-92-1	Lead	MET	6010B	3	µg/L	2	mg/kg
7439-95-4	Magnesium	MET	6010B	5000	µg/L	500	mg/kg
7439-96-5	Manganese	MET	6010B	15	µg/L	1.5	mg/kg
7439-97-6	Mercury	MET	7470A	0.2	µg/L	0.034	mg/kg
7440-02-0	Nickel	MET	6010B	10	µg/L	4	mg/kg
7440-09-7	Potassium	MET	6010B	10000	µg/L	1000	mg/kg
7782-49-2	Selenium	MET	6010B	10	µg/L	2	mg/kg
7440-22-4	Silver	MET	6010B	10	µg/L	1	mg/kg
7440-23-5	Sodium	MET	6010B	10000	µg/L	1000	mg/kg
7440-28-0	Thallium	MET	6010B	10	µg/L	1	mg/kg
7440-62-2	Vanadium	MET	6010B	50	µg/L	5	mg/kg
7440-66-6	Zinc	MET	6010B	20	µg/L	2	mg/kg
7664-41-7	Ammonia	AN	SM 4500NH3G	0.2	mg/L	-	-
7726-95-6	Bromide	AN	9056	0.5	mg/L	-	-
7773-52-6	Chloride	AN	9056	2	mg/L	20	mg/kg
57-12-5	Cyanide	AN	9010A	0.01	mg/L	0.024	mg/kg
84145-82-4	Nitrate	AN	353.2	0.1	mg/L	-	-
18785-72-3	Sulfate	AN	9056	10	mg/L	100	mg/kg
-	pH	General	SM 4500-H^+	NA	NA	-	-

Table 4
Analytical Method Reporting Limits

Former Pratt Oil Works
Long Island City, New York

CAS Number	Analyte	Type	SW-846 Method	Aqueous		Soil	
				RL	Units	RL	Units
-	pH	General	9045C	-	-	NA	NA
-	BOD	General	SM 5210B	2	mg/L	-	-
-	COD	General	SM 5220C	20	mg/L	-	-
-	Total Kjeldahl nitrogen	General	351.2	0.2	mg/L	-	-

Notes:
"-" multiple CAS numbers
AN - anion
CAS - Chemical Abstracts Service
µg/L - micrograms per liter
µg/kg - micrograms per kilogram
mg/L - milligrams per liter
mg/kg - milligrams per kilogram
MET - metal
NA - not applicable
RL - reporting limit
SVOC - semi-volatile organic compound
VOC - volatile organic compound

Table 5
QA/QC Requirements and Performance Standards for TCL VOCs by Method 8260B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
GC/MS Tunes with BFB	Inter-laboratory consistency and comparability	(1) Criteria listed in Table 4 of SW-846 Method 8260 (the same criteria must be used for all analyses) (2) Every 12 hours	No	(1) Perform instrument maintenance as necessary (2) Retune instrument	Suspend all analyses until tuning non-compliance is rectified
Initial Calibration	Laboratory Analytical Accuracy	(1) Minimum of 5 standards* (2) Low standard must be ≤RL (3) %RSD ≤15 or "r" ≥0.990 for all compounds except CCCs, which must be ≤30% RSD or "r" ≥0.990 (4) Must contain all target analytes (5) If regression is used, must not be forced through the origin (6) Minimum RF for all compounds 0.05	No	Recalibrate as required by method if: (1) Any of CCC >30% %RSD or (2) Any one of CCC "r" <0.990 or (3) >20% of remaining analytes have %RSD >30 or "r" <0.990	Sample analysis cannot proceed without a valid initial calibration. Report non-conforming compounds in case narrative. If the average response factor or linear regression are not used for quantitation (e.g. use of a quadratic equation), this must be noted in narrative with a list of affected analytes.
CCAL	Laboratory Analytical Accuracy	(1) Every 12 hours prior to analysis of samples (2) Concentration level near midpoint of curve (3) Must contain all target analytes (4) %D must be ≤20 for CCCs and should be ≤30 for all other compounds	No	Recalibrate as required by method if: (1) %D of any CCC >20 or (2) %D of >10% of other analytes >30	Report non-conforming compounds in case narrative

