

1888 BATHGATE AVENUE REDEVELOPMENT SITE

**4181 THIRD AVENUE
BRONX COUNTY
BRONX, NEW YORK**

SITE MANAGEMENT PLAN

**NYSDEC Site Number: C203088
AKRF Project Number: 170058**

Prepared for:
NYSDEC Region 2
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Long Island City, New York 11101

On Behalf Of:
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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

DECEMBER 2018

CERTIFICATION STATEMENT

I, Michelle Lapin, P.E., certify that I am currently a New York State registered professional engineer as defined in 6 NYCRR Part 375 and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).



NYS Professional Engineer #073934-1

12/4/18
Date


Signature

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List of Acronyms	
AGV	Air Guidance Values
ASP	Activated Sodium Persulfate
AWQS	Ambient Water Quality Standards
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
COC	Certificate of Completion
CVOC	Chlorinated Volatile Organic Compound
DD	Decision Document
DER	Division of Environmental Remediation
DUSR	Data Usability Summary Report
EC	Engineering Control
ECL	Environmental Conservation Law
EE	Environmental Easement
ELAP	Environmental Laboratory Approval Program
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
EWP	Excavation Work Plan
FER	Final Engineering Report
HASP	Health and Safety Plan
IC	Institutional Control
ISCO	In-Situ Chemical Oxidation
MFR	Modified Fenton's Reagent
NYCDOH	New York City Department of Health
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
OER	Office of Environmental Remediation
ORP	Oxygen Reduction Potential
OSHA	U.S. Occupational Safety and Health Administration
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PERM	Sodium Permanganate
PID	Photoionization Detector
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan

List of Acronyms	
QEP	Qualified Environmental Professional
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RDI	Remedial Design Investigation
RDIR	Remedial Design Investigation Report
REC	Recognized Environmental Condition
RI	Remedial Investigation
RIR	Remedial Investigation Report
ROI	Radius of Influence
RP	Responsible Party
RRSCO	Restricted Residential Use Soil Cleanup Objectives
RSO	Remedial Site Optimization
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SPDES	State Pollutant Discharge Elimination System
SRI	Supplemental Remedial Investigation
SRIR	Supplemental Remedial Investigation Report
SRIWP	Supplemental Remedial Investigation Work Plan
SVOC	Semivolatile Organic Compounds
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TOGS	Technical and Operational Guidance Series
UST	Underground Storage Tank
UUSCO	Unrestricted Use Soil Cleanup Objectives
VOC	Volatile Organic Compounds

EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification:	1888 Bathgate Avenue Redevelopment Site 4181 Third Avenue, Bronx, New York	
Institutional Controls:	1. The property may be used for restricted residential, commercial, and industrial use.	
	2. Environmental Easement	
	3. All ECs must be monitored at a frequency and in a manner defined in the SMP.	
Engineering Controls:	1. Groundwater Treatment Program [In-Situ Chemical Oxidation (ISCO)]	
Monitoring:		
1. Post-remedial groundwater monitoring and sampling.		Quarterly for one year
Reporting:		
1. Groundwater Monitoring Report		Quarterly for one year
2. Periodic Review Report		Annually

Further descriptions of these requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

This Site Management Plan (SMP) is a required element of the remedial program for the 1888 Bathgate Avenue Redevelopment Site located at 4181 Third Avenue in the Bronx, New York (hereinafter referred to as the “Site”). The Site is located in the Borough of the Bronx, New York and is identified as Tax Block 2924, Lot 7 (former Lots 7, 10, 25, 30, and 34) on the New York City Tax Map. The Site is currently enrolled in the New York State (NYS) Brownfield Cleanup Program (BCP) (Site No. C203088), which is administered by the New York State Department of Environmental Conservation (NYSDEC). The Site was investigated and remediated in accordance with Brownfield Cleanup Agreement (BCA) Index No. C203088-03-17, which was executed in May 2017 by Wilfrid East Properties LLC, Wilfrid East LIHTC LLC, and Wilfrid West Properties LLC (collectively the “Original Applicants”). The BCA was amended on August 2, 2017 to add the Applicants Wilfrid Realty Corp., Wilfrid Properties LLC, Wilfrid LIHTC LLC, and ACMH Wilfrid Housing Development Fund Corporation (collectively, with the Original Applicants the “Applicants”). The Site was remediated to Track 2 Restricted Residential Soil Cleanup Objectives (RRSCOs) in accordance with the NYSDEC-approved Remedial Action Work Plan (RAWP) and Decision Document (DD), as described in this SMP.

1.1 General

The Applicants entered into a BCA to investigate and remediate the approximately 0.83-acre Site. A Site Location Map is provided as Figure 1 and a Site Plan showing the Site boundaries is provided as Figure 2. The boundaries of the Site are more fully described in the metes and bounds description that is part of the Environmental Easement provided in Appendix A.

1.2 Purpose

After completion of the remedial work, some contamination was left at the Site, which is hereafter referred to as “remaining contamination.” Institutional and Engineering Controls (ICs and ECs) have been incorporated into the Site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Bronx County Clerk, requires compliance with this SMP and all ECs and ICs placed on the Site.

This SMP was prepared to manage remaining contamination at the Site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this SMP is required by the grantor of the Environmental Easement and the grantor’s successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC); and

- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 New York Codes, Rules, and Regulations (NYCRR) Part 375 and the BCA, (Index No. C203088-03-17; Site C203088) for the Site, and thereby subject to applicable penalties.

All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the Site is provided in Tables 1 and 2 of this SMP.

This SMP was prepared by AKRF, Inc. (AKRF), on behalf of the Applicants, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and ECs that are required by the Environmental Easement for the Site.

1.3 Revisions

Revisions to this SMP will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the Site conditions. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.4 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6 NYCRR Part 375 and/or Environmental Conservation Law (ECL);
- 7-day advance notice of any field activity associated with the remedial program;
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan (EWP);
- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect;
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public; and
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA and all approved work plans and reports, including this SMP; and
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 below includes contact information for the above notification. The information in this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Table 2.

Table 1
Notifications*

Company/Regulator	Contact Name	Contact Title	Contact Number
NYSDEC	Nigel Crawford, P.E.	Project Manager	718-482-7778
	Jane O'Connell	Chief, Superfund and Brownfield Cleanup Section	718-482-4599

* Note: Notifications are subject to change and will be updated as necessary.

Table 2
Site Contact List

Company	Individual Name	Title	Contact Number
AKRF	Michelle Lapin	Remedial Engineer	646-388-9520 (office)
	Marc Godick	Project Principal	914-922-2356 (office)
	Deborah Shapiro	Project Manager	646-388-9544 (office)
	Adrianna Bosco	Deputy Project Manager	646-388-9576 (office) 914-874-3358 (cell)
The Applicants	Emanuel Kokinakis	Applicant Representative	718-932-6342 (office)

2.0 SITE BACKGROUND

2.1 Site Location and Description

The Site is located in the Bronx, Bronx County, New York and is identified as Section 2, Block 2924, Lot 7 (formerly Lots 7, 10, 25, 30, and 34) on the New York City Tax Map, as shown on Figure 1. The Site is an approximately 0.83-acre area and is bounded by: commercial uses and a public school facility to the north; Third Avenue, followed by Tremont Park to the east; residential and commercial uses to the south; and Bathgate Avenue, followed by institutional and industrial uses and a parking lot to the west. The surrounding area is primarily developed with commercial, institutional, and residential properties, with some industrial uses. A Site plan is provided on Figure 2. The boundaries of the Site are more fully described in the Environmental Easement, provided as Appendix A. The owner of the Site at the time of issuance of this SMP is Wilfred Realty Corp.

2.2 Site History

A full Site history, including historical Sanborn maps and a summary of previous investigations conducted at the Site, was provided in the RAWP. Historic records indicated that the Site was developed with private residences and stores as early as 1896, with industrial and manufacturing uses including a lumber yard, various warehouses, Decorative Plastics Co., a glass and glazing facility, a bed spring company, various clothing and accessory manufacturers, a woodworking facility, and a rebar manufacturing facility. ABCO Steel Door (ABCO), a steel door manufacturing facility, occupied the Site between approximately 1980 and 1993. Since approximately 1993, no manufacturing operations occurred at the Site; however, the Site buildings have been used for storage of equipment and supplies by ABCO.

2.3 Physical Setting

2.3.1 Land Use

The zoning designation of the Site is M1-4/R7A/R7X (residential and manufacturing) and it is currently vacant. The Site is currently being redeveloped into two, 8-story residential buildings fronting Third and Bathgate Avenues, totaling 190 units. One cellar level beneath the entire Site will house a ventilated parking garage, building utilities, tenant storage space, and maintenance storage and offices. The ground floor will consist of the superintendent's residential unit, residential lobbies, a community facility, retail units, and a parking ramp to the cellar, accessible from Bathgate Avenue. Floors 2 through 8 are designed for residential use. Approximately 24,000 gross square feet of commercial and community facility space is proposed.

2.3.2 Geology

Soil beneath the Site consisted of fill comprising sand and silt, with varying amounts of brick, asphalt, wood, and gravel up to approximately nine feet below grade, underlain by sand and silt, with varying amounts of clay followed by glacial

till down to bedrock. The upper 15 feet of soil and fill were excavated from the Site during remedial activities.

During implementation of the remedy, bedrock was encountered across the Site between approximately 6 feet and 55 feet below grade. Shallow bedrock, between approximately 6 and 15 feet below grade, is generally located in the northwestern portion of the Site. From the approximate center line of the Site, the depth to bedrock ranged from approximately 20 to 50 feet below grade and then sloped upward toward Third Avenue to approximately 30 feet below grade. Based on the *Bedrock and Engineering Maps of Bronx County and Parts of New York and Queens Counties, New York* (U.S. Geological Survey, 1992), the eastern Site boundary may be located along Cameron's Fault Line, which has an eastward-dipping surface. Bedrock throughout the Site is described as Inwood Marble.

2.3.3 Hydrogeology

Depth to shallow groundwater beneath the Site ranges from approximately 12.3 to 15.5 feet below sidewalk grade. Based on the groundwater measurements and monitoring well surveys conducted during the remedy, shallow groundwater ranges from approximately 46 to 50 feet NAVD and flows in a generally southwesterly direction, and deep groundwater flows in a generally south-southeasterly direction.

Shallow and deep contour maps are provided as Figures 3 and 4, respectively.

2.4 Investigation and Remedial History

Phase I Environmental Site Assessment (ESA) – 1880-1888 Bathgate Avenue & 4179-4197 Third Avenue, Bronx, NY, ALC Environmental, Inc., April 2016

ALC Environmental (ALC) conducted a Phase I Environmental Site Assessment (ESA) of the Site in April 2016. The Phase I ESA identified the following:

- Historical industrial operations at the Site included a plastics company, a rebar factory, a bed spring company, and a steel door manufacturing facility.
- A potential former vent pipe was observed on the northwestern façade of the Site building. Although there was no information regarding former tanks at the Site, unregistered or unknown tanks were reported to be potentially present.

Based on the findings of the Phase I ESA, ALC recommended conducting a Phase II Subsurface Investigation to determine whether subsurface conditions had been affected by the Site's historical manufacturing and/or industrial operations. A geophysical investigation was also recommended to address the potential presence of an underground storage tank (UST).

Phase II Work Plan (Short Form) – 1888 Bathgate Avenue, Brooklyn, NY, ALC Environmental, May 2016

ALC prepared a Phase II Work Plan to investigate subsurface conditions at the Site in response to the findings of the April 2016 Phase I ESA and a meeting with the New York City Office of Environmental Remediation (OER). The Phase II scope of work proposed the following: a geophysical survey along the sidewalk fronting

the northwestern portion of the Site, the advancement of 10 soil borings with the collection and laboratory analysis of two soil samples per boring (for a total of 20 soil samples), the installation of three temporary groundwater monitoring wells with the collection and laboratory analysis of three groundwater samples, and the installation of five soil vapor implants with the collection and laboratory analysis of five soil vapor samples. The Phase II Work Plan was approved by OER in May 2016.

Remedial Investigation Report – 1888 Bathgate Avenue, Bronx, NY, ALC Environmental, November 2016

ALC conducted a Remedial Investigation (RI) at the Site in June 2016 in accordance with the May 2016 OER-approved Phase II Work Plan. The investigation consisted of: a geophysical survey; the advancement of 11 soil borings with the collection and laboratory analysis of 21 soil samples; the installation of 2 temporary groundwater monitoring wells with the collection and laboratory analysis of 2 groundwater samples; and the installation of 5 temporary soil vapor points with the collection and laboratory analysis of 5 soil vapor samples. The geophysical survey did not identify any anomalies at the Site. A Geoprobe® direct-push probe equipped with a 2-inch diameter macrocore sampler was used to advance the soil borings and install the soil vapor points.

Historic fill materials (comprising concrete, sand, silt, gravel, ash, brick, and wood) were encountered from just below the surface to approximately 8 to 12 feet below ground surface (bgs) across the Site, underlain by silt, sand, and gravel to the boring termination depths of approximately 20 feet bgs. Groundwater was encountered at depths between approximately 12 and 15 feet bgs. Soil samples were screened for volatile organic compounds (VOCs) with a photoionization detector (PID). No evidence of contamination (e.g., odors, staining, elevated PID readings) was detected in the soil borings advanced during this investigation. Shallow refusal was encountered at borings advanced in the northern and western portions of the Site. Apparent weathered bedrock was observed at the bottom of the macrocore sampler at these locations.

One to two soil samples were collected from each boring in the upper fill layer in borings that encountered shallow refusal. Samples were collected from the 2-foot interval below the proposed maximum excavation depth of 17 feet in the 2 borings that could be advanced greater than 17 feet bgs. Soil and groundwater samples were analyzed for VOCs by EPA Method 8260, semivolatile organic compounds (SVOCs) by EPA Method 8270, pesticides by EPA Method 8081, polychlorinated biphenyls (PCBs) by EPA Method 8082, and target analyte list (TAL) metals by EPA Methods 6010 and 7471. Soil vapor samples were analyzed for VOCs by EPA Method TO-15. Soil sample results were compared to the NYSDEC 6 New York Rules and Regulations (NYCRR) Part 375 Unrestricted Use Soil Cleanup Objectives (UUSCOs) and Restricted Residential Use Soil Cleanup Objectives (RRSCOs). Groundwater samples were compared to the NYSDEC Technical and Operational Guidance Series (TOGS) (1.1.1): Class GA Ambient Water Quality Standards and Guidance Values (AWQSs); Soil vapor samples were compared to

the New York State Department of Health (NYSDOH) 2006 Guidance for Evaluating Soil Vapor Intrusion Air Guidance Values (AGVs), the September 2013 NYSDOH Fact Sheet update for tetrachloroethene (PCE), the August 2015 Fact Sheet update for trichloroethene (TCE), and the Matrix 1 and Matrix 2 values listed in the NYSDOH 2006 Guidance for Evaluating Soil Vapor Intrusion.

Results of the soil sample analysis were as follows:

- One VOC, acetone was detected in one soil sample [SB-10 (5-7')] at a concentration above its respective UUSCO, but below its RRSCO. No other VOCs were detected at concentrations above their respective UUSCOs or RRSCOs.
- Several polycyclic aromatic hydrocarbons (PAHs), a class of SVOCs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, were detected above their respective UUSCOs and RRSCOs in four samples at concentrations ranging from 0.63 to 5.27 milligrams per kilogram (mg/kg). These samples were collected from the upper 8 feet bgs, where historical fill materials were encountered during the investigation.
- The metals barium, copper, lead, mercury, selenium, and/or zinc were detected in 11 soil samples at concentrations above their respective UUSCOs. Of the metals that exceeded UUSCOs, barium (maximum concentration of 1,030 mg/kg), lead (maximum concentration of 1,060 mg/kg), and/or mercury (maximum concentration of 6.23 mg/kg), were detected at concentrations above their respective RRSCOs in six soil samples.
- The pesticides 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, and dieldrin were detected above their respective UUSCOs, but below RRSCOs, in up to 7 samples at concentrations ranging from 0.0041 to 0.45 mg/kg. PCBs were detected at concentrations above the UUSCO for total PCBs of 0.1 mg/kg in soil sample SB-10 (5-7') at a concentration of 0.13 mg/kg, and above the RRSCO for total PCBs of 1 mg/kg in soil sample SB-03 (5-7') at a concentration of 2.66 mg/kg.

Results of the groundwater sample analyses were as follows:

- One VOC, PCE, was detected in groundwater sample MW-02, collected from the southwestern portion of the Site, at a concentration of 210 micrograms per liter (µg/L), above the AWQS of 5 µg/L. No SVOCs were detected above their respective TOGS.
- Concentrations of the metals magnesium, manganese, and sodium were detected in the total (unfiltered) groundwater analyses of both samples above their respective TOGS. Lead was also detected in one of the unfiltered groundwater samples above its TOGS. In the dissolved (filtered) analysis of the groundwater samples, magnesium and sodium were detected in both samples at concentrations above the TOGS.

- No pesticides or PCBs were detected above laboratory reporting limits in either of the groundwater samples.

Results of the soil vapor sample analyses were as follows:

- Petroleum-related VOCs were detected in the five soil vapor samples at concentrations up to 330 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$). Solvent-related VOCs were detected at concentrations up to $300 \mu\text{g}/\text{m}^3$. PCE was detected above the AGV of $30 \mu\text{g}/\text{m}^3$ in each of the five soil vapor samples at concentrations ranging from 37 to $300 \mu\text{g}/\text{m}^3$. TCE was detected in one soil vapor sample, SV-01, at a concentration of $56 \mu\text{g}/\text{m}^3$, above its AGV of $2 \mu\text{g}/\text{m}^3$. PCE and TCE are chlorinated solvents, which may have been used during historic operations at the Site.

Geotechnical Investigation Report – Third Avenue and Bathgate Avenue, Bronx, NY, SESI Consulting Engineers D.P.C., August 2016

SESI Consulting Engineers D.P.C. (SESI) conducted a geotechnical investigation at the Site in June and July 2016 to support the proposed construction of two mixed-use buildings. The investigation consisted of the advancement of 24 borings and the collection of soil samples for geotechnical evaluation. The results of the investigation indicated that the stratigraphy beneath the Site consisted of fill material comprising sand with varying amounts of gravel and silt, from approximately 3.5 to 11 feet bgs, underlain by a layer of clayey silt, followed by glacial till. Bedrock was encountered at depths ranging from approximately 7.5 to 55 feet bgs. Shallow bedrock, between approximately 7.5 feet and 15 feet bgs was located primarily in the northwestern portion of the Site. From the center line of the Site, the depth to bedrock ranged from approximately 20 to 50 feet bgs and then sloped upward toward Third Avenue to approximately 30 feet bgs.

Supplement Remedial Investigation (SRI) Report (SRIR) – 1888 Bathgate Avenue, Bronx, New York, AKRF, Inc. (AKRF), June 2017

AKRF conducted an SRI at the Site in February and March 2017 in accordance with the January 2017 SRI Work Plan (SRIWP), Health and Safety Plan (HASP), and Quality Assurance Project Plan (QAPP). The SRIR included: the installation of five soil borings with the collection of ten soil samples for chemical analysis; the installation of four permanent, two-inch diameter groundwater monitoring wells with the collection of four groundwater samples for chemical analysis; the installation of three temporary soil vapor probes with the collection of three soil vapor samples and one ambient air sample for chemical analysis; and the survey of groundwater monitoring well elevations to establish local groundwater flow beneath the Site.

The stratigraphy of the Site, from the surface down, generally consisted of fill comprising sand and silt, with varying amounts of brick, asphalt, wood, and gravel up to approximately 9 feet below sidewalk grade, underlain by sand and silt, with varying amounts of clay up to the maximum boring termination depth of 25 feet below sidewalk grade. Groundwater was encountered during the investigation at

depths ranging from approximately 11.7 to 15.9 feet below sidewalk grade; shallow groundwater was determined to flow in a southerly direction.

Based on an evaluation of the data and information from the 2016 RI and 2017 SRI, contaminated soil, groundwater, and soil vapor present at the Site were attributed to historic fill and the Site's historic industrial and manufacturing uses. The greatest concentrations of the chlorinated solvent PCE in soil vapor were detected in the southwestern and northwestern portions of the Site. Lower concentrations of PCE, but still at levels above the NYSDOH AGV, were detected in soil vapor samples collected from the eastern portion of the Site. PCE-contaminated groundwater was detected primarily in the southwestern portion of the Site, with lower concentrations detected upgradient in the northern portion of the Site. Soil beneath the Site contained elevated concentrations of SVOCs, heavy metals, and pesticides.

Remedial Action Work Plan – 1888 Bathgate Avenue Redevelopment Site, 4181 Third Avenue, Bronx, New York, AKRF, Inc., September 2017

AKRF prepared a RAWP in September 2017, which outlined the remedial activities and cleanup objectives for the Site. The RAWP proposed excavation of soil above the Track 2 RRSCOs with a Track 4 contingency in areas where Track 2 could not be achieved, if any. The remedy also included performance of an in-situ groundwater treatment program and installation of a waterproofing membrane/vapor barrier into the proposed building design as part of construction.

RAWP approval and the DD were both issued on September 21, 2017.

Remedial Design Investigation Report – 1888 Bathgate Avenue Redevelopment Site, 4181 Third Avenue, Bronx, New York, AKRF, Inc., June 2018

AKRF conducted a Remedial Design Investigation (RDI) between September 12 and 26, 2017 and February 6 and 22, 2018. The RDI was performed to aid with developing a groundwater remedy to be implemented under the RAWP and Decision Document. The RDI included the installation of four permanent, two-inch diameter nested groundwater monitoring wells (at shallow and deep intervals), and one permanent, two-inch diameter groundwater monitoring well with the collection of nine groundwater samples for chemical analysis and a Bench-Scale Treatability Study.

Groundwater in the shallow- and deep-screened monitoring wells was measured at approximately 12.4 to 15.5 feet below sidewalk grade, in the southern and northern portions of the Site, respectively. Based on a well elevation survey, shallow groundwater flows in a southwesterly direction and deep groundwater flows in a south-southeasterly direction beneath the Site.

The Bench-Scale Treatability Study was performed by In-Situ Oxidative Technologies, Inc. (ISOTEC) of Lawrenceville, New Jersey to evaluate the effectiveness of the reagent mix required to oxidize the PCE and TCE in shallow groundwater in the southwestern portion of the Site. One groundwater sample and one soil sample were collected from the proposed treatment area and analyzed by

ISOTEC under various dosages of three primary reagents: modified Fenton's reagent (MFR); sodium permanganate (PERM); and activated sodium persulfate (ASP). Based on the study, ISOTEC determined that PERM reduced the PCE concentration by 100% in the low, medium, and high dose analysis and was shown to be more effective than the other two reagents. Therefore, PERM was selected.

2.4.1 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as listed in the DD dated September 2017 are as follows:

Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for Environmental Protection

- Restore groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Remove the source of groundwater contamination.

Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.

Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion into buildings at a site.

2.5 Summary of Remedial Actions

The objectives for the remedial program were established through the remedy selection process stated in 6 NYCRR Part 375. Remedial actions were performed at the Site in accordance with the NYSDEC-approved RAWP and DD and applicable federal, state, and local rules and regulations. Detailed descriptions of

the completed remedial actions are included in the Final Engineering Report (FER). The following is a summary of the remedial actions conducted:

1. Soil Excavation and Off-Site Disposal

All on-site soils that exceeded the RRSCOs, as defined by 6 NYCRR Part 375-6.8, were excavated up to a maximum depth of 15 feet below grade and transported off-site for proper disposal at approved facilities. Approximately 19,000 cubic yards of soil were excavated and disposed off-site. During all excavation and ground intrusive activities, AKRF conducted real-time air monitoring for particulates and VOCs, in accordance with a NYSDEC-approved Community Air Monitoring Plan (CAMP).

Post-excavation soil endpoint samples were collected across the Site to evaluate performance of the remedy. Endpoint samples were not collected from areas that were excavated down to bedrock. Track 2 RRSCOs were met either by achieving excavation to 15 feet or meeting the Track 2 RRSCOs at depths shallower than 15 feet. The endpoint sample analytical results are included in Tables 3 through 7.

2. Tank Removal

During soil excavation activities, one 275-gallon No. 2 fuel oil UST and two 1,000-gallon No. 2 fuel oil USTs were encountered. During soil excavation activities, one 275-gallon No. 2 fuel oil UST and two 1,000-gallon No. 2 fuel oil USTs were encountered. The tanks were properly cleaned, removed, and disposed of off-site by a licensed tank remediation contractor. Endpoint samples were collected from the bottom and sidewalls of the tank graves. In September 2018, the tanks were registered with the NYSDEC Petroleum Bulk Storage (PBS) Database under Facility ID 2-612938.

3. Material Import

Approximately 573 cubic yards of virgin dense graded aggregate (DGA) meeting the requirements of 6 NYCRR Part 375-6.8(a) was imported to establish the design grades at the Site prior to installation of the waterproofing membrane and concrete slab and to construct a truck pad and ramp.

4. Remedial Design

An RDI was implemented between September 12 and 26, 2017 and February 6 and 22, 2018 in accordance with the NYSDEC-approved RDI Work Plan. The RDI was conducted to further delineate the on-site horizontal and vertical extent of chlorinated solvents in groundwater identified during the RI and SRI developing an in-situ groundwater treatment program. The RDI Report was submitted to NYSDEC in April 2018 and approved in June 2018.

5. Implementation of an In-Situ Groundwater Treatment Program

An ISCO Groundwater Treatment Program was conducted at the Site. Approximately 8,325 gallons of a 5% or 10% sodium permanganate/water solution were injected into 24 temporary injections points located in the southwestern portion of the Site (the groundwater treatment area). The injection points were

spaced approximately 12 to 14 feet apart to achieve a 6 to 7 feet overlapping radius of influence (ROI). Multiple intervals were targeted in the treatment area above the bedrock surface, up to approximately 28 feet below grade.

Four two-inch permanent groundwater monitoring wells (MW-10, MW-11, MW-12, and MW-13) were installed upgradient, within, and downgradient of the treatment area in the southwestern portion of the Site to monitor CVOC concentrations in groundwater before and after the groundwater treatment program. Well construction for monitoring wells MW-10 and MW-13 consisted of 10 feet of screen with solid riser installed to the ground surface. Due to shallow depth to bedrock, well construction for monitoring wells MW-11 and MW-12 consisted of 5 feet of screen with solid riser installed to the ground surface. The well locations and the groundwater treatment area are shown on Figure 5. Post-remedial well construction logs are provided in Appendix B. Groundwater samples were collected from each of the post-remedial wells prior to implementation of the treatment program.

On September 6, 2018, approximately two months after the initial ISCO event, groundwater samples were collected from the four post-remedial groundwater monitoring wells and placed in laboratory-supplied containers. The samples were submitted to Accutest of Dayton, New Jersey, for analysis of chlorinated volatile organic compounds (CVOCs) by EPA Method 8260 using Category B deliverables. One blind duplicate, one field blank, one trip blank, and one matrix spike/matrix spike duplicate (MS/MSD) sample were collected for Quality Assurance/Quality Control (QA/QC) purposes. The QA/QC samples were also analyzed for CVOCs. The groundwater data was reviewed by a third-party validator and a DUSR was prepared to document the usability and validity of the data.

6. Institutional Control (IC)

The imposition of an Institutional Control (IC) in the form of an Environmental Easement (EE) for the Site. The Site has a series of ICs in the form of Site restrictions and requirements. The Site restrictions that apply to the Site are:

- In-ground vegetable gardens and farming on the Site are prohibited;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Site that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;
- The Site may be used for restricted residential, commercial, and industrial use only, provided the IC/ECs included in the SMP are employed;
- The Site may not be used for a higher level of use, such as unrestricted or unrestricted residential use without an amendment or extinguishment of this EE; and

- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access the Site at any time to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This statement must be certified by an expert that the NYSDEC finds acceptable.

7. Site Management Plan (SMP)

Since post-remedial groundwater monitoring and sampling and an environmental easement were required following implementation of the remedy, an SMP, including an IC/EC Plan and Monitoring Plan to assess the performance and effectiveness of the remedy, was prepared.

2.6 Remaining Contamination

2.6.1 Soil

Following excavation of soil and fill material across the Site, 26 post-excavation endpoint samples were collected in areas that were not excavated to bedrock. Track 2 RRSCOs were met at all endpoint sample locations, or excavation extended to 15 feet below grade. No soil contamination is remaining in place above 15 feet below grade. The endpoint sample analytical results are included in Tables 3 through 7. The endpoint sample locations and comparison to the UUSCOs and RRSCOs are shown on Figure 6.

2.6.2 Groundwater

During the May 14, 2018 baseline groundwater sampling event, CVOCs were not detected above the TOGS standards in sample MW-10-20180514 and the associated blind duplicate sample, MW-X-20180514. PCE was detected at concentrations of 102 µg/L, 10.7 µg/L, and 29.1 µg/L, in groundwater samples MW-11-20180514, MW-12-20180514, and MW-13-20180514, respectively. The highest concentration was detected in the center of the groundwater treatment area, with decreasing concentrations detected downgradient of the treatment area. Breakdown products of PCE, including cis-1,2-dichloroethene and TCE, were detected above the TOGS of 5 µg/L in sample MW-13-20180514 at respective concentrations of 22.4 µg/L and 24 µg/L.

One round of groundwater samples was collected from the four post-remedial wells on September 6, 2018, approximately two months after the initial ISCO event. CVOCs were detected at concentrations above the NYSDEC TOGS in the majority of the groundwater samples, with the exception of MW-11-20180906. PCE was detected at concentrations of 12.5 µg/L, 12.4 µg/L, 19.5 µg/L, and 61.7 µg/L in samples MW-10-20180906, MW-X-20180906 (blind duplicate of MW-10-20180906) MW-12-20180906, and MW-13-20180906, respectively, above the

NYSDEC TOG of 5 µg/L. These concentrations slightly increased compared to the baseline sampling event in May 2018. Cis-1,2 dichloroethene and TCE were detected at respective concentrations of 28.8 µg/L and 34 µg/L in sample MW-13-20180906. No other CVOCs were detected at concentrations above their respective NYSDEC TOGS.

The baseline and post-remedial groundwater sample results are summarized in Table 8. Exceedances of the NYSDEC TOGS are identified on Figure 7.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contaminated groundwater exists at the Site, ICs and ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the Site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the Site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix C) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the remedy, as determined by the NYSDEC.

Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a HASP and associated CAMP prepared for the Site and provided in Appendix D.

3.2 Institutional Controls

A series of ICs is required by the RAWP to: (1) implement, maintain and monitor EC systems; (2) prevent future exposure to remaining contamination; and (3) limit the use and development of the Site to Restricted Residential, Commercial, and Industrial uses only. Adherence to these ICs on the Site is required by the EE and will be implemented under this SMP. ICs identified in the EE may not be discontinued without an amendment to or extinguishment of the EE. The IC boundaries are shown on Figure 2. These ICs are:

- The Site may be used for restricted residential, commercial or industrial use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP;
- The use of groundwater underlying the Site is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health to render it safe for use as drinking water or for industrial

purposes, and the user must first notify and obtain written approval to do so from the Department;

- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP;
- Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the Site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the EE; and
- The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 2, and any potential impacts that are identified must be monitored or mitigated; and
- In-ground vegetable gardens and farming on the Site are prohibited.

3.3 Engineering Controls

3.3.1 ISCO Groundwater Treatment Program

An ISCO Groundwater Treatment Program was established as part of the Site remedy. Approximately 8,325 gallons of a 5% to 10% sodium permanganate/water solution were injected into 24 temporary injections points located in the southwestern portion of the Site (the groundwater treatment area), as shown on Figure 5. The injection points were spaced approximately 12 to 14 feet apart to achieve 6 to 7 feet overlapping radius of influence (ROI). Multiple intervals were targeted in the treatment area above the bedrock surface, up to approximately 28 feet below grade. Groundwater will be monitored via the four post-remedial monitoring wells installed in the southwestern portion of the Site to evaluate the effectiveness of the in-situ groundwater treatment program. The post-remedial well locations are shown on Figure 5. Well construction logs are included in Appendix B.

The four post-remedial monitoring wells (MW-10, MW-11, MW-13, and MW-14) will be used during each future ISCO treatment event to monitor the effectiveness of the treatment program. As of the date of this SMP, two rounds of groundwater samples have been collected from the post-remedial wells (one round prior to the initial treatment event and one after the treatment event). Analytical data from the

initial sampling event will be utilized as baseline concentrations for which future sampling events will be compared.

3.3.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.2.1 - ISCO Groundwater Treatment Program

The ISCO treatment program will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the ISCO treatment program may no longer be required, a proposal to discontinue the treatment will be submitted by the remedial party. Conditions that may warrant discontinuing the ISCO treatment program include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards; (2) have become asymptotic to a low level over an extended period of time, as accepted by the NYSDEC; or (3) the NYSDEC has determined that the ISCO treatment program has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

3.3.2.2 - Monitoring Wells associated with Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC with consultation with NYSDOH, until residual groundwater concentrations are found to be consistently below ambient water quality standards or have become asymptotic at an acceptable level over an extended period. In the event that monitoring data indicates that monitoring for natural attenuation may no longer be required, a proposal to discontinue such monitoring will be submitted by the remedial party, but will otherwise continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, a revised chemical oxidation injection/treatment plan would be developed for the Site and submitted to the NYSDEC for review and approval. The dosage of any reagents may change based on the results of the post-remedial groundwater samples. If a revision to the treatment plan is warranted, notification will be made to NYSDEC with the proposed changes.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the groundwater treatment remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the Site are included in the QAPP provided in Appendix E.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., groundwater);
- Assessing compliance with applicable NYSDEC Standards, Criteria, and Guidance (SCGs), particularly NYSDEC *Technical and Operational Guidance Series (TOGS) (1.1.1): Class GA Ambient Water Quality Standards and Guidance Values (AWQSs)*; and
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment.

To adequately address these issues, this Monitoring and Sampling Plan provides information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;
- Analytical sampling program requirements;
- Inspection and maintenance requirements for monitoring wells; and
- Monitoring well decommissioning procedures.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Post-Remediation Media Monitoring and Sampling

4.2.1 Groundwater Sampling

Groundwater samples will be collected from the four post-remedial groundwater monitoring wells (MW-10, MW-11, MW-12, and MW-13) on a quarterly basis for one year. The first event will occur in October 2018, three months after the ISCO groundwater treatment event, and quarterly thereafter for one year (January, April, July, and October 2019). The monitoring well locations are identified on Figure 5. Groundwater samples will be collected via EPA low-flow methodology and analyzed for CVOCs by EPA Method 8260 using Category B deliverables, in accordance with the NYSDEC-approved RAWP. For QA/QC purposes, one MS/MSD, one trip blank, one field blank, and one blind duplicate will also be collected with the groundwater samples and analyzed for CVOCs by EPA Method 8260. The data will be reviewed by a third-party validator and a DUSR will be

prepared. All purge groundwater will be containerized in 55-gallon drums for future off-site disposal at a permitted facility.

Detailed sample collection and analytical procedures and protocols are provided in the QAPP, included as Appendix E.

Additional groundwater monitoring will be conducted if subsequent ISCO treatment events are requested. Modification to the frequency or sampling requirements will require approval from the NYSDEC. The network of monitoring wells has been installed to monitor upgradient, on-site, and downgradient groundwater conditions at the Site. Monitoring well construction logs are provided in Appendix B.

4.2.2 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix F - Site Management Forms. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the site-specific QAPP provided as Appendix E of this SMP.

Prior to collecting the samples, each well will be screened for the presence of VOCs using a PID after removing the well cap. The depth to groundwater will then be measured in the wells using an electronic oil/water interface probe attached to a measuring tape accurate to 0.01 foot; this will also be used to gauge potential measurable product on the surface of the water table. The water level data, well diameter, and depth to bottom will be used to calculate the volume of water in each well and any free-phase product will be documented, if present. The wells that do not contain free-phase product will then be purged using low-flow purging techniques, as described in the QAPP.

Groundwater samples will be collected using dedicated polyethylene tubing and placed directly into laboratory-supplied sample bottles. The samples will be analyzed by a NYSDOH ELAP-certified laboratory with NYSDEC Category B deliverables. For wells that contain free-phase product (not anticipated), a sample of the product will be collected and analyzed for flashpoint. All non-dedicated sampling equipment (e.g., submersible pumps and oil/water interface probe) will be decontaminated between sampling locations using the following procedure:

1. Scrub equipment with a bristle brush using a tap water/Simple Green® or Alconox® solution.
2. Rinse with tap water.
3. Scrub again with a bristle brush using a tap water/Simple Green® or Alconox® solution.
4. Rinse with tap water.
5. Rinse with distilled water.

6. Air-dry the equipment.

4.2.3 Monitoring Well Repairs and Decommissioning

If biofouling or silt accumulation occurs in the on-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable. Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent Periodic Review Report. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled *CP-43: Groundwater Monitoring Well Decommissioning Procedures*. Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC. Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.2.4 Soil Vapor Intrusion Evaluation

A soil vapor intrusion evaluation was performed for the proposed new building as part of the remedy. The evaluation was based on the following: 1) after completion of soil removal activities, no VOCs remain in soil above the RRSCOs; 2) the ISCO program has and will continue to address remaining CVOCs in groundwater; 3) the cellar level of the new Site building will house a ventilated parking garage; and, 4) a 20-mil vapor barrier/waterproofing membrane was installed beneath the cellar slab (Grace Preprufe® 300R) and behind subgrade foundation walls (Grace Preprufe® 160R). As the vapor barrier and NYCDOB ventilation requirements for indoor parking at the lowest level of the building will address potential vapor intrusion concerns (if any), no additional mitigation, monitoring or sampling is required at this time.

4.2.5 Soil Vapor Intrusion Sampling

Based on the soil vapor intrusion evaluation conducted for the proposed new building, soil vapor intrusion sampling is not needed at this time. However, if the building no longer houses a ventilated parking garage or a new building is constructed on the Site, vapor intrusion sampling consisting of soil vapor, indoor air, and ambient air sampling will be conducted in accordance with NYSDOH Soil Vapor Intrusion Guidance. A vapor intrusion work plan outlining the proposed sampling plan will be submitted to NYSDEC/NYSDOH for their review and approval prior to conducting any sampling.

5.0 ISCO GROUNDWATER TREATMENT

5.1 General

Based on the results of the October 2018 post-remedial groundwater sample results, a second ISCO treatment event is not required at this time. If NYSDEC or NYSDOH requires a second event in the future, the treatment program may vary from the initial event based on the laboratory analytical results; however, the program is anticipated to include up to 24 temporary injection points, as shown on Figure 5. The injection points will be spaced approximately 12 to 14 feet apart to achieve 6 to 7 feet overlapping ROI. Multiple intervals above the bedrock surface will be targeted. Each injection point may receive approximately 200 to 600 gallons of PERM, for a total reagent volume of approximately 8,800 gallons.

5.2 Post-Remedial Groundwater Sampling

Groundwater samples will be collected from the four post-remedial groundwater monitoring wells (MW-10, MW-11, MW-12, and MW-13) on a quarterly basis for one year. The first event will occur in October 2018, three months after the ISCO groundwater treatment event, and quarterly thereafter for one year (January, April, and July 2019). The samples will be submitted to a NYSDOH-certified laboratory for analysis of CVOCs by EPA Method 8260 using Category B deliverables. One blind duplicate, one field blank, one trip blank, and one MS/MSD sample will be collected for QA/QC purposes. The QA/QC samples will also be analyzed for CVOCs. The groundwater data will be reviewed by a third-party validator and a DUSR will be prepared to document the usability and validity of the data. Upon receipt of the groundwater analytical data collected after completion of the first ISCO treatment event, it will be determined whether additional rounds of the groundwater treatment program will be required.

The groundwater analytical results will be reported to NYSDEC in a brief letter report, which will include a summary of the ISCO treatment event, laboratory analytical results and a comparison to the baseline groundwater analytical results, and recommendations for additional groundwater treatment, if necessary.

6.0 OPERATION AND MAINTENANCE PLAN

6.1 General

The Site remedy does not rely on any mechanical systems, such as mechanical groundwater treatment systems, sub-slab depressurization systems, or air sparge/soil vapor extraction systems to protect public health and the environment. Therefore, the operation and maintenance of such components is not included in this SMP.

7.0 PERIODIC ASSESSMENTS/EVALUATIONS

7.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the Site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the Site during periodic assessments, and briefly summarizes the vulnerability of the Site and/or ECs to severe storms/weather events and associated flooding.

- Flood Plain: The Site is not located within a flood plain.
- Site Drainage and Storm Water Management: Stormwater at the Site and the surrounding area flows to the New York City combined sewer system.
- Erosion: As the entire Site will be covered with a concrete slab, erosion is not anticipated to be an issue of concern.
- High Wind: All permanent building components are secured against high winds. In the event that high winds are forecast for the Site, proper precautions will be taken to secure or shelter any Site components that are not protected against high winds.
- Electricity: Electricity to the buildings is supplied via newly installed underground vaults and conduits and is not expected to be affected by severe weather events.
- Spill/Contaminant Release: Storage of large amounts of fuel oil, or other chemicals at the Site is not expected. Nominal amounts of cleaning chemicals are likely to be stored throughout the Site, but are not expected to be affected by severe weather conditions.

7.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the

SMP provides a summary of any green remediation evaluations to be completed for the Site during Site management, and as reported in the Periodic Review Report (PRR).

7.2.3 Building Operations

Structures including buildings will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

7.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the Site and use of consumables in relation to visiting the Site to collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

7.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or are not expected to meet RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedy is exceeding the estimated costs;
- The remedy is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the Site management to another remedial party or agency; or
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

The RSO study will focus on overall site cleanup strategy, process optimization and management with the intent of identifying impediments to cleanup and improvements to site operations to increase efficiency, cost effectiveness and remedial time frames. Green remediation technology and principals are to be considered when performing the RSO.

8.0 REPORTING REQUIREMENTS

Maintenance reports (if any) and any other information generated during regular operations at the Site will be kept on-file on-site. All reports, forms, and other relevant information generated will be available upon request to the NYSDEC and submitted as part of the PRR, as specified in the Section 8.2 of this SMP.