Table 5
QA/QC Requirements and Performance Standards for TCL VOCs by Method 8260B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
Method Blanks	Laboratory Contamination Evaluation	(1) Every 12 hour shift or 20 samples, whichever is more frequent, prior to sample analysis and after calibration standards (2) Matrix and preservative-specific (e.g. water, MeOH, $NaHSO_4$) (3) Target analytes must be <RL except for common lab contaminants which must be <3 times the RL (acetone, methylene chloride, and 2-butanone)	Yes	(1) Locate source of contamination and correct problem (2) Reanalyze method blank.	(1) Report non-conformances in case narrative (2) All results for compounds present in method blank must be “B” flagged if detected in samples associated with the method blank
LCS	Laboratory Method Accuracy	(1) Every 20 samples/matrix or for each new tune clock, whichever is more frequent (2) Standard source different from initial calibration source (3) Concentration level must be near or at the mid-point of the initial calibration (4) Must contain all target analytes (5) Matrix and preservative specific (e.g. water, MeOH, $NaHSO_4$) (6) Laboratory determined percent recoveries must be between 70-130% for target compounds (7) Can also be used as CCAL (8) Lab may have up to 10% of compounds out of criteria as long as within 40-160% recovery	Yes	(1) Recalculate the percent recoveries (2) Reanalyze the LCS (3) Locate and correct problem (4) Reanalyze associated samples	(1) Report non-conformances in case narrative (2) Individual laboratories must identify and document problem analytes which routinely fall outside the 70-130% limit. Any exceedances must be noted in narrative. Data to support laboratory problem compounds kept on file at lab for review during audit

Table 5
QA/QC Requirements and Performance Standards for TCL VOCs by Method 8260B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
Site Specific MS/MSD	Method Accuracy in Sample Matrix Method Precision in Sample Matrix	(1) Every 20 samples (2) Matrix Specific, not required for trip blanks or field blanks (3) Must contain all target analytes (4) Laboratory determined percent recoveries should be between 70-130% for target compounds (5) RPDs should be ≤30% (6) Field blanks, trip blanks, etc. cannot be used for MS/MSDs.	Yes	Compare to LCS recoveries, narrate any non- conformances	Report non-conformances in case narrative

Table 5
QA/QC Requirements and Performance Standards for TCL VOCs by Method 8260B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
Surrogates	Accuracy in Sample Matrix	(1) A minimum of 3 surrogates must be added to all samples, blanks, etc prior to sample introduction (2) Evaluate recoveries in each sample (3) Laboratory determined percent recoveries must be between 70-130% for individual surrogate compounds. Laboratory determined recovery limits may be outside 70-130% limits for difficult matrices (e.g. waste, sludges, etc)	Yes	If one or more surrogates are outside limits, reanalyze the sample unless one of the following exceptions occurs: (1) For methanol preserved samples reanalysis is not required if moisture >25% and recoveries are >10% (2) If one surrogate exhibits high recovery and associated target compounds are not detected in the sample, report data as is, no reanalysis required.	(1) Note exceedances in narrative (2) If reanalysis confirms matrix interference, report both sets of results and note in narrative (3) If reanalysis performed in holding time and surrogate recoveries are in range, report only the compliant data (4) If reanalysis performed outside of holding time and surrogate recoveries are in range, report both sets of data, note in narrative

Table 5
QA/QC Requirements and Performance Standards for TCL VOCs by Method 8260B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
IS	Laboratory Analytical Accuracy and Method Accuracy in Sample	(1) Laboratory must use a minimum of 3 IS at retention times across the GC run (2) Area counts in samples must be within -50% to +100% of the area counts in the associated CCAL (3) Retention times of IS must be within ±30 seconds of the IS retention times in the associated CCAL	No	If any IS outside the QC limits, reanalyze the sample	(1) Note exceedances in narrative (2) If reanalysis confirms matrix interference, report both sets of results and note in narrative (3) If reanalysis performed in holding time and IS are in criteria, report only the compliant data (4) If reanalysis performed outside of holding time and IS are in out of criteria, report both sets of data, note in narrative

Table 5
QA/QC Requirements and Performance Standards for TCL VOCs by Method 8260B

Former Pratt Oil Works
Long Island City, New York

Notes:
* Six standards for a quadratic equation calibration curve. Seven for a polynomial fit. In either case the correlation coefficient must be ≥0.990.

Potentially Difficult Compounds include acetone, bromomethane, chloroethane, dichlorodifluoromethane, dibromochloromethane, hexachlorobutadiene, 2-butanone (MEK), 4-methyl-2-pentanone, and trichlorofluoromethane

CCC - Calibration Check Compound
CCAL - Continuing Calibration Standard
%D - Percent Difference or Percent Drift
BFB - 4-Bromofluorobenzene
GC/MS - Gas Chromatography/Mass Spectrometry
IS - Internal Standards
LCS - Laboratory Control Sample
MS/MSD - Matrix Spike/Matrix Spike Duplicate
N/A - Not Applicable
ND - Not Detected
r - Correlation Coefficient
%RSD - Relative Percent Standard Deviation
RPD - Relative Percent Difference
RF - Relative Response Factor
RL - Reporting Limit
RPD - Relative Percent Difference
RT - Retention Time
TICs - Tentatively Identified Compounds
VOC - Volatile Organic Compound

Table 6
QA/QC Requirements and Performance Standards for TCL SVOCs by Method 8270

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
General Reporting Issues	N/A	(1) The laboratory should report only concentrations detected above the sample specific RL (2) Concentrations below the RL should be reported as ND with the sample specific RL also reported (3) Dilutions: If diluted and undiluted analyses are performed, the laboratory should report results for both sets of data. Compounds which exceed the linear range should be flagged ("E" flag). Do not report more than two sets of data per sample. (4) If a dilution is performed, the highest detected analyte must be in the upper 60% of the calibration curve, unless there are non-target analytes whose concentrations are so high as to cause damage to the instrumentation or saturate the mass spectrometer (5) Refer to Appendix A for guidance on reporting TICs	N/A		(1) Qualification of results below the RL is required (2) Performance of dilutions must be documented in the case narrative (3) TICs will be evaluated according to Appendix A

Table 6
QA/QC Requirements and Performance Standards for TCL SVOCs by Method 8270

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
GC/MS Tunes with DFTPP	Inter-laboratory consistency and comparability	(1) Criteria listed in Table 3 of this document (the same criteria must be used for all analyses) (2) Every 12 hours (3) Pentachlorophenol and benzidine peak tailing should be evaluated. Peak tailing factor must be <3 for benzidine and <5 for pentachlorophenol. Note: Tune must be performed in full SCAN mode for SIM Analysis	No	Perform instrument maintenance as necessary; retune instrument	(1) Suspend all analyses until tuning non-compliance is rectified (2) Report peak tailing exceedances in narrative
Initial Calibration	Laboratory Analytical Accuracy	(1) Minimum of 5 standards* (2) Low standard must be ≤RL (3) Full Scan: %RSD ≤15 or r ≥0.990 for all compounds except CCCs, which must be ≤30% RSD or r ≥0.990 (4) SIM: %RSD ≤30 or r≥0.990. (5) Must contain all target analytes (6) If regression is used, must not be forced through the origin (7) If SIM is used, laboratory must monitor at least two ions/analytes for all targets, surrogates, and IS (8) Minimum RF for all compounds >0.05	No	Recalibrate as required by method if: (1) any of CCC %RSD >30% or (2) any one of CCC r <0.990 or (3) >20% of remaining analytes have %RSD >30 or r <0.990	Sample analysis cannot proceed without a valid initial calibration. Report non-conforming compounds in case narrative. If the average response factor or linear regression are not used for quantitation (e.g. use of a quadratic equation), this must be noted in narrative with a list of affected analytes.

Table 6
QA/QC Requirements and Performance Standards for TCL SVOCs by Method 8270

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
CCAL	Laboratory Analytical Accuracy	(1) Every 12 hours prior to analysis of samples (2) Concentration level near midpoint of curve (3) Must contain all target analytes (4) Full Scan: %D must be ≤20 for CCCs and should be ≤30 for all other compounds (5) SIM: %D should be ≤30 for compounds	No	Recalibrate as required by method if: (1) %D of any CCC >20 or (2) %D of >10% of other analytes >30	Report non-conforming compounds in case narrative
Method Blanks	Laboratory Contamination Evaluation	(1) Extracted every 20 or every batch, whichever is greater (2) Matrix specific (3) Target analytes must be <RL except for common lab contaminants which must be <3 times the RL. Common contaminants are phthalates.	Yes	(1) Locate source of contamination and correct problem (2) Reanalyze method blank	(1) Report in case narrative (2) All results for compounds present in method blank must be "B" flagged if detected in samples associated with the method blank (3) If re-extraction performed within holding time, report only compliant data. If re-extraction performed outside holding time report all data.