8.1 Site Management Reports

All site management inspection, maintenance, and monitoring events will be recorded on the appropriate site management forms provided in Appendix F. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data generated for the Site during the reporting period, will be provided in electronic format to the NYSDEC. It is anticipated that one PRR will be required.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., groundwater, sub-slab vapor, indoor air, outdoor air, etc.);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;

- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQUIS™ database in accordance with the requirements found at this link:

<http://www.dec.ny.gov/chemical/62440.html>.

8.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to NYSDEC beginning 16 months after the Certificate of Completion is issued. Based on future post-remedial groundwater sampling events, subsequent PRRs may not be required, as determined by NYSDEC. In the event that the Site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the Site described in the EE, provided as Appendix A. The PRR will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment, and certification of all ECs/ICs required by the remedy for the Site.
- Results of the severe condition inspections, if applicable.
- All applicable Site management forms and other records generated for the Site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.

- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (e.g., groundwater), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.
- A site evaluation, which includes the following:
 - The compliance of the remedy with the requirements of the site-specific RAWP and Decision Document;
 - The operation and the effectiveness of the treatment program, including identification of any needed modifications;
 - Any new conclusions or observations regarding Site groundwater contamination based on data generated by the Monitoring and Sampling Plan for the media being monitored;
 - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan;
 - Trends in contaminant levels in groundwater will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document; and
 - The overall performance and effectiveness of the remedy.

8.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

“For each Institutional or Engineering Control identified for the Site, I certify that all of the following statements are true:

- *The inspection of the Site to confirm the effectiveness of the Institutional and Engineering Controls required by the remedial program was performed under my direction;*
- *The Institutional Control and/or Engineering Control employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;*

- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any Site Management Plan for this control;*
- *Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the Site is compliant with the Environmental Easement;*
- *The Engineering Control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner's/Remedial Party's Designated Site Representative]."

- *No new information has come to my attention, including groundwater monitoring data from wells located at the Site boundary, if any, to indicate that the assumptions made in the qualitative exposure assessment of off-site contamination are no longer valid;*

For BCP projects, every five years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid."*

The signed certification will be included in the PRR.

The PRR will be submitted, in electronic format, to the NYSDEC Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

8.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an IC or EC, a Corrective Measures Work Plan (CMWP) will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the CMWP until it has been approved by the NYSDEC.

8.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 7.3), upon completion of an RSO, an RSO report must be submitted to NYSDEC for approval. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional work plans, design documents, HASP, etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A FER and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the Site is located, Site Control, and the NYSDOH Bureau of Environmental Exposure Investigation.

9.0 REFERENCES

- 6 NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.
- NYSDEC DER-10 – “Technical Guidance for Site Investigation and Remediation”.
- NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).
- BCP Agreement – 1888 Bathgate Avenue Redevelopment Site, Bronx, New York, AKRF, May 2017.
- BCP Agreement Amendment – 1888 Bathgate Avenue Redevelopment Site, Bronx, New York, August 2017.
- Decision Document – 1888 Bathgate Avenue Redevelopment Site, BCP, Bronx, Bronx County, September 2017.
- *Phase I Environmental Site Assessment (ESA)* – 1880-1888 Bathgate Avenue & 4179-4197 Third Avenue, Bronx, NY, ALC Environmental, Inc., April 2016.
- *Phase II Work Plan (Short Form)* – 1888 Bathgate Avenue, Brooklyn, NY, ALC Environmental, May 2016.
- *Remedial Investigation Report* – 1888 Bathgate Avenue, Bronx, NY, ALC Environmental, November 2016.
- *Geotechnical Investigation Report* – Third Avenue and Bathgate Avenue, Bronx, NY, SESI Consulting Engineers D.P.C., August 2016.
- *Supplement Remedial Investigation (SRI) Report (SRIR)* – 1888 Bathgate Avenue, Bronx, New York, AKRF, Inc. (AKRF), June 2017.
- *Remedial Action Work Plan* – 1888 Bathgate Avenue Redevelopment Site, 4181 Third Avenue, Bronx, New York, AKRF, Inc., September 2017.
- *Remedial Design Investigation Report* – 1888 Bathgate Avenue Redevelopment Site, 4181 Third Avenue, Bronx, New York, AKRF, Inc., June 2018.

TABLES

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-1(9)20180124 JC59665-1 1/24/2018 1 mg/kg	EP-X(9)20180124 JC59665-2 1/24/2018 1 mg/kg	EP-2(10)20180124 JC59665-3 1/24/2018 1 mg/kg	EP-3(11)20180130 JC59665-6 1/30/2018 1 mg/kg
1,1,1-Trichloroethane	0.68	100	0.002 UJ	0.002 U	0.002 U	0.0027 U
1,1-Dichloroethane	0.27	26	0.00099 U	0.001 U	0.001 U	0.0014 U
1,1-Dichloroethene	0.33	100	0.00099 U	0.001 U	0.001 U	0.0014 U
1,2,4-Trimethylbenzene	3.6	52	0.002 U	0.002 U	0.002 U	0.0027 U
1,2-Dichlorobenzene	1.1	100	0.00099 U	0.001 U	0.001 U	0.0014 U
1,2-Dichloroethane	0.02	3.1	0.00099 U	0.001 U	0.001 U	0.0014 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	0.002 U	0.002 U	0.002 U	0.0027 U
1,3-Dichlorobenzene	2.4	49	0.00099 U	0.001 U	0.001 U	0.0014 U
1,4-Dichlorobenzene	1.8	13	0.00099 U	0.001 U	0.001 U	0.0014 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.12 UJ	0.13 UJ	0.12 UJ	0.17 UJ
Acetone	0.05	100	0.0099 U	0.01 U	0.01 U	0.0092 J
Benzene	0.06	4.8	0.0005 UJ	0.00051 U	0.0005 U	0.00069 U
Carbon Tetrachloride	0.76	2.4	0.002 U	0.002 U	0.002 U	0.0027 U
Chlorobenzene	1.1	100	0.002 UJ	0.002 U	0.002 U	0.0027 U
Chloroform	0.37	49	0.002 U	0.002 U	0.002 U	0.0027 U
Cis-1,2-Dichloroethylene	0.25	100	0.00099 U	0.001 U	0.001 U	0.0014 U
Ethylbenzene	1	41	0.00099 U	0.001 U	0.001 U	0.0014 U
m/p xylene	NS	NS	0.00099 U	0.001 U	0.001 U	0.0014 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.0099 U	0.01 U	0.01 U	0.014 U
Methylene Chloride	0.05	100	0.0036 J	0.0052	0.0049 J	0.0093
N-Butylbenzene	12	100	0.002 U	0.002 U	0.002 U	0.0027 U
n-propylbenzene	3.9	100	0.002 U	0.002 U	0.002 U	0.0027 U
o-xylene	NS	NS	0.00099 U	0.001 U	0.001 U	0.0014 U
Sec-Butylbenzene	11	100	0.002 U	0.002 U	0.002 U	0.0027 U
T-Butylbenzene	5.9	100	0.002 U	0.002 U	0.002 U	0.0027 U
Tert-Butyl Methyl Ether	0.93	100	0.00099 U	0.001 U	0.001 U	0.0014 U
Tetrachloroethene (PCE)	1.3	19	0.002 U	0.002 U	0.002 U	0.0027 U
Toluene	0.7	100	0.00099 UJ	0.001 U	0.001 U	0.0014 U
Trans-1,2-Dichloroethene	0.19	100	0.00099 U	0.001 U	0.001 U	0.0014 U
Trichloroethene (TCE)	0.47	21	0.00099 U	0.001 U	0.001 U	0.0014 U
Vinyl Chloride	0.02	0.9	0.002 U	0.002 U	0.002 U	0.0027 U
Xylenes (total)	0.26	100	0.00099 U	0.001 U	0.001 U	0.0014 U

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCO's mg/kg	EP-4(9)20180312 JC62145-3 3/12/2018 1 mg/kg	EP-4(15)20180404 JC62145-23 4/4/2018 1 mg/kg	EP-5(9)20180312 JC62145-4 3/12/2018 1 mg/kg	EP-6(9)20180312 JC62145-5 3/12/2018 1 mg/kg
1,1,1-Trichloroethane	0.68	100	0.12 U	0.0023 U	0.0021 U	0.002 U
1,1-Dichloroethane	0.27	26	0.06 U	0.0011 U	0.001 U	0.00099 U
1,1-Dichloroethene	0.33	100	0.06 U	0.0011 U	0.001 U	0.00099 U
1,2,4-Trimethylbenzene	3.6	52	118 D	0.0023 U	0.0021 U	0.002 U
1,2-Dichlorobenzene	1.1	100	0.06 U	0.0011 U	0.001 U	0.00099 U
1,2-Dichloroethane	0.02	3.1	0.06 U	0.0011 U	0.001 U	0.00099 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	36.7 D	0.0023 U	0.0021 U	0.002 U
1,3-Dichlorobenzene	2.4	49	0.06 U	0.0011 U	0.001 U	0.00099 U
1,4-Dichlorobenzene	1.8	13	0.06 U	0.0011 U	0.001 U	0.00099 U
1,4-Dioxane (P-Dioxane)	0.1	13	7.6 U	0.14 UJ	0.13 U	0.12 U
Acetone	0.05	100	0.6 U	0.011 U	0.01 U	0.0123
Benzene	0.06	4.8	4.09	0.00056 U	0.00052 U	0.0005 U
Carbon Tetrachloride	0.76	2.4	0.12 U	0.0023 U	0.0021 U	0.002 U
Chlorobenzene	1.1	100	0.12 U	0.0023 U	0.0021 U	0.002 U
Chloroform	0.37	49	0.12 U	0.0023 U	0.0021 U	0.002 U
Cis-1,2-Dichloroethylene	0.25	100	0.06 U	0.0011 U	0.001 U	0.00099 U
Ethylbenzene	1	41	48.6 D	0.0011 U	0.001 U	0.00099 U
m/p xylene	NS	NS	187 D	0.0011 U	0.001 U	0.00099 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.6 U	0.011 U	0.01 U	0.0099 U
Methylene Chloride	0.05	100	0.3 U	0.0056 U	0.0052 U	0.005 U
N-Butylbenzene	12	100	4.57	0.0023 U	0.0021 U	0.002 U
n-propylbenzene	3.9	100	24.1 D	0.0023 U	0.0021 U	0.002 U
o-xylene	NS	NS	70.7	0.0011 U	0.001 U	0.00044 J
Sec-Butylbenzene	11	100	1.97	0.0023 U	0.0021 U	0.002 U
T-Butylbenzene	5.9	100	0.0321 J	0.0023 U	0.0021 U	0.002 U
Tert-Butyl Methyl Ether	0.93	100	0.06 U	0.0011 U	0.001 U	0.00099 U
Tetrachloroethene (PCE)	1.3	19	0.12 U	0.0023 U	0.0021 U	0.002 U
Toluene	0.7	100	111 D	0.0011 U	0.001 U	0.00099 U
Trans-1,2-Dichloroethene	0.19	100	0.06 U	0.0011 U	0.001 U	0.00099 U
Trichloroethene (TCE)	0.47	21	0.06 U	0.0011 U	0.001 U	0.00099 U
Vinyl Chloride	0.02	0.9	0.12 U	0.0023 U	0.0021 U	0.002 U
Xylenes (total)	0.26	100	258 D	0.0011 U	0.001 U	0.00044 J

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-7(9)20180312 JC62145-2 3/12/2018 1 mg/kg	EP-8(9)20180312 JC62145-1 3/12/2018 1 mg/kg	EP-9(9)20180312 JC62145-6 3/12/2018 1 mg/kg	EP-10(9)20180312 JC62145-7 3/12/2018 1 mg/kg
1,1,1-Trichloroethane	0.68	100	0.002 U	0.0021 U	0.002 U	0.0019 U
1,1-Dichloroethane	0.27	26	0.001 U	0.001 U	0.001 U	0.00095 U
1,1-Dichloroethene	0.33	100	0.001 U	0.001 U	0.001 U	0.00095 U
1,2,4-Trimethylbenzene	3.6	52	0.002 U	0.0021 U	0.002 U	0.005
1,2-Dichlorobenzene	1.1	100	0.001 U	0.001 U	0.001 U	0.00095 U
1,2-Dichloroethane	0.02	3.1	0.001 U	0.001 U	0.001 U	0.00095 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	0.002 U	0.0021 U	0.002 U	0.0015 J
1,3-Dichlorobenzene	2.4	49	0.001 U	0.001 U	0.001 U	0.00095 U
1,4-Dichlorobenzene	1.8	13	0.001 U	0.001 U	0.001 U	0.00095 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.12 U	0.13 U	0.12 U	0.12 UJ
Acetone	0.05	100	0.0398	0.0077 J	0.0125	0.0211
Benzene	0.06	4.8	0.0005 U	0.00052 U	0.0005 U	0.00047 U
Carbon Tetrachloride	0.76	2.4	0.002 U	0.0021 U	0.002 U	0.0019 U
Chlorobenzene	1.1	100	0.002 U	0.0021 U	0.002 U	0.0019 U
Chloroform	0.37	49	0.002 U	0.0021 U	0.002 U	0.0019 U
Cis-1,2-Dichloroethylene	0.25	100	0.001 U	0.001 U	0.001 U	0.00095 U
Ethylbenzene	1	41	0.001 U	0.001 U	0.001 U	0.00052 J
m/p xylene	NS	NS	0.001 U	0.001 U	0.001 U	0.0026
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.01 U	0.01 U	0.01 U	0.0095 U
Methylene Chloride	0.05	100	0.005 U	0.0052 U	0.005 U	0.0047 U
N-Butylbenzene	12	100	0.002 U	0.0021 U	0.002 U	0.0019 U
n-propylbenzene	3.9	100	0.002 U	0.0021 U	0.002 U	0.00025 J
o-xylene	NS	NS	0.001 U	0.0004 J	0.001 U	0.0014
Sec-Butylbenzene	11	100	0.002 U	0.0021 U	0.002 U	0.00026 J
T-Butylbenzene	5.9	100	0.002 U	0.0021 U	0.002 U	0.0019 U
Tert-Butyl Methyl Ether	0.93	100	0.001 U	0.001 U	0.001 U	0.00095 U
Tetrachloroethene (PCE)	1.3	19	0.002 U	0.0021 U	0.002 U	0.002
Toluene	0.7	100	0.001 U	0.001 U	0.001 U	0.00095 U
Trans-1,2-Dichloroethene	0.19	100	0.001 U	0.001 U	0.001 U	0.00095 U
Trichloroethene (TCE)	0.47	21	0.001 U	0.001 U	0.001 U	0.00095 U
Vinyl Chloride	0.02	0.9	0.002 U	0.0021 U	0.002 U	0.0019 U
Xylenes (total)	0.26	100	0.001 U	0.0004 J	0.001 U	0.0039

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-11(9)20180614 JC67062-2 6/14/2018 1 mg/kg	EP-X(9)20180614 JC67062-3 6/14/2018 1 mg/kg	EP-12(15)20180531 JC67062-1 5/31/2018 1 mg/kg	EP-13(9)20180404 JC62145-22 4/4/2018 1 mg/kg
1,1,1-Trichloroethane	0.68	100	0.0019 U	0.0017 U	0.002 U	0.0019 U
1,1-Dichloroethane	0.27	26	0.00096 U	0.00085 U	0.00099 U	0.00093 U
1,1-Dichloroethene	0.33	100	0.00096 U	0.00085 U	0.00099 U	0.00093 U
1,2,4-Trimethylbenzene	3.6	52	0.0019 U	0.0017 U	0.002 U	0.0019 U
1,2-Dichlorobenzene	1.1	100	0.00096 U	0.00085 U	0.00099 U	0.00093 U
1,2-Dichloroethane	0.02	3.1	0.00096 U	0.00085 U	0.00099 U	0.00093 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	0.0019 U	0.0017 U	0.002 U	0.0019 U
1,3-Dichlorobenzene	2.4	49	0.00096 U	0.00085 U	0.00099 U	0.00093 U
1,4-Dichlorobenzene	1.8	13	0.00096 U	0.00085 U	0.00099 U	0.00093 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.12 U	0.11 U	0.12 U	0.12 UJ
Acetone	0.05	100	0.0096 U	0.0109 J	0.0099 U	0.0093 U
Benzene	0.06	4.8	0.00048 U	0.00043 U	0.0005 U	0.00047 U
Carbon Tetrachloride	0.76	2.4	0.0019 U	0.0017 U	0.002 U	0.0019 U
Chlorobenzene	1.1	100	0.0019 U	0.0017 U	0.002 U	0.0019 U
Chloroform	0.37	49	0.0019 U	0.0017 U	0.002 U	0.0019 U
Cis-1,2-Dichloroethylene	0.25	100	0.00096 U	0.00085 U	0.00099 U	0.00093 U
Ethylbenzene	1	41	0.00096 U	0.00085 U	0.00099 U	0.00093 U
m/p xylene	NS	NS	0.00096 U	0.00085 U	0.00099 U	0.00093 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.0096 U	0.0085 U	0.0099 U	0.0093 U
Methylene Chloride	0.05	100	0.0048 U	0.0043 U	0.005 U	0.0047 U
N-Butylbenzene	12	100	0.0019 U	0.0017 U	0.002 U	0.0019 U
n-propylbenzene	3.9	100	0.0019 U	0.0017 U	0.002 U	0.0019 U
o-xylene	NS	NS	0.00096 U	0.00085 U	0.00099 U	0.00032 J
Sec-Butylbenzene	11	100	0.0019 U	0.0017 U	0.002 U	0.0019 U
T-Butylbenzene	5.9	100	0.0019 U	0.0017 U	0.002 U	0.0019 U
Tert-Butyl Methyl Ether	0.93	100	0.00096 U	0.00085 U	0.00099 U	0.00093 U
Tetrachloroethene (PCE)	1.3	19	0.0019 U	0.0017 U	0.002 U	0.0019 U
Toluene	0.7	100	0.00096 U	0.00085 U	0.00099 U	0.00093 U
Trans-1,2-Dichloroethene	0.19	100	0.00096 U	0.00085 U	0.00099 U	0.00093 U
Trichloroethene (TCE)	0.47	21	0.00096 U	0.00085 U	0.00099 U	0.00093 U
Vinyl Chloride	0.02	0.9	0.0019 U	0.0017 U	0.002 U	0.0019 U
Xylenes (total)	0.26	100	0.00096 U	0.00085 U	0.00099 U	0.00032 J

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-14(9)20180404 JC62145-21 4/4/2018 1 mg/kg	EP-15(9)20180404 JC62145-25 4/4/2018 1 mg/kg	EP-16(15)20180314 JC62145-16 3/14/2018 1 mg/kg	EP-19(9)20180404 JC62145-24 4/4/2018 1 mg/kg
1,1,1-Trichloroethane	0.68	100	0.0023 U	0.0021 U	0.0021 U	0.0029 U
1,1-Dichloroethane	0.27	26	0.0011 U	0.001 U	0.0011 U	0.0015 U
1,1-Dichloroethene	0.33	100	0.0011 U	0.001 U	0.0011 U	0.0015 U
1,2,4-Trimethylbenzene	3.6	52	0.0023 U	0.0021 U	0.0021 U	0.0029 U
1,2-Dichlorobenzene	1.1	100	0.0011 U	0.001 U	0.0011 U	0.0015 U
1,2-Dichloroethane	0.02	3.1	0.0011 U	0.001 U	0.0011 U	0.0015 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	0.0023 U	0.0021 U	0.0021 U	0.0029 U
1,3-Dichlorobenzene	2.4	49	0.0011 U	0.001 U	0.0011 U	0.0015 U
1,4-Dichlorobenzene	1.8	13	0.0011 U	0.001 U	0.0011 U	0.0015 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.14 U	0.13 UJ	0.13 U	0.18 UJ
Acetone	0.05	100	0.011 U	0.01 U	0.011 U	0.015 U
Benzene	0.06	4.8	0.00057 U	0.00051 U	0.00053 U	0.00073 U
Carbon Tetrachloride	0.76	2.4	0.0023 U	0.0021 U	0.0021 U	0.0029 U
Chlorobenzene	1.1	100	0.0023 U	0.0021 U	0.0021 U	0.0029 U
Chloroform	0.37	49	0.0023 U	0.0021 U	0.0021 U	0.0029 U
Cis-1,2-Dichloroethylene	0.25	100	0.0011 U	0.001 U	0.0011 U	0.0015 U
Ethylbenzene	1	41	0.0011 U	0.001 U	0.0011 U	0.0015 U
m/p xylene	NS	NS	0.0011 U	0.001 U	0.0011 U	0.0015 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.011 U	0.01 U	0.011 U	0.015 U
Methylene Chloride	0.05	100	0.0057 U	0.0051 U	0.0047 J	0.0073 U
N-Butylbenzene	12	100	0.0023 U	0.0021 U	0.0021 U	0.0029 U
n-propylbenzene	3.9	100	0.0023 U	0.0021 U	0.0021 U	0.0029 U
o-xylene	NS	NS	0.0011 U	0.001 U	0.0011 U	0.0015 U
Sec-Butylbenzene	11	100	0.0023 U	0.0021 U	0.0021 U	0.0029 U
T-Butylbenzene	5.9	100	0.0023 U	0.0021 U	0.0021 U	0.0029 U
Tert-Butyl Methyl Ether	0.93	100	0.0011 U	0.001 U	0.0011 U	0.0015 U
Tetrachloroethene (PCE)	1.3	19	0.0023 U	0.0021 U	0.0021 U	0.0029 U
Toluene	0.7	100	0.0011 U	0.001 U	0.0011 U	0.0015 U
Trans-1,2-Dichloroethene	0.19	100	0.0011 U	0.001 U	0.0011 UJ	0.0015 U
Trichloroethene (TCE)	0.47	21	0.0011 U	0.001 U	0.0011 U	0.0015 U
Vinyl Chloride	0.02	0.9	0.0023 U	0.0021 U	0.0021 U	0.0029 U
Xylenes (total)	0.26	100	0.0011 U	0.001 U	0.0011 U	0.0015 U

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-20(9)20180314 JC62145-17 3/14/2018 1 mg/kg	EP-X(9)20180314 JC62145-18 3/14/2018 1 mg/kg	EP-23(9)20180312 JC62145-15 3/12/2018 1 mg/kg	EP-24(8)20180312 JC62145-11 3/12/2018 1 mg/kg
1,1,1-Trichloroethane	0.68	100	0.0022 U	0.002 U	0.002 U	0.002 U
1,1-Dichloroethane	0.27	26	0.0011 U	0.00098 U	0.00099 U	0.001 U
1,1-Dichloroethene	0.33	100	0.0011 U	0.00098 U	0.00099 U	0.001 U
1,2,4-Trimethylbenzene	3.6	52	0.0022 U	0.002 U	0.002 U	0.002 U
1,2-Dichlorobenzene	1.1	100	0.0011 U	0.00098 U	0.00099 U	0.001 U
1,2-Dichloroethane	0.02	3.1	0.0011 U	0.00098 U	0.00099 U	0.001 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	0.0022 U	0.002 U	0.002 U	0.002 U
1,3-Dichlorobenzene	2.4	49	0.0011 U	0.00098 U	0.00099 U	0.001 U
1,4-Dichlorobenzene	1.8	13	0.0011 U	0.00098 U	0.00099 U	0.001 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.14 U	0.12 U	0.12 U	0.13 U
Acetone	0.05	100	0.0087 J	0.0098 U	0.0099 U	0.0135
Benzene	0.06	4.8	0.00056 U	0.00049 U	0.00049 U	0.0005 U
Carbon Tetrachloride	0.76	2.4	0.0022 U	0.002 U	0.002 U	0.002 U
Chlorobenzene	1.1	100	0.0022 U	0.002 U	0.002 U	0.002 U
Chloroform	0.37	49	0.0022 U	0.002 U	0.002 U	0.002 U
Cis-1,2-Dichloroethylene	0.25	100	0.0011 U	0.00098 U	0.00099 U	0.001 U
Ethylbenzene	1	41	0.0011 U	0.00098 U	0.00099 U	0.001 U
m/p xylene	NS	NS	0.0011 U	0.00098 U	0.00099 U	0.001 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.011 U	0.0098 U	0.0099 U	0.01 U
Methylene Chloride	0.05	100	0.0071 J	0.0049 U	0.0049 U	0.005 U
N-Butylbenzene	12	100	0.0022 U	0.002 U	0.002 U	0.002 U
n-propylbenzene	3.9	100	0.0022 U	0.002 U	0.002 U	0.002 U
o-xylene	NS	NS	0.0011 U	0.00098 U	0.00099 U	0.001 U
Sec-Butylbenzene	11	100	0.0022 U	0.002 U	0.002 U	0.002 U
T-Butylbenzene	5.9	100	0.0022 U	0.002 U	0.002 U	0.002 U
Tert-Butyl Methyl Ether	0.93	100	0.0011 U	0.00098 U	0.00099 U	0.001 U
Tetrachloroethene (PCE)	1.3	19	0.0022 U	0.002 U	0.002 U	0.002 U
Toluene	0.7	100	0.0011 U	0.00098 U	0.00099 U	0.001 U
Trans-1,2-Dichloroethene	0.19	100	0.0011 UJ	0.00098 U	0.00099 U	0.001 U
Trichloroethene (TCE)	0.47	21	0.0011 U	0.00057 J	0.00099 U	0.001 U
Vinyl Chloride	0.02	0.9	0.0022 U	0.002 U	0.002 U	0.002 U
Xylenes (total)	0.26	100	0.0011 U	0.00098 U	0.00099 U	0.001 U

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-25(9)20180312 JC62145-13 3/12/2018 1 mg/kg	EP-26(8)20180312 JC62145-14 3/12/2018 1 mg/kg	FB-20180124 JC59665-4 1/24/2018 1 mg/l	FB-20180314 JC62145-20 3/14/2018 1 mg/l
1,1,1-Trichloroethane	0.68	100	0.0023 U	0.002 U	0.001 U	0.001 U
1,1-Dichloroethane	0.27	26	0.0012 U	0.00099 U	0.001 U	0.001 U
1,1-Dichloroethene	0.33	100	0.0012 U	0.00099 U	0.001 U	0.001 U
1,2,4-Trimethylbenzene	3.6	52	0.0023 U	0.002 U	0.002 U	0.002 U
1,2-Dichlorobenzene	1.1	100	0.0012 U	0.00099 U	0.001 U	0.001 U
1,2-Dichloroethane	0.02	3.1	0.0012 U	0.00099 U	0.001 U	0.001 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	0.0023 U	0.002 U	0.002 U	0.002 U
1,3-Dichlorobenzene	2.4	49	0.0012 U	0.00099 U	0.001 U	0.001 U
1,4-Dichlorobenzene	1.8	13	0.0012 U	0.00099 U	0.001 U	0.001 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.14 U	0.12 U	0.13 U	0.13 U
Acetone	0.05	100	0.012 U	0.0156	0.01 U	0.01 U
Benzene	0.06	4.8	0.00058 U	0.00049 U	0.0005 U	0.0005 U
Carbon Tetrachloride	0.76	2.4	0.0023 U	0.002 U	0.001 U	0.001 U
Chlorobenzene	1.1	100	0.0023 U	0.002 U	0.001 U	0.001 U
Chloroform	0.37	49	0.0023 U	0.002 U	0.001 U	0.001 U
Cis-1,2-Dichloroethylene	0.25	100	0.0012 U	0.00099 U	0.001 U	0.001 U
Ethylbenzene	1	41	0.0012 U	0.00099 U	0.001 U	0.001 U
m/p xylene	NS	NS	0.0012 U	0.00099 U	0.001 U	0.001 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.012 U	0.0099 U	0.01 U	0.01 U
Methylene Chloride	0.05	100	0.0058 U	0.0049 U	0.002 U	0.002 U
N-Butylbenzene	12	100	0.0023 U	0.002 U	0.002 U	0.002 U
n-propylbenzene	3.9	100	0.0023 U	0.002 U	0.002 U	0.002 U
o-xylene	NS	NS	0.0012 U	0.00099 U	0.001 U	0.001 U
Sec-Butylbenzene	11	100	0.0023 U	0.002 U	0.002 U	0.002 U
T-Butylbenzene	5.9	100	0.0023 U	0.002 U	0.002 U	0.002 U
Tert-Butyl Methyl Ether	0.93	100	0.0012 U	0.00099 U	0.001 U	0.001 U
Tetrachloroethene (PCE)	1.3	19	0.0023 U	0.002 U	0.001 U	0.001 U
Toluene	0.7	100	0.0012 U	0.00099 U	0.001 U	0.001 U
Trans-1,2-Dichloroethene	0.19	100	0.0012 U	0.00099 U	0.001 U	0.001 U
Trichloroethene (TCE)	0.47	21	0.0012 U	0.00099 U	0.001 U	0.001 U
Vinyl Chloride	0.02	0.9	0.0023 U	0.002 U	0.001 U	0.001 U
Xylenes (total)	0.26	100	0.0012 U	0.00099 U	0.001 U	0.001 U

Table 3
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Volatile Organic Compounds (VOCs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	FB-20180614 JC67062-4 6/14/2018 1 mg/l	TB-20180124 JC59665-5 1/24/2018 1 mg/l	TB-20180314 JC62145-19 3/14/2018 1 mg/l	TB-20180614 JC67062-5 6/14/2018 1 mg/l
1,1,1-Trichloroethane	0.68	100	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethane	0.27	26	0.001 U	0.001 U	0.001 U	0.001 U
1,1-Dichloroethene	0.33	100	0.001 U	0.001 U	0.001 U	0.001 U
1,2,4-Trimethylbenzene	3.6	52	0.002 U	0.002 U	0.002 U	0.002 U
1,2-Dichlorobenzene	1.1	100	0.001 U	0.001 U	0.001 U	0.001 U
1,2-Dichloroethane	0.02	3.1	0.001 U	0.001 U	0.001 U	0.001 U
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52	0.002 U	0.002 U	0.002 U	0.002 U
1,3-Dichlorobenzene	2.4	49	0.001 U	0.001 U	0.001 U	0.001 U
1,4-Dichlorobenzene	1.8	13	0.001 U	0.001 U	0.001 U	0.001 U
1,4-Dioxane (P-Dioxane)	0.1	13	0.13 UJ	0.13 U	0.13 U	0.13 UJ
Acetone	0.05	100	0.01 U	0.01 U	0.01 U	0.01 U
Benzene	0.06	4.8	0.0005 U	0.0005 U	0.0005 U	0.0005 U
Carbon Tetrachloride	0.76	2.4	0.001 U	0.001 U	0.001 U	0.001 U
Chlorobenzene	1.1	100	0.001 U	0.001 U	0.001 U	0.001 U
Chloroform	0.37	49	0.001 U	0.001 U	0.001 U	0.001 U
Cis-1,2-Dichloroethylene	0.25	100	0.001 U	0.001 U	0.001 U	0.001 U
Ethylbenzene	1	41	0.001 U	0.001 U	0.001 U	0.001 U
m/p xylene	NS	NS	0.001 U	0.001 U	0.001 U	0.001 U
Methyl Ethyl Ketone (2-Butanone)	0.12	100	0.01 U	0.01 U	0.01 U	0.01 U
Methylene Chloride	0.05	100	0.002 U	0.002 U	0.002 U	0.002 U
N-Butylbenzene	12	100	0.002 U	0.002 U	0.002 U	0.002 U
n-propylbenzene	3.9	100	0.002 U	0.002 U	0.002 U	0.002 U
o-xylene	NS	NS	0.002 U	0.001 U	0.001 U	0.002 U
Sec-Butylbenzene	11	100	0.002 U	0.002 U	0.002 U	0.002 U
T-Butylbenzene	5.9	100	0.002 U	0.002 U	0.002 U	0.002 U
Tert-Butyl Methyl Ether	0.93	100	0.001 U	0.001 U	0.001 U	0.001 U
Tetrachloroethene (PCE)	1.3	19	0.001 U	0.001 U	0.001 U	0.001 U
Toluene	0.7	100	0.001 U	0.001 U	0.001 U	0.001 U
Trans-1,2-Dichloroethene	0.19	100	0.001 U	0.001 U	0.001 U	0.001 U
Trichloroethene (TCE)	0.47	21	0.001 U	0.001 U	0.001 U	0.001 U
Vinyl Chloride	0.02	0.9	0.001 U	0.001 U	0.001 U	0.001 U
Xylenes (total)	0.26	100	0.001 U	0.001 U	0.001 U	0.001 U

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-1(9)20180124 JC59665-1 1/24/2018 1 mg/kg	EP-X(9)20180124 JC59665-2 1/24/2018 1 mg/kg	EP-2(10)20180124 JC59665-3 1/24/2018 1 mg/kg
Acenaphthene	20	100	0.037 U	0.036 U	0.038 U
Acenaphthylene	100	100	0.037 U	0.036 U	0.038 U
Anthracene	100	100	0.037 U	0.036 U	0.0247 J
Benzo(a)Anthracene	1	1	0.0536	0.0659	0.0845
Benzo(a)Pyrene	1	1	0.0406	0.0576	0.0774
Benzo(b)Fluoranthene	1	1	0.0535	0.0682	0.101
Benzo(g,h,i)Perylene	100	100	0.0323 J	0.0592 J	0.0597
Benzo(k)Fluoranthene	0.8	3.9	0.0256 J	0.0305 J	0.0453
Chrysene	1	3.9	0.0491	0.06	0.0926 J
Dibenz(a,h)Anthracene	0.33	0.33	0.037 U	0.036 U	0.038 U
Fluoranthene	100	100	0.104	0.109	0.171
Fluorene	30	100	0.037 U	0.036 U	0.038 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.0293 J	0.0427 J	0.0615
Naphthalene	12	100	0.037 U	0.036 U	0.038 U
Phenanthrene	100	100	0.0535	0.0521	0.0843
Pyrene	100	100	0.106	0.121	0.165

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-3(11)20180130 JC59665-6 1/30/2018 1 mg/kg	EP-4(9)20180312 JC62145-3 3/12/2018 1 mg/kg	EP-4(15)20180404 JC62145-23 4/4/2018 1 mg/kg
Acenaphthene	20	100	0.038 U	0.0175 J	0.035 U
Acenaphthylene	100	100	0.038 U	0.0793	0.035 U
Anthracene	100	100	0.038 U	0.0746	0.035 U
Benzo(a)Anthracene	1	1	0.038 U	0.333	0.035 U
Benzo(a)Pyrene	1	1	0.038 U	0.349	0.035 U
Benzo(b)Fluoranthene	1	1	0.038 U	0.441	0.035 U
Benzo(g,h,i)Perylene	100	100	0.038 U	0.277	0.035 U
Benzo(k)Fluoranthene	0.8	3.9	0.038 U	0.175	0.035 U
Chrysene	1	3.9	0.038 U	0.32	0.035 U
Dibenz(a,h)Anthracene	0.33	0.33	0.038 U	0.0686	0.035 U
Fluoranthene	100	100	0.038 U	0.631	0.035 U
Fluorene	30	100	0.038 U	0.0231 J	0.035 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.038 U	0.313	0.035 U
Naphthalene	12	100	0.038 U	0.571	0.035 U
Phenanthrene	100	100	0.038 U	0.345	0.035 U
Pyrene	100	100	0.0166 J	0.538	0.035 U

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-5(9)20180312 JC62145-4 3/12/2018 1 mg/kg	EP-6(9)20180312 JC62145-5 3/12/2018 1 mg/kg	EP-7(9)20180312 JC62145-2 3/12/2018 1 mg/kg
Acenaphthene	20	100	0.04 U	0.037 U	0.039 U
Acenaphthylene	100	100	0.0298 J	0.0277 J	0.0213 J
Anthracene	100	100	0.04 U	0.0264 J	0.0304 J
Benzo(a)Anthracene	1	1	0.116	0.12	0.118
Benzo(a)Pyrene	1	1	0.136	0.133	0.115
Benzo(b)Fluoranthene	1	1	0.188	0.174	0.152
Benzo(g,h,i)Perylene	100	100	0.11	0.111	0.101
Benzo(k)Fluoranthene	0.8	3.9	0.0585	0.0609	0.048
Chrysene	1	3.9	0.124	0.116	0.108
Dibenz(a,h)Anthracene	0.33	0.33	0.0275 J	0.0227 J	0.0217 J
Fluoranthene	100	100	0.249	0.218	0.214
Fluorene	30	100	0.04 U	0.037 U	0.039 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.127	0.119	0.116
Naphthalene	12	100	0.04 U	0.037 U	0.039 U
Phenanthrene	100	100	0.15	0.104	0.136
Pyrene	100	100	0.223	0.195	0.207

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-8(9)20180312 JC62145-1 3/12/2018 1 mg/kg	EP-9(9)20180312 JC62145-6 3/12/2018 1 mg/kg	EP-10(9)20180312 JC62145-7 3/12/2018 1 mg/kg
Acenaphthene	20	100	0.0254 J	0.038 U	0.036 U
Acenaphthylene	100	100	0.0297 J	0.038 U	0.0187 J
Anthracene	100	100	0.0767	0.0275 J	0.0347 J
Benzo(a)Anthracene	1	1	0.19	0.0904	0.0983
Benzo(a)Pyrene	1	1	0.193	0.0864	0.0982
Benzo(b)Fluoranthene	1	1	0.243	0.115	0.13
Benzo(g,h,i)Perylene	100	100	0.141	0.0615	0.0795
Benzo(k)Fluoranthene	0.8	3.9	0.0851	0.0399	0.0448
Chrysene	1	3.9	0.179	0.0805	0.0938
Dibenz(a,h)Anthracene	0.33	0.33	0.0403	0.038 U	0.0198 J
Fluoranthene	100	100	0.396	0.178	0.187
Fluorene	30	100	0.0349 J	0.038 U	0.0193 J
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.17	0.0674	0.0921
Naphthalene	12	100	0.039 U	0.038 U	0.036 U
Phenanthrene	100	100	0.312	0.0962	0.147
Pyrene	100	100	0.352	0.151	0.181

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-11(9)20180614 JC67062-2 6/14/2018 1 mg/kg	EP-X(9)20180614 JC67062-3 6/14/2018 1 mg/kg	EP-12(15)20180531 JC67062-1 5/31/2018 1 mg/kg
Acenaphthene	20	100	0.0448	0.036 UJ	0.037 U
Acenaphthylene	100	100	0.32	0.0221 JL	0.087
Anthracene	100	100	0.355	0.0289 JL	0.0927
Benzo(a)Anthracene	1	1	0.769	0.0926 JL	0.34
Benzo(a)Pyrene	1	1	0.684	0.0876 JL	0.339
Benzo(b)Fluoranthene	1	1	0.802	0.103 JL	0.393
Benzo(g,h,i)Perylene	100	100	0.424	0.0629 JL	0.246
Benzo(k)Fluoranthene	0.8	3.9	0.298	0.0497 JL	0.145
Chrysene	1	3.9	0.731	0.0933 JL	0.336
Dibenz(a,h)Anthracene	0.33	0.33	0.117	0.036 UJ	0.0574
Fluoranthene	100	100	1.29	0.158 JL	0.705
Fluorene	30	100	0.352	0.036 UJ	0.0223 J
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.441	0.0631 JL	0.256
Naphthalene	12	100	0.289	0.036 UJ	0.037 U
Phenanthrene	100	100	1.74	0.0959 JL	0.274
Pyrene	100	100	1.43	0.203 JL	0.572

Table 4
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Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-13(9)20180404 JC62145-22 4/4/2018 1 mg/kg	EP-14(9)20180404 JC62145-21 4/4/2018 1 mg/kg	EP-15(9)20180404 JC62145-25 4/4/2018 1 mg/kg
Acenaphthene	20	100	0.037 U	0.036 U	0.038 U
Acenaphthylene	100	100	0.037 U	0.036 U	0.038 U
Anthracene	100	100	0.037 U	0.036 U	0.035 J
Benzo(a)Anthracene	1	1	0.0358 J	0.0485	0.18
Benzo(a)Pyrene	1	1	0.0303 J	0.052	0.186
Benzo(b)Fluoranthene	1	1	0.0384	0.0632	0.254
Benzo(g,h,i)Perylene	100	100	0.0216 J	0.0393	0.125
Benzo(k)Fluoranthene	0.8	3.9	0.0174 J	0.0271 J	0.105 J
Chrysene	1	3.9	0.0334 J	0.0434	0.189
Dibenz(a,h)Anthracene	0.33	0.33	0.037 U	0.036 U	0.0329 J
Fluoranthene	100	100	0.0673	0.0867	0.239
Fluorene	30	100	0.037 U	0.036 U	0.038 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.0201 J	0.0401	0.128
Naphthalene	12	100	0.037 U	0.036 U	0.038 U
Phenanthrene	100	100	0.0391	0.0558	0.118
Pyrene	100	100	0.0632	0.0804	0.261

Table 4
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Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-16(15)20180314 JC62145-16 3/14/2018 1 mg/kg	EP-19(9)20180404 JC62145-24 4/4/2018 1 mg/kg	EP-20(9)20180314 JC62145-17 3/14/2018 1 mg/kg
Acenaphthene	20	100	0.033 J	0.041 U	0.037 U
Acenaphthylene	100	100	0.243	0.041 U	0.037 U
Anthracene	100	100	0.212	0.041 U	0.037 U
Benzo(a)Anthracene	1	1	0.708	0.041 U	0.0205 J
Benzo(a)Pyrene	1	1	0.791	0.041 U	0.0208 J
Benzo(b)Fluoranthene	1	1	1.05	0.041 U	0.0264 J
Benzo(g,h,i)Perylene	100	100	0.699	0.041 U	0.037 U
Benzo(k)Fluoranthene	0.8	3.9	0.376	0.041 U	0.037 U
Chrysene	1	3.9	0.836	0.041 U	0.0211 J
Dibenz(a,h)Anthracene	0.33	0.33	0.148	0.041 U	0.037 U
Fluoranthene	100	100	1.22	0.041 U	0.0399
Fluorene	30	100	0.0601	0.041 U	0.037 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.654	0.041 U	0.037 U
Naphthalene	12	100	0.0381 J	0.041 U	0.037 U
Phenanthrene	100	100	0.969	0.041 U	0.0273 J
Pyrene	100	100	1.33	0.041 U	0.0368 J