Table 6
QA/QC Requirements and Performance Standards for TCL SVOCs by Method 8270

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
LCS	Laboratory Method Accuracy	(1) Every 20 samples or each batch, whichever is more frequent (2) Standard source different from initial calibration source (3) Concentration level must be near or at the mid-point of the initial calibration (4) Must contain all target analytes (5) Matrix and preservative specific (6) Laboratory determined percent recovery limits must be between 40-140% for base-neutrals and 30-130% for acid compounds	Yes	(1) Recalculate percent recoveries (2) Reanalyze the LCS (3) Re-extract LCS and samples if >20% compounds outside acceptance criteria (4) Locate & correct problem (5) Reanalyze associated samples	(1) Report in case narrative (2) Individual laboratories must identify and document problem analytes which routinely fall outside the limits (3) Exceedances must be noted in narrative (4) Data to support laboratory problem compounds kept on file at lab for review during audit (5) If re-extraction performed within holding time, report only compliant data. If re-extraction performed outside holding time report data.

Table 6
QA/QC Requirements and Performance Standards for TCL SVOCs by Method 8270

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
Site Specific MS/MSD	Precision and Accuracy in Sample Matrix	(1) Every 20 samples per matrix (2) Spike concentration in lower part of calibration curve (3) Must contain all target analytes (4) Laboratory determined percent recovery limits must be between 40-140% for base-neutrals and 30-130% for acid compounds (5) RPDs 20% for waters and 30% for soils	Yes	(1) If compounds out compare to LCS (2) If LCS recoveries in note in narrative (3) If LCS compounds out note in narrative probable lab error	Note outliers in narrative
Surrogates	Accuracy in Sample Matrix	(1) Minimum 3 base-neutral and 3 acid surrogates across retention times of GC run (2) Soil recovery limits lab generated and within 30-130% (3) Water recovery limits lab generated and within 30-130% for base-neutrals, 15-110% for acidic compounds	Yes	(1) Allowed one acid or one base-neutral surrogate out as long as above 10% recovery (2) If any one surrogate <10% recovery or if any two in a fraction out, re- extract (3) If surrogate diluted out below lowest calibration standard, no recovery criteria	(1) Note exceedances in narrative (2) If re-extraction confirms matrix interference or if re-extraction outside holding times report all results (3) If re-extraction results in criteria and in holding time, report only compliant data

Table 6
QA/QC Requirements and Performance Standards for TCL SVOCs by Method 8270

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
IS	Laboratory and Method Accuracy in Sample Matrix	(1) Full Scan: Minimum of six IS across GC run (2) SIM: Number of IS will vary depending on number of analytes of interest. IS must elute reasonably close to analytes and of similar class (3) Area counts -50 to +100% of areas in associated continuing cal check (4) RTs of IS ±30 seconds of associated continuing cal check	No	If any IS outside criteria, reanalyze sample extract	(1) Note exceedances in narrative (2) If reanalysis confirms matrix interference report all results (3) If reanalysis does not confirm matrix interference, report only compliant data (4) If reanalysis outside holding time, report both sets of data
Quantitation	N/A	(1) Quantitation must be based on IS method (2) Laboratory must use average RF or linear regression from initial calibration (3) IS used for quantitation closest eluting to analyte	N/A	N/A	If the average RF or linear regression not used for quantitation (e.g. quadratic equation) lab must note in narrative with list of affected analytes. Quadratic or polynomial fits require 6 & 7 calibration points.

Table 6
QA/QC Requirements and Performance Standards for TCL SVOCs by Method 8270

Former Pratt Oil Works
Long Island City, New York

Notes:
* Six standards are required for a quadratic equation calibration curve, and seven are required for a polynomial fit. In either case the correlation coefficient must be ≥0.990.

Potentially Difficult Compounds include dimethyl phthalate, 4-nitrophenol, phenol, 4-methylphenol, 2-methylphenol, 2,4-dinitrophenol, pentachlorophenol, and 4-chloroaniline

CCCs - Calibration Check Compounds
CCAL - Continuing Calibration Standard
%D - Percent Difference or Percent Drift
DFTPP - Decafluorotriphenylphosphine
GC/MS - Gas Chromatography/Mass Spectrometry
IS - Internal Standards
LCS - Laboratory Control Sample
MS/MSD - Matrix Spike/Matrix Spike Duplicate
N/A - Not Applicable
ND - Not Detected
r - Correlation Coefficient
%RSD - Relative Percent Standard Deviation
RF - Relative Response Factor
RL - Reporting Limit
RPD - Relative Percent Difference
RT - Retention Time
SIM - Selected Ion
SVOC - Semi-Volatile Organic Compound
TICs - Tentatively Identified Compounds

Table 7
QA/QC Requirements and Performance Standards for TAL Metals by Method 6010B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
Initial Calibration	Laboratory Analytical Accuracy	(1) Daily following instrument profiling and prior to sample analysis (2) Minimum of calibration blank plus one standard (3) Linear curve with “r” ≥0.995. Can use second order fit if “r” ≥0.995	No	Re-optimize instrument and recalibrate as necessary.	Linear curve criteria applicable to calibration curves with blank plus 2 or more calibration standards
ICV	Laboratory Analytical Accuracy	(1) Daily immediately after calibration and prior to sample analysis (2) 2nd source standard (3) ICV ±10% of true value. Must use at least two burns with RPD <5%	No	Recalibrate/Re-analyze ICV as required by method	Suspend all analyses until problem corrected and ICV meets criteria
ICB	Evaluation of instrument drift, sensitivity, and contamination	(1) Daily immediately after ICV (2) Matrix matched with standards and samples (3) ICB must be <RL	No	Recalibrate/Reanalyze ICB as required by method	
Low Level Calibration Check Standard	Instrument sensitivity to support RL	Only required if low calibration standard not at or below RL (1) Daily prior to sample analysis (2) Standard concentration ≤RL for all analytes (3) Recovery ±30% of true value	No	Recalibrate/Narrate	Report non-conformances in narrative
CCV	Laboratory Analytical Accuracy	(1) Every 10 samples and at end of analytical sequence (2) Can be same source or second source (3) Recovery ±10% of true value, Must use at least two burns with RPD <5%	No	Recalibrate/Reanalyze all samples since last compliant CCV	Report non-conformances in narrative

Table 7
QA/QC Requirements and Performance Standards for TAL Metals by Method 6010B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
CCB	Evaluation of instrument drift, sensitivity, and contamination.	(1) Every 10 samples immediately after CCV (2) Matrix matched with standards and samples (3) ICB must be <RL	No	Recalibrate/Reanalyze all samples since last compliant CCV	Report non-conformances in narrative
ICSA & ICSAB	Laboratory Analytical Accuracy	(1) Daily prior to sample analysis and at the end of the analytical sequence (2) ICSA and ICSAB containing known amounts of analytes and interferents per method (3) Recoveries for all analytes ±20% of true value	No	May require adjustment of inter-element correction factors, background correction and/or linear ranges	Report non-conformances in narrative
Method Blanks	Laboratory Contamination Evaluation	(1) Digested every 20 or every batch, whichever is greater. If no digestion, ICB = blank (2) Matrix specific and matrix matched (3) Target analytes must be <RL	Yes	(1) Locate source of contamination and correct problem (2) Reanalyze method blank (3) Prepare samples unless all analyte concentration >10 times method blank level	Report non-conformances in case narrative

Table 7
QA/QC Requirements and Performance Standards for TAL Metals by Method 6010B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
LCS	Laboratory Method Accuracy	(1) Every 20 samples or each batch, whichever is more frequent. If samples not digested, ICV = LCS (2) Standard source different from initial calibration source (3) Matrix specific (solid, aqueous, etc) (4) LCS recoveries ±20% for aqueous media and within vendor control (95% confidence limits) for solids	Yes	Re-digest and reanalyze all samples	Report non-conformances in narrative
Site Specific MS	Accuracy in Sample Matrix	(1) Every 20 samples or batch per matrix (2) Percent recovery limits must be between 75-125%	Yes	If recoveries >30% and LCS in limits, note in narrative. If MS recoveries <30%, prepare and reanalyze samples.	Note outliers in narrative
Site Specific Matrix Duplicate (Lab may elect to analyze MSD instead)	Precision in Sample Matrix	(1) Every 20 samples or batch per matrix (2) For aqueous samples: If concentration >5 times the RL, RPD ±20%, if concentration <5 times RL, difference <RL (3) For solids: If concentration >5 times RL, RPD ±35%. If concentration <5 times RL, difference ≤2 times RL	Yes	If LCS in criteria, narrate outliers	Note outliers in narrative
Linear Range Determination	Laboratory Method Accuracy	(1) Performed at least annually (2) Determine upper limit of linear dynamic range for each wavelength utilized as per method	No	N/A	Data must be on-file to document performance

Table 7
QA/QC Requirements and Performance Standards for TAL Metals by Method 6010B