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-X(9)20180314 JC62145-18 3/14/2018 1 mg/kg	EP-23(9)20180312 JC62145-15 3/12/2018 1 mg/kg	EP-24(8)20180312 JC62145-11 3/12/2018 1 mg/kg
Acenaphthene	20	100	0.037 U	0.037 U	0.037 U
Acenaphthylene	100	100	0.037 U	0.037 U	0.0528
Anthracene	100	100	0.037 U	0.0279 J	0.0408
Benzo(a)Anthracene	1	1	0.037 UJ	0.0801	0.208
Benzo(a)Pyrene	1	1	0.037 UJ	0.0864	0.213
Benzo(b)Fluoranthene	1	1	0.037 UJ	0.114	0.282
Benzo(g,h,i)Perylene	100	100	0.037 U	0.0741	0.18
Benzo(k)Fluoranthene	0.8	3.9	0.037 U	0.0387	0.0999
Chrysene	1	3.9	0.037 UJ	0.0788	0.21
Dibenz(a,h)Anthracene	0.33	0.33	0.037 U	0.0207 J	0.048
Fluoranthene	100	100	0.037 U	0.168	0.39
Fluorene	30	100	0.037 U	0.037 U	0.037 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.037 U	0.0873	0.183
Naphthalene	12	100	0.037 U	0.037 U	0.037 U
Phenanthrene	100	100	0.037 UJ	0.117	0.198
Pyrene	100	100	0.037 UJ	0.151	0.355

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-25(9)20180312 JC62145-13 3/12/2018 1 mg/kg	EP-26(8)20180312 JC62145-14 3/12/2018 1 mg/kg	FB-20180124 JC59665-4 1/24/2018 1 mg/l
Acenaphthene	20	100	0.035 U	0.037 U	0.001 U
Acenaphthylene	100	100	0.035 U	0.0364 J	0.001 U
Anthracene	100	100	0.035 U	0.041	0.001 U
Benzo(a)Anthracene	1	1	0.035 U	0.11	0.001 U
Benzo(a)Pyrene	1	1	0.035 U	0.116	0.001 U
Benzo(b)Fluoranthene	1	1	0.035 U	0.134	0.001 U
Benzo(g,h,i)Perylene	100	100	0.035 U	0.0905	0.001 U
Benzo(k)Fluoranthene	0.8	3.9	0.035 U	0.054	0.001 U
Chrysene	1	3.9	0.035 U	0.0974	0.001 U
Dibenz(a,h)Anthracene	0.33	0.33	0.035 U	0.0221 J	0.001 U
Fluoranthene	100	100	0.035 U	0.226	0.001 U
Fluorene	30	100	0.035 U	0.0256 J	0.001 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.035 U	0.0974	0.001 U
Naphthalene	12	100	0.035 U	0.037 U	0.001 U
Phenanthrene	100	100	0.035 U	0.185	0.001 U
Pyrene	100	100	0.035 U	0.205	0.001 U

Table 4
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polycyclic Aromatic Hydrocarbons (PAHs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	FB-20180314 JC62145-20 3/14/2018 1 mg/l	FB-20180614 JC67062-4 6/14/2018 1 mg/l
Acenaphthene	20	100	0.001 U	0.001 U
Acenaphthylene	100	100	0.001 U	0.001 U
Anthracene	100	100	0.001 U	0.001 U
Benzo(a)Anthracene	1	1	0.001 U	0.001 U
Benzo(a)Pyrene	1	1	0.001 U	0.001 U
Benzo(b)Fluoranthene	1	1	0.001 U	0.001 U
Benzo(g,h,i)Perylene	100	100	0.001 U	0.001 U
Benzo(k)Fluoranthene	0.8	3.9	0.001 U	0.001 U
Chrysene	1	3.9	0.001 U	0.001 U
Dibenz(a,h)Anthracene	0.33	0.33	0.001 U	0.001 U
Fluoranthene	100	100	0.001 U	0.001 U
Fluorene	30	100	0.001 U	0.001 U
Indeno(1,2,3-c,d)Pyrene	0.5	0.5	0.001 U	0.001 U
Naphthalene	12	100	0.001 U	0.001 U
Phenanthrene	100	100	0.001 U	0.001 U
Pyrene	100	100	0.001 U	0.001 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-1(9)20180124 JC59665-1 1/24/2018 1 mg/kg	EP-X(9)20180124 JC59665-2 1/24/2018 1 mg/kg	EP-2(10)20180124 JC59665-3 1/24/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.036 U	0.038 U	0.036 U
PCB-1221 (Aroclor 1221)	NS	NS	0.036 U	0.038 U	0.036 U
PCB-1232 (Aroclor 1232)	NS	NS	0.036 U	0.038 U	0.036 U
PCB-1242 (Aroclor 1242)	NS	NS	0.036 U	0.038 U	0.036 U
PCB-1248 (Aroclor 1248)	NS	NS	0.036 U	0.038 U	0.036 U
PCB-1254 (Aroclor 1254)	NS	NS	0.036 U	0.038 U	0.036 U
PCB-1260 (Aroclor 1260)	NS	NS	0.036 U	0.038 U	0.036 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.036 U	0.038 U	0.036 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-3(11)20180130 JC59665-6 1/30/2018 1 mg/kg	EP-4(15)20180404 JC62145-23 4/4/2018 1 mg/kg	EP-4(9)20180312 JC62145-3 3/12/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.039 U	0.034 U	0.04 U
PCB-1221 (Aroclor 1221)	NS	NS	0.039 U	0.034 U	0.04 U
PCB-1232 (Aroclor 1232)	NS	NS	0.039 U	0.034 U	0.04 U
PCB-1242 (Aroclor 1242)	NS	NS	0.039 U	0.034 U	0.0511
PCB-1248 (Aroclor 1248)	NS	NS	0.039 U	0.034 U	0.04 U
PCB-1254 (Aroclor 1254)	NS	NS	0.039 U	0.034 U	0.04 U
PCB-1260 (Aroclor 1260)	NS	NS	0.039 U	0.034 U	0.04 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.039 U	0.034 U	0.0511

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-5(9)20180312 JC62145-4 3/12/2018 1 mg/kg	EP-6(9)20180312 JC62145-5 3/12/2018 1 mg/kg	EP-7(9)20180312 JC62145-2 3/12/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.04 U	0.037 U	0.039 U
PCB-1221 (Aroclor 1221)	NS	NS	0.04 U	0.037 U	0.039 U
PCB-1232 (Aroclor 1232)	NS	NS	0.04 U	0.037 U	0.039 U
PCB-1242 (Aroclor 1242)	NS	NS	0.04 U	0.037 U	0.039 U
PCB-1248 (Aroclor 1248)	NS	NS	0.04 U	0.037 U	0.039 U
PCB-1254 (Aroclor 1254)	NS	NS	0.04 U	0.037 U	0.039 U
PCB-1260 (Aroclor 1260)	NS	NS	0.04 U	0.037 U	0.039 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.04 U	0.037 U	0.039 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-8(9)20180312 JC62145-1 3/12/2018 1 mg/kg	EP-9(9)20180312 JC62145-6 3/12/2018 1 mg/kg	EP-10(9)20180312 JC62145-7 3/12/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.039 U	0.039 U	0.036 U
PCB-1221 (Aroclor 1221)	NS	NS	0.039 U	0.039 U	0.036 U
PCB-1232 (Aroclor 1232)	NS	NS	0.039 U	0.039 U	0.036 U
PCB-1242 (Aroclor 1242)	NS	NS	0.039 U	0.039 U	0.036 U
PCB-1248 (Aroclor 1248)	NS	NS	0.039 U	0.039 U	0.036 U
PCB-1254 (Aroclor 1254)	NS	NS	0.039 U	0.039 U	0.036 U
PCB-1260 (Aroclor 1260)	NS	NS	0.039 U	0.039 U	0.036 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.039 U	0.039 U	0.036 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-11(9)20180614 JC67062-2 6/14/2018 1 mg/kg	EP-X(9)20180614 JC67062-3 6/14/2018 1 mg/kg	EP-12(15)20180531 JC67062-1 5/31/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.036 U	0.036 U	0.037 U
PCB-1221 (Aroclor 1221)	NS	NS	0.036 U	0.036 U	0.037 U
PCB-1232 (Aroclor 1232)	NS	NS	0.036 U	0.036 U	0.037 U
PCB-1242 (Aroclor 1242)	NS	NS	0.036 U	0.036 U	0.037 U
PCB-1248 (Aroclor 1248)	NS	NS	0.036 U	0.036 U	0.037 U
PCB-1254 (Aroclor 1254)	NS	NS	0.036 U	0.036 U	0.037 U
PCB-1260 (Aroclor 1260)	NS	NS	0.036 U	0.036 U	0.037 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.036 U	0.036 U	0.037 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-13(9)20180404 JC62145-22 4/4/2018 1 mg/kg	EP-14(9)20180404 JC62145-21 4/4/2018 1 mg/kg	EP-15(9)20180404 JC62145-25 4/4/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.035 U	0.038 U	0.039 U
PCB-1221 (Aroclor 1221)	NS	NS	0.035 U	0.038 U	0.039 U
PCB-1232 (Aroclor 1232)	NS	NS	0.035 U	0.038 U	0.039 U
PCB-1242 (Aroclor 1242)	NS	NS	0.035 U	0.038 U	0.039 U
PCB-1248 (Aroclor 1248)	NS	NS	0.035 U	0.038 U	0.039 U
PCB-1254 (Aroclor 1254)	NS	NS	0.035 U	0.038 U	0.039 U
PCB-1260 (Aroclor 1260)	NS	NS	0.035 U	0.038 U	0.039 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.035 U	0.038 U	0.039 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-16(15)20180314 JC62145-16 3/14/2018 1 mg/kg	EP-19(9)20180404 JC62145-24 4/4/2018 1 mg/kg	EP-20(9)20180314 JC62145-17 3/14/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.035 U	0.039 U	0.035 U
PCB-1221 (Aroclor 1221)	NS	NS	0.035 U	0.039 U	0.035 U
PCB-1232 (Aroclor 1232)	NS	NS	0.035 U	0.039 U	0.035 U
PCB-1242 (Aroclor 1242)	NS	NS	0.035 U	0.039 U	0.035 U
PCB-1248 (Aroclor 1248)	NS	NS	0.035 U	0.039 U	0.035 U
PCB-1254 (Aroclor 1254)	NS	NS	0.035 U	0.039 U	0.0195 J
PCB-1260 (Aroclor 1260)	NS	NS	0.035 U	0.039 U	0.035 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.035 U	0.039 U	0.0195 J

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-X(9)20180314 JC62145-18 3/14/2018 1 mg/kg	EP-23(9)20180312 JC62145-15 3/12/2018 1 mg/kg	EP-24(8)20180312 JC62145-11 3/12/2018 1 mg/kg
PCB-1016 (Aroclor 1016)	NS	NS	0.034 U	0.038 U	0.038 U
PCB-1221 (Aroclor 1221)	NS	NS	0.034 U	0.038 U	0.038 U
PCB-1232 (Aroclor 1232)	NS	NS	0.034 U	0.038 U	0.038 U
PCB-1242 (Aroclor 1242)	NS	NS	0.034 U	0.038 U	0.038 U
PCB-1248 (Aroclor 1248)	NS	NS	0.034 U	0.038 U	0.038 U
PCB-1254 (Aroclor 1254)	NS	NS	0.034 UJ	0.038 U	0.038 U
PCB-1260 (Aroclor 1260)	NS	NS	0.034 U	0.038 U	0.038 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.034 U	0.038 U	0.038 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-25(9)20180312 JC62145-13 3/12/2018 1 mg/kg	EP-26(8)20180312 JC62145-14 3/12/2018 1 mg/kg	FB-20180124 JC59665-4 1/24/2018 1 mg/l
PCB-1016 (Aroclor 1016)	NS	NS	0.034 U	0.038 U	0.00033 U
PCB-1221 (Aroclor 1221)	NS	NS	0.034 U	0.038 U	0.00033 U
PCB-1232 (Aroclor 1232)	NS	NS	0.034 U	0.038 U	0.00033 U
PCB-1242 (Aroclor 1242)	NS	NS	0.034 U	0.038 U	0.00033 U
PCB-1248 (Aroclor 1248)	NS	NS	0.034 U	0.038 U	0.00033 U
PCB-1254 (Aroclor 1254)	NS	NS	0.034 U	0.038 U	0.00033 U
PCB-1260 (Aroclor 1260)	NS	NS	0.034 U	0.038 U	0.00033 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.034 U	0.038 U	0.00033 U

Table 5
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
 Soil Endpoint Sample Analytical Results
Polychlorinated Biphenyls (PCBs)

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	FB-20180314 JC62145-20 3/14/2018 1 mg/l	FB-20180614 JC67062-4 6/14/2018 1 mg/l
PCB-1016 (Aroclor 1016)	NS	NS	0.00033 U	0.00033 U
PCB-1221 (Aroclor 1221)	NS	NS	0.00033 U	0.00033 U
PCB-1232 (Aroclor 1232)	NS	NS	0.00033 U	0.00033 U
PCB-1242 (Aroclor 1242)	NS	NS	0.00033 U	0.00033 U
PCB-1248 (Aroclor 1248)	NS	NS	0.00033 U	0.00033 U
PCB-1254 (Aroclor 1254)	NS	NS	0.00033 U	0.00033 U
PCB-1260 (Aroclor 1260)	NS	NS	0.00033 U	0.00033 U
Polychlorinated Biphenyl (PCBs)	0.1	1	0.00033 U	0.00033 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-1(9)20180124 JC59665-1 1/24/2018 1 mg/kg	EP-X(9)20180124 JC59665-2 1/24/2018 1 mg/kg	EP-2(10)20180124 JC59665-3 1/24/2018 1 mg/kg	EP-3(11)20180130 JC59665-6 1/30/2018 1 mg/kg
4,4'-DDD	0.0033	13	0.00072 U	0.00076 U	0.00071 U	0.00077 U
4,4'-DDE	0.0033	8.9	0.00072 U	0.00076 U	0.0049	0.00077 U
4,4'-DDT	0.0033	7.9	0.0055	0.0052	0.0174	0.00077 U
Aldrin	0.005	0.097	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Alpha Endosulfan	NS	NS	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Beta Endosulfan	NS	NS	0.00072 U	0.00076 U	0.00071 U	0.00077 U
cis-Chlordane	0.094	4.2	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Dieldrin	0.005	0.2	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Endosulfan Sulfate	NS	NS	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Endrin	0.014	11	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Gamma Bhc (Lindane)	0.1	1.3	0.00072 U	0.00076 U	0.00071 U	0.00077 U
Heptachlor	0.042	2.1	0.00072 U	0.00076 U	0.00071 U	0.00077 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-4(9)20180312 JC62145-3 3/12/2018 1/10 mg/kg	EP-4(15)20180404 JC62145-23 4/4/2018 1 mg/kg	EP-5(9)20180312 JC62145-4 3/12/2018 1 mg/kg	EP-6(9)20180312 JC62145-5 3/12/2018 1/10 mg/kg
4,4'-DDD	0.0033	13	0.008	0.00067 U	0.0044	0.0053
4,4'-DDE	0.0033	8.9	0.0152	0.00067 U	0.0101	0.0097
4,4'-DDT	0.0033	7.9	0.0429 D	0.00067 U	0.0585	0.0388 D
Aldrin	0.005	0.097	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Alpha Endosulfan	NS	NS	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Beta Endosulfan	NS	NS	0.00081 U	0.00067 U	0.00079 U	0.00073 U
cis-Chlordane	0.094	4.2	0.0076 J	0.00067 U	0.0069 J	0.0077 J
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Dieldrin	0.005	0.2	0.0095	0.00067 U	0.0076	0.0096
Endosulfan Sulfate	NS	NS	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Endrin	0.014	11	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Gamma Bhc (Lindane)	0.1	1.3	0.00081 U	0.00067 U	0.00079 U	0.00073 U
Heptachlor	0.042	2.1	0.00081 U	0.00067 U	0.00079 U	0.00073 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-7(9)20180312 JC62145-2 3/12/2018 1 mg/kg	EP-8(9)20180312 JC62145-1 3/12/2018 1 mg/kg	EP-9(9)20180312 JC62145-6 3/12/2018 1 mg/kg	EP-10(9)20180312 JC62145-7 3/12/2018 1 mg/kg
4,4'-DDD	0.0033	13	0.0041	0.0031 J	0.00077 U	0.0014
4,4'-DDE	0.0033	8.9	0.0079	0.0069	0.0031	0.0027
4,4'-DDT	0.0033	7.9	0.0382	0.0421	0.0201	0.014
Aldrin	0.005	0.097	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Alpha Endosulfan	NS	NS	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Beta Endosulfan	NS	NS	0.00079 U	0.00077 U	0.00077 U	0.00072 U
cis-Chlordane	0.094	4.2	0.0045 J	0.0044 J	0.0025	0.0012
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Dieldrin	0.005	0.2	0.0038 J	0.0049	0.0035	0.0014
Endosulfan Sulfate	NS	NS	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Endrin	0.014	11	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Gamma Bhc (Lindane)	0.1	1.3	0.00079 U	0.00077 U	0.00077 U	0.00072 U
Heptachlor	0.042	2.1	0.00079 U	0.00077 U	0.00077 U	0.00072 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-11(9)20180614 JC67062-2 6/14/2018 1 mg/kg	EP-X(9)20180614 JC67062-3 6/14/2018 1 mg/kg	EP-12(15)20180531 JC67062-1 5/31/2018 1 mg/kg	EP-13(9)20180404 JC62145-22 4/4/2018 1 mg/kg
4,4'-DDD	0.0033	13	0.0014	0.0013 J	0.0018 J	0.00071 U
4,4'-DDE	0.0033	8.9	0.0031 J	0.0027	0.0057	0.00071 U
4,4'-DDT	0.0033	7.9	0.0103	0.0138	0.0408	0.00071 U
Aldrin	0.005	0.097	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Alpha Endosulfan	NS	NS	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Beta Endosulfan	NS	NS	0.00072 U	0.00072 U	0.00074 U	0.00071 U
cis-Chlordane	0.094	4.2	0.0018 JN	0.0024 J	0.0034 J	0.00071 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Dieldrin	0.005	0.2	0.0014	0.0021 J	0.0045	0.00071 U
Endosulfan Sulfate	NS	NS	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Endrin	0.014	11	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Gamma Bhc (Lindane)	0.1	1.3	0.00072 U	0.00072 U	0.00074 U	0.00071 U
Heptachlor	0.042	2.1	0.00072 U	0.00072 U	0.00074 U	0.00071 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-14(9)20180404 JC62145-21 4/4/2018 1 mg/kg	EP-15(9)20180404 JC62145-25 4/4/2018 1 mg/kg	EP-16(15)20180314 JC62145-16 3/14/2018 1 mg/kg	EP-19(9)20180404 JC62145-24 4/4/2018 1 mg/kg
4,4'-DDD	0.0033	13	0.00077 U	0.00077 U	0.0017 JN	0.00079 U
4,4'-DDE	0.0033	8.9	0.00077 U	0.00077 U	0.0028	0.00079 U
4,4'-DDT	0.0033	7.9	0.00077 U	0.0074	0.0238 J	0.00079 U
Aldrin	0.005	0.097	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Alpha Endosulfan	NS	NS	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Beta Endosulfan	NS	NS	0.00077 U	0.00077 U	0.0007 U	0.00079 U
cis-Chlordane	0.094	4.2	0.00077 U	0.00077 U	0.002 J	0.00079 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Dieldrin	0.005	0.2	0.00077 U	0.00077 U	0.0125	0.00079 U
Endosulfan Sulfate	NS	NS	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Endrin	0.014	11	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Gamma Bhc (Lindane)	0.1	1.3	0.00077 U	0.00077 U	0.0007 U	0.00079 U
Heptachlor	0.042	2.1	0.00077 U	0.00077 U	0.0007 U	0.00079 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-20(9)20180314 JC62145-17 3/14/2018 1 mg/kg	EP-X(9)20180314 JC62145-18 3/14/2018 1 mg/kg	EP-23(9)20180312 JC62145-15 3/12/2018 1 mg/kg	EP-24(8)20180312 JC62145-11 3/12/2018 1/10 mg/kg
4,4'-DDD	0.0033	13	0.0007 U	0.00069 U	0.00076 U	0.0181
4,4'-DDE	0.0033	8.9	0.00092 J	0.0017 J	0.00076 U	0.0224
4,4'-DDT	0.0033	7.9	0.0056 J	0.0128 J	0.0178	0.266 D
Aldrin	0.005	0.097	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Alpha Endosulfan	NS	NS	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Beta Endosulfan	NS	NS	0.0007 U	0.00069 U	0.00076 U	0.00076 U
cis-Chlordane	0.094	4.2	0.0007 UJ	0.00072 J	0.00076 U	0.0462 J
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Dieldrin	0.005	0.2	0.0007 U	0.00069 U	0.0015	0.00076 U
Endosulfan Sulfate	NS	NS	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Endrin	0.014	11	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Gamma Bhc (Lindane)	0.1	1.3	0.0007 U	0.00069 U	0.00076 U	0.00076 U
Heptachlor	0.042	2.1	0.0007 U	0.00069 U	0.00076 U	0.00076 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-25(9)20180312 JC62145-13 3/12/2018 1 mg/kg	EP-26(8)20180312 JC62145-14 3/12/2018 1 mg/kg	FB-20180124 JC59665-4 1/24/2018 1 mg/l	FB-20180314 JC62145-20 3/14/2018 1 mg/l
4,4'-DDD	0.0033	13	0.00068 U	0.00076 U	0.00001 U	0.00001 U
4,4'-DDE	0.0033	8.9	0.00068 U	0.00076 U	0.00001 U	0.00001 U
4,4'-DDT	0.0033	7.9	0.00068 U	0.011	0.00001 U	0.00001 U
Aldrin	0.005	0.097	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Alpha Endosulfan	NS	NS	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Beta Endosulfan	NS	NS	0.00068 U	0.00076 U	0.00001 U	0.00001 U
cis-Chlordane	0.094	4.2	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Dieldrin	0.005	0.2	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Endosulfan Sulfate	NS	NS	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Endrin	0.014	11	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Gamma Bhc (Lindane)	0.1	1.3	0.00068 U	0.00076 U	0.00001 U	0.00001 U
Heptachlor	0.042	2.1	0.00068 U	0.00076 U	0.00001 U	0.00001 U

Table 6
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
Pesticides

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	FB-20180614 JC67062-4 6/14/2018 1 mg/l
4,4'-DDD	0.0033	13	0.00001 U
4,4'-DDE	0.0033	8.9	0.000004 J
4,4'-DDT	0.0033	7.9	0.00001 U
Aldrin	0.005	0.097	0.00001 U
Alpha Bhc (Alpha Hexachlorocyclohexane)	0.02	0.48	0.00001 U
Alpha Endosulfan	NS	NS	0.00001 U
Beta Bhc (Beta Hexachlorocyclohexane)	0.036	0.36	0.00001 U
Beta Endosulfan	NS	NS	0.00001 U
cis-Chlordane	0.094	4.2	0.00001 U
Delta BHC (Delta Hexachlorocyclohexane)	0.04	100	0.00001 U
Dieldrin	0.005	0.2	0.00001 U
Endosulfan Sulfate	NS	NS	0.00001 U
Endrin	0.014	11	0.00001 U
Gamma Bhc (Lindane)	0.1	1.3	0.00001 U
Heptachlor	0.042	2.1	0.00001 U

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-1(9)20180124 JC59665-1 1/24/2018 1 mg/kg	EP-X(9)20180124 JC59665-2 1/24/2018 1 mg/kg	EP-2(10)20180124 JC59665-3 1/24/2018 1 mg/kg	EP-3(11)20180130 JC59665-6 1/30/2018 1/2 mg/kg
Arsenic	13	16	2.2 U	2.3 U	2.3	4.6
Barium	350	400	45.5	44.6	79.1	55.5
Cadmium	2.5	4.3	0.54 U	0.56 U	0.58 U	0.61 U
Chromium, Total	30	180	15.6	13.4	17	42.6
Lead	63	400	24.3	27.5	77.8	175
Mercury	0.18	0.81	0.037 U	0.033 U	0.11	0.081
Selenium	3.9	180	2.2 U	2.3 U	2.3 U	2.4 U
Silver	2	180	0.54 U	0.56 U	0.58 U	1.2 UD

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-4(9)20180312 JC62145-3 3/12/2018 1 mg/kg	EP-4(15)20180404 JC62145-23 4/4/2018 1 mg/kg	EP-5(9)20180312 JC62145-4 3/12/2018 1 mg/kg	EP-6(9)20180312 JC62145-5 3/12/2018 1 mg/kg
Arsenic	13	16	4.7	2.2 U	2.4 U	2.3
Barium	350	400	316	23.9	60.5	101
Cadmium	2.5	4.3	0.59 U	0.56 U	0.6 U	0.55 U
Chromium, Total	30	180	23.9	12.8	14.7	19.3
Lead	63	400	243	2.3	32.7	79.9
Mercury	0.18	0.81	0.49	0.035 U	0.054	0.13
Selenium	3.9	180	2.4 U	2.2 U	2.4 U	2.2 U
Silver	2	180	0.59 U	0.56 U	0.6 U	0.55 U

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-7(9)20180312 JC62145-2 3/12/2018 1 mg/kg	EP-8(9)20180312 JC62145-1 3/12/2018 1 mg/kg	EP-9(9)20180312 JC62145-6 3/12/2018 1 mg/kg	EP-10(9)20180312 JC62145-7 3/12/2018 1 mg/kg
Arsenic	13	16	2.7	2.5	2.3 U	2.3 U
Barium	350	400	103	106	61.7	59.6
Cadmium	2.5	4.3	0.61 U	0.6 U	0.57 U	0.57 U
Chromium, Total	30	180	20.7	18.1	17.5	15.2
Lead	63	400	96.2	80	55.6	39.6
Mercury	0.18	0.81	0.23	0.13	0.095	0.066
Selenium	3.9	180	2.4 U	2.4 U	2.3 U	2.3 U
Silver	2	180	0.61 U	0.6 U	0.57 U	0.57 U

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-11(9)20180614 JC67062-2 6/14/2018 1 mg/kg	EP-X(9)20180614 JC67062-3 6/14/2018 1 mg/kg	EP-12(15)20180531 JC67062-1 5/31/2018 1 mg/kg	EP-13(9)20180404 JC62145-22 4/4/2018 1 mg/kg
Arsenic	13	16	2.7	2.3	3	2.3 U
Barium	350	400	82	90.1	80.1	31.5
Cadmium	2.5	4.3	0.56 U	0.55 U	0.56 U	0.56 U
Chromium, Total	30	180	20.9	19.7	20.6	17.1
Lead	63	400	39.1	45.2	36.4	10.2
Mercury	0.18	0.81	0.08	0.083	0.049	0.038
Selenium	3.9	180	2.3 U	2.2 U	2.2 U	2.3 U
Silver	2	180	0.56 U	0.55 U	0.56 U	0.56 U

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-14(9)20180404 JC62145-21 4/4/2018 1 mg/kg	EP-15(9)20180404 JC62145-25 4/4/2018 1 mg/kg	EP-16(15)20180314 JC62145-16 3/14/2018 1 mg/kg	EP-19(9)20180404 JC62145-24 4/4/2018 1 mg/kg
Arsenic	13	16	2.9	2.3 U	3.1	2.6 U
Barium	350	400	77.5	53.8	208	34.4
Cadmium	2.5	4.3	0.57 U	0.58 U	0.56 U	0.64 U
Chromium, Total	30	180	20.7	17.8	22.8	16.1
Lead	63	400	48.4	30.9	138	3.3
Mercury	0.18	0.81	0.16	0.062	0.17	0.022 U
Selenium	3.9	180	2.3 U	2.3 U	2.2 U	2.6 U
Silver	2	180	0.57 U	0.58 U	0.56 U	0.64 U

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-20(9)20180314 JC62145-17 3/14/2018 1 mg/kg	EP-X(9)20180314 JC62145-18 3/14/2018 1 mg/kg	EP-23(9)20180312 JC62145-15 3/12/2018 1 mg/kg	EP-24(8)20180312 JC62145-11 3/12/2018 1 mg/kg
Arsenic	13	16	2.3 U	2.2	2.2 U	2.8
Barium	350	400	51.8	40.9	57.9	196
Cadmium	2.5	4.3	0.57 U	0.54 U	0.54 U	0.55 U
Chromium, Total	30	180	18.6	15.7	15.2	17
Lead	63	400	11.7 J	6 J	37.1	74.1
Mercury	0.18	0.81	0.035 U	0.035 U	0.055	0.074
Selenium	3.9	180	2.3 U	2.2 U	2.2 U	2.2 U
Silver	2	180	0.57 U	0.54 U	0.54 U	0.55 U

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	EP-25(9)20180312 JC62145-13 3/12/2018 1 mg/kg	EP-26(8)20180312 JC62145-14 3/12/2018 1 mg/kg	FB-20180124 JC59665-4 1/24/2018 1 mg/l	FB-20180314 JC62145-20 3/14/2018 1 mg/l
Arsenic	13	16	2.2 U	2.5	0.003 U	0.003 U
Barium	350	400	25.8	81	0.2 U	0.2 U
Cadmium	2.5	4.3	0.54 U	0.59 U	0.003 U	0.003 U
Chromium, Total	30	180	13.4	15	0.01 U	0.01 U
Lead	63	400	6.9	34.6	0.003 U	0.003 U
Mercury	0.18	0.81	0.043	0.058	0.0002 U	0.0002 U
Selenium	3.9	180	2.2 U	2.3 U	0.01 U	0.01 U
Silver	2	180	0.54 U	0.59 U	0.01 U	0.01 U

Table 7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
 Soil Endpoint Sample Analytical Results
RCRA 8 Metals

Sample ID Lab Sample ID Sample Date Dilution Factor Unit	NYSDEC Part 375 UUSCOs mg/kg	NYSDEC Part 375 RRSCOs mg/kg	FB-20180614 JC67062-4 6/14/2018 1 mg/l
Arsenic	13	16	0.003 U
Barium	350	400	0.2 U
Cadmium	2.5	4.3	0.003 U
Chromium, Total	30	180	0.01 U
Lead	63	400	0.003 U
Mercury	0.18	0.81	0.0002 U
Selenium	3.9	180	0.01 U
Silver	2	180	0.01 U

Tables 3-7
1888 Bathgate Avenue Redevelopment Site
Bronx, New York

Soil Endpoint Sample Analytical Results

Notes

Part 375 Soil Cleanup Objectives (SCOs):

Soil Cleanup Objectives (SCOs) listed in New York State Department of Environmental Conservation (NYSDEC) Part 375 Regulations (6 NYCRR Part 375).

Exceedances of Part 375 Unrestricted Use SCOs (UUSCOs) are in bold font.

Exceedances of Part 375 Restricted Residential SCOs (RRSCOs) are highlighted in gray.

Sample EP-X(9)20180124 is a blind duplicate of sample EP-1(9)20180124.

Sample EP-X(9)20180314 is a blind duplicate of sample EP-20(9)20180314.

Sample EP-X(9)20180614 is a blind duplicate of sample EP-11(9)20180614.

J : The analyte was positively identified; the associated numerical value is approximate and may be inaccurate or imprecise.

JL : The result is an estimated quantity and may be biased low.

U : The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

D : The reported result is from a diluted analysis.

N : The analysis indicates the presence of a analyte for which this is presumptive evidence to make a "tentative identification."

NS : A standard has not been established for the analyte.

mg/kg : milligrams per kilogram = parts per million (ppm)

mg/L : milligrams per liter

Table 8
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Baseline and Post-Remedial Groundwater Sample Analytical Results
Chlorinated Volatile Organic Compounds (CVOCs)

Sample ID Lab Sample ID Sample Date Unit	NYSDEC Class GA TOGS µg/L	MW-10-20180514 JC66132-1 5/14/2018 µg/L	MW-X-20180514 JC66132-7 5/14/2018 µg/L	MW-11-20180514 JC66132-2 5/14/2018 µg/L	MW-12-20180514 JC66132-3 5/14/2018 µg/L
1,1,1-Trichloroethane	5	0.25 U	0.25 U	0.25 U	0.25 U
1,1-Dichloroethane	5	0.21 UJ	0.21 U	0.21 U	0.21 U
1,1-Dichloroethene	5	0.47 U	0.47 U	0.47 U	0.47 U
1,2-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.6	0.2 U	0.2 U	0.2 U	0.2 U
Carbon Tetrachloride	5	0.34 U	0.34 U	0.34 U	0.34 U
Chloroform	7	0.39 J	0.41 J	0.29 U	0.29 U
Cis-1,2-Dichloroethene	5	0.5 U	0.5 U	2	3.6
Methylene Chloride	5	1 U	1 U	1 U	1 U
Tetrachloroethene (PCE)	5	3.7	3.6	102	10.7
Trans-1,2-Dichloroethene	5	0.4 U	0.4 U	0.4 U	0.4 U
Trichloroethene (TCE)	5	0.27 U	0.27 U	3	3.5
Vinyl Chloride	2	0.62 U	0.62 U	0.62 U	0.62 U

Sample ID Lab Sample ID Sample Date Unit	NYSDEC Class GA TOGS µg/L	MW-10-20180906 JC73268-1 9/6/2018 µg/L	MW-X-20180906 JC73268-7 9/6/2018 µg/L	MW-11-20180906 JC73268-2 9/6/2018 µg/L	MW-12-20180906 JC73268-3 9/6/2018 µg/L
1,1,1-Trichloroethane	5	0.54 U	0.54 U	0.54 U	0.54 U
1,1-Dichloroethane	5	0.57 U	0.57 U	0.57 U	0.57 U
1,1-Dichloroethene	5	0.59 U	0.59 U	0.59 U	0.59 U
1,2-Dichlorobenzene	3	0.53 U	0.53 U	0.53 U	0.53 U
1,2-Dichloroethane	0.6	0.6 U	0.6 U	0.6 U	0.6 U
Carbon Tetrachloride	5	0.55 U	0.55 U	0.55 U	0.55 U
Chloroform	7	1.4	1.3	0.5 U	0.5 U
Cis-1,2-Dichloroethene	5	0.51 U	0.51 U	4.5	4.5
Methylene Chloride	5	1 U	1 U	1 U	1 U
Tetrachloroethene (PCE)	5	12.5	12.4	0.9 U	19.5
Trans-1,2-Dichloroethene	5	0.54 U	0.54 U	0.54 U	0.54 U
Trichloroethene (TCE)	5	0.66 J	0.67 J	0.53 U	4.4
Vinyl Chloride	2	0.79 U	0.79 U	0.79 U	0.79 U

Table 8
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Baseline and Post-Remedial Groundwater Sample Analytical Results
Chlorinated Volatile Organic Compounds (CVOCs)

Sample ID Lab Sample ID Sample Date Unit	NYSDEC Class GA TOGS µg/L	MW-13-20180514 JC66132-4 5/14/2018 µg/L	FB-20180514 JC66132-6 5/14/2018 µg/L	TB-20180514 JC66132-5 5/14/2018 µg/L
1,1,1-Trichloroethane	5	0.25 U	0.25 U	0.25 U
1,1-Dichloroethane	5	0.64 J	0.21 U	0.21 U
1,1-Dichloroethene	5	0.47 U	0.47 U	0.47 U
1,2-Dichlorobenzene	3	0.5 U	0.5 U	0.5 U
1,2-Dichloroethane	0.6	0.2 U	0.2 U	0.2 U
Carbon Tetrachloride	5	0.34 U	0.34 U	0.34 U
Chloroform	7	0.29 U	0.29 U	0.29 U
Cis-1,2-Dichloroethene	5	22.4	0.5 U	0.5 U
Methylene Chloride	5	1 U	1 U	1 U
Tetrachloroethene (PCE)	5	29.1	0.5 U	0.5 U
Trans-1,2-Dichloroethene	5	0.4 U	0.4 U	0.4 U
Trichloroethene (TCE)	5	24	0.27 U	0.27 U
Vinyl Chloride	2	0.62 U	0.62 U	0.62 U

Sample ID Lab Sample ID Sample Date Unit	NYSDEC Class GA TOGS µg/L	MW-13-20180906 JC73268-3 9/6/2018 µg/L	FB-20180906 JC73268-6 9/6/2018 µg/L	TB-20180906 JC73268-5 6/9/2018 µg/L
1,1,1-Trichloroethane	5	0.54 U	0.54 U	0.54 U
1,1-Dichloroethane	5	0.77 J	0.57 U	0.57 U
1,1-Dichloroethene	5	0.59 U	0.59 U	0.59 U
1,2-Dichlorobenzene	3	0.53 U	0.53 U	0.53 U
1,2-Dichloroethane	0.6	0.6 U	0.6 U	0.6 U
Carbon Tetrachloride	5	0.55 U	0.55 U	0.55 U
Chloroform	7	0.5 U	0.5 U	0.5 U
Cis-1,2-Dichloroethene	5	28.8	0.51 U	0.51 U
Methylene Chloride	5	1 U	1 U	1 U
Tetrachloroethene (PCE)	5	61.7	0.9 U	0.9 U
Trans-1,2-Dichloroethene	5	0.54 U	0.54 U	0.54 U
Trichloroethene (TCE)	5	34	0.53 U	0.53 U
Vinyl Chloride	2	0.79 U	0.79 U	0.79 U

Table 8
1888 Bathgate Avenue Redevelopment Site
Bronx, New York
Baseline and Post-Remedial Groundwater Sample Analytical Results
Notes

GENERAL

U : The analyte was analyzed for, but was not detected above the reported sample quantitation limit.

J : The analyte was positively identified; the reported concentration is approximate and may be inaccurate or imprecise.

GROUNDWATER

NYSDEC : New York State Department of Environmental Conservation (NYSDEC) Technical and
Class GA : Operational Guidance Series (TOGS) (1.1.1): Class GA Ambient Water Quality Standards
TOGS (AWQS) and Guidance Values.

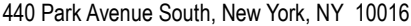
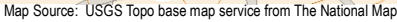
µg/L : micrograms per Liter = parts per billion (ppb)

Exceedances of NYSDEC Class GA TOGS are highlighted in bold font.

Sample MW-X-20180514 is a blind duplicate of sample MW-10-20180514.

Sample MW-X-20180906 is a blind duplicate of sample MW-10-20180906.

FIGURES



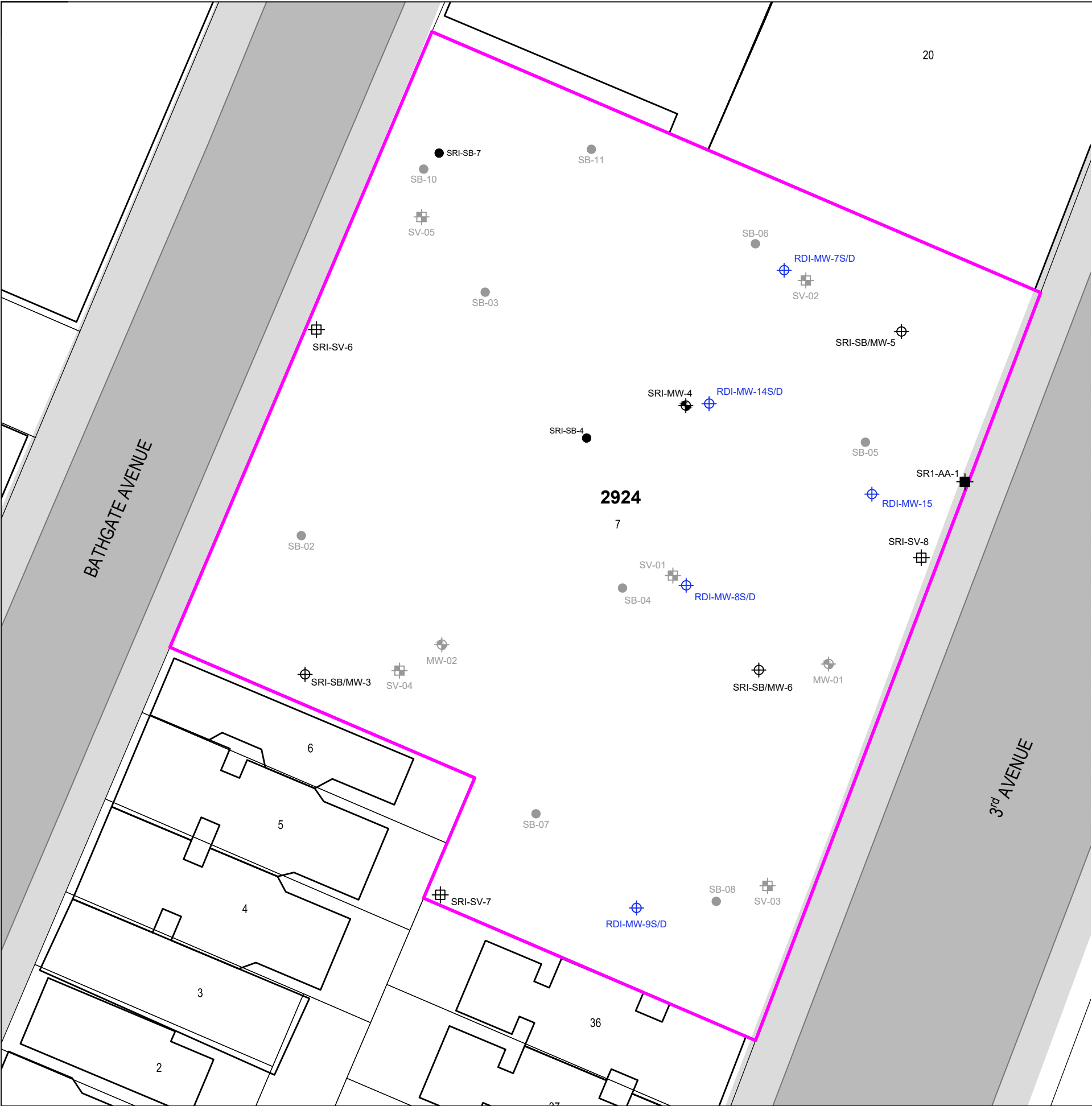
SITE LOCATION

DATE
4/24/2017

PROJECT NO.
170058

FIGURE
1

©2018 AKRF, Inc. W:\Projects\170058 - 1888 BATHGATE AVENUE REDEVELOPMENT\Technical\Hazmat\FERCAD\170058 Fig 2 Site Plan.dwg last save: jszalus 9/28/2018 12:33 PM



PROJECT SITE LOCATION

REMEDIAL INVESTIGATION SOIL BORING LOCATION (JUNE 2016)

REMEDIAL INVESTIGATION SOIL BORING/GROUNDWATER SAMPLE LOCATION (JUNE 2016)

REMEDIAL INVESTIGATION SOIL VAPOR SAMPLE LOCATION (JUNE 2016)

SUPPLEMENTAL REMEDIAL INVESTIGATION SOIL VAPOR SAMPLE LOCATION (FEBRUARY/MARCH 2017)

SUPPLEMENTAL REMEDIAL INVESTIGATION SOIL BORING/GROUNDWATER SAMPLE LOCATION (FEBRUARY/MARCH 2017)

SUPPLEMENTAL REMEDIAL INVESTIGATION SOIL BORING SAMPLE LOCATION (FEBRUARY 2017)

SUPPLEMENTAL REMEDIAL INVESTIGATION GROUNDWATER SAMPLE LOCATION (MARCH 2017)

SUPPLEMENTAL REMEDIAL INVESTIGATION AMBIENT AIR SAMPLE LOCATION (MARCH 2017)

REMEDIAL DESIGN INVESTIGATION GROUNDWATER MONITORING WELL LOCATION (SEPTEMBER 2017)

7

LOT BOUNDARY AND TAX LOT NUMBER

2924

TAX BLOCK NUMBER

Map Source:
NYCDP (NYC Dept. of City Planning) GIS database.



1888 Bathgate Avenue Redevelopment Site

4181 Third Avenue
Bronx, New York

SITE PLAN

DATE
9/28/2018

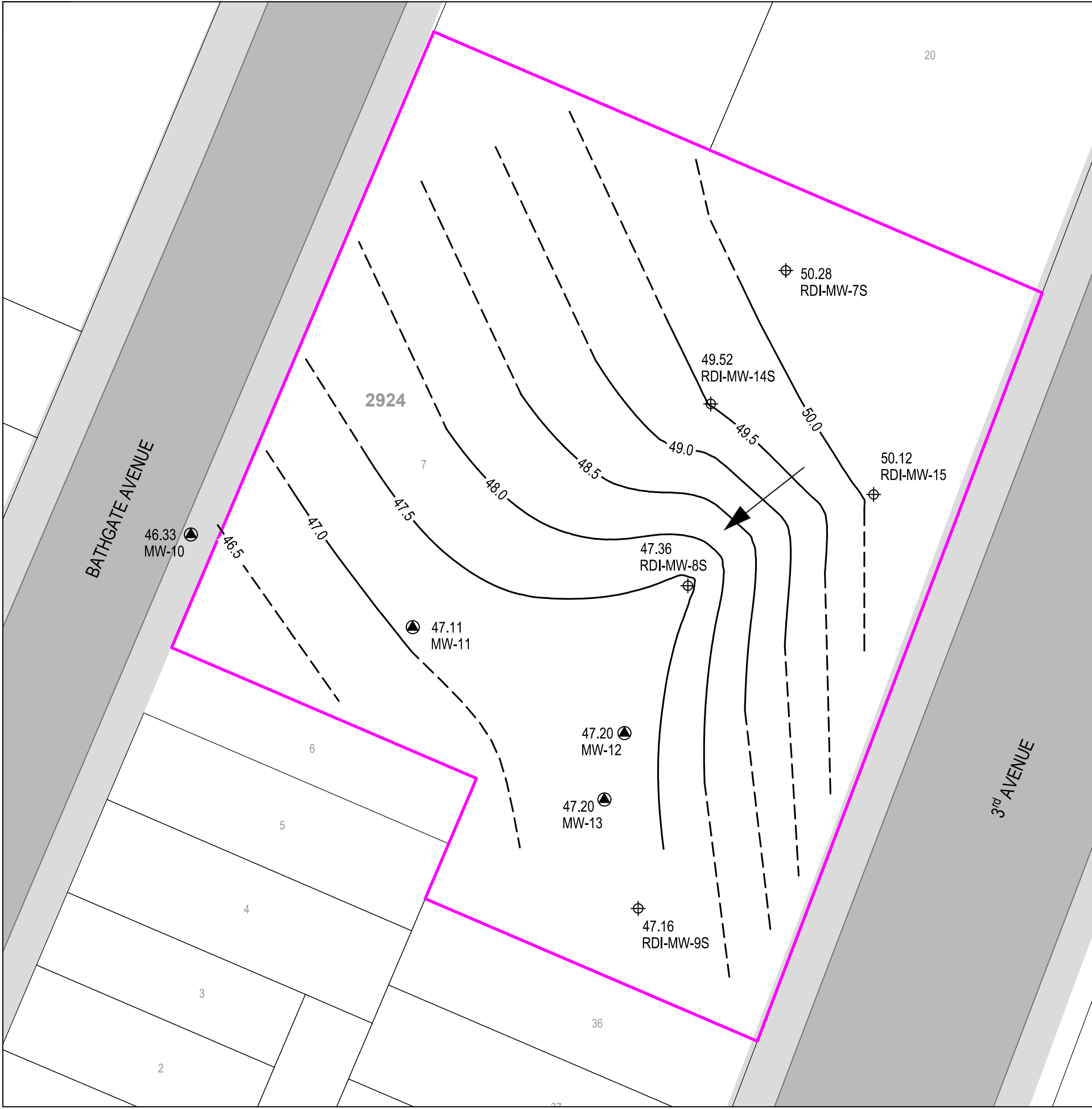
PROJECT NO.
170058

FIGURE
2



440 Park Avenue South, New York, N.Y. 10016

©2018 AKRF, Inc. W:\Projects\170058 - 1888 BATHGATE AVENUE REDEVELOPMENT\Technical\Hazmat\SMP\CAD\170058 Figure 3 - Groundwater Elevations May 14- 2018.dwg last save: jszalus 7/31/2018 9:04 AM



Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.



Well ID	Top of Casing (feet)	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)
RDI-MW-7S	62.72	12.44	50.28
RDI-MW-8S	62.81	15.45	47.36
RDI-MW-9S	61.67	14.51	47.16
RDI-MW-14S	51.05	1.53	49.52
RDI-MW-15	52.62	2.5	50.12
MW-10	58.64	12.31	46.33
MW-11	49.75	2.64	47.11
MW-12	53.70	6.50	47.20
MW-13	53.35	6.15	47.20

Notes:
All elevations are referenced to the
North American Vertical Datum of 1988 (NAVD88).
TOC - Top of Casing

PROJECT SITE LOCATION

REMEDIAL DESIGN INVESTIGATION GROUNDWATER MONITORING WELL

POST - REMEDIAL GROUNDWATER MONITORING WELLS

48.0

MONITORING WELL WATER TABLE ELEVATION IN FEET

DASHED LINES REPRESENT INFERRED WATER TABLE ELEVATION

INFERRED SHALLOW GROUNDWATER FLOW DIRECTION

7

LOT BOUNDARY AND TAX LOT NUMBER

2924

TAX BLOCK NUMBER



1888 Bathgate Avenue Redevelopment Site
4181 Third Avenue
Bronx, New York

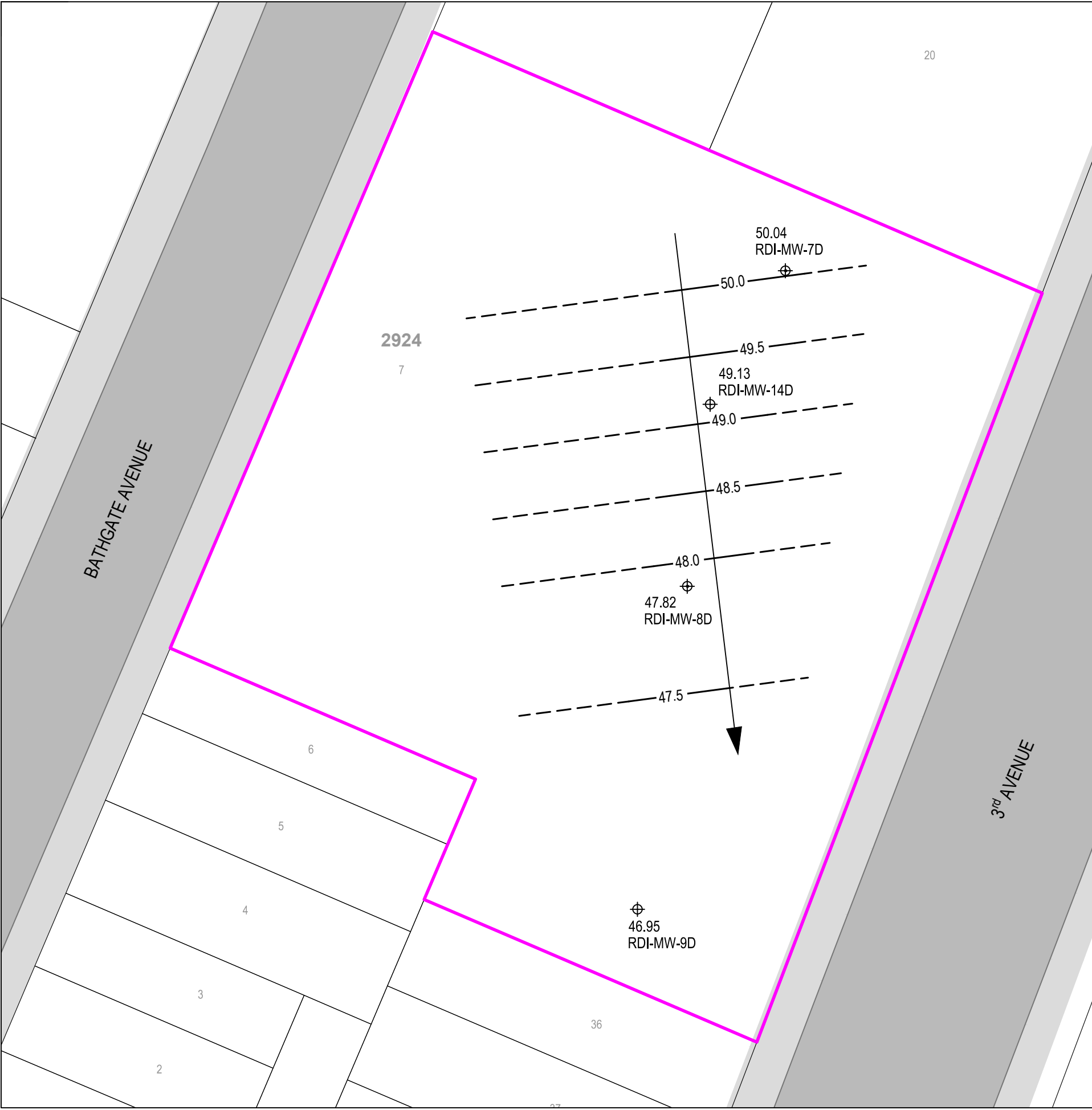


440 Park Avenue South, New York, N.Y. 10016

SHALLOW GROUNDWATER ELEVATIONS

DATE
7/31/2018
PROJECT NO.
170058
FIGURE
3

©2018 AKRF, Inc. W:\Projects\170058 - 1888 BATHGATE AVENUE REDEVELOPMENT\Technical\Hazmat\RD\ICAD\Figure 4 - Deep Groundwater Contour Map sept 2017.dwg last save: mveilleux 4/11/2018 1:36 PM



Well ID	Top of Casing (feet)	Depth to Groundwater (feet below TOC)	Groundwater Elevation (feet)
RDI-MW-7D	62.65	12.61	50.04
RDI-MW-8D	62.71	14.89	47.82
RDI-MW-9D	61.89	14.94	46.95
RDI-MW-14D	51.05	1.92	49.13

47.82
RDI-MW-8D

48.5

7

2924

PROJECT SITE LOCATION

GROUNDWATER ELEVATION WITH GROUNDWATER WELL ID

MONITORING WELL WATER TABLE ELEVATION IN FEET

DASHED LINES REPRESENT INFERRED WATER TABLE ELEVATION

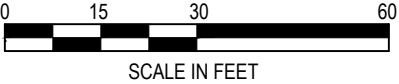
INFERRED DEEP GROUNDWATER FLOW DIRECTION

LOT BOUNDARY AND TAX LOT NUMBER

TAX BLOCK NUMBER

NOTES:
ALL ELEVATIONS ARE REFERENCED TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
TOC - TOP OF CASING

Map Source:
NYCDCP (NYC Dept. of City Planning) GIS database.



1888 Bathgate Avenue Redevelopment Site

4181 Third Avenue
Bronx, New York

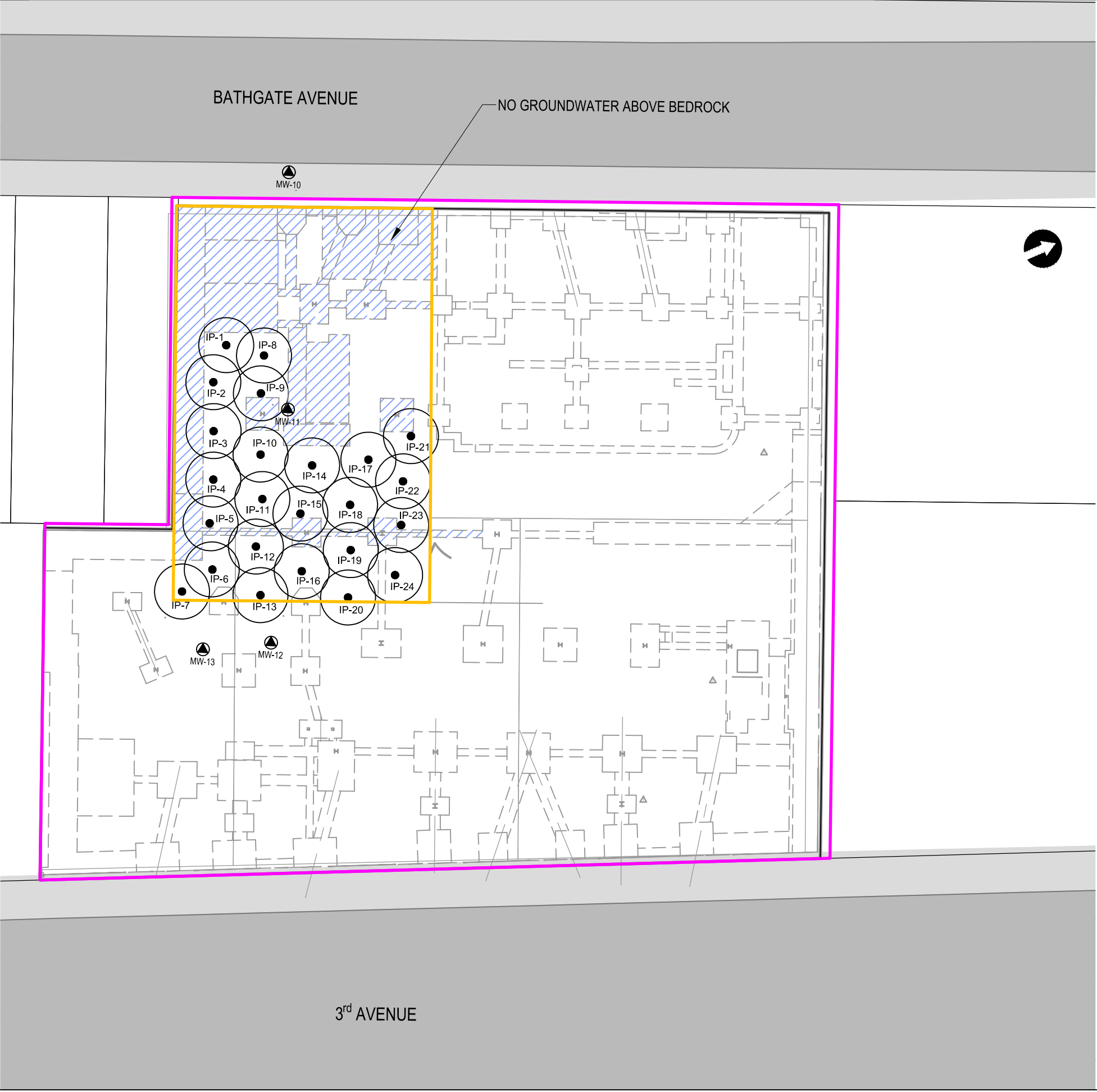


440 Park Avenue South, New York, N.Y. 10016

DEEP GROUNDWATER ELEVATIONS

DATE	4/11/2018
PROJECT NO.	170058
FIGURE	4

©2018 AKRF, Inc W:\Projects\170058 - 1888 BATHGATE AVENUE REDEVELOPMENT\Technical\Hazmat\FERCAD\170058 Figure 11 ISCO Injection Locations.dwg last save: jszalus 9/28/2018 2:06 PM



LEGEND

- PROJECT SITE LOCATION
- POST - REMEDIAL GROUNDWATER MONITORING WELLS
- SHALLOW GROUNDWATER TREATMENT AREA
- ISCO INJECTION POINT LOCATION
- APPROXIMATE EXTENT OF RADIUS OF INFLUENCE (ROI)
- EXISTING PILE CAPS, GRADE BEAMS, AND ELEVATOR PIT



1888 Bathgate Avenue Redevelopment Site
4181 Third Avenue
Bronx, New York

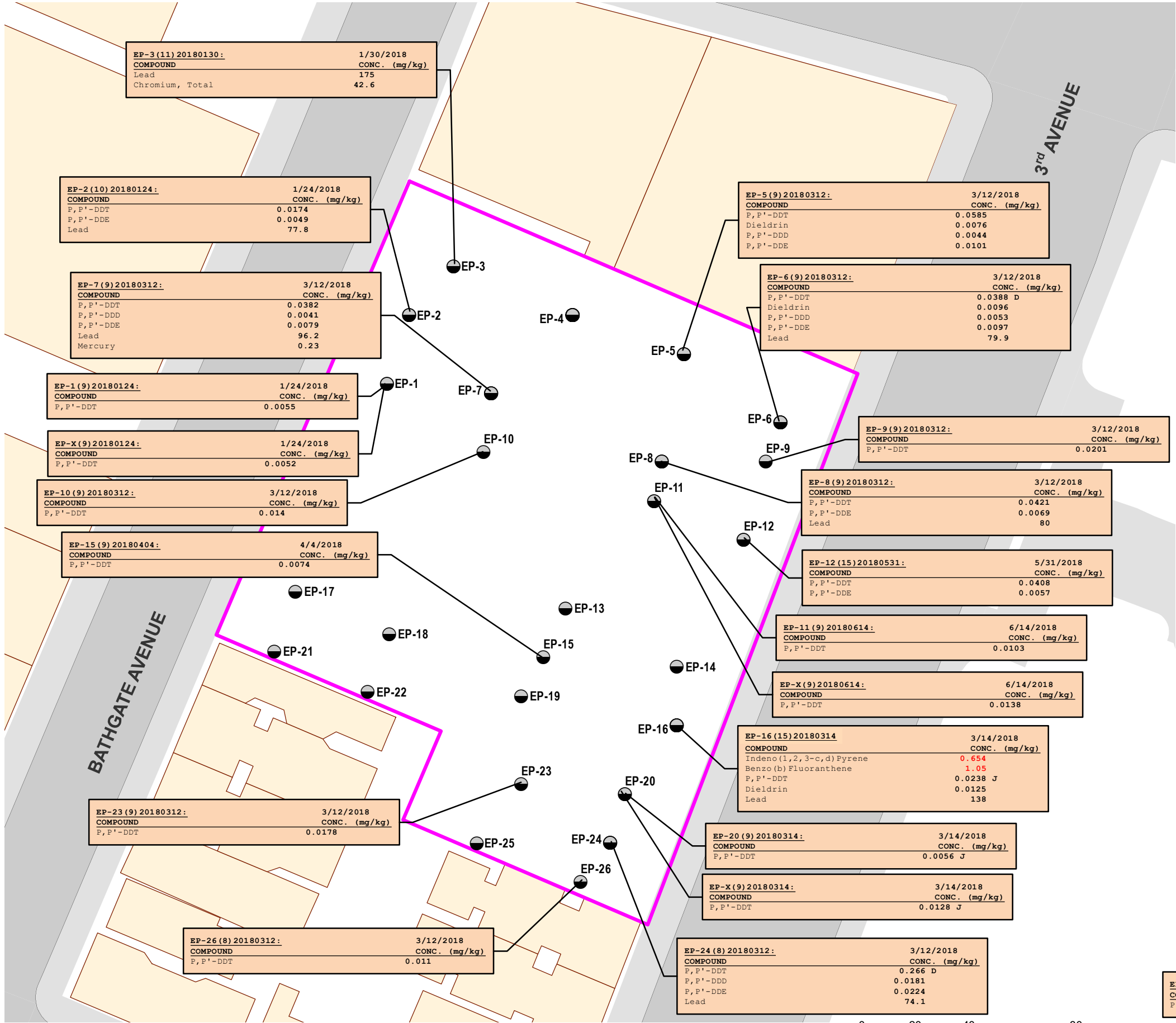


440 Park Avenue South, New York, N.Y. 10016

ISCO INJECTION LOCATIONS

DATE
9/28/2018
PROJECT NO.
170058
FIGURE
5

© 2018 AKRF W:\Projects\170058 - 1888 BATHGATE AVENUE REDEVELOPMENT\Technical\GIS and Graphics\hazmat\Equis Figure 10 - Post Excavation Endpoints Soil Sample Concentrations FER.mxd 9/28/2018 1:36:18 PM isalus



LEGEND

- ENDPOINT SAMPLE LOCATIONS
- PROJECT SITE LOCATION
- BUILDING

COMPOUND	NYSDEC UUSCOs	NYSDEC RRSCOs
Metals	(mg/kg)	(mg/kg)
Chromium, Total	30	180
Lead	63	400
Mercury	0.18	0.81
Pesticides	(mg/kg)	(mg/kg)
Dieldrin	0.005	0.2
P, P'-DDD	0.0033	13
P, P'-DDE	0.0033	8.9
P, P'-DDT	0.0033	7.9
Semivolatile Organic Compounds	(mg/kg)	(mg/kg)
Benzo(b)Fluoranthene	1	1
Indeno(1,2,3-c,d)Pyrene	0.5	0.5
Volatile Organic Compounds	(mg/kg)	(mg/kg)
1,2,4-Trimethylbenzene	3.6	52
1,3,5-Trimethylbenzene (Mesitylene)	8.4	52
Benzene	0.06	4.8
Ethylbenzene	1	41
N-Propylbenzene	3.9	100
Toluene	0.7	100
Xylenes	0.26	100

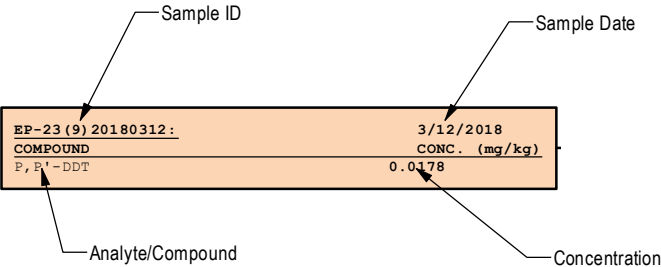
SOIL

Part 375 Soil Cleanup Objectives: (SCOs):
NYSDEC SCOs listed in New York State Department of Environmental Conservation NYSDEC Part 375 Regulations (6 NYCRR Part 375).

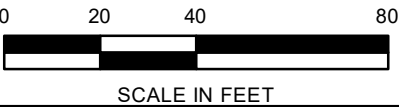
Exceedances of Part 375 Unrestricted Use SCOs (UUSCOs) are highlighted in bold font.
Exceedances of Part 375 Restricted Residential SCOs (RRSCOs) are highlighted in red.

mg/kg: milligrams per kilogram = parts per million (ppm).

J: The concentration given is an estimated value.
D: Analyte concentration obtained from dilution.



Map Source:
NYC DCP (NYC Dept. of City Planning) GIS database

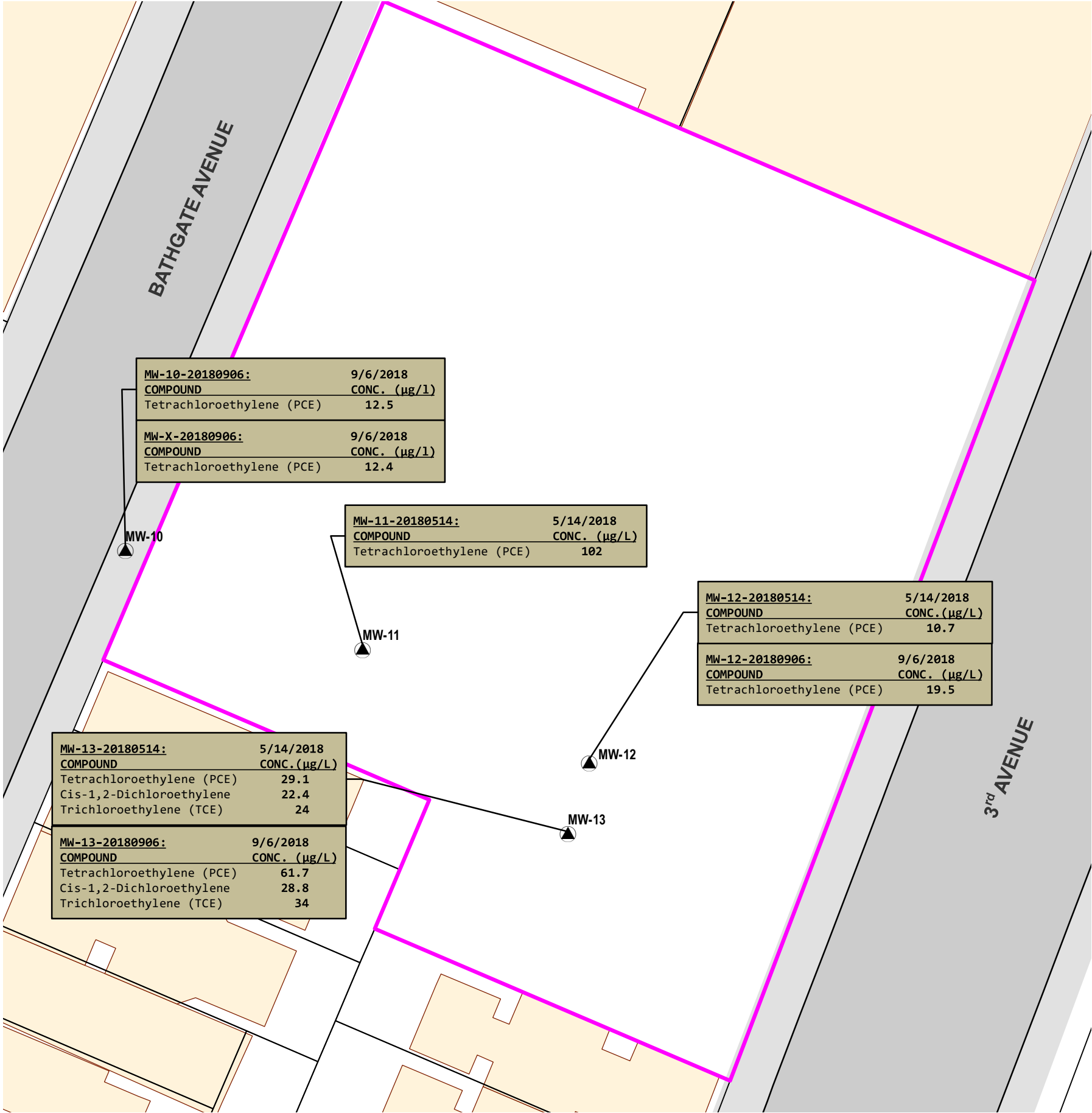


1888 Bathgate Avenue Redevelopment Site
4181 Third Avenue
Bronx, New York



DATE	9/28/2018
PROJECT NO.	170058
FIGURE	6

POST EXCAVATION ENDPOINT SOIL SAMPLE
CONCENTRATIONS ABOVE NYSDEC UUSCOs AND/OR RRSCOs



Map Source:
NYC DCP (NYC Dept. of City Planning) GIS database

LEGEND

- PROJECT SITE LOCATION
- POST - REMEDIAL GROUNDWATER MONITORING WELLS
- LOT BOUNDARY
- BUILDING

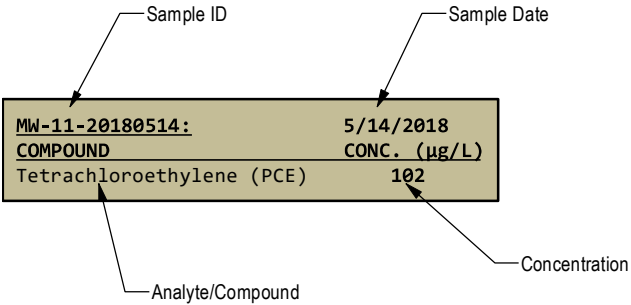
COMPOUND	NYSDEC TOGS
CVOC	µg/L
Tetrachloroethylene (PCE)	5
Cis-1,2-Dichloroethylene	5
Trichloroethylene (TCE)	5

NYSDEC TOGS Class GA AWQS

New York State Department of Environmental Conservation (NYSDEC) Technical and Operational Guidance Series (TOGS) (1.1.1): Class GA Ambient Water Quality Standards and Guidance Values (AWQS).

µg/L : micrograms per Liter = parts per billion (ppb)

Only exceedances of the NYSDEC TOGS AWQS are shown



1888 Bathgate Avenue Redevelopment Site
4181 Third Avenue
Bronx, New York

BASELINE AND POST-REMEDIAL GROUNDWATER SAMPLE
CONCENTRATIONS ABOVE NYSDEC TOGS

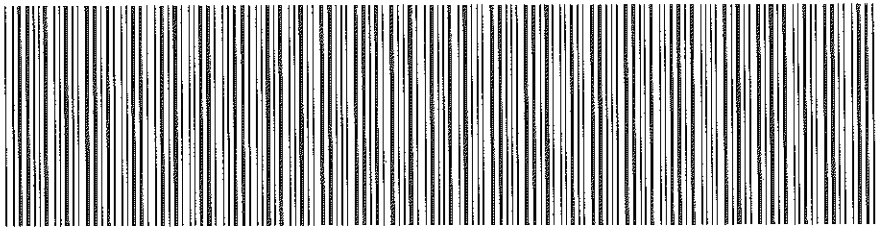


DATE	10/1/2018
PROJECT NO.	170058
FIGURE	7

APPENDIX A
ENVIRONMENTAL EASEMENT

**NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER**

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument. The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.



2018111200589001002E4420

RECORDING AND ENDORSEMENT COVER PAGE

PAGE 1 OF 11

Document ID: 2018111200589001

Document Date: 10-10-2018

Preparation Date: 12-03-2018

Document Type: EASEMENT

Document Page Count: 10

PRESENTER:

CHICAGO TITLE INSURANCE CO. (PICK-UP)
711 THIRD AVE, 5TH FLOOR
CT18-80168-BX (CES)
NEW YORK, NY 10017
212-880-1200
CTINYRECORDING@CTT.COM

RETURN TO:

CHICAGO TITLE INSURANCE COMPANY
NEIL FALCONE, ESQ.
711 THIRD AVENUE, 5TH FLOOR
NEW YORK, NY 10017

		PROPERTY DATA	
Borough	Block Lot	Unit	Address
BRONX	2924 7 Entire Lot		4181 THIRD AVENUE
Property Type: COMMERCIAL REAL ESTATE Easement			

CROSS REFERENCE DATA

CRFN _____ or DocumentID _____ or _____ Year _____ Reel _____ Page _____ or File Number _____

PARTIES

GRANTOR/SELLER:

WILFRID REALTY CORP.
4181 THIRD AVENUE
BRONX, NY 10457

GRANTEE/BUYER:

NYS DEPARTMENT OF ENVIRONMENTAL
CONSERVATION
625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage :			Filing Fee:	
Mortgage Amount:	\$	0.00	\$	100.00
Taxable Mortgage Amount:	\$	0.00	NYC Real Property Transfer Tax:	
Exemption:			\$	0.00
TAXES: County (Basic):	\$	0.00	NYS Real Estate Transfer Tax:	
City (Additional):	\$	0.00	\$	0.00
Spec (Additional):	\$	0.00		
TASF:	\$	0.00		
MTA:	\$	0.00		
NYCTA:	\$	0.00		
Additional MRT:	\$	0.00		
TOTAL:	\$	0.00		
Recording Fee:	\$	87.00		
Affidavit Fee:	\$	0.00		

**RECORDED OR FILED IN THE OFFICE
OF THE CITY REGISTER OF THE
CITY OF NEW YORK**



Recorded/Filed 12-03-2018 15:51
City Register File No.(CRFN):
2018000398399

Annette McHill

City Register Official Signature

ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36
OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW

^{as of}
THIS INDENTURE made this 10th day of October, 2018, between
Owner(s) Wilfrid Realty Corp., having an office at 4181 3rd Ave, Bronx, New York 10457,
County of Bronx, State of New York (the "Grantor"), and The People of the State of New York
(the "Grantee."), acting through their Commissioner of the Department of Environmental
Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with
its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public
interest to encourage the remediation of abandoned and likely contaminated properties ("sites")
that threaten the health and vitality of the communities they burden while at the same time
ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public
interest to establish within the Department a statutory environmental remediation program that
includes the use of Environmental Easements as an enforceable means of ensuring the
performance of operation, maintenance, and/or monitoring requirements and the restriction of
future uses of the land, when an environmental remediation project leaves residual contamination
at levels that have been determined to be safe for a specific use, but not all uses, or which includes
engineered structures that must be maintained or protected against damage to perform properly
and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental
Easement shall mean an interest in real property, created under and subject to the provisions of
Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which
contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with
engineering controls which are intended to ensure the long term effectiveness of a site remedial
program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 4181 3rd
Avenue in the City of New York, County of Bronx and State of New York, known and designated
on the tax map of the New York City Department of Finance as tax map parcel number: Block
2924 Lot 7, being the same as that property conveyed to Grantor by deed dated January 26, 2017
and recorded in the City Register of the City of New York as CRFN # 2017000064989. The
property subject to this Environmental Easement (the "Controlled Property") comprises
approximately 0.8288 +/- acres, and is hereinafter more fully described in the Land Title Survey
dated May 11, 2018 prepared by Robert J. Fehringer, L.L.S. of Fehringer Surveying, P.C., which
will be attached to the Site Management Plan. The Controlled Property description is set forth in
and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the
protection of public health and the environment and to achieve the requirements for remediation

established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C203088-03-17 as amended August 2, 2017, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement").

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

**Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii),
Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial
as described in 6 NYCRR Part 375-1.8(g)(2)(iv)**

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled

Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held

by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:
(i) are in-place;
(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee

interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to: Site Number: C203088
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to: Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

11. Consistency with the SMP. To the extent there is any conflict or inconsistency between the terms of this Environmental Easement and the SMP, regarding matters specifically addressed by the SMP, the terms of the SMP will control.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Wilfrid Realty Corp.:

By:

Print Name:

Title:

Date: _____

Grantor's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF *Queens*)

On the 17th day of September, in the year 2013 before me, the undersigned, personally appeared Isabel Schmitz, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public - State of New York

ELLEN NOELLE PRESOTTO
NOTARY PUBLIC, STATE OF NEW YORK
No. 01PR6267343
Qualified in Nassau County
My Commission Expires August 20, 2020

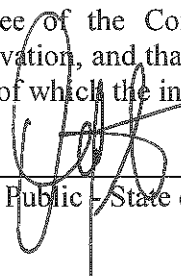
THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: 
Michael J. Ryan, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 10th day of October, in the year 2018, before me, the undersigned, personally appeared Michael J. Ryan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.


Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2019

SCHEDULE "A" PROPERTY DESCRIPTION

ALL that certain piece or parcel of land, situate, lying and being in the Borough and County of the Bronx, City and State of New York, more particularly bounded and described as follows:

BEGINNING at a point on the southeasterly side of Bathgate Avenue (as now open and in use, 60 feet wide) distant 86.19 feet southwesterly from a corner formed by the intersection of said southeasterly side of Bathgate Avenue and the southwesterly side of East Tremont Avenue (as now open and in use, 75 feet wide)

RUNNING THENCE southeasterly along a line at interior angle of 89 degrees 59 minutes 33 seconds with the southeasterly side of Bathgate Avenue, 178.13 feet to the northwesterly side of 3rd Avenue (as now open and in use, 80 feet wide)

RUNNING THENCE southwesterly along the northwesterly side of 3rd Avenue; 216.02 feet;

THENCE northwesterly along a line at interior angle of 87 degrees 47 minutes 41 seconds with the northwesterly side of 3rd Avenue, 95.87 feet;

THENCE northeasterly along a line at interior angle of 90 degrees 00 minutes 08 seconds with the last mentioned course, 35.86 feet;

THENCE northwesterly along a line at interior angle of 269 degrees 59 minutes 02 seconds with the last mentioned course, 90.56 feet to the southeasterly side of Bathgate Avenue;

THENCE northeasterly along the southeasterly side of Bathgate Avenue, 180.00 feet to the Point or Place of BEGINNING.

THE ABOVE MENTIONED DESCRIPTION HAS AN ACREAGE OF 0.8288 AND A SQUARE FOOTAGE OF 36,100.37.

TITLE SURVEY

[illegible][illegible]BATHGATE AVENUE
WIDE ASPHALT PAVED (PUBLIC ROAD)

EAST TREMONT AVENUE

15
1 STORY CONCRETE BLOCK
WITH BASEMENT
#390

20
4 STORY BRICK
WITH STUCCO FACE
WITH BASEMENT
#516

7
LOT UNDER CONSTRUCTION

6
4 STORY BRICK
WITH BASEMENT
#174

5
YARD

16
4 STORY BRICK
WITH BASEMENT
#415

3RD AVENUE

RAILROAD

1916

SCALE

N

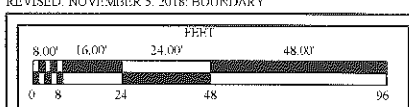
3RD AVENUE

"This property is subject to an environmental easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the New York Environmental Conservation Law. The engineering and institutional controls for this Easement are set forth in more detail in the Site Management Plan (SMP). A copy of the SMP must be obtained by any party with an interest in the property. The SMP can be obtained from NYS Department of Environmental Conservation, Division of Environmental Remediation, Site Control Section, 625 Broadway, Albany, NY 12233 or at derweb@dec.ny.gov".