Former Pratt Oil Works
Long Island City, New York

Required QA/QC Parameter	Data Quality Objective	Required Performance Standard	Required Deliverable	Recommended Corrective Action	Analytical Response Action
IECs	Laboratory Method Accuracy	(1) Verify every six months (2) Routine analysis of ICSA and ICSAB verifies inter-element spectral interference corrections — See method for details	No	Adjust software settings	Data must be on-file to document performance
General Reporting Issues	N/A	(1) The laboratory should report only concentrations detected above the sample specific RL (2) Concentrations below the RL should be reported as “ND” with the sample specific RL also reported (3) Dilutions: If analytes above linear range, dilute and reanalyze for those analytes (4) Soils/sediments reported on a dry weight basis.	N/A	N/A	

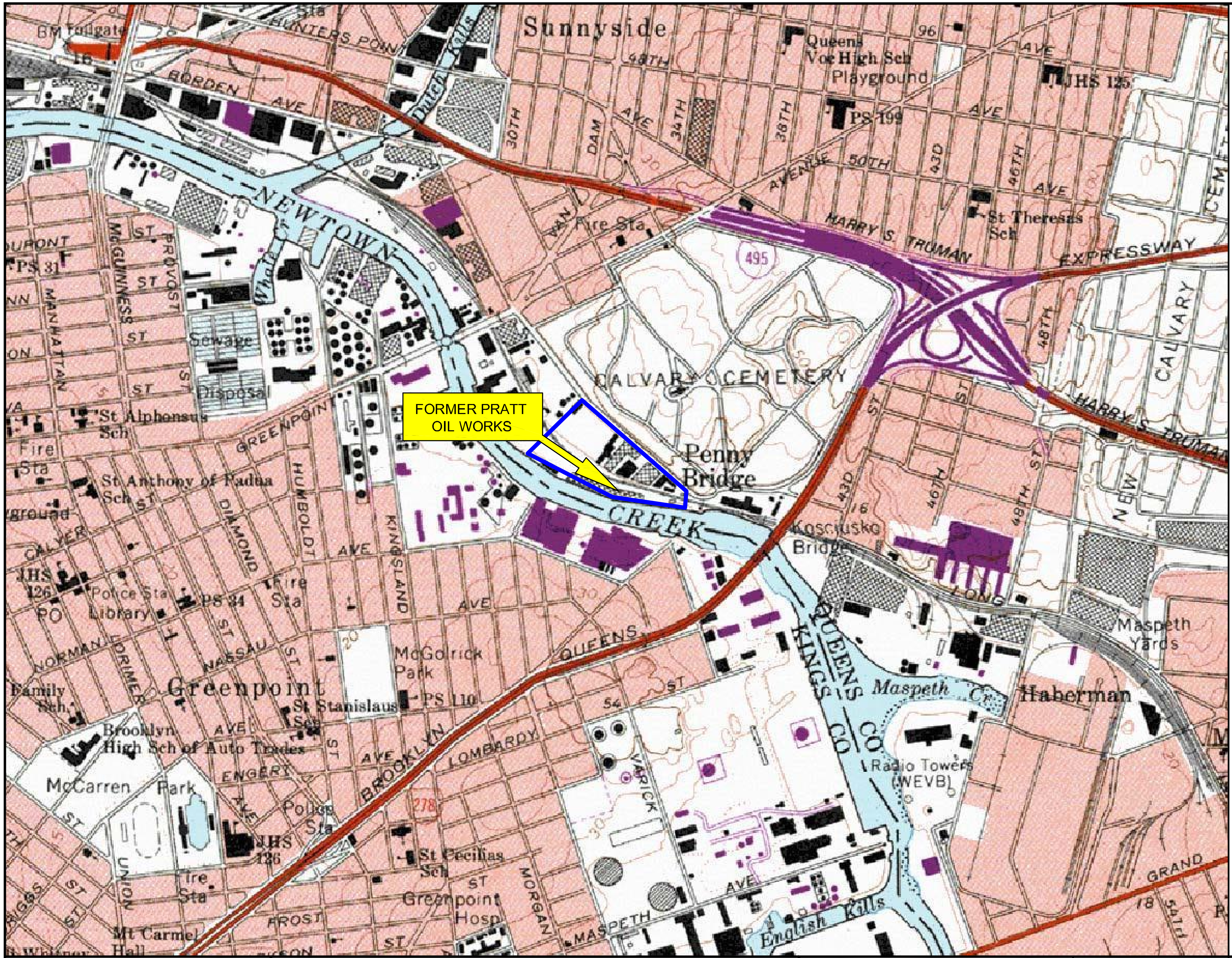
Table 7
QA/QC Requirements and Performance Standards for TAL Metals by Method 6010B

Former Pratt Oil Works
Long Island City, New York

Notes:

CCB - Continuing Calibration Blank
CCV - Continuing Calibration Verification
ICB - Initial Calibration Blank
ICSA & ICSB - Interference Check Standards
ICV - Initial Calibration Verification
IECs - Interelement Correction Factors
LCS - Laboratory Control Sample
MS/MSD - Matrix Spike/Matrix Spike Duplicate
N/A - Not Applicable
ND - Not Detected
r - Correlation Coefficient
RL - Reporting Limit

FIGURES



0 500 1,000 2,000

SCALE (feet)

APPROXIMATE LOCATION OF FORMER PRATT OIL WORKS

N

LATITUDE:	40° 43' 47.32" N
LONGITUDE:	73° 56' 08.26" W

SOURCE:
USGS 7.5' SERIES TOPOGRAPHIC MAP,
"BROOKLYN, NY QUADRANGLE
PHOTOREVISED 1979"

QUADRANGLE LOCATION

BOHEMIA, NY

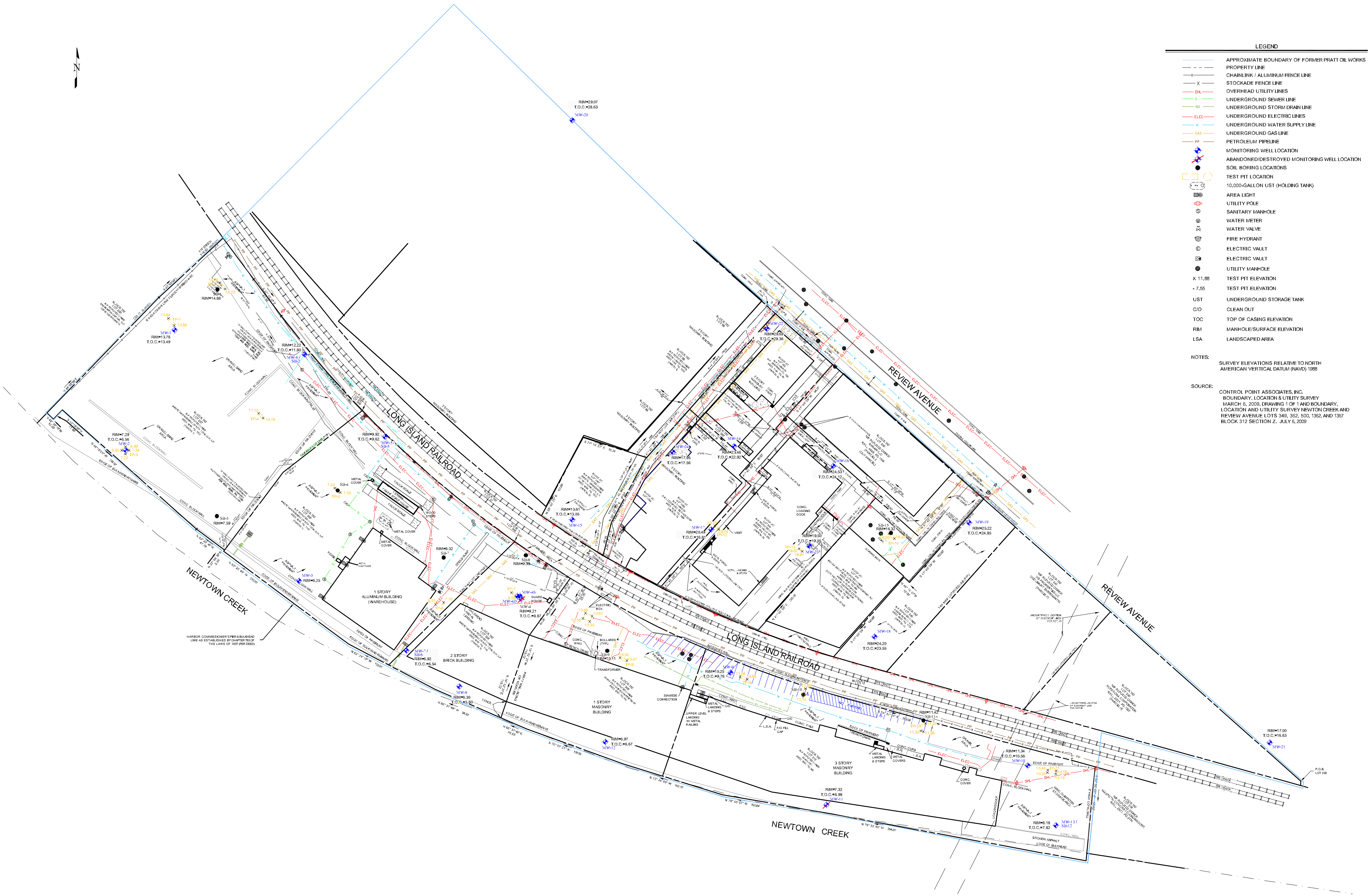
KLEINFELDER
Bright People. Right Solutions.
www.kleinfelder.com