 INDICATES ENVIRONMENTAL EASEMENT AREA
AREA = 36,115.40 SQ. FT. = 0.8291 ACRES

[illegible]

RECEIVED NOVEMBER 5, 2018; ACCEPTED MAY 1, 2019



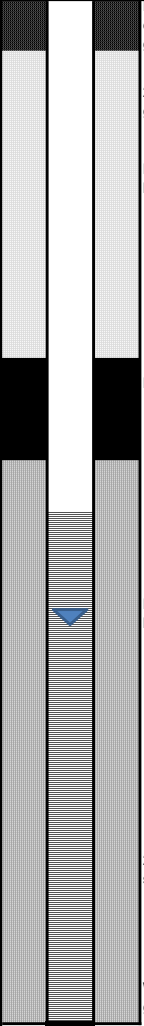
SCALE: 1" = 16'

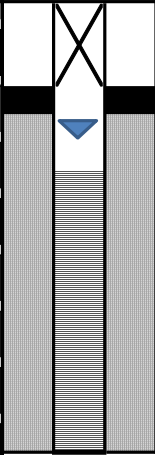
SURVEYED: MAY 11, 2018

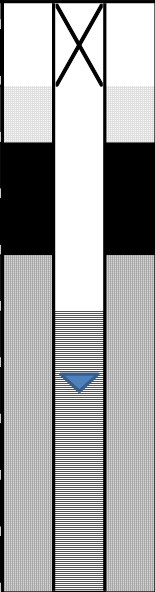
SURVEY OF PROPERTY SITUATED IN
4181 3RD AVENUE
BOROUGH OF BRONX
COUNTY OF BRONX
CITY OF NEW YORK
STATE OF NEW YORK

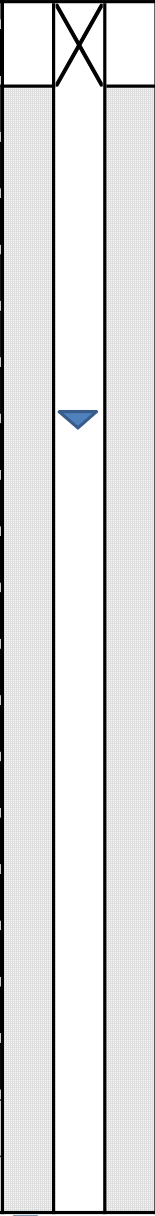
FEHRINGER SURVEYING, P.C.
ROBERT FEHRINGER
LICENSED LAND SURVEYOR
430 WEST HERRING AVENUE
220 JACKSON AVENUE
SPRING, N.Y. 10983
(914) 368-1015 FAX (914) 368-1025

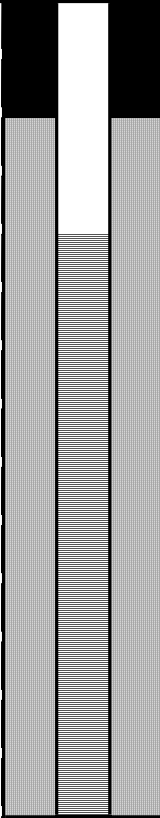
APPENDIX B
POST-REMEDIAL MONITORING WELL
CONSTRUCTION LOGS

SOIL BORING AND WELL INSTALLATION LOG		1888 Bathgate Avenue Redevelopment Site Bronx, New York AKRF Project Number: 170058		Groundwater Monitoring Well ID: Sheet 1 of 1		MW-10		Soil Boring ID: MW-10	
 440 Park Avenue South, 7 th Floor New York, NY 10016		Drilling Method: Geoprobe DPP		Drilling					
		Sampling Method: 5 foot macrocore		Start Time: 7:30				Finish Time: 9:45	
		Driller: AARCO Environmental							
		Weather: 45 °F, Rainy		Date: 4/25/2018					
Logged by: A. Jackson, AKRF									
Depth (feet)	Well Construction	Surface Condition: Concrete	Recovery (Inches)	Soil Boring Log	Odor	Moisture	PID	NAPL	Soil Samples Collected for Laboratory Analysis
1		Locking J-plug, flush mount locking well cover, concrete patch 0' to 1' below grade.	60	Top 10": CONCRETE.	ND	Moist	ND	ND	
2		2-inch Ø PVC well casing: 3" to 10' below grade.		Next 50": Brown SAND, some Concrete, trace Brick, Gravel, Silt [FILL].	ND	Moist	ND	ND	
3		Non-shrinking cement grout: 1' to 7' below grade.							
4									
5									
6		Bentonite seal: 7' to 9' below grade.	Top 6": Brown SAND, little Concrete, trace Gravel, Silt [FILL].	ND	Moist	ND	ND		
7			Next 15": Brown SAND and SILT, trace Gravel.	ND	Moist	ND	ND		
8			Next 17": Yellow-brown SILT, little Sand, Clay, trace Gravel.	ND	Moist	ND	ND		
9			Bottom 22": Brown SAND, some Silt, little Gravel.	ND	Moist	ND	ND		
10									
11		No. 2 morie sandpack filter: 9' to 20' below grade.	Top 25": Brown SAND, some Silt, little Gravel.	ND	Moist	ND	ND		
12			Middle 20": Brown SAND, some Gravel, little Silt.	ND	Moist	ND	ND		
13			Bottom 15": Brown-gray SAND and SILT, trace Gravel, Clay.	ND	Wet @ 14'	ND	ND		
14									
15									
16		2-inch Ø 0.020-inch slotted PVC well screen: 10' to 20' below grade.	Top 40": Brown-gray SAND, some Gravel, little Silt.	ND	Wet	ND	ND		
17			Bottom 20": Brown SAND, tr. Silt, Gravel.	ND	Wet	ND	ND		
18									
19									
20		Well cap at bottom of well: 20' below grade.							
21		Top 18": Brown SAND, some Gravel, little Silt.	ND	Wet	ND	ND			
22		Bottom 3": Yellow SAND.	ND	Wet	ND	ND			
23									
24									
25									
Notes:  Groundwater Depth Indicator Groundwater monitoring well MW-10 installed to 20 feet below grade. Groundwater measured at 12.31 feet below grade during sampling on 5/14/2018.			End of soil boring at 22 feet below grade due to bedrock. Groundwater encountered at approximately 14 feet below grade during soil boring advancement. PID = photoionization detector NAPL = non-aqueous phase liquid ND = not detected						

SOIL BORING AND WELL INSTALLATION LOG		1888 Bathgate Avenue Redevelopment Site Bronx, New York AKRF Project Number: 170058		Groundwater Monitoring Well ID: Sheet 1 of 1		MW-11		Soil Boring ID: MW-11		
 440 Park Avenue South, 7 th Floor New York, NY 10016		Drilling Method:	Sonic Rig	Drilling						
		Sampling Method:	Plastic Sleeve	Start Time: 8:10				Finish Time: 9:00		
		Driller:	AARCO Environmental	Date: 4/30/2018						
		Weather:	45 °F, Partly Cloudy							
		Logged by:	A. Jackson, AKRF							
Depth (feet)	Well Construction	Surface Condition: Soil		Recovery (Inches)	Soil Boring Log	Odor	Moisture	PID (ppm)	NAPL	Soil Samples Collected for Laboratory Analysis
+1		Protective steel casing: 1.5' above grade to XX' below grade.								
0		2-inch Ø PVC well casing: 1.5' above grade to 6.5' below grade.								
1		Bentonite seal: 0' to 0.5' below grade.								
2		No. 2 morie sandpack filter: 0.5 to 6.5' below grade.	25	Brown SAND, some Silt, trace Gravel.	ND	Wet	110	ND		
3										
4		2-inch Ø 0.020-inch slotted PVC well screen: 1.5' to 6.5' below grade.								
5										
6		Well cap at bottom of well: 6.5' below grade		Top 20": SLOUGH FROM ABOVE.	ND	Wet	ND	ND		
7			31	Next 9": Gray SILT and SAND, trace Gravel.	ND	Wet	ND	ND		
8				Bottom 2": BEDROCK.	ND	Dry	5.3	ND		
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										
Notes:  Groundwater Depth Indicator Groundwater monitoring well MW-11 installed to 6.5 feet below grade. Groundwater measured at 1 foot below grade during sampling on 5/14/2018.				End of soil boring at 6.5 feet below grade due to bedrock. Groundwater encountered immediately below grade during soil boring advancement. PID = photoionization detector NAPL = non-aqueous phase liquid ppm = parts per million ND = not detected						

SOIL BORING AND WELL INSTALLATION LOG		1888 Bathgate Avenue Redevelopment Site Bronx, New York AKRF Project Number: 170058		Groundwater Monitoring Well ID: Sheet 1 of 1		MW-12		Soil Boring ID: MW-12	
 440 Park Avenue South, 7 th Floor New York, NY 10016		Drilling Method:	Sonic Rig	Drilling					
		Sampling Method:	Plastic Sleeve	Start Time: 8:10				Finish Time: 9:10	
		Driller:	AARCO Environmental	Date: 4/24/2018					
		Weather:	60 °F, Clear						
		Logged by:	A. Jackson, AKRF						
Depth (feet)	Well Construction	Surface Condition: Soil	Recovery (Inches)	Soil Boring Log	Odor	Moisture	PID (ppm)	NAPL	Soil Samples Collected for Laboratory Analysis
+1		Protective steel casing: 1.5' above grade to 3' below grade.							
0		2-inch Ø PVC well casing: 1' above grade to 6.5' below grade.							
1		Non-shrinking cement grout: 0' to 1' below grade.							
2									
3		Bentonite seal: 1' to 3' below grade.	56	Brown SAND, little Silt, trace fine Gravel, Brick, Concrete, Metal [FILL].	ND	Moist	5.4	ND	
4		No. 2 morie sandpack filter: 3' to 9' below grade.							
5									
6									
7		2-inch Ø 0.020-inch slotted PVC well screen: 4' to 9' below grade.	50	Top 36": Brown SAND, little Silt, trace fine Gravel.	Solvent-like	Wet	11.8	ND	
8									
9		Well cap at bottom of well: 9' below grade		Bottom 14": WEATHERED BEDROCK.	Solvent-like	Wet	13.1	ND	
10									
11									
12									
13									
14									
15									
16									
17									
18									
19									
20									
Notes:  Groundwater Depth Indicator Groundwater monitoring well MW-12 installed to 9 feet below grade. Groundwater measured at 5.5 feet below grade during sampling on 5/14/2018.			End of soil boring at 9 feet below grade due to bedrock. Groundwater encountered at approximately 5 feet below grade during soil boring advancement. PID = photoionization detector NAPL = non-aqueous phase liquid ppm = parts per million ND = not detected						

SOIL BORING AND WELL INSTALLATION LOG		1888 Bathgate Avenue Redevelopment Site Bronx, New York AKRF Project Number: 170058		Groundwater Monitoring Well ID: Sheet 1 of 1		MW-13		Soil Boring ID: MW-13						
 440 Park Avenue South, 7 th Floor New York, NY 10016		Drilling Method:	Sonic Rig	Drilling										
		Sampling Method:	Plastic Sleeve	Start Time: 9:20				Finish Time: 11:00						
		Driller:	AARCO Environmental	Date: 4/24/2018										
		Weather:	60 °F, Clear											
		Logged by:	A. Jackson, AKRF											
Depth (feet)	Well Construction	Surface Condition: Soil		Recovery (Inches)	Soil Boring Log	Odor	Moisture	PID (ppm)	NAPL	Soil Samples Collected for Laboratory Analysis				
+1		Protective steel casing: 1.5' above grade to XX' below grade.												
0														
1		2-inch Ø PVC well casing: 1' above grade to 24' below grade.		54	Top 48": Brown SAND, little Silt, trace Brick, Gravel, Concrete [FILL].	ND	Moist	5	ND					
2				Bottom 6": Brown SAND, trace Silt.	ND	Wet @ 3'	2	ND						
3														
4														
5		Non-shrinking cement grout: 0' to 20' below grade.												
6				56	Brown SAND, trace Silt.	ND	Wet	3	ND					
7														
8														
9														
10														
11		46	Brown SAND, trace Silt.	ND	Wet	ND	ND							
12														
13														
14														
15														
16		54	Top 25": Brown SAND, trace Silt.	ND	Wet	ND	ND							
17									Next 13": Brown SAND, some Silt, trace Gravel.	ND	Wet	ND	ND	
18														
19														
20		Bottom 16": Brown SAND, little Gravel, trace Silt.	ND	Wet	ND	ND								
Notes:  Groundwater Depth Indicator Groundwater monitoring well MW-13 installed to 34 feet below grade. Groundwater measured at 6.15 feet below grade during sampling on 5/14/2018.				End of soil boring at 34 feet below grade due to bedrock. Groundwater encountered at approximately 3 feet below grade during soil boring advancement. PID = photoionization detector NAPL = non-aqueous phase liquid ppm = parts per million ND = not detected										

SOIL BORING AND WELL INSTALLATION LOG		1888 Bathgate Avenue Redevelopment Site Bronx, New York AKRF Project Number: 170058		Groundwater Monitoring Well ID: MW-13		Soil Boring ID: MW-13					
 440 Park Avenue South, 7 th Floor New York, NY 10016		Drilling Method: Sonic Rig Sampling Method: Plastic Sleeve Driller: AARCO Environmental Weather: 60 °F, Clear Logged by: A. Jackson, AKRF		Drilling Start Time: 9:20 Finish Time: 11:00 Date: 4/24/2018							
Depth (feet)	Well Construction	Surface Condition: Soil	Recovery (Inches)	Soil Boring Log	Odor	Moisture	PID (ppm)	NAPL	Soil Samples Collected for Laboratory Analysis		
21		Bentonite seal: 1' to 3' below grade. 2-inch Ø 0.020-inch slotted PVC well screen: 24' to 34' below grade. No. 2 morie sandpack filter: 22' to 34' below grade.	52	Top 11": Brown SAND, trace Silt, Gravel.	ND	Wet	ND	ND			
22				Next 16": Brown SAND, sme Silt, trace Gravel.	ND	Wet	ND	ND			
23				Next 12": Brown SAND, trace Silt, Gravel.	ND	Wet	ND	ND			
24				Bottom 13": GRAVEL and SAND, trace Silt.	ND	Wet	3	ND			
25											
26					60	Top 23": Brown SAND and GRAVEL, trace Silt.	ND	Wet	2	ND	
27				Next 8": Gray SAND, little Gravel, Silt.		ND	Wet	3	ND		
28				Bottom 25": Gray SAND, trace Clay, Gravel.		ND	Wet	1	ND		
29											
30											
31					44	SAND and SILT, trace Clay.	ND	Wet	1	ND	
32											
33											
34											
35											
36											
37											
38											
39											
40											
Notes:  Groundwater Depth Indicator Groundwater monitoring well MW-13 installed to 34 feet below grade. Groundwater measured at 6.15 feet below grade during sampling on 5/14/2018.			End of soil boring at 34 feet below grade due to bedrock. Groundwater encountered at approximately 3 feet below grade during soil boring advancement. PID = photoionization detector NAPL = non-aqueous phase liquid ppm = parts per million ND = not detected								

APPENDIX C
EXCAVATION WORK PLAN

EXCAVATION WORK PLAN

1.0 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the Site owner or their representative will notify the NYSDEC. Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information.

Table 1 Notifications*

Nigel Crawford , P.E. NYSDEC Region 2 Office Representative	(718) 482-7778 / nigel.crawford@dec.ny.gov
Kelly Lewandowski NYSDEC Site Control, Central Office	(518) 402-9569 / kelly.lewandowski@dec.ny.gov

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's Health and Safety Plan (HASP), in electronic format, if it differs from the HASP provided in Appendix D of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

2.0 SOIL SCREENING METHODS

Visual, olfactory, and instrument-based [e.g. photoionization detector (PID)] soil screening will be performed by a Qualified Environmental Professional (QEP) or someone under the direct supervision of a QEP, during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the Certificate of Completion (COC).

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections 5.0 through 7.0 of this Appendix.

3.0 SOIL STAGING METHODS

Any soil excavated from areas on the Site not meeting the RRSCOs will be placed in separate designated stockpiles based on the results of field screening and/or laboratory analysis. Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points. Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the site and available for inspection by the NYSDEC. Soil that exhibits evidence of contamination (i.e., elevated PID readings, staining, odors, etc.) will be separately staged for off-site disposal. Information on staged soil will be tracked in the Site field log book and updated at the end of each workday.

4.0 MATERIALS EXCAVATION AND LOAD-OUT

A QEP or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material. The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this EWP. The presence of utilities and easements on the Site will be investigated by the QEP. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate federal, state, local, and New York State Department of Transportation (NYSDOT) requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site, as appropriate. The QEP will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete truck wash waters will be collected and disposed of off-site in an appropriate manner. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-site soil tracking. The QEP will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

5.0 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded. Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development. Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

6.0 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, state, (including 6 NYCRR Part 360) and federal regulations. If disposal of material from this Site is proposed for unregulated off-site disposal (i.e., clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this Site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, construction and demolition (C&D) recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6 NYCRR Part 360-1.2. Material that does not meet Unrestricted Soil Cleanup Objectives (UUSCOs) is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

7.0 MATERIALS REUSE ON-SITE

Contaminated soil, or any material in direct contact with the contaminated soil, may not be separated for reuse on-site and will be disposed of as described above in Section 5.0. Soil that does not exhibit evidence of contamination during field screening and is free of debris will be stockpiled and tested at a frequency of one sample per 500 cubic yards and characterized for reuse below the Site cap. Chemical criteria for on-site reuse of material will meet the lower of the NYSDEC Part 375 protection of groundwater or the protection of public health for restricted residential use SCOs and can only be used as backfill beneath the composite cover system for the approved use of the Site consistent with the Environmental Easement (EE). The QEP will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

8.0 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including but not limited to, excavation dewatering, decontamination waters, and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, state, and federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, and will be managed off-site, unless prior approval is obtained from NYSDEC. Discharge of water generated during large-scale construction activities to surface waters (i.e., a local pond, stream or river) will be performed under a State Pollutant Discharge Elimination System (SPDES) permit.

9.0 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site will be approved by the QEP and will be in compliance with provisions in this SMP prior to receipt at the Site. A Request to Import/Reuse Fill or Soil form, which can be found at <http://www.dec.ny.gov/regulations/67386.html>, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6 NYCRR 375-6.7(d). Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

10.0 EXCAVATION CONTINGENCY PLAN

If underground storage tanks (USTs) or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes [Target Analyte List (TAL) metals; Target Compound List (TCL) volatile organic compounds (VOCs) and semivolatile compounds (SVOCs), TCL pesticides, and polychlorinated biphenyls (PCBs)], unless the Site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

11.0 COMMUNITY AIR MONITORING PLAN

Work zone monitoring will be performed for the health and safety of workers during interior intrusive work activities in accordance with action levels and guidance outlined in the site-specific HASP. During intrusive activities, all windows and doors at street level will remain closed to prevent exposure to the public and the existing ventilation system and any additional ventilation fans will vent to the roof.

Community air monitoring will be performed at the perimeter of the Site continuously during intrusive Site activities including the loading or staging of excavated soil prior to transportation and off-site disposal. In addition, community air monitoring will be performed periodically (at a minimum once per hour) on a roving basis with a concentration on any active exterior work area(s).

VOC and particulate monitoring equipment will consist of a PID capable of detecting the VOCs found in the excavated soil and real-time aerosol or particulate monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM₁₀). VOC monitoring equipment will be calibrated, and the particulate monitoring equipment

zeroed, on a daily basis and documented in a dedicated field log book. Both VOC and particulate monitoring equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the prescribed action levels.

If VOC monitoring results in the ambient air concentration of total organic vapors in excess of 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases below 5 ppm over background, work activities can resume with measures taken to reduce vapors and continue monitoring. If total organic vapor levels persist at levels in excess of 5 ppm over background, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. If the organic vapor level is repeatedly over 25 ppm above background, activities will be shut down and the engineering controls and the Site work plan re-evaluated.

If particulate monitoring results in a 15-minute average concentration measurement that is between 100 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) and $150 \mu\text{g}/\text{m}^3$ above the background level, additional dust suppression techniques will be implemented to reduce the generation of fugitive dust and corrective action taken to protect Site personnel and reduce the potential for contaminant migration. Should dust suppression measures being utilized not lower particulates to an acceptable level (e.g., below $150 \mu\text{g}/\text{m}^3$ above the background level, and no visible dust from the work area), work will be suspended until appropriate corrective measures are implemented to remedy the situation.

Details regarding work zone and community air monitoring are outlined in the HASP attached as Appendix C. Exceedances of action levels listed in the CAMP will be reported to the NYSDEC and NYSDOH project managers.

The locations of air sampling stations will be determined prior to the start of work based on wind conditions to provide an upwind and at least two downwind monitoring stations. At least one fixed monitoring station will be located on the western Site perimeter nearby the adjacent residential buildings. If additional sensitive receptors are identified during Site work (i.e., daycares, schools, etc.), the CAMP stations will be moved adjacent to any such receptors.

12.0 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors emanating on-site. Specific odor control methods to be used on a routine basis will include monitoring by the on-site QEP or personnel under their direct supervision. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the remedial party's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

All necessary means will be employed to prevent on- and off-site nuisances. At a minimum, these measures will include: (a) limiting the area of open excavations and size of soil

stockpiles; (b) shrouding open excavations with tarps and other covers; and (c) using foams to cover exposed odorous soils. If odors develop and cannot be otherwise controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-site disposal; (e) use of chemical odorants in spray or misting systems; and, (f) use of staff to monitor odors in surrounding neighborhoods.

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

13.0 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site water source for road wetting. The water source will be capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.
- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

14.0 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX D
HEALTH AND SAFETY PLAN

1888 BATHGATE AVENUE REDEVELOPMENT SITE

4181 THIRD AVENUE

BRONX, NEW YORK

Health and Safety Plan

NYSDEC BCP Number: C203088

Prepared for:

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1.0 INTRODUCTION

1.1 Purpose

This Health and Safety Plan (HASP) has been prepared by AKRF, Inc. (AKRF) for the 1888 Bathgate Avenue Redevelopment Site, herein referred to as “the Site,” located at 4181 Third Avenue in the Bronx, New York. The Site was investigated and remediated in accordance with Brownfield Cleanup Agreement (BCA) Index No. C203088-03-17, which was executed in May and amended in August 2017. The Site was remediated to restricted residential use in accordance with the NYSDEC-approved Remedial Action Work Plan (RAWP) and Decision Document (DD), dated September 2017. A Site Management Plan (SMP) was prepared to manage remaining groundwater contamination at the Site until the Environmental Easement [an Institutional Control (IC) restricting the type of use at the property to restricted residential] is extinguished. The SMP includes an Engineering Control (EC) and IC Plan, a Monitoring Plan, and a Site Management Reporting Plan. An Excavation Work Plan (EWP), which includes provisions for managing excavated material, is also attached to the SMP. Details on the Site environmental history and remedial activities performed are provided in the SMP. The main contaminants of concern are chlorinated volatile organic compounds (CVOCs) in groundwater.

ECs have been incorporated into the Site remedy to control exposure to remaining groundwater contamination during the use of the Site to ensure protection of public health and the environment. An in-situ groundwater treatment program was implemented as part of the remedial action and is an EC for the Site. An Environmental Easement granted to the NYSDEC and recorded with the Bronx County Clerk will require compliance with this SMP and all ECs and ICs placed on the Site.

The ICs place restrictions on the Site use and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. The SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Environmental Easement for contamination that may remain at the Site. The SMP may be revised only with the approval of the NYSDEC.

This HASP is an appendix to the SMP, which details the procedures required to manage known or potential residual contamination following completion of the remedial action at the Site. The purpose of the HASP is to assign responsibilities, establish personnel protection standards and mandatory safety practices and procedures, and provide contingencies that may arise associated with the post-remediation groundwater treatment, periodic sampling activities, and potential soil disturbance activities conducted at the Site. The HASP takes into account the specific hazards inherent to the Site, and presents procedures to be followed by AKRF and contractors in order to avoid and if necessary, protect against health and/or safety hazards. Application of this HASP should be considered on a task-by-task basis as not all measures are necessary for all activities on-site. On-site work activities should comply with applicable parts of Occupational Safety and Health Administration (OSHA) Regulations, primarily 29 CFR Parts 1910 and 1926. A copy of this HASP will be maintained on-site during work performed under the SMP.

All workers who participate in activities at the Site that are under the direction of AKRF or the Site owner are required to comply with the provisions specified in this HASP. All Site visitors who enter designated work zones must also comply with this HASP. Refusal or failure to comply with the HASP or violation of any safety procedures by field personnel and/or subcontractors performing work covered by this HASP may result in immediate removal from the Site following consultation with the owner's representative. No personnel are permitted to enter permit confined spaces under this HASP.

1.2 Scope

This HASP has been developed to address the health and safety concerns during Site operations and maintenance, monitoring, and inspections after completion of the Site remedy, under the direction of AKRF and the contractor as specified in the SMP. Although the HASP addresses all activities listed herein, work at the individual locations may include all or only some of these tasks. On-site work anticipated under the SMP includes the following tasks:

- Sampling and analysis of appropriate media (e.g., groundwater).

1.3 Application

The HASP applies to all personnel involved in the above tasks under the direction of the Site owner or AKRF who wish to gain access to active intrusive work areas, including but not limited to:

- Owner's representatives, contractors, and subcontractors performing tasks under the direction of AKRF, the owner, or the owner's representative;
- Federal, state, or local representatives;
- AKRF or the contractor's employees; and
- AKRF or the contractor's subcontractors.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITIES

This section specifies the project team's project organization.

2.1 Remedial Engineer

The Remedial Engineer for this project is Michelle Lapin, P.E. The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the Site. The Remedial Engineer will coordinate the work of other contractors and subcontractors involved in all aspects of remedial construction, including soil excavation, stockpiling, characterization, removal and disposal, air monitoring, emergency spill response services, import of back fill material, and management of waste transport and disposal. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

2.2 Project Director

The project director is a qualified health and safety professional with experience in hazardous waste Site remediation activities. The project director is Marc Godick, LEP of AKRF. The project director responsibilities include the following:

- Provides for the development and approval of the HASP;
- Serves as the primary contact to review health and safety matters that may arise;
- Approves revised or new safety protocols for field operations;
- Coordinates revisions of this HASP with field personnel;
- Coordinates upgrading or downgrading of personal protective equipment with the SM;
- Assists in the investigation of all accidents/incidents; and
- Enforces work stoppage following reporting of on-site activities from the PM and SM.

2.3 QA/QC Officer

The Quality Assurance/Quality Control (QA/QC) officer is Deborah Shapiro, QEP of AKRF. The QA/QC officer's responsibilities include the following:

- Plans, schedules, and manages implementation of remediation activities;
- Coordinates with the Project Manager, Site Supervisor, and Project Director to ensure that health and safety requirements are met;
- Ensures that field work is scheduled with adequate personnel and equipment resources to complete the job safely and enforce Site health and safety rules;
- Conducts periodic inspections;
- Participates in incident investigations;
- Ensures the HASP has all of the required approvals before any Site work is conducted;
- Ensures that the Project Manager is informed of project changes that require modifications of the HASP; and
- Has overall project responsibility for Project Health and Safety.

2.4 Project Manager

The Project Manager is Adrianna Bosco of AKRF. The Project Manager responsibilities include the following:

- Manages day-to-day implementation of the Site safety measures specified in the HASP;
- Ensures that adequate communication between field crews, health and safety monitoring personnel, and emergency response personnel is maintained;
- Confirms that field Site personnel are adequately trained and qualified to work at the Site and that proper personal protective equipment (PPE) is utilized by field teams;
- Investigates and report all accidents/incidents to the QA/QC officer and Project Director;
- Conducts and documents periodic safety briefings;
- Stops work if necessary based on health and safety monitoring;
- Acts as the primary point of contact for Site-related activities and coordination with non-project-related Site operations;

- Identifies operational changes that require potential modifications to health and safety procedures and Site safety plans, and reports such changes to the QA/QC officer and Project Director;
- Conducts health and safety monitoring activities;
- Determines upgrades or downgrades of PPE based on Site conditions and/or real-time monitoring results;
- Ensures that monitoring instruments are calibrated; and
- Reports to the QA/QC officer and Project Director to provide summaries of field operations and progress.

2.5 Site Supervisor

The Site Supervisor will be appointed from the owner's contractor. If work is being performed solely by AKRF, the Site Supervisor tasks would be performed by the Project Manager (see Section 2.2). The Site Supervisor responsibilities include the following:

- Provide for the necessary training of field crews in accordance with OSHA regulations and provides proof of training to the Project Manager prior to entering the Site;
- Conduct routine safety inspections of their work areas;
- Conduct incident investigations and together with the Project Manager, prepares appropriate reports;
- Enforces health and safety rules and compliance with the HASP; and
- Plans field work using appropriate safe procedures and equipment.

2.6 Site Personnel

The Site Personnel responsibilities include the following:

- Report any unsafe or potentially hazardous conditions to the Project Manager;
- Maintain knowledge of the information, instructions and emergency response actions contained in the HASP;
- Comply with rules, regulations and procedures as set forth in this HASP and any revisions;
- Prevent admittance to work Sites by unauthorized personnel; and
- Inspect all tools and equipment, including PPE, prior to use.

3.0 SITE HISTORY AND BACKGROUND

The Site is an approximately 0.829-acre parcel located at 4181 Third Avenue in the East Tremont neighborhood of the Bronx, New York and is identified as Tax Block 2924, Lot 7 (formerly Lots 7, 10, 25, 30, and 34). The Site was developed with five interconnected, single-story warehouses until their demolition in July and August 2017 in preparation for remediation and redevelopment. The Site is abutted by commercial uses and a school facility to the north; Third Avenue, followed by Tremont Park to the east; residential and commercial uses to the south; and Bathgate Avenue, followed by institutional and industrial uses and a parking lot to the west. The surrounding area is developed primarily with commercial, institutional, and residential properties with some industrial uses.

Historic records indicate that the Site was developed with private residences and stores as early as 1896, with industrial and manufacturing uses including a lumber yard, various warehouses, Decorative Plastics Co., a glass and glazing facility, a bed spring company, various clothing and accessory manufacturers, a woodworking facility, and a rebar manufacturing facility. ABCO Steel Door (ABCO), a steel door manufacturing facility, occupied the Site between approximately 1980 and 1993. Since approximately 1993, no manufacturing operations occurred at the Site; however, the Site buildings have been used for storage of equipment and supplies by ABCO. Prior industrial and manufacturing uses may have led to Site contamination.

Between September 2017 and July 2018, the Site was remediated in accordance with the NYSDEC-approved Remedial Action Work Plan. The remedial elements performed consisted of the following:

1. Soil Excavation and Off-Site Disposal:

All on-site soils which exceeded the Restricted Residential Soil Cleanup Objectives (RRSCOs), as defined by 6 New York Codes, Rules, and Regulations (NYCRR) Part 375-6.8, were excavated up to a maximum depth of 15 feet below grade and transported off-site for proper disposal at approved facilities. Approximately 19,000 cubic yards of soil were excavated and disposed off-site. During all excavation and ground intrusive activities, AKRF conducted real-time air monitoring for particulates and VOCs, in accordance with a NYSDEC-approved Community Air Monitoring Plan (CAMP).

Post-excavation soil endpoint samples were collected across the Site to evaluate performance of the remedy. Endpoint samples were not collected from areas that were excavated down to bedrock. Track 2 RRSCOs were met or an excavation depth of 15 feet was achieved.

2. Tank Removal:

During soil excavation activities, one 275-gallon No. 2 fuel oil aboveground storage tank (AST) and two 1,000-gallon No. 2 fuel oil underground storage tanks (USTs) were encountered. The tanks were properly cleaned, removed, and disposed of off-site by a licensed tank remediation contractor. Endpoint samples were collected from the bottom and sidewalls of the tank graves.

3. Material Import:

Approximately 573 cubic yards of virgin dense graded aggregate (DGA) meeting the requirements of 6 NYCRR Part 375-6.8(a) was imported to establish the designed grades at the Site prior to installation of the waterproofing membrane and concrete slab and to construct a truck pad and ramp.

4. Remedial Design:

A Remedial Design Investigation (RDI) was implemented between September 12 and 26, 2017 and February 6 and 22, 2018 in accordance with the NYSDEC-approved RDI Work Plan. The RDI was conducted to further delineate the on-site horizontal and vertical extent of chlorinated solvents in groundwater identified during the RI and SRI developing an in-

situ groundwater treatment program. The RDI Report was submitted to NYSDEC in April 2018 and approved in June 2018.

5. Implementation of an In-Situ Groundwater Treatment Program

An In-Situ Chemical Oxidation (ISCO) Groundwater Treatment Program was conducted at the Site. Approximately 8,325 gallons of a 5% or 10% sodium permanganate/water solution was injected into 24 temporary injections points located in the southwestern portion of the Site (the groundwater treatment area). The injection points were spaced approximately 12 to 14 feet apart to achieve a 6 to 7 feet overlapping radius of influence (ROI). Multiple intervals were targeted in the treatment area above the bedrock surface, up to approximately 28 feet below grade.

Four two-inch permanent groundwater monitoring wells (MW-10, MW-11, MW-12, and MW-13) were installed upgradient, within, and downgradient of the treatment area in the southwestern portion of the Site to monitor CVOC concentrations in groundwater before and after the groundwater treatment program. Well construction for monitoring wells MW-10 and MW-13 consisted of 10 feet of screen with solid riser installed to the ground surface. Due to shallow depth to bedrock, well construction for monitoring wells MW-11 and MW-12 consisted of 5 feet of screen with solid riser installed to the ground surface. The well locations and the groundwater treatment area are shown on Figure 5 of the SMP. Post-remedial well construction logs are provided in Appendix B of the SMP. Groundwater samples were collected from each of the post-remedial wells prior to implementation of the treatment program.

On September 6, 2018, approximately two months after the initial ISCO event, groundwater samples were collected from the four post-remedial groundwater monitoring wells and placed in laboratory-supplied containers. The samples were submitted to Accutest of Dayton, New Jersey, for analysis of CVOCs by EPA Method 8260 using Category B deliverables. One blind duplicate, one field blank, one trip blank, and one matrix spike/matrix spike duplicate (MS/MSD) sample were collected for Quality Assurance/Quality Control (QA/QC) purposes. The QA/QC samples were also analyzed for CVOCs. The groundwater data was reviewed by a third-party validator and a DUSR was prepared to document the usability and validity of the data.

6. Institutional Control (IC)

The imposition of an Institutional Control (IC) in the form of an Environmental Easement (EE) for the Site. The Site has a series of ICs in the form of Site restrictions and requirements. The Site restrictions that apply to the Site are:

- In-ground vegetable gardens and farming on the Site are prohibited;
- Use of groundwater underlying the Site is prohibited without treatment rendering it safe for intended purpose;
- All future activities on the Site that will disturb residual contaminated material are prohibited unless they are conducted in accordance with the soil management provisions in the SMP;

- The Site may be used for restricted residential, commercial, and industrial use only, provided the IC/ECs included in the SMP are employed;
- The Site may not be used for a higher level of use, such as unrestricted or unrestricted residential use without an amendment or extinguishment of this EE; and
- Grantor agrees to submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Site are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP. NYSDEC retains the right to access the Site at any time to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow. This statement must be certified by an expert that the NYSDEC finds acceptable.

7. Site Management Plan (SMP)

Since post-remedial groundwater monitoring and sampling and an environmental easement were required following implementation of the remedy, an SMP, including an IC/EC Plan and Monitoring Plan to assess the performance and effectiveness of the remedy, was prepared.

Full documentation of remedial activities will be provided in the Final Engineering Report (FER).

4.0 POTENTIAL HAZARDS AT THE SITE

This section presents an assessment of the chemical, biological, and physical hazards that may be encountered during the tasks specified under HASP Section 1.2.

4.1 Hazard Potential

Although remediation has been completed, groundwater monitoring and sampling is required and additional treatment events may be required following receipt of the initial round of post-remedial groundwater sampling event.

4.2 Properties of Chemical Contamination

4.2.1 Chemical Hazards in Soil and/or Groundwater

Potential chemical issues related to work at this Site include but are not limited to: dermal contact and/or ingestion hazards associated with contaminated groundwater and soil deeper than 15 feet below grade.

The potential health effects from on-site contamination are summarized in Table 1 and detailed in the U.S. Department of Health and Human Services Agency for Toxic Substances and Disease Registry (ATSDR) fact sheets attached in Appendix A.

Table 1 Potential Health Effects from On-Site Contamination

Chemical	REL/PEL/STEL	Health Hazards
1,2,4-Trimethylbenzene	N REL: 25 ppm	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid).
1,3,5-Trimethylbenzene	REL: 25 ppm	Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid).
Benzene	REL: 0.1 ppm N STEL: 1 ppm PEL: 1 ppm O STEL: 5 ppm	Irritation eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen].
Chromium	REL: 0.5 mg/m ³ PEL: 1 mg/m ³	Irritation eyes, skin; lung fibrosis (histologic).
Cis 1,2-Dichloroethene	REL: 200 ppm PEL: 200 ppm	Irritation eyes, respiratory system; central nervous system depression.
Dieldrin	N REL: 0.25 mg/m ³ O PEL: 0.25 mg/m ³	Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; In Animals: liver, kidney damage [potential occupational carcinogen].
DDD, DDE, & DDT	REL: 0.5 mg/m ³ PEL: 1 mg/m ³	Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen].
Ethylbenzene	REL: 100 ppm N STEL: 125 ppm PEL: 100 ppm	Irritation eyes, nose, respiratory system; headache, lassitude (weakness, exhaustion), dizziness, confusion, malaise (vague feeling of discomfort), drowsiness, unsteady gait; narcosis; defatting dermatitis; possible liver injury; reproductive effects.
Lead	REL: 0.050 mg/m ³ PEL: 0.050 mg/m ³	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension.

Chemical	REL/PEL/STEL	Health Hazards
Mercury	REL: 0.05 mg/m ³ REL C: 0.1 mg/m ³ PEL: 0.1 mg/m ³	Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria.
PAHs	REL: 0.1 mg/m ³ PEL: 0.2 mg/m ³	Effects reported from occupational exposure to PAHs include chronic bronchitis, chronic cough irritation, bronchogenic cancer, dermatitis, cutaneous photosensitization, and pilosebaceous reactions. Reported health effects associated with chronic exposure to coal tar and its by-products (e.g., PAHs): Skin: erythema, burns, and warts on sun-exposed areas with progression to cancer. The toxic effects of coal tar are enhanced by exposure to ultraviolet light. Eyes: irritation and photosensitivity. Respiratory system: cough, bronchitis, and bronchogenic cancer. Gastrointestinal system: leukoplakia, buccal-pharyngeal cancer, and cancer of the lip. Hematopoietic system: leukemia (inconclusive) and lymphoma. Genitourinary system: hematuria and kidney and bladder cancers.
Tetrachloroethylene	PEL: 100 ppm PEL C: 200 ppm; max peak: 300 ppm	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen].
Toluene	REL: 100 ppm N STEL: 150 ppm PEL: 200 ppm PEL C: 300 ppm; 10-min max peak: 500 ppm	Irritation eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage.
Trichloroethylene	PEL: 100 ppm PEL C: 200 ppm; 5-min max peak: 300 ppm	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen].
Xylene	REL: 100 ppm N STEL: 150 ppm PEL: 100 ppm	Irritation eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis.
Notes: REL: Recommended exposure limit (NIOSH) PEL: Permissible exposure limits (OSHA) STEL: Short-term exposure limit N: NIOSH O: OSHA C: Ceiling		

4.2.2 Other Chemical Hazards

Chemicals not identified in this HASP may be used or encountered during Site work. Prior to the initiation of these tasks, Material Safety Data Sheets (MSDS) will be obtained for each of the chemicals to be used and all Site workers and visitors who may potentially be exposed will be made aware of the hazards.

4.3 Physical Hazards

Physical hazards will be addressed as necessary. More detailed safety procedures are provided as appendices to this HASP, where applicable.

4.3.1 Cold Stress

At certain times of the year, workers may be exposed to the hazards of working in cold environments. Potential hazards in cold environments include frostbite, trench/immersion foot, and hypothermia as well as slippery surfaces and brittle equipment.

4.3.2 Heat Stress

Heat stress is a significant potential hazard, which is greatly exacerbated with the use of PPE in hot environments. The potential hazards of working in hot environments include dehydration, cramps, heat rash, heat exhaustion, and heat stroke. A heat stress prevention program will be implemented when ambient temperatures exceed 70 °F for personnel wearing impermeable clothing.

4.3.3 Noise

Noise is a potential hazard associated with the operation of heavy equipment, power tools, pumps and generators. Operations that require the use of hearing protection include operation of heavy equipment, generators, jackhammers, chain saws, sheetpile drivers, dewatering equipment, and pressure washers. Site workers who will perform suspected high noise tasks and operations will be provided with earplugs. Workers not performing those tasks but working in close proximity to that equipment will also be required to wear hearing protection. If deemed necessary by the Project Manager, the Project Director will be consulted on the need for additional hearing protection and the need to monitor sound levels for Site activities.

4.3.4 Hand and Power Tools

To complete the various tasks for the project, personnel will utilize hand and power tools. The use of hand and power tools can present a variety of hazards, including physical harm from being struck by flying objects, being cut or struck by the tool, fire, and electrocution. Work gloves, safety glasses, and hard hats will be worn by the operating personnel at all times when utilizing hand and power tools, and GFI-equipped circuits will be used for all power tools.

4.3.5 Slips, Trips, and Falls

Working in and around the Site will pose slip, trip and fall hazards due to slippery surfaces that may be oil covered, or from surfaces that are wet from rain or ice. Excavation at the Sites will cause uneven footing in the trenches and around the spoil piles. Care should be exercised when walking at the Site, especially when carrying equipment.

4.3.6 Fire and Explosion

The use of cutting/grinding tools which may spark in the vicinity of flammable building materials, use of gasoline-powered instruments, or a diesel engine on equipment could present the possibility of encountering fire and explosion hazards. Care should be exercised and fire extinguishers available during work which presents fire or explosion hazard.

4.3.7 Manual Lifting

Manual lifting of heavy objects such as sections of pipe or blower supplies may be required. Failure to follow proper lifting technique can result in back injuries and strains. Site workers will be instructed to use power equipment to lift heavy loads whenever possible and to evaluate loads before trying to lift them (i.e., they should be able to easily tip the load and then return it to its original position). Heavy loads should be carried with a buddy and the following proper lifting techniques will be stressed: 1) make sure footing is solid, 2) make back straight with no curving or slouching, 3) center body over feet, 4) grasp the object firmly and as close to your body as possible, 5) lift with legs, and 6) turn with your feet, don't twist. Back injuries are a serious concern as they are the most common workplace injury, often resulting in lost or restricted work time, and long treatment and recovery periods. In addition, hand digging for pipes may present lifting/ergonomic hazards.

4.3.8 Utilities (Electrocution and Fire Hazards)

Underground utilities at the Site pose fire, explosion, and electrocution hazards. Potential adverse effects of electrical hazards include burns and electrocution, which could result in death. Underground utilities, facilities, equipment, and structures will be located prior to start of remedial excavation activities. The Underground Utilities Call Center will be notified a minimum of three days before any subsurface disturbance. Care shall be exercised to avoid damage to utilities beneath the surface slab.

4.4 Task Hazard Analysis

The scope of work described in Section 1.2 will be accomplished with the following tasks:

1. Mobilization/Demobilization: mobilize equipment; establish Site security, work zones, and staging areas.
2. Site Preparation: locate utilities; construct decontamination pad; construct negative pressure environmental enclosure around excavation area.

3. Sampling: use of appropriate personal protection equipment (PPE) (e.g., nitrile gloves, safety glasses, ear plugs, hard hats);
4. Site Restoration Activities: restore flooring in excavation area and any damaged adjacent floors/walls to original condition.

All of these tasks include the potential for the chemical and physical hazards, and care should be taken within the work zone to avoid these hazards as described above. All tasks should be conducted using the appropriate PPE for the associated exposure, as described in Section 6.0.

5.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The PPE required for various remediation tasks are based on 29 CFR 1910.120, Hazardous Waste Operations and Emergency Response, Appendix B, “General Description and Discussion of the Levels of Protection and Protective Gear.” All on-site personnel shall wear, at a minimum, Level D PPE. The protection will be based on the air monitoring described in Section 7.0. Table 2 lists the required PPE for the anticipated remediation tasks:

Table 2 Personal Protection Equipment Requirements

LEVEL OF PROTECTION & PPE		All Tasks
Level D ☒ Steel Toe Shoes ☒ Hard Hat (within 25 ft. of excavator) ☒ Work Gloves	☒ Safety Glasses ☐ Face Shield ☒ Ear Plugs (within 25 ft. of excavator) ☒ Nitrile Gloves ☒ Tyvek for tank contractor if NAPL present	Yes
Level C (in addition to Level D) ☒ Half-Face Respirator ☒ Full Face Respirator ☐ Full-Face PAPR	☐ Particulate Cartridge ☐ Organic Cartridge ☒ Dual Organic/Particulate Cartridge	If PID > 5 ppm or particulate > 0.150 mg/m ³ above background
Comments: Cartridges to be changed out at least once per shift unless warranted beforehand (e.g., more difficult to breath or any odors detected). PAPR = powered air purifying respirator		

The PPE specified in Table 2 reflects the hazard analysis presented in Section 4.0 and PPE selection required by 29 CFR 1910.132. For the purposes of PPE selection, the Project Director, QA/QC officer, and Project Manager are considered competent persons. The signatures on the front of the HASP constitute certification of the hazard assessment. For activities not covered by Table 2, the SM will conduct the hazard assessment and select the PPE in consultation with the Project Director.

5.1 OSHA Requirements for PPE

All PPE used must meet the following OSHA standards:

Table 3 PPE OSHA Requirements

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133	ANSI Z87.1 1968
Respiratory	29 CFR 1910.134	ANSI Z88.1 1980
Head	29 CFR 1910.135	ANSI Z89.1 1969
Foot	29 CFR 1910.136	ANSI Z41.1 1967

ANSI = American National Standards Institute

6.0 MONITORING

6.1 Monitoring Requirements

Environmental Health and Safety Monitoring will be performed during any soil disturbance activities in accordance with this section.

6.1.1 Work Zone Monitoring

The following monitoring instruments will be available for use during field operation as necessary:

- Photoionization detector (PID) with 10.6 eV lamp, or equivalent; and
- Dust meter, TSI DustTrak or equivalent.

All air monitoring equipment will be calibrated and maintained in accordance with manufacturer's requirements and will be recorded by the AKRF field personnel in the daily log.

Organic vapor concentrations shall be measured using a PID with 10.6 eV lamp during excavating and other intrusive activities. During intrusive operations, organic vapor concentrations shall be taken at least once every hour. Organic vapor concentrations shall be measured upwind of the work zone to determine background concentrations at least twice a day, (once in the morning and once in the afternoon). The Site Personnel and Project Manager will interpret monitoring results using professional judgment.

A particulate meter will be used to measure airborne particulate matter during intrusive activities. Monitoring will be at least once per hour and readings will be averaged over a 15-minute period for comparison with the action levels. Monitoring personnel will make a best effort to collect dust monitoring data from downwind of the intrusive activity. If off-site sources are considered to be the source of the measured particulate, upwind readings will also be collected.

Measurements will be taken prior to commencement of work and periodically or continuously during the work, depending on the contaminant being monitored, as outlined in Table 4. Measurements will be made as close to the workers as practicable and at the breathing height of the workers.

The Site Personnel shall set up the equipment and confirm that it is working properly. His/her designee may oversee the air measurements during the day. The initial measurement for the day will be performed before the start of work and will establish the background level for that day. The final measurement for the day will be performed after the end of work. The action levels and required responses are listed in the following table:

Table 4 Work Zone Air Monitoring Action Levels

Instrument	Action Level	Response Action
PID	Less than 5 ppm in breathing zone	Level D or D-Modified
	Between 5 ppm and 50 ppm	Level C
	More than 50 ppm	Stop work. Resume work when readings are less than 50 ppm
Particulate Monitor (MIE 1000 Personal DataRam™ or equivalent)	Less than 0.150 mg/m ³ above background in breathing zone	Level D or D-Modified
	More than 0.150 mg/m ³ above background in breathing zone	Stop work. Resume work when readings are less than 0.150 mg/m ³ above background.
Notes: mg/m ³ = milligrams per cubic meter; ppm = parts per million		

7.0 ZONES, PROTECTION, AND COMMUNICATION

7.1 Site Control

Site zones are intended to control the potential spread of contamination and to assure that only authorized individuals are permitted into potentially hazardous areas. A three-zone approach will be utilized. It will include an Exclusion Zone (EZ), Contamination Reduction Zone (CRZ) and a Support Zone (SZ). Specific zones will be established on the work Site when operations begin for each task requiring such delineation (i.e., intrusive work beneath the Site cover or handling of contaminated materials). For larger scale subgrade work the work zones will be sketched out and maps delineating the various work zones will be available at the Site and used during initial Site-specific training.

This project is being conducted under the requirements of 29 CFR 1910.120, and any personnel working in an area where the potential for exposure to Site contaminants exists, will only be allowed access after proper training and medical documentation is provided to the Project Manager. These records will be maintained by the Project Manager and copies should be provided to the Project Manager prior to mobilization for project activities.

The following will be used for guidance in revising these preliminary zone designations, if necessary:

- Support Zone (SZ) - The SZ is an uncontaminated area that will be the field support area for most operations. The SZ provides for field team communications and staging for emergency response. Appropriate sanitary facilities and safety equipment will be located in this zone. Potentially contaminated personnel/materials are not allowed in

this zone. The only exception will be appropriately packaged/decontaminated and labeled samples.

- Contamination Reduction Zone (CRZ) - The CRZ is established between the EZ and the SZ. The CRZ contains the contamination reduction corridor and provides an area for decontamination of personnel and portable hand-held equipment, tools and heavy equipment. A personnel decontamination area will be prepared at each exclusion zone. The CRZ will be used for Exclusion Zone entry and egress in addition to access for heavy equipment and emergency support services.
- Exclusion Zone (EZ) - All activities that may involve exposure to Site contaminants, hazardous materials and/or conditions should be considered an exclusion zone. This zone will be clearly delineated by cones, tapes or other means. The Project Manager and/or Project Director may establish more than one EZ where different levels of protection may be employed or different hazards exist. The size of the EZ shall be determined by the Site Project Manager and/or Project Director allowing adequate space for the activity to be completed, field members and emergency equipment.

7.2 Contamination Control

7.2.1 Personnel Decontamination Station

Personnel hygiene, coupled with diligent decontamination, will significantly reduce the potential for exposure.

7.2.2 Minimization of Contact With Contaminants

During completion of all Site activities, personnel should attempt to minimize the degree of contact with contaminated materials. This involves a conscientious effort to keep "clean" during Site activities. All personnel should minimize kneeling, splash generation, and other physical contact with contamination. This may ultimately minimize the degree of decontamination required and the generation of waste materials from Site operations.

Field procedures will be developed to control over spray and runoff and to ensure that unprotected personnel working nearby are not affected.

7.2.3 Personnel Decontamination Sequence

Consideration will be given to prevailing wind directions so that the decontamination line, the support zone, and contamination reduction zone exit is upwind from the exclusion zone and the first station of the decontamination line. Decontamination will be performed by removing all PPE used in EZ and placing in drums/trash cans within the CRZ. Baby wipes will be available for washing hands and face after PPE removal. In addition, brushes will be available for removing mud/soil from boots.

7.2.4 Emergency Decontamination

If circumstances dictate that contaminated clothing cannot be readily removed, then remove gross contamination; wrap injured personnel with clean garments/blankets to avoid contaminating other personnel or transporting equipment.

If the injured person can be moved, he/she will be moved to the EZ boundary and decontaminated by Site personnel as described above before emergency responders handle the victim. If the person cannot be moved because of the extent of the injury (a back or neck injury) provisions shall be made to ensure that emergency response personnel will be able to respond to victim without being exposed to potentially hazardous atmospheric conditions. If the potential for inhalation hazards exist, such as with open excavation, this area will be covered with poly to eliminate any potential inhalation hazards. All emergency personnel are to be immediately informed of the injured person's condition, potential contaminants, and provided with all pertinent chemical data.

7.2.5 Heavy Equipment Decontamination

Decontamination of chemically contaminated heavy equipment will be accomplished using high-pressure steam or dry decontamination with brushes and shovels. Decontamination shall take place on a decontamination pad and all liquids used in the decontamination procedure will be collected. Vehicles or equipment brought into an exclusion zone will be treated as contaminated, and will be decontaminated prior to removal. All liquids used in the decontamination procedure will be collected, stored and disposed of in accordance with federal, state and local regulations. Personnel performing this task will wear the proper PPE as prescribed in Table 2.

7.3 Communications

The following communications equipment shall be specified as appropriate:

- Telephones - A cellular telephone will be located in the SZ for communication with emergency support services/facilities and the home office. Personnel in the EZ can carry cellular telephones for communication as well if Level D PPE has been determined to be appropriate.
- Hand Signals - Hand signals shall be used by field teams along with the buddy system. They shall be known by the entire field team before operations commence and their use covered during Site-specific training. Typical hand signals are described in Table 5:

Table 5 Hand Signals

Signal	Meaning
Hand gripping throat	Out of air, can't breathe
Grip on a partner's wrist or placement of both hands around a partner's waist	Leave area immediately, no debate
Hands on top of head	Need assistance
Thumbs up	Okay, I'm all right, I understand
Thumbs down	No, negative

8.0 MEDICAL SURVEILLANCE PROCEDURES

All personnel performing field work where potential exposure to contaminants exists at the Site are required to have passed a complete medical surveillance examination in accordance with 29 CFR 1910.120(f) and, where applicable, expanded health standards.

8.1 Medical Surveillance Requirements

A physician's medical release for work will be confirmed by the Project Manager before a worker can enter the exclusion zone. The medical release shall consider the type of work to be performed and the required PPE. The examination will be conducted annually at a minimum. Additional medical testing may be required by the Project Director in consultation with the Project Manager if an over-exposure or accident occurs, if an employee exhibits symptoms of exposure, or if other Site conditions warrant further medical surveillance.

9.0 DISPOSAL PROCEDURES

All discarded materials, waste materials or other objects shall be handled in such a way as to preclude the potential for spreading contamination, creating a sanitary hazard or causing litter to be left on-site. All potentially contaminated materials, e.g., clothing, gloves, etc., will be bagged or drummed as necessary, labeled and segregated for disposal. All non-contaminated materials shall be collected and bagged for appropriate disposal. The waste management procedures as specified in the applicable specifications and SMP for activities being performed, shall be complied with.

10.0 EMERGENCY RESPONSE / CONTINGENCY PLAN

This section establishes procedures and provides information for use during a project emergency. Emergencies happen unexpectedly and quickly, and require an immediate response; therefore, contingency planning and advanced training of staff are essential. Specific elements of emergency support procedures addressed in the following subsections include communications, local emergency support units, preparation for medical emergencies, first aid for injuries incurred on-site, record keeping, and emergency Site evacuation procedures.

10.1 Responsibilities

10.1.1 Project Environmental and Safety Manager (PROJECT DIRECTOR)

The Project Director oversees and approves the Emergency Response/Contingency Plan and performs audits to determine that the plan is in effect and that all pre-emergency requirements are met. The Project Director acts as a liaison to applicable regulatory agencies and notifies OSHA of reportable accidents.

10.1.2 Site Supervisor

The Site Supervisor is responsible for ensuring that all personnel are evacuated safely and that machinery and processes are shut down or stabilized in the event of a stop work order or evacuation. The Site Supervisor is required to immediately notify the PM and Project Director of any fatalities or catastrophes (three or more workers injured and hospitalized) so that the Project Director can notify OSHA within the required time frame. The Project Director will be notified of all OSHA recordable injuries, fires, spills, releases or equipment damage in excess of \$500 within 24 hours. The Site Supervisor also serves as the Alternate Emergency Coordinator.

10.1.3 Emergency Coordinator

In the event of an emergency, the Emergency Coordinator, shall make contact with Local Emergency Response personnel. In these contacts, the Emergency Coordinator will inform response personnel about the nature of work on the Site, the type of contaminants and associated health or safety effects, and the nature of the emergency, particularly if it is related to exposure to contaminants.

The Emergency Coordinator shall review this plan and verify emergency phone numbers and identify hospital routes prior to beginning work on-site. The Emergency Coordinator shall make necessary arrangements to be prepared for any emergencies that could occur.

The Emergency Coordinator shall implement the Emergency Response/Contingency Plan whenever conditions at the Site warrant such action.

10.1.4 Site Personnel

Site personnel are responsible for knowing the Emergency Response/Contingency Plan and the procedures contained herein. Personnel are expected to notify the Emergency Coordinator of situations that could constitute a Site emergency.

10.2 Communications

A variety of communication systems may be utilized during emergency situations. These are discussed in the following sections.

The primary form of communication during an emergency between field groups in the exclusion zone and the Emergency Coordinator will be verbal communications. During an emergency situation, the lines will be kept clear so that instructions can be received by all field teams.

10.2.1 Telephone Communications

A cellular telephone will be available on-site.

10.2.2 Hand Signals

Hand signals will be employed by downrange field teams where necessary for communication during emergency situations. Hand signals are found in Section 8.3.

10.3 Pre-Emergency Planning

Before the field activities begin, the local emergency response personnel may be notified by the Owner's Representative or Owner's contractor of the schedule for field activities and about the materials that are thought to exist on the Site so that they will be able to respond quickly and effectively in the event of a fire, explosion, or other emergency.

To be able to deal with any emergency that might occur during remedial activities at the Site, emergency telephone numbers will be readily available in the Site office or construction trailer. These telephone numbers are presented Section 11.16. The Emergency phone numbers listed are preliminary and will be updated as needed prior to the start of work. Immediately prior to mobilization the SM shall verify all numbers, and document any changes in the Site Logbook. Hospital route maps will also be readily available on-site.

10.4 Emergency Medical Treatment

The procedures and rules in this HASP are designed to prevent employee injury. However, should an injury occur, no matter how slight, it will be reported to the Project Manager immediately. First-aid equipment such as a first aid kit and disposable eye washes will be available on-site.

During the Site safety briefing, project personnel will be informed of the location of the first aid station(s) that have been set up. In the case of a medical emergency, the Project Manager will determine the nature of the emergency and he/she will have someone call for an ambulance, if needed. If the nature of the injury is not serious, i.e., the person can be moved without expert emergency medical personnel, he/she should be driven to a hospital by on-site personnel. Directions to the hospital with a hospital route map are provided in Section 11.15. Unless they are in immediate danger, severely injured persons will not be moved until paramedics can attend to them. Some injuries, such as severe cuts and lacerations or burns, may require immediate treatment. Any first aid instructions that can be obtained from doctors or paramedics, before an emergency-response squad arrives at the Site or before the injured person can be transported to the hospital, will be followed closely.

10.5 Emergency Site Evacuation Routes and Procedures

In the event of a Site Emergency that would require the evacuation of personnel, the Emergency Coordinator will immediately contact the Owner's Representative (this person may or may not be on-site). All project personnel will be instructed on proper emergency response procedures and locations of emergency telephone numbers during the initial Site

safety meeting. If an emergency occurs at the work area, including but not limited to fire, explosion or significant release of toxic gas into the atmosphere, immediate evacuation of all personnel is necessary due to an immediate or impending danger. The following evacuation procedures will be used:

- The Field Team Leader will initiate evacuation procedures by signaling to leave the Site or exclusion zone. The signal for Site evacuation will consist of three long blasts on an air horn.
- All heavy equipment will be shut down and all personnel will evacuate the work areas and assemble at a pre-determined meeting location. The designated meeting location for the Site will be at the sidewalk along the west side of West Street.
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately.
- The Field Team Leader will then give further instruction.

If any task covered under this HASP has the potential for significant hazards, evacuation drills will be performed as deemed necessary by the Project Manager and Project Director.

10.6 Fire Prevention and Protection

In the event of a fire or explosion, the work area will be evacuated immediately and the Emergency Coordinator will notify the local fire and police departments. No personnel will fight a fire beyond the stage where it can be put out with a portable extinguisher (incipient stage).

Fires will be prevented by adhering to the following precautions:

- Good housekeeping and storage of materials.
- Storage of flammable liquids and gases will be stored in flammable storage cabinets away from oxidizers when not in use.
- Oxygen will be stored at least 25 feet away from acetylene cylinders when not in use. Oxygen and acetylene may not be stored on welding carts.
- No smoking in the exclusion zone or any work area.
- No hot work without a properly executed hot work permit.
- Shutting off engines to refuel.
- Grounding and bonding metal containers during transfer of flammable liquids.
- Use of UL approved flammable storage cans.
- Fire extinguishers rated at least 10 pounds Class A, B, and C located on all heavy equipment, in all trailers and near all hot work activities.
- Monthly inspections of all fire extinguishers.

The contractor is responsible for the maintenance of fire prevention and/or control equipment and the control of fuel source hazards.

10.7 Overt Chemical Exposure

The following are standard procedures to treat chemical exposures. Other, specific procedures detailed on the Material Safety Data Sheet will be followed as necessary. If first aid or emergency medical treatment is necessary, the Emergency Coordinator will contact the appropriate emergency facilities. All chemical exposure incidents must be reported in writing to the Project Director. If a member of the field crew demonstrates symptoms of chemical exposure, another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the Site Personnel (via voice and hand signals) of the chemical exposure. The Project Manager and/or on-site personnel should contact the appropriate emergency response agency. The procedures outlined below should be followed:

Table 6 Chemical Exposure Treatment Procedures

EXPOSURE PATHWAY	TREATMENT PROCEDURE
SKIN AND EYE CONTACT	Use copious amounts of soap and water. Wash/rinse affected areas thoroughly, and then provide appropriate medical attention. Eyes should be rinsed for 15 minutes upon chemical contamination. Skin should also be rinsed for 15 minutes if contact with caustics, acids or hydrogen peroxide occurs.
INHALATION	Move to fresh air. Decontaminate and transport to hospital or local medical provider.
INGESTION	Decontaminate and transport to emergency medical facility.
PUNCTURE WOUND OR LACERATION	Decontaminate and transport to emergency medical facility.

10.8 Personal Injury

In case of personal injury at the Site, the following procedures should be followed:

- Another team member (buddy) should signal the Field Team Leader that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- If deemed necessary, the victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- The Field Team Leader or FSO is responsible for making certain that an Incident Report Form is completed. This form is to be submitted to the AKRF HSO. Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.
- A first-aid kit and an eye-wash will be kept on-site during the field activities.

10.9 Decontamination During Medical Emergencies

If emergency life-saving first aid and/or medical treatment are required, normal decontamination procedures may need to be abbreviated or postponed. The Project Manager or designee will accompany contaminated victims to the medical facility to advise on matters involving decontamination, when necessary. The outer garments can be

removed if they do not cause delays, interfere with treatment or aggravate the problem. Respiratory equipment must always be removed. Protective clothing can be cut away. If the outer contaminated garments cannot be safely removed on Site, a plastic barrier between the injured individual and clean surfaces should be used to help prevent contamination of the inside of ambulances and/or medical personnel. Outer garments may then be removed at the medical facility. No attempt will be made to wash or rinse the victim if his/her injuries are life threatening, unless it is known that the individual has been contaminated with an extremely toxic or corrosive material which could also cause severe injury or loss of life to emergency response personnel. For minor medical problems or injuries, the normal decontamination procedures will be followed.

10.10 Accident/Incident Reporting

Written confirmation of verbal reports of injuries or other emergencies are to be submitted to the Project Director within 24 hours. The accident/incident report form is provided as Appendix D.

In addition to the incident reporting procedures and actions described in the HASP, the Project Manager will coordinate with the Owner's Representative for reporting and notification for all environmental, safety, and other incidents.

If necessary, a Site safety briefing will be held to discuss accidents/incidents and any findings from the investigation of the incident. The HASP will be modified if deemed necessary by the Project Director.

10.11 Spill Control and Response

All small hazardous spills/environmental releases shall be contained as close to the source as possible. Whenever possible, the MSDS will be consulted to assist in determining the best means of containment and cleanup. For small spills, absorbent materials such as sand, sawdust or commercial sorbents should be placed directly on the substance to contain the spill and aid recovery. Any acid spills should be diluted or neutralized carefully prior to attempting recovery. Berms of earthen or sorbent materials can be used to contain the leading edge of the spills. Drains or drainage areas should be blocked. All spill containment materials will be properly disposed. An exclusion zone of 50-100 feet around the spill area should be established depending on the size and type of the spill.

The following steps should be taken by the Emergency Coordinator:

1. Determine the nature, identity and amounts of major spill components;
2. Make sure all unnecessary persons are removed from the spill area;
3. Notify appropriate response teams and authorities;
4. Use proper PPE in consultation with the SM;
5. If a flammable liquid, gas or vapor is involved, remove all ignition sources and use non-sparking and/or explosive proof equipment to contain or clean up the spill (diesel only vehicles, air operated pumps, etc.);
6. If possible, try to stop the leak with appropriate material;
7. Remove all surrounding materials that can react or compound with the spill; and

8. Notify the Owner and determine who will report the spill to the NYSDEC Hotline, as applicable.

10.12 Emergency Equipment

The following minimum emergency equipment shall be kept and maintained on-site:

- Industrial first aid kit
- Portable eye washes
- Fire extinguishers (one per vehicle and heavy equipment)
- Absorbent material

10.13 Postings

The following information shall be posted or be readily visible and available at conspicuous locations throughout the Site:

- Emergency telephone numbers
- Hospital Route Map

10.14 Restoration and Salvage

After an emergency, prompt restoration of utilities, fire protection equipment, medical supplies and other equipment will reduce the possibility of further losses. Some of the items that may need to be addressed are:

- Refilling fire extinguishers
- Refilling medical supplies
- Recharging eyewashes and/or showers
- Replenishing spill control supplies
- Replacing used air horns

10.15 Hospital Directions

The address and directions to the nearest hospital to the project Site are provided below:

Table 7 Hospital Directions

Hospital Name:	St. Barnabas Hospital
Phone Number:	718-960-6497
Address/Location:	4422 Third Avenue, Bronx, New York 10457
Directions:	1. Go SOUTHWEST on Bathgate Avenue towards East 176 th Street. 2. Turn LEFT onto Cross Bronx Expressway. 3. Turn LEFT onto Third Avenue.

	4. Emergency Department will be on the RIGHT between East 182 nd Street and East 183 rd Street.
--	---

A map showing the Site and driving route to the hospital is provided as Figure 1.

10.16 Emergency Contacts

Table 8 Emergency Contacts

Company	Individual Name	Title	Contact Number
AKRF	Michelle Lapin	Remedial Engineer	646-388-9520 (office)
	Marc Godick	Project Director	914-922-2356 (office)
	Deborah Shapiro	QA/QC Officer	646-388-9544 (office)
	Adrianna Bosco	Project Manager	646-388-9576 (office) 914-874-3358 (cell)
	Mark Candelario	Site Safety Officer (SSO)	646-233-9307 (cell)
	Tara Simmons	SSO Alternate	828-550-2612 (cell)
BCP Applicants	Emanuel Kokinakis	Applicant Representative	718-932-6342 (office)
Ambulance, Fire Department, & Police Department	-	-	911
NYSDEC Spill Hotline	-	-	800-457-7362

The emergency contact list will be updated as needed.

11.0 TRAINING

11.1 General Health and Safety Training

In accordance with 29 CFR 1910.120, hazardous waste Site workers shall, at the time of job assignment, have received a minimum of 40 hours of initial health and safety training for hazardous waste Site operations unless otherwise noted in the above reference. At a minimum, the training will have consisted of instruction in the topics outlined in the standard. Personnel who have not met the requirements for initial training shall not be allowed to work in any Site activities during which they may be exposed to hazards (chemical or physical). Proof of training shall be submitted to the Project Manager prior to the start of field activities. Other personnel involved in ancillary, or support activities, including transportation of material for disposal, shall have the proper training as required by federal, state, and local regulations.

11.2 Annual Eight-Hour Refresher Training

Annual eight-hour refresher training will be required of hazardous waste Site field personnel working in the work zone in order to maintain their qualifications for fieldwork. The training will cover a review of 29 CFR 1910.120 requirements and related company programs and procedures.

11.3 Supervisor Training

Personnel acting in a supervisory capacity shall have received 8 hours of instruction in addition to the initial 40 hours training.

11.4 Site-Specific Training

Prior to commencement of field activities, all field personnel assigned to the project will have completed training that will specifically address the activities, procedures, monitoring, and equipment used in the Site operations. The training will cover Site and facility layout, hazards and emergency services, and all provisions contained within this HASP. This training will also allow field workers to clarify anything they do not understand and to reinforce their responsibilities regarding safety and operations for their particular activity. The training should include the following topics:

- General requirements of this HASP;
- Review of the scope of work;
- Names of personnel responsible for Site safety and health;
- Potential hazards and acute effects of compounds present at the Site;
- Air monitoring procedures;
- Proper use of personal protective equipment;
- Safe use of engineering controls and equipment on the Site;
- Decontamination procedures; and
- Work practices by which the employee can minimize risk from hazards. This may include a specific review of heavy equipment safety, safety during inclement weather, changes in common escape rendezvous point, Site security measures, or other Site-specific issues that need to be addressed before work begins.

Personnel that have not received Site-specific training will not be allowed in the work zone.

11.5 On-Site Safety Briefings

Project personnel working in designated work zones on-site will be given health and safety briefings periodically to assist Site personnel in safely conducting their work activities. The briefings will include information on new operations to be conducted, changes in work practices or changes in the Site's environmental conditions, as well as periodic reinforcement of previously discussed topics. The briefings will also provide a forum to facilitate conformance with safety requirements and to identify performance deficiencies related to safety during daily activities or as a result of safety inspections. The meetings will also be an opportunity to periodically update the crews on monitoring results.

12.0 LOGS, REPORTS, AND RECORD KEEPING

The following is a summary of required health and safety logs, reports, and record keeping.

12.1 Medical and Training Records

Copies or verification of training (40 hour, 8 hour, supervisor, and Site-specific training) and medical clearance for hazardous waste Site work and respirator use will be maintained by the Project Manager.

12.2 On-Site Log

A log of personnel on-site each day will be kept by the Site Supervisor in a field logbook.

12.3 Exposure Records

The Project Manager will periodically notify the Project Director of exposure monitoring results that require workers to upgrade to Level C. All personal monitoring results, laboratory reports, calculations and air sampling data sheets will be maintained by the Project Manager during Site work conducted as part of the SMP.

12.4 Accident/Incident Reports

The incident reporting and investigation during Site work will be completed using an Incident Report Form, provided as Appendix D.

12.5 Hazard Communication Program/MSDS

MSDS will be obtained for applicable substances and included in the Site hazard communication file. The hazard communication program will be maintained on-Site in accordance with 29 CFR 1910.1200.

12.6 Work Permits

All work permits, including lockout/tagout, sidewalk permits, and debris container permits (if necessary) will be maintained in the project files. Copies of the work permits shall also be provided to the Project Manager and the Owner's Representative.

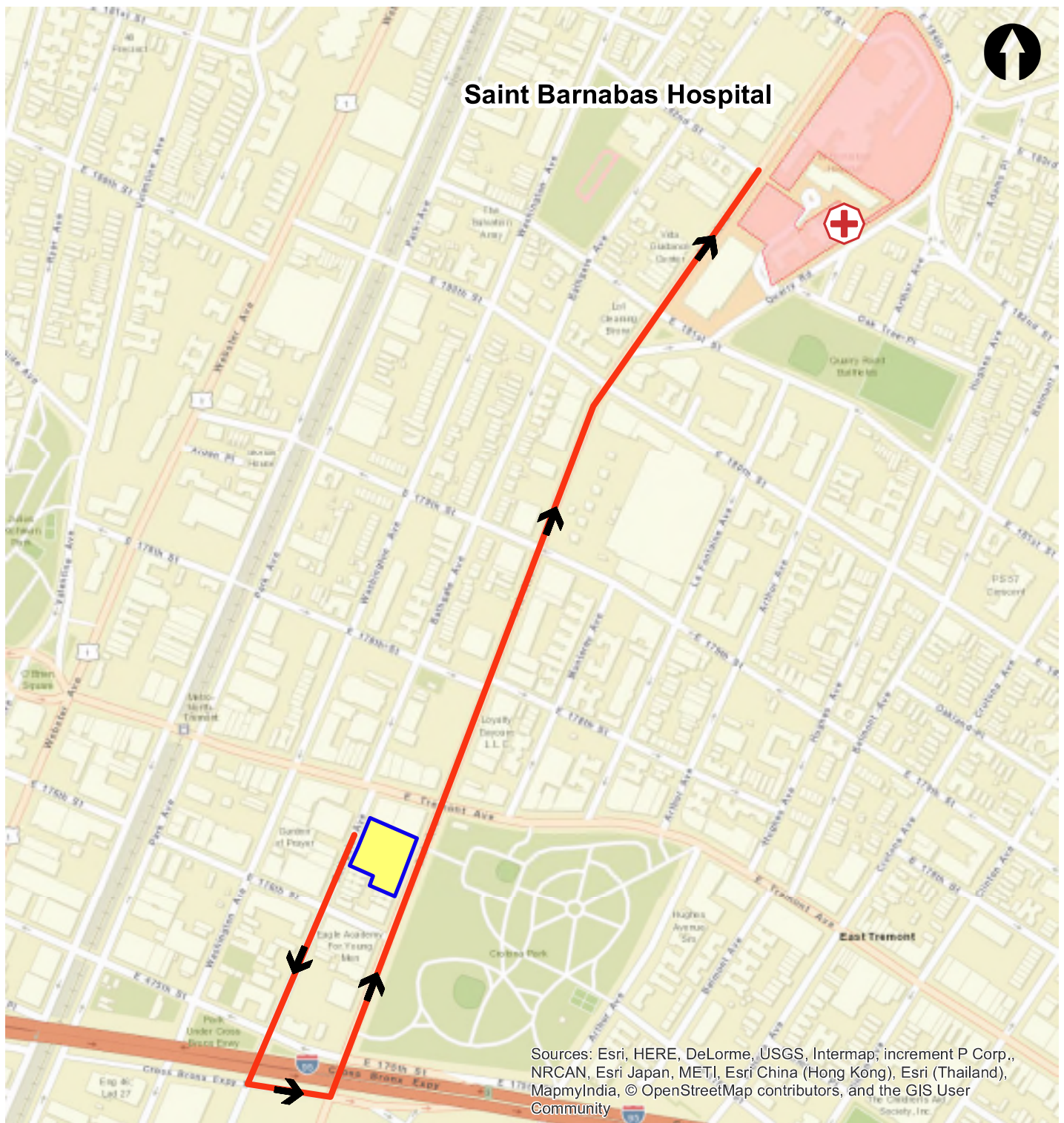
14.0 FIELD PERSONNEL REVIEW

This form serves as documentation that field personnel have read, or have been informed of, and understand the provisions of this HASP for 1888 Bathgate Avenue Redevelopment Site located at 4181 Third Avenue, Bronx, NY. It is maintained on-site as a project record. Each field team member shall sign this section after training in the contents of this HASP has been completed. Site workers must sign this form after Site-specific training is completed and before being permitted to work on-site.

I have read, or have been informed of, the Health and Safety Plan and understand the information presented. I have also completed Site-specific training for the work detailed in the project Specifications. I will comply with the provisions contained therein.

[illegible]

FIGURES



Legend

Route to Hospital

Project Site Location

Hospital Location

0 500 1,000
Feet

Saint Barnabas Hospital
4422 Third Avenue
Bronx, NY 10457
(718) 960-6497

1888 Bathgate Avenue Redevelopment Site
4181 Third Avenue
Bronx, New York



Environmental Consultants
440 Park Avenue South, New York, NY 10016

DATE
10/25/2016

PROJECT NO.
170058

FIGURE
1

HOSPITAL LOCATION MAP

APPENDIX A
ASTDR CHEMICAL FACT SHEETS

(/niosh/index.htm)

1,2,4-Trimethylbenzene

Synonyms & Trade Names

Asymmetrical trimethylbenzene, psi-Cumene, Hemimellitene [1,2,4-Trimethylbenzene], Pseudocumene
[Note: Hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]

CAS No.

95-63-6

RTECS No.

DC3325000

DOT ID & Guide

Formula

$C_6H_3(CH_3)_3$

Conversion

1 ppm = 4.92 mg/m³

IDLH

N.D.

See: IDLH INDEX

Exposure Limits**NIOSH REL**

TWA 25 ppm (125 mg/m³)

OSHA PEL

none See Appendix G ([nengapdxg.html](#))

Measurement Methods**OSHA PV2091**

See: NMAM or OSHA Methods

Physical Description

Clear, colorless liquid with a distinctive, aromatic odor.

Molecular Weight

120.2

Boiling Point

337°F

Freezing Point

-77°F

Solubility

0.006%

Vapor Pressure
(56°F): 1 mmHg

Ionization Potential
8.27 eV

Specific Gravity
0.88

Flash Point
112°F

Upper Explosive Limit
6.4%

Lower Explosive Limit
0.9%

Class II Flammable Liquid

Incompatibilities & Reactivities

Oxidizers, nitric acid

Exposure Routes

inhalation, ingestion, skin and/or eye contact

Symptoms

irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)

Target Organs

Eyes, skin, respiratory system, central nervous system, blood

Personal Protection/Sanitation

(See protection codes (protect.html))

Skin:Prevent skin contact

Eyes:Prevent eye contact

Wash skin:When contaminated

Remove:When wet or contaminated

Change:No recommendation

First Aid

(See procedures (firstaid.html))

Eye:Irrigate immediately

Skin:Soap wash

Breathing:Respiratory support

Swallow:Medical attention immediately

Respirator Recommendations

Not available.

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#).

See also

INTRODUCTION ICSC CARD: 1433

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(/niosh/index.htm)

1,3,5-Trimethylbenzene

Synonyms & Trade Names

Mesitylene, Symmetrical trimethylbenzene, sym-Trimethylbenzene

CAS No.

108-67-8

RTECS No.

OX6825000

DOT ID & Guide

2325 129

Formula

$C_6H_3(CH_3)_3$

Conversion

1 ppm = 4.92 mg/m³

IDLH

N.D.

See: IDLH INDEX

Exposure Limits**NIOSH REL**

TWA 25 ppm (125 mg/m³)

OSHA PEL

none See Appendix G ([nengapdxg.html](#))

Measurement Methods**OSHA PV2091**

See: NMAM or OSHA Methods

Physical Description

Clear, colorless liquid with a distinctive, aromatic odor.

Molecular Weight

120.2

Boiling Point

329°F

Freezing Point

-49°F

Solubility

0.002%

Vapor Pressure

2 mmHg

Ionization Potential

8.39 eV

Specific Gravity

0.86

Flash Point

122°F

Upper Explosive Limit

?

Lower Explosive Limit

?

Class II Flammable Liquid

Incompatibilities & Reactivities

Oxidizers, nitric acid

Exposure Routes

inhalation, ingestion, skin and/or eye contact

Symptoms

irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)

Target Organs

Eyes, skin, respiratory system, central nervous system, blood

Personal Protection/Sanitation

(See protection codes (protect.html))

Skin:Prevent skin contact

Eyes:Prevent eye contact

Wash skin:When contaminated

Remove:When wet or contaminated

Change:No recommendation

First Aid

(See procedures (firstaid.html))

Eye:Irrigate immediately

Skin:Soap wash

Breathing:Respiratory support

Swallow:Medical attention immediately

Respirator Recommendations

Not available.

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#).

See also

INTRODUCTION ICSC CARD: 1155

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(/niosh/index.htm)

Dieldrin

Synonyms & Trade Names

HEOD, 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,exo-5,8-dimethanonaphthalene

CAS No.

60-57-1

RTECS No.

IO1750000

DOT ID & Guide

2761 151

Formula

$C_{12}H_8Cl_6O$

Conversion

IDLH

Ca [50 mg/m³]

See: 60571

Exposure Limits**NIOSH REL**

Ca TWA 0.25 mg/m³ [skin] See Appendix A ([nengapdxa.html](#))

OSHA PEL

TWA 0.25 mg/m³ [skin]

Measurement Methods**NIOSH S283 (II-3)**

See: NMAM or OSHA Methods

Physical Description

Colorless to light-tan crystals with a mild, chemical odor. [insecticide]

Molecular Weight

380.9

Boiling Point

Decomposes

Melting Point

349°F

Solubility

0.02%

Vapor Pressure
(77°F): 8 x 10 ⁻⁷ mmHg
Ionization Potential
?
Specific Gravity
1.75
Flash Point
NA
Upper Explosive Limit
NA
Lower Explosive Limit
NA

Noncombustible Solid

Incompatibilities & Reactivities

Strong oxidizers, active metals such as sodium, strong acids, phenols

Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms

headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; ; In Animals: liver, kidney damage [potential occupational carcinogen]

Target Organs

central nervous system, liver, kidneys, skin

Cancer Site

[in animals: lung, liver, thyroid & adrenal gland tumors]

Personal Protection/Sanitation

(See protection codes (protect.html))

Skin:Prevent skin contact

Eyes:Prevent eye contact

Wash skin:When contaminated/Daily

Remove:When wet or contaminated

Change:Daily

Provide:Eyewash, Quick drench

First Aid

(See procedures (firstaid.html))

Eye:Irrigate immediately

Skin:Soap wash immediately

Breathing:Respiratory support

Swallow:Medical attention immediately

Respirator Recommendations

NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter.

[Click here \(pgintrod.html#nrp\)](#) for information on selection of N, R, or P filters.

Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection \(pgintrod.html#mustread\)](#).

See also

INTRODUCTION ICSC CARD: 0787 MEDICAL TESTS: 0077

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This fact sheet answers the most frequently asked health questions (FAQs) about 1,2-dichloroethene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to 1,2-dichloroethene occurs mainly in workplaces where it is made or used. Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired. *cis*-1,2-Dichloroethene has been found in at least 146 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA). *trans*-1,2-Dichloroethene was found in at least 563 NPL sites. 1,2-Dichloroethene was found at 336 sites, but the isomer (*cis*- or *trans*-) was not specified.

What is 1,2-dichloroethene?

(Pronounced 1,2-dī-klôr' ô-ěth'ēn)

1,2-Dichloroethene, also called 1,2-dichloroethylene, is a highly flammable, colorless liquid with a sharp, harsh odor. It is used to produce solvents and in chemical mixtures. You can smell very small amounts of 1,2-dichloroethene in air (about 17 parts of 1,2-dichloroethene per million parts of air [17 ppm]).

There are two forms of 1,2-dichloroethene; one is called *cis*-1,2-dichloroethene and the other is called *trans*-1,2-dichloroethene. Sometimes both forms are present as a mixture.

What happens to 1,2-dichloroethene when it enters the environment?

- ☐ 1,2-Dichloroethene evaporates rapidly into air.
- ☐ In the air, it takes about 5-12 days for half of it to break down.
- ☐ Most 1,2-dichloroethene in the soil surface or bodies of water will evaporate into air.
- ☐ 1,2-Dichloroethene can travel through soil or dissolve in water in the soil. It is possible that it can contaminate groundwater.
- ☐ In groundwater, it takes about 13-48 weeks to break down.

- ☐ There is a slight chance that 1,2-dichloroethene will break down into vinyl chloride, a different chemical which is believed to be more toxic than 1,2-dichloroethene.

How might I be exposed to 1,2-dichloroethene?

- ☐ Breathing 1,2-dichloroethene that has leaked from hazardous waste sites and landfills.
- ☐ Drinking contaminated tap water or breathing vapors from contaminated water while cooking, bathing, or washing dishes.
- ☐ Breathing 1,2-dichloroethene, touching it, or touching contaminated materials in the workplace.

How can 1,2-dichloroethene affect my health?

Breathing high levels of 1,2-dichloroethene can make you feel nauseous, drowsy, and tired; breathing very high levels can kill you.

When animals breathed high levels of *trans*-1,2-dichloroethene for short or longer periods of time, their livers and lungs were damaged and the effects were more severe with longer exposure times. Animals that breathed very high

ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

levels of *trans*-1,2-dichloroethene had damaged hearts.

Animals that ingested extremely high doses of *cis*- or *trans*-1,2-dichloroethene died.

Lower doses of *cis*-1,2-dichloroethene caused effects on the blood, such as decreased numbers of red blood cells, and also effects on the liver.

The long-term (365 days or longer) human health effects after exposure to low concentrations of 1,2-dichloroethene aren't known. One animal study suggested that an exposed fetus may not grow as quickly as one that hasn't been exposed.

Exposure to 1,2-dichloroethene hasn't been shown to affect fertility in people or animals.

How likely is 1,2-dichloroethene to cause cancer?

The EPA has determined that *cis*-1,2-dichloroethene is not classifiable as to its human carcinogenicity.

No EPA cancer classification is available for *trans*-1,2-dichloroethene.

Is there a medical test to show whether I've been exposed to 1,2-dichloroethene?

Tests are available to measure concentrations of the breakdown products of 1,2-dichloroethene in blood, urine, and tissues. However, these tests aren't used routinely to determine whether a person has been exposed to this compound. This is because after you are exposed to 1,2-dichloroethene, the breakdown products in your body that are detected with these tests may be the same as those that come from exposure to other chemicals. These tests aren't available in most doctors' offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum allowable level of *cis*-1,2-dichloroethene in drinking water at 0.07 milligrams per liter of water (0.07 mg/L) and *trans*-1,2-dichloroethene at 0.1 mg/L.

The EPA requires that any spills or accidental release of 1,000 pounds or more of 1,2-dichloroethene must be reported to the EPA.

The Occupational Health Safety and Health Administration (OSHA) has set the maximum allowable amount of 1,2-dichloroethene in workroom air during an 8-hour workday in a 40-hour workweek at 200 parts of 1,2-dichloroethene per million parts of air (200 ppm).

Glossary

Carcinogenicity: Ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Fertility: Ability to reproduce.

Ingest: To eat or drink something.

Milligram (mg): One thousandth of a gram.

ppm: Parts per million.

Solvent: A chemical that can dissolve other substances.

References

This ToxFAQs information is taken from the 1996 Toxicological Profile for 1,2-Dichloroethene produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about benzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Benzene is a widely used chemical formed from both natural processes and human activities. Breathing benzene can cause drowsiness, dizziness, and unconsciousness; long-term benzene exposure causes effects on the bone marrow and can cause anemia and leukemia. Benzene has been found in at least 813 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is benzene?

(Pronounced bĕn'zĕn')

Benzene is a colorless liquid with a sweet odor. It evaporates into the air very quickly and dissolves slightly in water. It is highly flammable and is formed from both natural processes and human activities.

Benzene is widely used in the United States; it ranks in the top 20 chemicals for production volume. Some industries use benzene to make other chemicals which are used to make plastics, resins, and nylon and synthetic fibers. Benzene is also used to make some types of rubbers, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes and forest fires. Benzene is also a natural part of crude oil, gasoline, and cigarette smoke.

What happens to benzene when it enters the environment?

- ☐ Industrial processes are the main source of benzene in the environment.
- ☐ Benzene can pass into the air from water and soil.
- ☐ It reacts with other chemicals in the air and breaks down within a few days.
- ☐ Benzene in the air can attach to rain or snow and be carried back down to the ground.

- ☐ It breaks down more slowly in water and soil, and can pass through the soil into underground water.
- ☐ Benzene does not build up in plants or animals.

How might I be exposed to benzene?

- ☐ Outdoor air contains low levels of benzene from tobacco smoke, automobile service stations, exhaust from motor vehicles, and industrial emissions.
- ☐ Indoor air generally contains higher levels of benzene from products that contain it such as glues, paints, furniture wax, and detergents.
- ☐ Air around hazardous waste sites or gas stations will contain higher levels of benzene.
- ☐ Leakage from underground storage tanks or from hazardous waste sites containing benzene can result in benzene contamination of well water.
- ☐ People working in industries that make or use benzene may be exposed to the highest levels of it.
- ☐ A major source of benzene exposures is tobacco smoke.

How can benzene affect my health?

Breathing very high levels of benzene can result in death, while high levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death.

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The major effect of benzene from long-term (365 days or longer) exposure is on the blood. Benzene causes harmful effects on the bone marrow and can cause a decrease in red blood cells leading to anemia. It can also cause excessive bleeding and can affect the immune system, increasing the chance for infection.

Some women who breathed high levels of benzene for many months had irregular menstrual periods and a decrease in the size of their ovaries. It is not known whether benzene exposure affects the developing fetus in pregnant women or fertility in men.

Animal studies have shown low birth weights, delayed bone formation, and bone marrow damage when pregnant animals breathed benzene.

How likely is benzene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that benzene is a known human carcinogen. Long-term exposure to high levels of benzene in the air can cause leukemia, cancer of the blood-forming organs.