PROJECT NO.	108988
DRAWN:	04/08/2010
DRAWN BY:	JR
CHECKED BY:	
FILE NAME:	

LOCUS PLAN

FORMER PRATT OIL WORKS
THE INLAND PARCELS (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
1



0 30 60 120
SCALE (feet)

LEGEND

——	APPROXIMATE BOUNDARY OF FORMER PRATT OIL WORKS
— — —	PROPERTY LINE
—o——	CHAINLINK / ALUMINUM FENCE LINE
—X——	STOCKADE FENCE LINE
—OHL—	OVERHEAD UTILITY LINES
—S—	UNDERGROUND SEWER LINE
—SD—	UNDERGROUND STORM DRAIN LINE
—ELEC—	UNDERGROUND ELECTRIC LINES
—W—	UNDERGROUND WATER SUPPLY LINE
—GAS—	UNDERGROUND GAS LINE
—PP—	PETROLEUM PIPELINE
⊕	MONITORING WELL LOCATION
⊘	ABANDONED/DESTROYED MONITORING WELL LOCATION
●	SOIL BORING LOCATIONS
▭ ◯	TEST PIT LOCATION
⬭	10,000-GALLON UST (HOLDING TANK)
▪◎	AREA LIGHT
⊖	UTILITY POLE
Ⓢ	SANITARY MANHOLE
Ⓦ	WATER METER
⋈	WATER VALVE
◎	FIRE HYDRANT
Ⓔ	ELECTRIC VAULT
▣	ELECTRIC VAULT
●	UTILITY MANHOLE
X 11.88	TEST PIT ELEVATION
• 7.55	TEST PIT ELEVATION
UST	UNDERGROUND STORAGE TANK
C/O	CLEAN OUT
TOC	TOP OF CASING ELEVATION
RIM	MANHOLE/SURFACE ELEVATION
LSA	LANDSCAPED AREA

NOTES:

SURVEY ELEVATIONS RELATIVE TO NORTH AMERICAN VERTICAL DATUM (NAVD) 1988

SOURCE:

CONTROL POINT ASSOCIATES, INC.
BOUNDARY, LOCATION & UTILITY SURVEY
MARCH 6, 2009, DRAWING 1 OF 1 AND BOUNDARY,
LOCATION AND UTILITY SURVEY NEWTON CREEK AND
REVIEW AVENUE LOTS 349, 362, 500, 1362, AND 1367
BLOCK 312 SECTION Z. JULY 6, 2009

THE EDUCATION LAW OF THE STATE OF NEW YORK PROHIBITS ANY PERSON ALTERING ANYTHING ON THESE DRAWINGS AND/OR THE ACCOMPANYING SPECIFICATIONS, UNLESS IT IS UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. WHERE SUCH ALTERATIONS ARE MADE, THE PROFESSIONAL ENGINEER MUST SIGN, SEAL, DATE AND DESCRIBE THE FULL EXTENT OF THE ALTERATION ON THE DRAWINGS AND/OR IN THE SPECIFICATIONS. (NYS EDUCATION LAW SECTION 7209-2)

NO.	REVISION	BY	DATE
1			

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PROJ. NO. 108988
ACAD FILE: FPOW SITE PLAN WATERFRONT.dwg
DRAWN BY: JR
CHECKED BY: -
DESIGNED BY: -

SITE PLAN

FORMER PRATT OIL WORKS
THE INLAND PARCELS (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FOR REDUCED PLANS:
ORIGINAL IN INCHES
0 0.5 1.0 1.5 2.0

DATE: 05/28/2010
SCALE: 1" = 60'
FIGURE 2

3 of 28 sheets

N

0 40 80
Feet

1 inch equals 80 feet

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PROJECT NO.	108988
DRAWN:	04/08/2010
DRAWN BY:	J.R.
CHECKED BY:	J.W.
FILE NAME:	

AERIAL PLAN

FORMER PRATT OIL WORKS
THE INLAND PARCELS (TRACT I)
THE WATERFRONT PARCELS (TRACT II)
LONG ISLAND CITY, NEW YORK

FIGURE
3