Is there a medical test to show whether I've been exposed to benzene?

Several tests can show if you have been exposed to benzene. There is test for measuring benzene in the breath; this test must be done shortly after exposure. Benzene can also be measured in the blood, however, since benzene disappears rapidly from the blood, measurements are accurate only for recent exposures.

In the body, benzene is converted to products called metabolites. Certain metabolites can be measured in the urine. However, this test must be done shortly after exposure and is not a reliable indicator of how much benzene you have been exposed to, since the metabolites may be present in urine from other sources.

Has the federal government made recommendations to protect human health?

The EPA has set the maximum permissible level of benzene in drinking water at 0.005 milligrams per liter (0.005 mg/L). The EPA requires that spills or accidental releases into the environment of 10 pounds or more of benzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit of 1 part of benzene per million parts of air (1 ppm) in the workplace during an 8-hour workday, 40-hour workweek.

Glossary

Anemia: A decreased ability of the blood to transport oxygen.

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Chromosomes: Parts of the cells responsible for the development of hereditary characteristics.

Metabolites: Breakdown products of chemicals.

Milligram (mg): One thousandth of a gram.

Pesticide: A substance that kills pests.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Benzene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- ☐ Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- ☐ Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- ☐ Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- ☐ Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- ☐ Eating food containing chromium(III).

- ☐ Breathing contaminated workplace air or skin contact during use in the workplace.
- ☐ Drinking contaminated well water.
- ☐ Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

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Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive to chromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens. In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risks of exposure to chromium?

- ☐ Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- ☐ Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- ☐ Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to chromium in drinking water at concentrations of 1 mg/L for up to 10 days is not expected to cause any adverse effects in a child.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.0005 mg/m³ chromium(VI), 0.5 mg/m³ chromium(III), and 1.0 mg/m³ chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2008. Toxicological Profile for Chromium (Draft for Public Comment). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about DDT, DDE, and DDD. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to DDT, DDE, and DDD occurs mostly from eating foods containing small amounts of these compounds, particularly meat, fish and poultry. High levels of DDT can affect the nervous system causing excitability, tremors and seizures. In women, DDE can cause a reduction in the duration of lactation and an increased chance of having a premature baby. DDT, DDE, and DDD have been found in at least 441 of the 1,613 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are DDT, DDE, and DDD?

DDT (dichlorodiphenyltrichloroethane) is a pesticide once widely used to control insects in agriculture and insects that carry diseases such as malaria. DDT is a white, crystalline solid with no odor or taste. Its use in the U.S. was banned in 1972 because of damage to wildlife, but is still used in some countries.

DDE (dichlorodiphenyldichloroethylene) and DDD (dichlorodiphenyldichloroethane) are chemicals similar to DDT that contaminate commercial DDT preparations. DDE has no commercial use. DDD was also used to kill pests, but its use has also been banned. One form of DDD has been used medically to treat cancer of the adrenal gland.

What happens to DDT, DDE, and DDD when they enter the environment?

- ☐ DDT entered the environment when it was used as a pesticide; it still enters the environment due to current use in other countries.
- ☐ DDE enters the environment as contaminant or breakdown product of DDT; DDD also enters the environment as a breakdown product of DDT.
- ☐ DDT, DDE, and DDD in air are rapidly broken down by sunlight. Half of what's in air breaks down within 2 days.
- ☐ They stick strongly to soil; most DDT in soil is broken down slowly to DDE and DDD by microorganisms; half the DDT in soil will break down in 2-15 years, depending on the type of soil.

- ☐ Only a small amount will go through the soil into groundwater; they do not dissolve easily in water.
- ☐ DDT, and especially DDE, build up in plants and in fatty tissues of fish, birds, and other animals.

How might I be exposed to DDT, DDE, and DDD?

- ☐ Eating contaminated foods, such as root and leafy vegetables, fatty meat, fish, and poultry, but levels are very low.
- ☐ Eating contaminated imported foods from countries that still allow the use of DDT to control pests.
- ☐ Breathing contaminated air or drinking contaminated water near waste sites and landfills that may contain high levels of these chemicals.
- ☐ Infants fed on breast milk from mothers who have been exposed.
- ☐ Breathing or swallowing soil particles near waste sites or landfills that contain these chemicals.

How can DDT, DDE, and DDD affect my health?

DDT affects the nervous system. People who accidentally swallowed large amounts of DDT became excitable and had tremors and seizures. These effects went away after the exposure stopped. No effects were seen in people who took small daily doses of DDT by capsule for 18 months. A study in humans showed that women who had high amounts of a form of DDE in their breast milk were unable to

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breast feed their babies for as long as women who had little DDE in the breast milk. Another study in humans showed that women who had high amounts of DDE in breast milk had an increased chance of having premature babies. In animals, short-term exposure to large amounts of DDT in food affected the nervous system, while long-term exposure to smaller amounts affected the liver. Also in animals, short-term oral exposure to small amounts of DDT or its breakdown products may also have harmful effects on reproduction.

How likely are DDT, DDE, and DDD to cause cancer?

Studies in DDT-exposed workers did not show increases in cancer. Studies in animals given DDT with the food have shown that DDT can cause liver cancer. The Department of Health and Human Services (DHHS) determined that DDT may reasonably be anticipated to be a human carcinogen. The International Agency for Research on Cancer (IARC) determined that DDT may possibly cause cancer in humans. The EPA determined that DDT, DDE, and DDD are probable human carcinogens.

How can DDT, DDE, and DDD affect children?

There are no studies on the health effects of children exposed to DDT, DDE, or DDD. We can assume that children exposed to large amounts of DDT will have health effects similar to the effects seen in adults. However, we do not know whether children differ from adults in their susceptibility to these substances.

There is no evidence that DDT, DDE, or DDD cause birth defects in people. A study showed that teenage boys whose mothers had higher DDE amounts in the blood when they were pregnant were taller than those whose mothers had lower DDE levels. However, a different study found the opposite in preteen girls. The reason for the discrepancy between these studies is unknown.

Studies in rats have shown that DDT and DDE can mimic the action of natural hormones and in this way affect the development of the reproductive and nervous systems. Puberty was delayed in male rats given high amounts of DDE as juveniles. This could possibly happen in humans.

A study in mice showed that exposure to DDT during the first weeks of life may cause neurobehavioral problems later in life.

How can families reduce the risk of exposure to DDT, DDE, and DDD?

- ☐ Most families will be exposed to DDT by eating food or drinking liquids contaminated with small amounts of DDT.
- ☐ Cooking will reduce the amount of DDT in fish.
- ☐ Washing fruit and vegetables will remove most DDT from their surface.
- ☐ Follow health advisories that tell you about consumption of fish and wildlife caught in contaminated areas.

Is there a medical test to show whether I've been exposed to DDT, DDE, and DDD?

Laboratory tests can detect DDT, DDE, and DDD in fat, blood, urine, semen, and breast milk. These tests may show low, moderate, or excessive exposure to these compounds, but cannot tell the exact amount you were exposed to, or whether you will experience adverse effects. These tests are not routinely available at the doctor's office because they require special equipment.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) sets a limit of 1 milligram of DDT per cubic meter of air (1 mg/m³) in the workplace for an 8-hour shift, 40-hour workweek.

The Food and Drug Administration (FDA) has set limits for DDT, DDE, and DDD in foodstuff at or above which the agency will take legal action to remove the products from the market.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2002. Toxicological Profile for DDT/DDE/DDD (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about ethylbenzene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Ethylbenzene is a colorless liquid found in a number of products including gasoline and paints. Breathing very high levels can cause dizziness and throat and eye irritation. Ethylbenzene has been found in at least 731 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is ethylbenzene?

(Pronounced ěth/ əl běn/ zěn')

Ethylbenzene is a colorless, flammable liquid that smells like gasoline. It is found in natural products such as coal tar and petroleum and is also found in manufactured products such as inks, insecticides, and paints.

Ethylbenzene is used primarily to make another chemical, styrene. Other uses include as a solvent, in fuels, and to make other chemicals.

What happens to ethylbenzene when it enters the environment?

- ☐ Ethylbenzene moves easily into the air from water and soil.
- ☐ It takes about 3 days for ethylbenzene to be broken down in air into other chemicals.
- ☐ Ethylbenzene may be released to water from industrial discharges or leaking underground storage tanks.
- ☐ In surface water, ethylbenzene breaks down by reacting with other chemicals found naturally in water.
- ☐ In soil, it is broken down by soil bacteria.

How might I be exposed to ethylbenzene?

- ☐ Breathing air containing ethylbenzene, particularly in areas near factories or highways.
- ☐ Drinking contaminated tap water.
- ☐ Working in an industry where ethylbenzene is used or made.
- ☐ Using products containing it, such as gasoline, carpet glues, varnishes, and paints.

How can ethylbenzene affect my health?

Limited information is available on the effects of ethylbenzene on people's health. The available information shows dizziness, throat and eye irritation, tightening of the chest, and a burning sensation in the eyes of people exposed to high levels of ethylbenzene in air.

Animals studies have shown effects on the nervous system, liver, kidneys, and eyes from breathing ethylbenzene in air.

How likely is ethylbenzene to cause cancer?

The EPA has determined that ethylbenzene is not classifiable as to human carcinogenicity.

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No studies in people have shown that ethylbenzene exposure can result in cancer. Two available animal studies suggest that ethylbenzene may cause tumors.

How can ethylbenzene affect children?

Children may be exposed to ethylbenzene through inhalation of consumer products, including gasoline, paints, inks, pesticides, and carpet glue. We do not know whether children are more sensitive to the effects of ethylbenzene than adults.

It is not known whether ethylbenzene can affect the development of the human fetus. Animal studies have shown that when pregnant animals were exposed to ethylbenzene in air, their babies had an increased number of birth defects.

How can families reduce the risk of exposure to ethylbenzene?

Exposure to ethylbenzene vapors from household products and newly installed carpeting can be minimized by using adequate ventilation.

Household chemicals should be stored out of reach of children to prevent accidental poisoning. Always store household chemicals in their original containers; never store them in containers children would find attractive to eat or drink from, such as old soda bottles. Gasoline should be stored in a gasoline can with a locked cap.

Sometimes older children sniff household chemicals, including ethylbenzene, in an attempt to get high. Talk with your children about the dangers of sniffing chemicals.

Is there a medical test to show whether I've been exposed to ethylbenzene?

Ethylbenzene is found in the blood, urine, breath, and

some body tissues of exposed people. The most common way to test for ethylbenzene is in the urine. This test measures substances formed by the breakdown of ethylbenzene. This test needs to be done within a few hours after exposure occurs, because the substances leave the body very quickly.

These tests can show you were exposed to ethylbenzene, but cannot predict the kind of health effects that might occur.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level of 0.7 milligrams of ethylbenzene per liter of drinking water (0.7 mg/L).

The EPA requires that spills or accidental releases into the environment of 1,000 pounds or more of ethylbenzene be reported to the EPA.

The Occupational Safety and Health Administration (OSHA) has set an occupational exposure limit of 100 parts of ethylbenzene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for ethylbenzene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about lead. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to lead can happen from breathing workplace air or dust, eating contaminated foods, or drinking contaminated water. Children can be exposed from eating lead-based paint chips or playing in contaminated soil. Lead can damage the nervous system, kidneys, and reproductive system. Lead has been found in at least 1,272 of the 1,684 National Priority List sites identified by the Environmental Protection Agency (EPA).

What is lead?

Lead is a naturally occurring bluish-gray metal found in small amounts in the earth's crust. Lead can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, and manufacturing.

Lead has many different uses. It is used in the production of batteries, ammunition, metal products (solder and pipes), and devices to shield X-rays. Because of health concerns, lead from paints and ceramic products, caulking, and pipe solder has been dramatically reduced in recent years. The use of lead as an additive to gasoline was banned in 1996 in the United States.

What happens to lead when it enters the environment?

- ☐ Lead itself does not break down, but lead compounds are changed by sunlight, air, and water.
- ☐ When lead is released to the air, it may travel long distances before settling to the ground.
- ☐ Once lead falls onto soil, it usually sticks to soil particles.
- ☐ Movement of lead from soil into groundwater will depend on the type of lead compound and the characteristics of the soil.

How might I be exposed to lead?

- ☐ Eating food or drinking water that contains lead. Water pipes in some older homes may contain lead solder. Lead can leach out into the water.

- ☐ Spending time in areas where lead-based paints have been used and are deteriorating. Deteriorating lead paint can contribute to lead dust.

- ☐ Working in a job where lead is used or engaging in certain hobbies in which lead is used, such as making stained glass.

- ☐ Using health-care products or folk remedies that contain lead.

How can lead affect my health?

The effects of lead are the same whether it enters the body through breathing or swallowing. Lead can affect almost every organ and system in your body. The main target for lead toxicity is the nervous system, both in adults and children. Long-term exposure of adults can result in decreased performance in some tests that measure functions of the nervous system. It may also cause weakness in fingers, wrists, or ankles. Lead exposure also causes small increases in blood pressure, particularly in middle-aged and older people and can cause anemia. Exposure to high lead levels can severely damage the brain and kidneys in adults or children and ultimately cause death. In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can damage the organs responsible for sperm production.

How likely is lead to cause cancer?

We have no conclusive proof that lead causes cancer in humans. Kidney tumors have developed in rats and mice that had been given large doses of some kind of lead compounds. The Department of Health and Human Services

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(DHHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens and the EPA has determined that lead is a probable human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

How can lead affect children?

Small children can be exposed by eating lead-based paint chips, chewing on objects painted with lead-based paint, or swallowing house dust or soil that contains lead.

Children are more vulnerable to lead poisoning than adults. A child who swallows large amounts of lead may develop blood anemia, severe stomachache, muscle weakness, and brain damage. If a child swallows smaller amounts of lead, much less severe effects on blood and brain function may occur. Even at much lower levels of exposure, lead can affect a child's mental and physical growth.

Exposure to lead is more dangerous for young and unborn children. Unborn children can be exposed to lead through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. These effects are more common if the mother or baby was exposed to high levels of lead. Some of these effects may persist beyond childhood.

How can families reduce the risks of exposure to lead?

- ☐ Avoid exposure to sources of lead.
- ☐ Do not allow children to chew on mouth surfaces that may have been painted with lead-based paint.
- ☐ If you have a water lead problem, run or flush water that has been standing overnight before drinking or cooking with it.
- ☐ Some types of paints and pigments that are used as make-up or hair coloring contain lead. Keep these kinds of products away from children
- ☐ If your home contains lead-based paint or you live in an area contaminated with lead, wash children's hands and faces

often to remove lead dusts and soil, and regularly clean the house of dust and tracked in soil.

Is there a medical test to determine whether I've been exposed to lead?

A blood test is available to measure the amount of lead in your blood and to estimate the amount of your recent exposure to lead. Blood tests are commonly used to screen children for lead poisoning. Lead in teeth or bones can be measured by X-ray techniques, but these methods are not widely available. Exposure to lead also can be evaluated by measuring erythrocyte protoporphyrin (EP) in blood samples. EP is a part of red blood cells known to increase when the amount of lead in the blood is high. However, the EP level is not sensitive enough to identify children with elevated blood lead levels below about 25 micrograms per deciliter ($\mu\text{g}/\text{dL}$). These tests usually require special analytical equipment that is not available in a doctor's office. However, your doctor can draw blood samples and send them to appropriate laboratories for analysis.

Has the federal government made recommendations to protect human health?

The Centers for Disease Control and Prevention (CDC) recommends that states test children at ages 1 and 2 years. Children should be tested at ages 3–6 years if they have never been tested for lead, if they receive services from public assistance programs for the poor such as Medicaid or the Supplemental Food Program for Women, Infants, and Children, if they live in a building or frequently visit a house built before 1950; if they visit a home (house or apartment) built before 1978 that has been recently remodeled; and/or if they have a brother, sister, or playmate who has had lead poisoning. CDC considers a blood lead level of 10 $\mu\text{g}/\text{dL}$ to be a level of concern for children.

EPA limits lead in drinking water to 15 μg per liter.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for lead (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about mercury. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to mercury occurs from breathing contaminated air, ingesting contaminated water and food, and having dental and medical treatments. Mercury, at high levels, may damage the brain, kidneys, and developing fetus. This chemical has been found in at least 714 of 1,467 National Priorities List sites identified by the Environmental Protection Agency.

What is mercury?

(Pronounced mŭr'kyə-rē)

Mercury is a naturally occurring metal which has several forms. The metallic mercury is a shiny, silver-white, odorless liquid. If heated, it is a colorless, odorless gas.

Mercury combines with other elements, such as chlorine, sulfur, or oxygen, to form inorganic mercury compounds or "salts," which are usually white powders or crystals. Mercury also combines with carbon to make organic mercury compounds. The most common one, methylmercury, is produced mainly by microscopic organisms in the water and soil. More mercury in the environment can increase the amounts of methylmercury that these small organisms make.

Metallic mercury is used to produce chlorine gas and caustic soda, and is also used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used in skin lightening creams and as antiseptic creams and ointments.

What happens to mercury when it enters the environment?

- ☐ Inorganic mercury (metallic mercury and inorganic mercury compounds) enters the air from mining ore deposits, burning coal and waste, and from manufacturing plants.
- ☐ It enters the water or soil from natural deposits, disposal of wastes, and volcanic activity.

- ☐ Methylmercury may be formed in water and soil by small organisms called bacteria.
- ☐ Methylmercury builds up in the tissues of fish. Larger and older fish tend to have the highest levels of mercury.

How might I be exposed to mercury?

- ☐ Eating fish or shellfish contaminated with methylmercury.
- ☐ Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- ☐ Release of mercury from dental work and medical treatments.
- ☐ Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- ☐ Practicing rituals that include mercury.

How can mercury affect my health?

The nervous system is very sensitive to all forms of mercury. Methylmercury and metallic mercury vapors are more harmful than other forms, because more mercury in these forms reaches the brain. Exposure to high levels of metallic, inorganic, or organic mercury can permanently damage the brain, kidneys, and developing fetus. Effects on brain functioning may result in irritability, shyness, tremors, changes in vision or hearing, and memory problems.

Short-term exposure to high levels of metallic mercury vapors may cause effects including lung damage, nausea,

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vomiting, diarrhea, increases in blood pressure or heart rate, skin rashes, and eye irritation.

How likely is mercury to cause cancer?

There are inadequate human cancer data available for all forms of mercury. Mercuric chloride has caused increases in several types of tumors in rats and mice, and methylmercury has caused kidney tumors in male mice. The EPA has determined that mercuric chloride and methylmercury are possible human carcinogens.

How can mercury affect children?

Very young children are more sensitive to mercury than adults. Mercury in the mother's body passes to the fetus and may accumulate there. It can also can pass to a nursing infant through breast milk. However, the benefits of breast feeding may be greater than the possible adverse effects of mercury in breast milk.

Mercury's harmful effects that may be passed from the mother to the fetus include brain damage, mental retardation, incoordination, blindness, seizures, and inability to speak. Children poisoned by mercury may develop problems of their nervous and digestive systems, and kidney damage.

How can families reduce the risk of exposure to mercury?

Carefully handle and dispose of products that contain mercury, such as thermometers or fluorescent light bulbs. Do not vacuum up spilled mercury, because it will vaporize and increase exposure. If a large amount of mercury has been spilled, contact your health department. Teach children not to play with shiny, silver liquids.

Properly dispose of older medicines that contain mercury. Keep all mercury-containing medicines away from children.

Pregnant women and children should keep away from

rooms where liquid mercury has been used.

Learn about wildlife and fish advisories in your area from your public health or natural resources department.

Is there a medical test to show whether I've been exposed to mercury?

Tests are available to measure mercury levels in the body. Blood or urine samples are used to test for exposure to metallic mercury and to inorganic forms of mercury. Mercury in whole blood or in scalp hair is measured to determine exposure to methylmercury. Your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 2 parts of mercury per billion parts of drinking water (2 ppb).

The Food and Drug Administration (FDA) has set a maximum permissible level of 1 part of methylmercury in a million parts of seafood (1 ppm).

The Occupational Safety and Health Administration (OSHA) has set limits of 0.1 milligram of organic mercury per cubic meter of workplace air (0.1 mg/m^3) and 0.05 mg/m^3 of metallic mercury vapor for 8-hour shifts and 40-hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1999. Toxicological profile for mercury. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl'ī-sī'klīk ār'ə-măt'īk hī'drə-kar'bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- ☐ PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- ☐ PAHs can occur in air attached to dust particles.
- ☐ Some PAH particles can readily evaporate into the air from soil or surface waters.
- ☐ PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.

- ☐ PAHs enter water through discharges from industrial and wastewater treatment plants.
- ☐ Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- ☐ Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- ☐ In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- ☐ PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- ☐ Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smoke-houses; and municipal trash incineration facilities.
- ☐ Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- ☐ Coming in contact with air, water, or soil near hazardous waste sites.
- ☐ Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- ☐ Drinking contaminated water or cow's milk.

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- ❑ Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any

health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about trichloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Trichloroethylene is a colorless liquid which is used as a solvent for cleaning metal parts. Drinking or breathing high levels of trichloroethylene may cause nervous system effects, liver and lung damage, abnormal heartbeat, coma, and possibly death. Trichloroethylene has been found in at least 852 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is trichloroethylene?

Trichloroethylene (TCE) is a nonflammable, colorless liquid with a somewhat sweet odor and a sweet, burning taste. It is used mainly as a solvent to remove grease from metal parts, but it is also an ingredient in adhesives, paint removers, typewriter correction fluids, and spot removers.

Trichloroethylene is not thought to occur naturally in the environment. However, it has been found in underground water sources and many surface waters as a result of the manufacture, use, and disposal of the chemical.

What happens to trichloroethylene when it enters the environment?

- ❑ Trichloroethylene dissolves a little in water, but it can remain in ground water for a long time.
- ❑ Trichloroethylene quickly evaporates from surface water, so it is commonly found as a vapor in the air.
- ❑ Trichloroethylene evaporates less easily from the soil than from surface water. It may stick to particles and remain for a long time.
- ❑ Trichloroethylene may stick to particles in water, which will cause it to eventually settle to the bottom sediment.
- ❑ Trichloroethylene does not build up significantly in

plants and animals.

How might I be exposed to trichloroethylene?

- ❑ Breathing air in and around the home which has been contaminated with trichloroethylene vapors from shower water or household products such as spot removers and typewriter correction fluid.
- ❑ Drinking, swimming, or showering in water that has been contaminated with trichloroethylene.
- ❑ Contact with soil contaminated with trichloroethylene, such as near a hazardous waste site.
- ❑ Contact with the skin or breathing contaminated air while manufacturing trichloroethylene or using it at work to wash paint or grease from skin or equipment.

How can trichloroethylene affect my health?

Breathing small amounts may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating.

Breathing large amounts of trichloroethylene may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

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Drinking large amounts of trichloroethylene may cause nausea, liver damage, unconsciousness, impaired heart function, or death.

Drinking small amounts of trichloroethylene for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear.

Skin contact with trichloroethylene for short periods may cause skin rashes.

How likely is trichloroethylene to cause cancer?

Some studies with mice and rats have suggested that high levels of trichloroethylene may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of trichloroethylene in drinking water or in workplace air have found evidence of increased cancer. Although, there are some concerns about the studies of people who were exposed to trichloroethylene, some of the effects found in people were similar to effects in animals.

In its 9th Report on Carcinogens, the National Toxicology Program (NTP) determined that trichloroethylene is “reasonably anticipated to be a human carcinogen.” The International Agency for Research on Cancer (IARC) has determined that trichloroethylene is “probably carcinogenic to humans.”

Is there a medical test to show whether I’ve been exposed to trichloroethylene?

If you have recently been exposed to trichloroethylene, it can be detected in your breath, blood, or urine. The breath test, if it is performed soon after exposure, can tell if you have been exposed to even a small amount of trichloroethylene.

Exposure to larger amounts is assessed by blood

and urine tests, which can detect trichloroethylene and many of its breakdown products for up to a week after exposure. However, exposure to other similar chemicals can produce the same breakdown products, so their detection is not absolute proof of exposure to trichloroethylene. This test isn’t available at most doctors’ offices, but can be done at special laboratories that have the right equipment.

Has the federal government made recommendations to protect human health?

The EPA has set a maximum contaminant level for trichloroethylene in drinking water at 0.005 milligrams per liter (0.005 mg/L) or 5 parts of TCE per billion parts water.

The EPA has also developed regulations for the handling and disposal of trichloroethylene.

The Occupational Safety and Health Administration (OSHA) has set an exposure limit of 100 parts of trichloroethylene per million parts of air (100 ppm) for an 8-hour workday, 40-hour workweek.

Glossary

Carcinogenicity: The ability of a substance to cause cancer.

CAS: Chemical Abstracts Service.

Evaporate: To change into a vapor or gas.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

ppm: Parts per million.

Sediment: Mud and debris that have settled to the bottom of a body of water.

Solvent: A chemical that dissolves other substances.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Trichloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

This fact sheet answers the most frequently asked health questions (FAQs) about tetrachloroethylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Tetrachloroethylene is a manufactured chemical used for dry cleaning and metal degreasing. Exposure to very high concentrations of tetrachloroethylene can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Tetrachloroethylene has been found in at least 771 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is tetrachloroethylene?

(Pronounced tět'rə-klôr' ō-ěth'ə-lēn')

Tetrachloroethylene is a manufactured chemical that is widely used for dry cleaning of fabrics and for metal-degreasing. It is also used to make other chemicals and is used in some consumer products.

Other names for tetrachloroethylene include perchloroethylene, PCE, and tetrachloroethene. It is a nonflammable liquid at room temperature. It evaporates easily into the air and has a sharp, sweet odor. Most people can smell tetrachloroethylene when it is present in the air at a level of 1 part tetrachloroethylene per million parts of air (1 ppm) or more, although some can smell it at even lower levels.

What happens to tetrachloroethylene when it enters the environment?

- ☐ Much of the tetrachloroethylene that gets into water or soil evaporates into the air.
- ☐ Microorganisms can break down some of the tetrachloroethylene in soil or underground water.
- ☐ In the air, it is broken down by sunlight into other chemicals or brought back to the soil and water by rain.
- ☐ It does not appear to collect in fish or other animals that live in water.

How might I be exposed to tetrachloroethylene?

- ☐ When you bring clothes from the dry cleaners, they will release small amounts of tetrachloroethylene into the air.
- ☐ When you drink water containing tetrachloroethylene, you are exposed to it.

How can tetrachloroethylene affect my health?

High concentrations of tetrachloroethylene (particularly in closed, poorly ventilated areas) can cause dizziness, headache, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death.

Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations or have intentionally used tetrachloroethylene to get a "high."

In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of tetrachloroethylene are not known.

Results from some studies suggest that women who work in dry cleaning industries where exposures to tetrachloroethyl-

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ene can be quite high may have more menstrual problems and spontaneous abortions than women who are not exposed. However, it is not known if tetrachloroethylene was responsible for these problems because other possible causes were not considered.

Results of animal studies, conducted with amounts much higher than those that most people are exposed to, show that tetrachloroethylene can cause liver and kidney damage. Exposure to very high levels of tetrachloroethylene can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

How likely is tetrachloroethylene to cause cancer?

The Department of Health and Human Services (DHHS) has determined that tetrachloroethylene may reasonably be anticipated to be a carcinogen. Tetrachloroethylene has been shown to cause liver tumors in mice and kidney tumors in male rats.

Is there a medical test to show whether I've been exposed to tetrachloroethylene?

One way of testing for tetrachloroethylene exposure is to measure the amount of the chemical in the breath, much the same way breath-alcohol measurements are used to determine the amount of alcohol in the blood.

Because it is stored in the body's fat and slowly released into the bloodstream, tetrachloroethylene can be detected in the breath for weeks following a heavy exposure.

Tetrachloroethylene and trichloroacetic acid (TCA), a breakdown product of tetrachloroethylene, can be detected in the blood. These tests are relatively simple to perform. These tests aren't available at most doctors' offices, but can be per-

formed at special laboratories that have the right equipment.

Because exposure to other chemicals can produce the same breakdown products in the urine and blood, the tests for breakdown products cannot determine if you have been exposed to tetrachloroethylene or the other chemicals.

Has the federal government made recommendations to protect human health?

The EPA maximum contaminant level for the amount of tetrachloroethylene that can be in drinking water is 0.005 milligrams tetrachloroethylene per liter of water (0.005 mg/L).

The Occupational Safety and Health Administration (OSHA) has set a limit of 100 ppm for an 8-hour workday over a 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) recommends that tetrachloroethylene be handled as a potential carcinogen and recommends that levels in workplace air should be as low as possible.

Glossary

Carcinogen: A substance with the ability to cause cancer.

CAS: Chemical Abstracts Service.

Milligram (mg): One thousandth of a gram.

Nonflammable: Will not burn.

References

This ToxFAQs information is taken from the 1997 Toxicological Profile for Tetrachloroethylene (update) produced by the Agency for Toxic Substances and Disease Registry, Public Health Service, U.S. Department of Health and Human Services, Public Health Service in Atlanta, GA.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about toluene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to toluene occurs from breathing contaminated workplace air, in automobile exhaust, some consumer products paints, paint thinners, fingernail polish, lacquers, and adhesives. Toluene affects the nervous system. Toluene has been found at 959 of the 1,591 National Priority List sites identified by the Environmental Protection Agency

What is toluene?

Toluene is a clear, colorless liquid with a distinctive smell. Toluene occurs naturally in crude oil and in the tolu tree. It is also produced in the process of making gasoline and other fuels from crude oil and making coke from coal.

Toluene is used in making paints, paint thinners, fingernail polish, lacquers, adhesives, and rubber and in some printing and leather tanning processes.

What happens to toluene when it enters the environment?

☐ Toluene enters the environment when you use materials that contain it. It can also enter surface water and groundwater from spills of solvents and petroleum products as well as from leaking underground storage tanks at gasoline stations and other facilities.

☐ When toluene-containing products are placed in landfills or waste disposal sites, the toluene can enter the soil or water near the waste site.

☐ Toluene does not usually stay in the environment long.

☐ Toluene does not concentrate or buildup to high levels in animals.

How might I be exposed to toluene?

☐ Breathing contaminated workplace air or automobile exhaust.

☐ Working with gasoline, kerosene, heating oil, paints, and lacquers.

☐ Drinking contaminated well-water.

☐ Living near uncontrolled hazardous waste sites containing toluene products.

How can toluene affect my health?

Toluene may affect the nervous system. Low to moderate levels can cause tiredness, confusion, weakness, drunken-type actions, memory loss, nausea, loss of appetite, and

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hearing and color vision loss. These symptoms usually disappear when exposure is stopped.

Inhaling High levels of toluene in a short time can make you feel light-headed, dizzy, or sleepy. It can also cause unconsciousness, and even death.

High levels of toluene may affect your kidneys.

How likely is toluene to cause cancer?

Studies in humans and animals generally indicate that toluene does not cause cancer.

The EPA has determined that the carcinogenicity of toluene can not be classified.

How can toluene affect children?

It is likely that health effects seen in children exposed to toluene will be similar to the effects seen in adults. Some studies in animals suggest that babies may be more sensitive than adults.

Breathing very high levels of toluene during pregnancy can result in children with birth defects and retard mental abilities, and growth. We do not know if toluene harms the unborn child if the mother is exposed to low levels of toluene during pregnancy.

How can families reduce the risk of exposure to toluene?

- ☐ Use toluene-containing products in well-ventilated areas.

- ☐ When not in use, toluene-containing products should be tightly covered to prevent evaporation into the air.

Is there a medical test to show whether I've been exposed to toluene?

There are tests to measure the level of toluene or its breakdown products in exhaled air, urine, and blood. To determine if you have been exposed to toluene, your urine or blood must be checked within 12 hours of exposure. Several other chemicals are also changed into the same breakdown products as toluene, so some of these tests are not specific for toluene.

Has the federal government made recommendations to protect human health?

EPA has set a limit of 1 milligram per liter of drinking water (1 mg/L).

Discharges, releases, or spills of more than 1,000 pounds of toluene must be reported to the National Response Center.

The Occupational Safety and Health Administration has set a limit of 200 parts toluene per million of workplace air (200 ppm).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological Profile for Toluene. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs™ Internet address is <http://www.atsdr.cdc.gov/toxfaq.html>. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



This fact sheet answers the most frequently asked health questions (FAQs) about xylene. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

SUMMARY: Exposure to xylene occurs in the workplace and when you use paint, gasoline, paint thinners and other products that contain it. People who breathe high levels may have dizziness, confusion, and a change in their sense of balance. This substance has been found in at least 658 of the 1,430 National Priorities List sites identified by the Environmental Protection Agency (EPA).

What is xylene?

(Pronounced zī'lēn)

Xylene is a colorless, sweet-smelling liquid that catches on fire easily. It occurs naturally in petroleum and coal tar and is formed during forest fires. You can smell xylene in air at 0.08–3.7 parts of xylene per million parts of air (ppm) and begin to taste it in water at 0.53–1.8 ppm.

Chemical industries produce xylene from petroleum. It's one of the top 30 chemicals produced in the United States in terms of volume.

Xylene is used as a solvent and in the printing, rubber, and leather industries. It is also used as a cleaning agent, a thinner for paint, and in paints and varnishes. It is found in small amounts in airplane fuel and gasoline.

What happens to xylene when it enters the environment?

- ☐ Xylene has been found in waste sites and landfills when discarded as used solvent, or in varnish, paint, or paint thinners.
- ☐ It evaporates quickly from the soil and surface water into the air.

- ☐ In the air, it is broken down by sunlight into other less harmful chemicals.
- ☐ It is broken down by microorganisms in soil and water.
- ☐ Only a small amount of it builds up in fish, shellfish, plants, and animals living in xylene-contaminated water.

How might I be exposed to xylene?

- ☐ Breathing xylene in workplace air or in automobile exhaust.
- ☐ Breathing contaminated air.
- ☐ Touching gasoline, paint, paint removers, varnish, shellac, and rust preventatives that contain it.
- ☐ Breathing cigarette smoke that has small amounts of xylene in it.
- ☐ Drinking contaminated water or breathing air near waste sites and landfills that contain xylene.
- ☐ The amount of xylene in food is likely to be low.

How can xylene affect my health?

Xylene affects the brain. High levels from exposure for short periods (14 days or less) or long periods (more than 1 year) can cause headaches, lack of muscle coordination, dizziness, confusion, and changes in one's sense of balance. Exposure of

ToxFAQs Internet home page via WWW is <http://www.atsdr.cdc.gov/toxfaq.html>

people to high levels of xylene for short periods can also cause irritation of the skin, eyes, nose, and throat; difficulty in breathing; problems with the lungs; delayed reaction time; memory difficulties; stomach discomfort; and possibly changes in the liver and kidneys. It can cause unconsciousness and even death at very high levels.

Studies of unborn animals indicate that high concentrations of xylene may cause increased numbers of deaths, and delayed growth and development. In many instances, these same concentrations also cause damage to the mothers. We do not know if xylene harms the unborn child if the mother is exposed to low levels of xylene during pregnancy.

How likely is xylene to cause cancer?

The International Agency for Research on Cancer (IARC) has determined that xylene is not classifiable as to its carcinogenicity in humans.

Human and animal studies have not shown xylene to be carcinogenic, but these studies are not conclusive and do not provide enough information to conclude that xylene does not cause cancer.

Is there a medical test to show whether I've been exposed to xylene?

Laboratory tests can detect xylene or its breakdown products in exhaled air, blood, or urine. There is a high degree of agreement between the levels of exposure to xylene and the levels of xylene breakdown products in the urine. However, a urine sample must be provided very soon after exposure ends because xylene quickly leaves the body. These tests are not routinely available at your doctor's office.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 10 ppm of xylene in drinking water.

The EPA requires that spills or accidental releases of xylenes into the environment of 1,000 pounds or more must be reported.

The Occupational Safety and Health Administration (OSHA) has set a maximum level of 100 ppm xylene in workplace air for an 8-hour workday, 40-hour workweek.

The National Institute for Occupational Safety and Health (NIOSH) and the American Conference of Governmental Industrial Hygienists (ACGIH) also recommend exposure limits of 100 ppm in workplace air.

NIOSH has recommended that 900 ppm of xylene be considered immediately dangerous to life or health. This is the exposure level of a chemical that is likely to cause permanent health problems or death.

Glossary

Evaporate: To change from a liquid into a vapor or a gas.

Carcinogenic: Having the ability to cause cancer.

CAS: Chemical Abstracts Service.

ppm: Parts per million.

Solvent: A liquid that can dissolve other substances.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for xylenes (update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop E-29, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 404-498-0093. ToxFAQs Internet address via WWW is <http://www.atsdr.cdc.gov/toxfaq.html> ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.



APPENDIX B
COLD STRESS PROGRAM

1.0 PURPOSE & INTRODUCTION

The purpose of this document is to educate the employee about exposure to cold environments and the effects of hypothermia and other cold-related injuries. Through proper use of Personal Protective Equipment (PPE); engineering and administrative controls; and education, cold injury, both to the extremities and the body's core temperature, can be prevented.

2.0 SCOPE

This program is intended for use by employees engaged in work with the potential for exposure to cold environments. Training will be provided annually to all those potentially affected prior to the start of field work potentially involving cold exposure.

3.0 WORKING IN COLD ENVIRONMENTS

3.1 Metabolic Responses

The human body is designed to function best at a rectal temperature of 99-100 °F. The body maintains this temperature in two ways: by gaining heat from food and muscular work; or, by losing it through radiation and sweating. By constricting blood vessels of the skin and/or shivering, the body uses its first line of cold defense.

Temperature control of the body is better understood by dividing the body into two main parts: the shell; and the core. The shell is comprised of the skin, capillaries, nerves, muscles and fat. Other internal organs such as the heart, lungs, brain and kidneys make up the core.

During exposure to cold, the skin is first affected. Blood in the peripheral capillaries is cooled, sending a signal to a portion of the brain called the hypothalamus. Regulating body temperature is one of the many basic body functions of the hypothalamus. Acting like a thermostat, adjustments are performed in order to maintain normal body temperatures. When a chill signal is received, two processes are begun by the hypothalamus: conserve heat already in the body; and generate new heat.

Heat conservation is performed through constriction of the blood vessels in the skin (shell), thus reducing heat loss from the shell and acting as an insulator for the core. Sweat glands are also inhibited, thus preventing heat loss by evaporation.

Additional fuel for the body is provided in the form of glucose. Glucose causes the heart to beat faster, sending oxygen and glucose-rich blood to the tissue where needed. In an attempt to produce heat, the muscles rapidly contract. This process is better known as "shivering", and generates heat similarly to that created by strenuous activity, raising the body's metabolic rate.

During physical activity and fatigue, the body is more prone to heat loss. As exhaustion approaches, blood vessels can suddenly enlarge, resulting in rapid loss of heat. Exposure to extreme cold causes nerve pulses to be slowed, resulting in fumbling, sluggish and clumsy reactions.

4.0 COLD INJURIES

Cold injuries are classified into two categories: local; or, general. Local injuries include frostbite, frostnip, chilblain and trenchfoot. General injuries include hypothermia and blood vessel abnormalities (genetically or chemically induced). Factors contributing to cold injury include: exposure to humidity and high winds; contact with wetness or metal; inadequate clothing; age; and, general health. Allergies, vascular disease, excessive smoking and/or drinking, and certain drugs and medicines are physical conditions that can compound the effects of exposure to a cold environment.

4.1 Hypothermia

Hypothermia is a condition of reduced body temperature. Most cases develop in air temperatures between 30-50 °F, not taking wind-chill factor in consideration.

Symptoms of hypothermia are uncontrolled shivering and the sensation of cold. The heartbeat slows and sometimes becomes irregular, weakening the pulse and changing blood pressure. Changes in the body chemistry cause severe shaking or rigid muscles; vague or slow slurred speech; memory lapses; incoherence; and drowsiness. Cool skin, slow irregular breathing, low blood pressure, apparent exhaustion, and fatigue after rest can be seen before complete collapse.

As the core temperature drops, the victim can become listless, confused, and make little or no effort to keep warm. Pain in the extremities can be the first warning of dangerous exposure to cold. Severe shivering must be taken as a sign of danger. At a core body temperature of about 85°F, serious problems develop due to significant drops in blood pressure, pulse rate and respiration. In some cases, the victim may die.

Sedative drugs and alcohol increase the risk of hypothermia. Sedative drugs interfere with the transmission of impulses to the brain. Alcohol dilates blood vessels near the skin's surface, increasing heat loss and lowering body temperature.

Table I provides information on the onset of hypothermia and metabolic responses at different body temperatures.

4.2 Raynaud's Phenomenon

Raynaud's Phenomenon is the abnormal constriction of the blood vessels of the fingers on exposure to cold temperatures, resulting in blanching of the ends of the fingers. Numbness, itching, tingling or a burning sensation may occur during related attacks. The disease is also associated with the use of vibrating hand tools in a condition sometimes called White Finger Disease. Persistent cold sensitivity, ulceration and amputations can occur in severe cases.

4.3 Acrocyanosis

Acrocyanosis is caused by exposure to the cold and reduces the level of hemoglobin in the blood, resulting in a slightly blue, purple or gray coloring of the hands and/or feet.

4.4 Thromboangitis Obliterans

Thromboangitis obliterans is clotting of the arteries due to inflammation and fibrosis of connective tissue surrounding medium-sized arteries and veins. This is one of the many disabling diseases that can also result from tobacco use. Gangrene of the affected limb often requires amputation.

4.5 Frostbite

Frostbite is the freezing of the body tissues due to exposure to extremely low temperatures, resulting in damage to and loss of tissue. Frostbite occurs because of inadequate circulation and/or

insulation, resulting in freezing of fluids around the cells of the body tissues. Most vulnerable parts of the body are the nose, cheeks, ears, fingers and toes.

Frostbite can affect outer layers of skin or can include the tissues beneath. Damage can be serious, with permanent loss of movement in the affected parts, scarring, necrotic tissue, and amputation are all possibilities. Skin and nails that slough off can grow back.

The freezing point of the skin is about 30 °F. As wind velocity increases, heat loss is greater and frostbite will set in more rapidly.

There are three degrees of frostbite: first degree, freezing without blistering and peeling; second degree, freezing with blistering and peeling; and, third degree, freezing with death of skin tissues and possibly the deeper tissues.

The following are symptoms of frostbite:

1. Skin changes color to white or grayish-yellow, progresses to reddish-violet, and finally turns black as the tissue dies;
2. Pain may be felt at first, but subsides;
3. Blisters may appear; and
4. Affected part is cold and numb.

The first symptom of frostbite is usually an uncomfortable sensation of coldness followed by numbness. Tingling, stinging, cramping and aching feelings will be experienced by the victim. Frostbite of the outer layer of the skin has a waxy or whitish look and is firm to the touch. Cases of deep frostbite cause severe injury. The tissues are cold, pale and solid. The victim is often unaware of the frostbite until someone else observes these symptoms. It is therefore important to use the "buddy system" when working in cold environments, so that any symptoms of overexposure can be noted.

Table II describes the cooling power of wind on exposed flesh. This information can be used as a guide for determining equivalent chill temperatures when the wind is present in cold environments.

4.6 Trench Foot and Chilblains

Trench foot is swelling of the foot caused by long, continuous exposure to cold without freezing, combined with persistent dampness or immersion in water. Edema (swelling), tingling, itching and severe pain occurs, followed by blistering, necrotic tissue and ulcerations. Chilblains have similar symptoms as trench foot, except that other areas of the body are affected.

4.7 Frostnip

Frostnip occurs when the face or extremities are exposed to a cold wind, causing the skin to turn white.

5.0 PREVENTION OF COLD STRESS

Cold stress can be prevented through a combination of various factors: acclimation; water and salt displacement; medical screening; proper clothing selection; and training and education. Through the use of engineering controls, work practices, work/rest schedules, environmental monitoring and consideration of the wind-chill temperature, the employee can be protected.

5.1 Acclimation

Acclimation can be achieved to some degree. Sufficient exposure to cold causes the body to undergo changes to increase comfort and reduce the risk of injury. However, these changes are minor and require repeated exposure to cold and uncomfortable temperatures to induce them.

5.2 Dehydration

The dryness of cold air causes the body to lose a significant amount of water through the skin and lungs. It is essential that caffeine-free, non-alcoholic beverages be available at the worksite for fluid replacement. Dehydration also increases the risk of injury due to cold and affects blood flow to the extremities.

5.3 Diet

A well-balanced diet is important for employees working in cold environments. Diets restricted only to certain foods may not provide the necessary elements for the body to withstand cold stress, leaving the worker vulnerable.

5.4 Control Measures

When the windchill factor results in an equivalent temperature of -26 °F, continuous exposure of the skin will not be permitted. Any worker exposed to temperatures of 36 °F or less who becomes immersed in water will be given dry clothing immediately and treated for hypothermia at the local hospital if any symptoms of hyperthermia are present. Notification of this incident will be provided to the Health and Safety Division immediately after sending the worker to the hospital.

5.5 Engineering Controls

The following are some ways that environmental controls can be used to reduce the effects of a cold environment:

1. General or spot heating should be used to increase temperature in certain areas in the workplace;
2. Warm air jets, radiant heaters or contact warm plates can be used to warm the worker's hands if fine work is to be performed with bare hands for 10 to 20 minutes or more;
3. Shield the work area if air velocity at the work Site is increased by wind, draft or ventilating equipment;
4. Metal handles of tools and control bars should be covered with thermal insulating material at temperatures below 30 °F;
5. Unprotected metal chair seats will not be used in cold environments;
6. When appropriate and feasible, equipment and processes will be substituted, isolated, relocated, or redesigned;
7. Power tools, hoists, cranes or lifting aids will be used to reduce the metabolic workload;
8. Heated warming shelters will be made available for continuous work being performed in an equivalent temperature of 20 °F or below, workers will be encouraged to use the shelters regularly; and
9. Administrative work practice controls.

Work practices and guidelines can be designed and developed to reduce exposure to cold stress. Some of these may include:

1. Work-rest schedules to reduce the peak of cold stress;
2. Enforce scheduled breaks;
3. Enforce intake of caffeine-free, non-alcoholic beverages;

4. Schedule work that has potential exposure to cold stress for the warmest part of the day;
5. Move work to warmer areas, whenever possible;
6. Assign extra workers for high-demand tasks;
7. Provide relief workers for other workers needing breaks;
8. Teach basic principles of recognizing and preventing cold stress;
9. Use the buddy system for work at 10 °F or below, and keep within eyeshot;
10. Allow new employees to adjust to the conditions before they work full-time in cold environments;
11. Minimize sitting and standing in one place for long periods of time; and
12. Include weight and bulkiness of clothing when estimating work performance requirements and weights to be lifted;

Table III provides a work/warm-up schedule for cold environments, with wind chill taken into account.

5.6 Special Considerations

Older workers and workers with circulatory problems should be extra careful in cold environments. Sufficient sleep and good nutrition are important preventive measures for maintenance tolerance to the cold. Double shifts and overtime work should be avoided when working in cold environments.

If any of the following symptoms are observed on-site, the affected worker will immediately go to warm shelter:

- Onset of heavy shivering;
- Frostnip;
- Feeling of excessive fatigue;
- Drowsiness; and
- Euphoria.

After entering the warm shelter, the outer layer of clothing should be removed. If the clothing is wet from sweat and perspiration, dry clothing should be provided. If this is not feasible, then the clothing should be loosened to allow sweat to evaporate.

Anyone working in cold environments and on prescribed medication should consult their physician concerning any possible side effects due to cold stress. Those individuals suffering from diseases and/or taking medication that interferes with normal body temperature regulation or reduces the tolerance to cold will not be allowed to work in temperatures of 30 °F or below.

6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

In choosing PPE for cold environments, it is important to maintain airspace between the body and outer layer of clothing to retain body heat. The more air pockets, the better the insulation. The clothing should also allow for the evaporation of sweat if the skin is wet.

The most important parts of the body to protect are the feet, hands, head and face. Hands and feet become cooled most easily, because of their distance from the heart. Keeping the head covered is equally important. As much as 40% of body heat loss is through the head when it is exposed.

Ideal clothing for exposure to cold environments is made of wool, polypropylene, or other wicking fabrics. Loosely fitted clothing also aids in sweat evaporation. Recommended clothing may include the following:

1. Polypropylene under shirt and shorts under thermal underwear (preferably two-piece);
2. Wool socks;

3. Wool or thermal pants, lapped over boot tops to keep out snow and water;
4. Suspenders (belts can constrict and reduce circulation);
5. Insulated work boots, preferably waterproof. Safety toe, if necessary;
6. Wool or cotton shirt;
7. Parka;
8. Knit cap/hard hat liner;
9. Wool mittens or gloves (depending on the dexterity required); and
10. Face mask or scarf.

Dirty or greasy clothing loses much of its insulation value. Dirty clothing crushes air pockets, allowing air to escape more easily. Also, denim is not a good protective fabric. It is loosely woven and allows water to penetrate and wind to blow away body heat.

TABLE I
PROGRESSIVE CLINICAL PRESENTATION OF HYPOTHERMIA*

Core Temperature		Clinical Signs
Deg. C	Deg. F	
37.6	99.6	"Normal" Rectal Temperature
37	98.6	"Normal" Oral Temperature
36	96.8	Metabolic rate increases in an attempt to compensate for heat loss.
35	95.0	Maximum shivering.
34	93.2	Victim conscious and responsive, with normal blood pressure.
33	91.4	Severe hypothermia below this temperature.
32	89.6	Consciousness clouded, blood pressure becomes difficult to obtain, Pupils dilated but react to light, shivering ceases.
31	87.8	
30	86.0	Progressive loss of consciousness, muscular rigidity increases, Pulse and blood pressure difficult to obtain, respiratory rate decreases
29	84.2	
28	82.4	Ventricular fibrillation possible with myocardial irritability.
27	80.6	Voluntary motion ceases, pupils non-reactive to light, deep tendon And superficial reflexes absent.
26	78.8	
25	77.0	Ventricular fibrillation may occur spontaneously.
24	75.2	Pulmonary edema.
22	71.6	Maximum risk of ventricular fibrillation.
20	68.0	Cardiac standstill.
18	64.4	Lowest accidental hypothermia victim to recover.
17	62.6	Isoelectric electroencephalogram.

9	48.2	Lowest artificially cooled hypothermia patient to recover.
* Presentations approximately related to core temperature. Reprinted from the January 1982 issue of <u>American Family Physician</u> , published by the American Academy of Family Physicians.		

TABLE II
Cooling Power of Wind on Exposed Flesh as Equivalent Temperature
(Under calm conditions)*

Estimated Wind Speed (mph)	Actual Temperature Reading (Degrees Fahrenheit)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (°F)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-121
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	LITTLE DANGER In < hr with dry skin. Maximum danger of false sense of security.				INCREASING DANGER Danger from freezing of exposed flesh within one minute.				GREAT DANGER Flesh may freeze within 30 seconds.			

* Developed by the U.S. Army Research Institute of Environmental Medicine, Natick, MA

Note #1: Wind speeds greater than 40 mph have little additional effect.

Note #2: Trenchfoot and immersion foot may occur at any point on this chart

TABLE III
Threshold Limit Values Work/Warm-up Schedule for 4-Hour Shift (*)

Air Temp.-Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C (approx)	°F (approx)	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks	Max. Work Period	No. of Breaks
-26° to -28°	-15° to -19°	(Norm. Breaks) 1		(Norm.Breaks) 1		75 min.	2	55 min.	3	40 min.	4
-29° to -31°	-20° to -24°	(Norm. Breaks) 1		75 min	2	55 min.	3	40 min.	4	30 min.	5
-32° to -34°	-25° to -29°	75 min	2	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease	
-35° to -37°	-30° to -34°	55 min.	3	40 min.	4	30 min.	5	Non-emergency work should cease			
-38° to -39°	-35° to -39°	40 min.	4	30 min.	5	Non-emergency work should cease					
-40° to -42°	-40° to -44°	30 min.	5	Non-emergency work should cease							
-43° & below	-45° & below	Non-emergency work should cease									

Notes for TABLE III:

1. Schedule applies to moderate to heavy work activity with warm-up breaks of 10 minutes in a warm location. For light to moderate work (limited physical motion), apply the schedule one step lower. For example, at -30 °F with no noticeable wind (step 4, a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4 hour period.
 2. The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph, light flag moves; 10 mph, light flag fully extended; 15 mph, raises newspaper sheet; 20 mph, blowing drifting snow.
 3. If only the wind-chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be: 1) special warm-up breaks should be initiated at a wind-chill cooling rate of about 17 watts per square meter (W/m^2); 2) all non-emergency work should have ceased at or before a wind-chill of 2250 W/m^2 . In general the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart over-compensates for the actual temperatures in the colder ranges, since windy conditions prevail at extremely low temperatures.
 4. TLVs apply only for workers in dry clothing.
- * Adapted from Occupational Health and Safety Division, Saskatchewan Department of Labour.

APPENDIX C
HEAT STRESS PROGRAM

1.0 INTRODUCTION

Heat stress is one of the most common (and potentially serious) illnesses at job Sites. Although it is caused by a number of interacting factors, the wearing of PPE puts the worker at a much higher risk during warmer environmental conditions. The results of heat stress range from fatigue to serious illness or death. Through regular fluid replacement and other preventive measures, heat stress can be controlled, leading to increased efficiency and a higher level of safety on the job.

2.0 PURPOSE

To create an awareness among employees concerning the body's physiologic responses to heat; different types of heat stress that can affect the body; recognition of signs and symptoms; first aid treatment; and preventive measures.

3.0 SOURCES OF HEAT

There are two sources of heat that are important to anyone working in a hot environment:

- Internally generated metabolic heat; and
- Externally imposed environmental heat.

4.0 PHYSIOLOGIC RESPONSES TO HEAT

The human body maintains a fairly constant internal temperature, even though it is exposed to varying environmental temperatures. To keep internal body temperatures within safe limits, the body must get rid of its excess heat, primarily through varying the rate and amount of blood circulation through the skin and the release of fluid onto the skin by the sweat glands. These automatic responses usually occur when the temperature of the blood exceeds 98.6 °F and are kept in balance and controlled by the brain. In this process of lowering internal body temperature, the heart begins to pump more blood, blood vessels expand to accommodate the increased flow, and the microscopic blood vessels (capillaries) which thread through the upper layers of the skin begin to fill with blood. The blood circulates closer to the surface of the skin, and the excess heat is lost to the cooler environment.

If the heat loss from increased blood circulation through the skin is not adequate, the brain continues to sense overheating and signals the sweat glands in the skin to release large quantities of sweat onto the skin surface. Evaporation of sweat cools the skin, eliminating large quantities of heat from the body.

As environmental temperatures approach normal skin temperature, cooling of the body becomes more difficult. If air temperature is as warm as or warmer than the skin, blood brought to the body surface cannot lose its heat. Under these conditions, the heart continues to pump blood to the body surface, the sweat gland pour liquids containing electrolytes onto the surface of the skin, and the evaporation of the sweat becomes the principal effective means of maintaining a constant body temperature. Sweating does not cool the body unless the moisture is removed from the skin by evaporation. In high humidity, the evaporation of sweat from the skin is decreased and the body's efforts to maintain an acceptable body temperature may be significantly impaired. These conditions adversely affect an individual's ability to work in the hot environment. With so much blood going to the external surface of the body, relatively less goes to the active muscles, the brain, and other internal organs; strength declines; and fatigue occurs sooner than it would

otherwise. Alertness and mental capacity also may be affected. Workers who must perform delicate or detailed work may find their accuracy suffering, and others may find their comprehension and retention of information lowered.

When temperature differences exist between two or more bodies, heat can be transferred. Net heat transfer is always from the body (or object) of higher temperature to that of lower temperature and occurs by one or more of the following mechanisms:

- **Conduction.** The transfer of heat from one point to another within the body, or from one body to another when both bodies are in physical contact. Conduction can be a localized source of discomfort from direct physical contact with a hot or cold surface, it is normally not a significant factor to total heat stress.
- **Convection.** The transfer of heat from one place to another by moving gas or liquid. Natural convection results from differences in density caused by temperature differences. Thus warm air is less dense than cool air.
- **Radiation.** The process by which energy, electromagnetic (visible and infrared), is transmitted through space without the presence or movement of matter in or through this space.

5.0 PREDISPOSING FACTORS TO HEAT STRESS

Factors that may predispose an individual to heat stress vary according to the individual. These factors include:

- Lack of physical fitness;
- Lack of acclimatization;
- Age;
- Dehydration;
- Obesity;
- Drug/alcohol abuse;
- Infection;
- Sunburn;
- Diarrhea; and
- Chronic disease.

Predisposing factors and an increased risk of excessive heat stress are both directly influenced by the type and amount of PPE worn. PPE adds weight and bulk, reduces the body's access to normal heat exchange mechanisms (evaporation, convection and radiation) and increases energy expenditure.

6.0 FORMS OF HEAT STRESS AND FIRST AID

(The following excerpts were taken from NIOSH Publication No. 86-112, Working in Hot Environments):

"Excessive exposure to a hot work environment can bring about a variety of heat-induced disorders. Among the most common are heat stroke, heat exhaustion, heat cramps, fainting and heat rash.

6.1 Heat Stroke

Heat Stroke is the most serious of health problems associated with working in hot environments. It occurs when the body's temperature regulatory system fails and sweating becomes inadequate. The

body's only effective means of removing excess heat is compromised with little warning to the victim that a crisis stage has been reached.

A heat stroke victim's skin is hot, usually dry, red or spotted. Body temperature is usually 105 °F or higher, and the victim is mentally confused, delirious perhaps in convulsions, or unconscious. Unless the victim receives quick and appropriate treatment, death can occur.

Individuals with signs or symptoms of heat stroke require immediate hospitalization. First aid should be immediately administered. This includes removing the victim to a cool area, thoroughly soaking the clothing with water, and vigorously fanning the body to increase cooling. Further treatment, at a medical facility, should be directed to the continuation of the cooling process and the monitoring of complications that often accompany heat stroke. Early recognition and treatment are the only means of preventing permanent brain damage or death.

6.2 Heat Exhaustion

Heat Exhaustion includes several clinical disorders having symptoms that may resemble the early symptoms of heat stroke. Heat exhaustion is caused by the loss of large amounts of fluid by sweating, sometimes with excessive loss of salt. A worker suffering from heat exhaustion still sweats but experiences weakness or fatigue, giddiness, nausea or headache. In more serious cases, the victim may vomit or lose consciousness. The skin is clammy and moist, the complexion is pale or flushed, and the body temperature is normal or only slightly elevated.

In most cases, treatment involves having the victim rest in a cool place and drink plenty of liquids. Victims with mild cases of heat exhaustion usually recover spontaneously with this treatment. Those with severe cases may require extended care for several days. There are no known permanent effects.

6.3 Heat Cramps

Heat cramps are painful spasms of the muscles that occur among those who sweat profusely in heat, drink large quantities of water, but do not adequately replace the body's salt loss. The drinking of large amounts of water tends to dilute the body's fluids, while the body continues to lose salt. Shortly after, the low salt level in the muscles causes painful cramps. The affected muscles may be part of the arms, legs, or abdomen; but tired muscles (those used in performing the work) are usually the ones most susceptible to cramps. Cramps may occur during or after work hours and may be relieved by taking salted liquids by mouth.

6.4 Fainting

Fainting occurs in workers not accustomed to hot environments and who stand erect and immobile in the heat.

With enlarged blood vessels in the skin and in the lower part of the body due to the body's attempts to control internal temperature, blood may pool there rather than return to the heart to be pumped to the brain. Upon lying down, the worker should soon recover. By moving around, and thereby preventing blood from pooling, the patient can prevent further fainting.

6.5 Heat Rash (Prickly Heat)

Heat rash, also known as prickly heat, is likely to occur in hot, humid environments where sweat is not as easily removed from the surface of the skin by evaporation and the skin remains wet most of the time. The sweat ducts become plugged, and a skin rash soon appears. When the rash is

extensive or when it is complicated by infection, prickly heat can be very uncomfortable and may reduce a worker's performance. The worker can prevent this condition by resting in a cool place part of each day and by regularly bathing and drying the skin."

7.0 SELECTION OF PERSONAL PROTECTIVE EQUIPMENT (PPE)

During work periods where the increased risk of heat stress exists, each item's benefit will be carefully evaluated. Once the PPE is chosen, safe work durations/rest periods will be determined based on the following conditions:

- Anticipated work rate;
- Ambient temperature and humidity; and
- Level of protection.

8.0 PREVENTION OF HEAT STRESS

Prevention of heat stress will be addressed in the following manner:

- Adjustment of work schedules.
- Modify work/rest schedules.
 1. Enforce work slowdowns, as needed.
 2. Rotate personnel to minimize overstress or overexertion.
 3. When possible, work will be scheduled and performed during cooler hours.
- Provide shelter or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels.
 1. Drink approximately 12 to 16 ounces of non-caffeinated liquid (preferably water, Gatorade or equivalent) prior to the start of work. Caffeinated fluids act to dehydrate the worker.
 2. Workers will be urged to drink a cup or two every 15 to 20 minutes, or at each break. A total of 1 to 1.5 gallons of water per individual per day are recommended for fluid replacement under heat stress conditions, but more may be required.
- Encourage physical fitness among the workers.
- Gradually acclimatize workers on Site to help build up an "immunity" to the conditions.
 1. Heat acclimatization can usually be induced in 5 to 7 days of exposure at a hot job. For workers with previous experience with the job, acclimatization will include exposures of 50% for day 1, 60% for day 2, 80% for day 3, and 100% for the remaining additional days.
- Provide cooling devices during prolonged work or severe heat exposure.
 1. Supply field showers or hose down areas.
 2. Supply personnel with cooling jackets, vests, and suits.
- Train workers in recognition and treatment of heat stress.
- Use of the buddy system that depends on the recognition of signs and symptoms of heat stress.
- Identification of heat-intolerant individuals through medical screening.

APPENDIX D
INCIDENT REPORT FORM

SUPERVISOR'S REPORT OF ACCIDENT

Supervisor's Name: _____

Basic Rules for Accident Investigation

- Find the cause to prevent future accidents - Use an unbiased approach during investigation.
- Interview witnesses & injured employees at the scene - conduct a walkthrough of the accident.
- Conduct interviews in private - Interview one witness at a time.
- Get signed statements from all involved.
- Take photos or make a sketch of the accident scene.
- What hazards are present - what unsafe acts contributed to accident?
- Ensure hazardous conditions are corrected immediately.

Date & Time		Location	
Task Performed		Witnesses	
Resulted in	☐ Injury ☐ Fatality ☐ Property Damage	Property Damage	
Injured		Injured	
Describe Accident Facts & Events			

Supervisors Root Cause Analysis (Check ALL that apply to this accident)			
Unsafe Act		Unsafe Conditions	
Improper work technique	☐	Poor workstation design	☐
Safety rule violation	☐	Unsafe operation method	☐
Improper PPE or PPE not used	☐	Improper maintenance	☐
Operating without authority	☐	Lack of direct supervision	☐
Failure to warn or secure	☐	Insufficient training	☐
Operating at improper speeds	☐	Lack of experience	☐
By-passing Safety device	☐	Insufficient knowledge of job	☐

Protective equipment not in use		Slippery conditions	
Improper loading or placement		Excessive noise	
Improper lifting		Inadequate guarding of hazards	
Servicing Machinery in motion		Defective tools/equipment	
Horseplay		Poor housekeeping	
Drug or alcohol use		Insufficient lighting	
Unsafe Acts require a written warning and re-training before the Employee resumes work.			
Date		Date	
Retraining Assigned		Unsafe Condition Guarded	
Retraining Completed		Unsafe Condition Corrected	
Supervisor Signature		Supervisor Signature	

APPENDIX E
QUALITY ASSURANCE PROJECT PLAN

1888 BATHGATE AVENUE REDEVELOPMENT SITE

4181 THIRD AVENUE

BRONX, NEW YORK

Quality Assurance Project Plan

AKRF Project Number: 170058

BCP Site Number: C203088

Prepared for:

Wilfrid East Properties LLC, Wilfrid Realty Corp.,
Wilfrid East LIHTC LLC, Wilfrid Properties LLC,
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DECEMBER 2018

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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) describes the protocols and procedures that will be followed during implementation of all environmental sampling under the Site Management Plan (SMP). The Site is an approximately 0.83-acre parcel located at 4181 Third Avenue in the East Tremont neighborhood of the Bronx, New York. The Site formerly comprised Tax Block 2924, Lots 7, 10, 25, 30, and 34; however, the lots were merged into one lot, Lot 7. It is noted that the New York City Tax Map has been updated to reflect the tax lot apportionment.

The objective of this QAPP is to provide for Quality Assurance (QA) and maintain Quality Control (QC) of environmental investigative, sampling, and remedial activities conducted under the New York State Department of Environmental Conservation (NYSDEC) oversight in the Brownfield Cleanup Program (BCP) (BCP Site No. C203088). Adherence to the QAPP will ensure that defensible data will be obtained during all environmental work at the Site.

2.0 PROJECT TEAM

The project team will be drawn from AKRF professional and technical personnel, and AKRF's subcontractors. All field personnel and subcontractors will have completed a 40-hour training course and updated 8-hour refresher course that meet the Occupational Safety and Health Administration (OSHA) requirements of 29 CFR Part 1910. The following sections describe the key project personnel and their responsibilities.

2.1 PROJECT DIRECTOR, REMEDIAL ENGINEER, AND QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) OFFICER

The project director will be responsible for the general oversight of all aspects of the project, including scheduling, budgeting, data management, and field program decision-making. The project director will communicate regularly with all members of the AKRF project team and the NYSDEC to ensure a smooth flow of information between involved parties. Marc Godick, LEP will serve as the project director.

The Remedial Engineer for this project will be Michelle Lapin, P.E. The Remedial Engineer will have primary direct responsibility for implementation of the post-remedial program for the Site. The Remedial Engineer will be responsible for all appropriate communication with NYSDEC and NYSDOH.

Ms. Deborah Shapiro, QEP will serve as the QA/QC officer and will be responsible for adherence to the QAPP. The QA/QC officer will review the procedures with all personnel prior to commencing any fieldwork. The QA/QC officer will also be responsible for reviewing Data Usability Summary Reports (DUSRs) for groundwater analytical results, as described in Section 4.7 of this QAPP. Ms. Lapin's, Mr. Godick's, and Ms. Shapiro's resumes are included in Attachment A.

2.2 PROJECT MANAGER

The project manager will be responsible for directing and coordinating all elements of the SMP. The project manager will prepare reports and participate in meetings with the Site owner/Participant, and/or the NYSDEC. Adrianna Bosco will serve as the project manager for the SMP. Ms. Bosco's resume is included in Attachment A.

2.3 FIELD TEAM LEADER, FIELD TECHNICIAN, AND SITE SAFETY OFFICER, AND ALTERNATES

The field team leader will be responsible for supervising the daily sampling and health and safety activities in the field and will ensure adherence to the work plan and Health and Safety Plan (HASP), included in Appendix D of the SMP. The field team leader will also act as the field technician and Site safety officer (SSO), and will report to the project manager or project manager alternate on a regular basis regarding daily progress and any deviations from the SMP. The field team leader will be a qualified and responsible person able to act professionally and promptly during environmental work at the Site. Mark Candelario will be the field team leader. Field team leader alternate includes Tara Simmons of AKRF. Mr. Candelario's resume is included in Attachment A.

2.4 LABORATORY QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) OFFICER

The laboratory QA/QC officer will be Nick Straccione of SGS North America (SGS), the New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP)-certified laboratory being employed for all environmental sampling at the Site. The laboratory QA/QC officer will be responsible for quality control procedures and checks in the laboratory and ensuring adherence to laboratory protocols. He will track the movement of samples from the time they are checked in at the laboratory to the time that analytical results are issued. He will also conduct a final check on the analytical calculations and sign off on the laboratory reports.

3.0 STANDARD OPERATING PROCEDURES (SOPS)

The following sections describe the SOPs for the post-remedial activities conducted under the SMP. During these operations, safety monitoring will be performed as described in the HASP, included as Appendix D of the SMP.

3.1 DECONTAMINATION OF SAMPLING EQUIPMENT

All sampling equipment (pumps, oil/water level indicators, etc.) will be either dedicated or decontaminated between sampling locations. Decontamination will be conducted on plastic sheeting (or equivalent) that is bermed to prevent discharge to the ground. The decontamination procedure will be as follows:

1. Scrub using tap water/Simple Green® (or Alconox®) mixture and bristle brush.
2. Rinse with tap water.
3. Scrub again with tap water/Simple Green® (or Alconox®) mixture and bristle brush.
4. Rinse with tap water.
5. Rinse with distilled water.
6. Air-dry the equipment, if possible.

3.2 MANAGEMENT OF INVESTIGATION DERIVED WASTE (IDW)

IDW will be containerized in New York State Department of Transportation (NYSDOT)-approved 55-gallon drums. The drums will be sealed at the end of each work day and labeled with the date, monitoring well location, the type of waste (i.e., purged groundwater), and the name and phone number of an AKRF point-of-contact. All IDW exhibiting field evidence of contamination will be disposed of or treated according to applicable local, state, and federal regulations.

4.0 SAMPLING AND LABORATORY PROCEDURES

4.1 SOIL SAMPLING

At this time, it is unknown whether any soil sampling will be required under the SMP; however, in the event that any subsurface activities require the collection of soil samples for laboratory analysis, the following procedures will be implemented:

- Soil samples may be collected from a Geoprobe® direct-push probe (DPP) drill rig, hand auger, excavator, or stockpile, depending on the scope of work and construction activities.
- Characterize the sample according to the modified Burmister soil classification system.
- Field screen the sample for evidence of contamination (e.g., odors, staining,) using visual and olfactory methods and screen for volatile organic compounds (VOCs) using a photoionization detector (PID) equipped with a 10.6 electron Volt (eV) lamp.
- Collect an aliquot of soil from each proposed sample location, place in laboratory-supplied glassware, label the sample in accordance with Section 4.5 of this QAPP, and place in an ice-filled cooler for shipment to the laboratory.
- Complete the proper chain-of-custody paperwork and seal the cooler.
- Record sample location, sample depth, and sample observations (evidence of contamination, PID readings, soil classification, etc.) in field log book and boring log data sheet, if applicable.
- Decontaminate any soil sampling equipment between sample locations as described in Section 3.1 of this QAPP.

4.2 GROUNDWATER SAMPLING

Under the SMP, groundwater will be monitored by four permanent monitoring wells (MW-10 through MW-13). Groundwater samples will be collected at least one week following well development. Low flow sampling techniques will be used, as described in U.S. EPA's Groundwater Sampling Guidelines for Superfund and RCRA Project Managers (EPA 542-S-02-001, May 2002). Sampling will be conducted according to the following procedure:

- Prepare the sampling area by placing plastic sheeting over the well. Cut a hole in the sheeting to provide access to the well cover.
- Slowly remove the locking cap and immediately measure the vapor concentrations in the well with a PID equipped with a 10.6 eV lamp, calibrated to the manufacturer's specifications.
- Measure the depth to water and total well depth, and check for the presence of non-aqueous phase liquid (NAPL) using an oil/water interface probe. Measure the thickness of NAPL, if any, and record in field book and well log. Collect a sample of NAPL using a disposable plastic weighted bailer or similar collection device. Groundwater samples will not be collected from wells containing measurable NAPL.
- Use the water level and total well depth measurements to calculate the length of the mid-point of the water column within the screened interval. For example, for a well where the total depth is 20 feet, screened interval is 10 to 20 feet, and depth to water is 14 feet, the mid-point of the water column within the screened interval would be 17 feet.
- For a 2-inch well, connect dedicated tubing to either a submersible or bladder pump and lower the pump such that the intake of the pump is set at the mid-point of the water column within

the screened interval of the well. Connect the discharge end of the tubing to the flow-through cell of a Horiba Quanta multi-parameter (or equivalent) meter. Connect tubing to the output of the cell and place the discharge end of the tubing in a five-gallon bucket.

- Activate the pump at the lowest flow rate setting of the pump.
- Measure the depth to water within the well. The pump flow rate may be increased such that the water level measurements do not change by more than 0.3 foot as compared to the initial static reading. The well-purging rate should be adjusted so as to produce a smooth, constant (laminar) flow rate and so as not to produce excessive turbulence in the well. The expected targeted purge rate will be approximately 0.5 liter and will be no greater than 3.8 liters/minute.
- Transfer discharged water from the 5-gallon buckets to 55-gallon drums designated for well-purge water.
- During purging, collect periodic samples and analyze for water quality indicators (e.g., turbidity, pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity) with measurements collected approximately every five minutes.
- Continue purging the well until turbidity is less than 50 NTU and water quality indicators have stabilized to the extent practicable. The criteria for stabilization will be three successive readings for the following parameters and criteria:

Table 1
Stabilization Criteria

Parameter	Stabilization Criteria
PH	+/- 0.1 pH units
Specific Conductance	+/- 3% mS/cm
ORP/Eh	+/- 10mV
Turbidity	<50 NTU
Dissolved Oxygen	+/- 0.3 mg/l

Notes: mS/cm = millisievert per centimeter
mV = millivolt
NTU = nephthalometric turbidity unit
mg/l = milligram per liter

- If the water quality parameters do not stabilize and/or turbidity is greater than 50 NTU within two hours, purging may be discontinued. Efforts to stabilize the water quality for the well must be recorded in the field book, and samples may then be collected as described herein.
- After purging, disconnect the tubing to the inlet of the flow-through cell. Collect groundwater samples directly from the discharge end of the tubing and place into the required sample containers as described in Section 4.3 of this QAPP. Label the containers as described in Section 4.5 of this QAPP and place in an ice-filled cooler for shipment to the laboratory.
- Collect one final field sample and analyze for turbidity and water quality parameters (pH, temperature, dissolved oxygen, reduction-oxidation potential, and specific conductivity).
- Once sampling is complete, remove the pump and tubing from the well. Disconnect the tubing and place it back in the well for reuse during the next sampling event. Dispose of the sample filter in a 55-gallon drum designated for disposable sampling materials and PPE. The purge water will be managed as described in Section 3.2 of this QAPP.
- Decontaminate the pump, oil/water interface probe, and flow-through cell, as described in Section 3.1 of this QAPP.

- Record all measurements (depth to water, depth to NAPL, water quality parameters, turbidity), calculations (well volume), and observations in the project logbook and field data sheet, if applicable.

4.3 LABORATORY METHODS

Table 2 summarizes the laboratory methods that will be used to analyze field samples and the sample container type, preservation, and applicable holding times. SGS Accutest of Dayton, New Jersey, a NYSDOH ELAP-certified laboratory subcontracted to AKRF, will be used for all chemical analyses in accordance with the Division of Environmental Remediation (DER)-10 2.1(b) and 2.1(f) with Category B Deliverables. The number and frequency of soil samples may vary and will depend on the purpose of the sampling event.

Table 2
Laboratory Analytical Methods for Analysis Groups

Matrix	Analysis	EPA Method	Bottle Type	Preservative	Hold Time	QA/QC Samples*
Soil	TCL Volatile Organic Compounds (VOCs)	8260C	EnCore samplers (3) and 2 oz. plastic jar	$\leq 6^{\circ}\text{C}$	48 hours	Trip Blank
	TCL Semivolatile Organic Compounds (SVOCs)	8270D	4 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	14 days	MS/MSD, Blind Duplicate, Field Blank
	TAL Metals, RCRA 8 Metals, and Hexavalent Chromium	6020A, 6010C, 6010D, 7471B, and 7196A	4 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	Mercury – 28 days; Hexavalent Chromium – 30 days; TAL Metals – 180 days	MS/MSD, Blind Duplicate, Field Blank
	Polychlorinated Biphenyls (PCBs)	8082A	4 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	14 days	MS/MSD, Blind Duplicate, Field Blank
	Pesticides	8081B	4 oz. Glass Jar	$\leq 6^{\circ}\text{C}$	14 days	MS/MSD, Blind Duplicate, Field Blank
Post-Remedial Groundwater Sampling	CVOCs	8260C	3, 40 mL Glass Vials	HCl, pH < 2 and $\leq 6^{\circ}\text{C}$	14 days	Trip Blank, MS/MSD, Blind Duplicate, Field Blank

Notes:

EPA - Environmental Protection Agency

RCRA – Resource Conservation and Recovery Act

TAL – Target Analyte List

TCL – Target Compound List

*QA/QC samples will be collected at a rate of every 20 field samples collected or per sample digestion group, per matrix.

4.4 QUALITY CONTROL (QC) SAMPLING

In addition to the laboratory analysis of the groundwater samples, additional analysis will be included for QC measures, as required by the Category B sampling techniques. These samples will include field blank, trip blank, matrix spike/matrix spike duplicate (MS/MSD), and blind duplicate samples at a frequency of one sample per 20 field samples collected or per sample digestion group

(SDG), per matrix. QC samples will be analyzed for the same parameters as the accompanying samples, with the exception of any trip blanks, which will be analyzed for the VOC list only.

4.5 SAMPLE HANDLING

4.5.1 Sample Identification

All samples will be consistently identified in all field documentation, chain-of-custody (COC) documents, and laboratory reports. All samples will be given a unique name and the collection date at the end of the sample name in a year, month, day (YYYYMMDD) format. Blind duplicate sample nomenclature will consist of the sample type, followed by an “X”; MS/MSD samples nomenclature will consist of the parent sample name, followed by “MS/MSD”; and trip and field blanks will consist of “TB-” and “FB-”, respectively, followed by a sequential number of the trip/field blanks collected within the sample digestion group (SDG). Special characters, including primes/apostrophes (’), will not be used for sample nomenclature.

In addition to the nomenclature detailed above, groundwater samples collected during the quarterly sampling events will be identified with “MW-” for groundwater monitoring wells, and the groundwater monitoring well number. Table 3 provides examples of the sampling identification scheme for samples collected during the post-remedial groundwater sampling events.

Table 3
Groundwater Sample Nomenclature

Sample Description	Sample Designation
Groundwater sample collected from groundwater monitoring well MW-10 on October 1, 2018	MW-10-20181001
Matrix spike/matrix spike duplicate sample of groundwater sample collected from groundwater monitoring well MW-10 on October 1, 2018	MW-10-MS/MSD- 20181001
Blind duplicate sample of groundwater sample collected from groundwater monitoring well MW-10 on October 1, 2018	MW-X-20181001
Aqueous field blank collected on October 1, 2018	FB-20181001
Aqueous trip blank submitted with samples collected on October 1, 2018	TB-20181001

Sample Labeling and Shipping

All sample containers will be provided with labels containing the following information:

- Project identification, including Site name, BCP Site number, Site address
- Sample identification
- Date and time of collection
- Analysis(es) to be performed
- Sampler’s initials

Once the samples are collected and labeled, they will be placed in chilled coolers and stored in a cool area away from direct sunlight to await shipment to the laboratory. All samples will be submitted to the laboratory on the same day as the sampling event.

The samples will be prepared for shipment by placing each sample in laboratory-supplied glassware, then wrapping each container in bubble wrap to prevent breakage, and adding freezer packs and/or fresh ice in sealable plastic bags. The COC form will be properly completed by the sampler in ink, and all sample shipment transactions will be documented with signatures, and the date and time of custody transfer. Samples will be shipped overnight (e.g., Federal Express) or transported by a laboratory courier. All coolers shipped to the laboratory will be sealed with mailing tape and a COC seal to ensure that the samples remain under strict COC protocol.

Sample Custody

Field personnel will be responsible for maintaining the sample coolers in a secured location until they are picked up and/or sent to the laboratory. The record of possession of samples from the time they are obtained in the field to the time they are delivered to the laboratory or shipped off-site will be documented on COC forms. The COC forms will contain the following information: project name; names of sampling personnel; sample number; date and time of collection and matrix; and signatures of individuals involved in sample transfer, and the dates and times of transfers. Laboratory personnel will note the condition of the custody seal and sample containers at sample check-in.

4.6 FIELD INSTRUMENTATION

Field personnel will be trained in the proper operation of all field instruments utilized during post-remedial sampling. Instruction manuals for the equipment will be included with the equipment for reference in the field. The equipment will be calibrated according to manufacturer specifications at the start of each day of fieldwork. If an instrument fails calibration, the project manager or QA/QC officer will be contacted immediately to obtain a replacement instrument. The PID will be equipped with a 10.6 eV lamp and will be calibrated each day using 100 parts per million (ppm) isobutylene standard gas in accordance with the manufacturer's standards.

4.7 QUALITY ASSURANCE (QA)

All soil and groundwater sample laboratory analytical data will be reviewed by a third-party validator and a Data Usability Summary Report (DUSR) will be prepared to document the usability and validity of the data. The Periodic Review Report (PRR) will include a detailed description of groundwater sampling activities, data summary tables, concentration map showing groundwater sample locations and concentrations, DUSR, and laboratory reports. The resume of the third-party validator is provided in Attachment A.

ATTACHMENT A
RESUMES OF PROJECT DIRECTOR, PROJECT MANAGER, PROJECT MANAGER ALTERNATE, AND
FIELD TEAM LEADER

MICHELLE LAPIN, P.E.

SENIOR VICE PRESIDENT

Michelle Lapin is a Senior Vice President with more than 29 years of experience in the assessment and remediation of hazardous waste issues. She leads the firm's Hazardous Materials group and offers extensive experience providing strategic planning and management for clients. Ms. Lapin has been responsible for the administration of technical solutions to contaminated soil, groundwater, air and geotechnical problems. Her other duties have included technical and report review, proposal writing, scheduling, budgeting, and acting as liaison between clients and regulatory agencies, and project coordination with federal, state, and local authorities.

Ms. Lapin's hydrogeologic experience includes groundwater investigations, formulation and administration of groundwater monitoring programs and remediation throughout the Northeast. Her experience with groundwater contamination includes Level B hazardous waste site investigations; leaking underground storage tank studies, including hazardous soil removal and disposal and associated soil and water issues; soil gas/vapor intrusion surveys; and wetlands issues. Ms. Lapin is experienced in investigation and remediation concerning hazardous waste cell closures, and landfills. She has directed hundreds of Phase I, Phase II, and Phase III investigations and remediations, many of them in conjunction with developers, law firms, lending institutions, and national retail chains. She is also experienced in the cleanup of contaminated properties under Brownfield Cleanup Program (BCP) regulations.

BACKGROUND

Education

M.S., Civil Engineering, Syracuse University, 1985

B.S., Civil Engineering, Clarkson University, 1983

Professional Licenses/Certifications

New York State P.E.

State of Connecticut P.E.

Professional Memberships

Member, National Society of Professional Engineers (NSPE), National and CT Chapters

Member, American Society of Civil Engineers (ASCE), National and CT Chapters

Member, Connecticut Business & Industry Association (CBIA), CBIA Environmental Policies Council (EPC)

Member, Environmental Professionals' Organization of Connecticut (EPOC)

Board Member, New York City Brownfield Partnership

Member, NAIOP, a Commercial Real Estate Development Association

Years of Experience

Year started in company: 1994

Year started in industry: 1986

RELEVANT EXPERIENCE

Gedney Way Landfill, White Plains, NY

Ms. Lapin was the Engineer of Record for this closure of a former ash landfill, which is also utilized as a leaf and yard waste compost facility by the City of White Plains. The landfill closure required investigations to document the landfill's disposal history and the extent of the solvent contamination and methane. The investigation and



MICHELLE LAPIN, P.E.

SENIOR VICE PRESIDENT

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closure of the landfill were completed to satisfy the requirements of a New York State Department of Environmental Conservation's (NYSDEC) consent order, were completed in compliance with NYSDEC DER-10 and 6NYCRR Part 360, and included placement of landfill cap, methane recovery system, and sealing of storm sewers traversing the landfill.

Roosevelt Union Free School District – District-wide Improvement Program, Roosevelt, NY

Ms. Lapin managed the hazardous materials investigation for the Draft and Final Environmental Impact Statements (EIS) for the improvement program, which included the demolition of three existing elementary schools and portions of the junior-senior high school, and the reconstruction of three replacement elementary schools, a separate replacement middle school, and renovations to the high school. Following the EIS, additional hazardous materials investigations were completed, including comprehensive asbestos and lead surveys; Phase I and Phase II Environmental Site Assessments; the preparation of asbestos, lead, hazardous materials and demolition specifications; and obtaining site-specific variances from the New York State Department of Labor (NYSDOL). The middle school remediation was conducted through coordination with the New York State Department of Environmental Conservation (NYSDEC), the New York State Department of Health (NYSDOH), the New York State Education Department (NYSED) and the local school district. The project was approved, and construction/renovation for the new middle school completed such that the school opened for the Fall 2008 semester as planned.

Memorial Sloan Kettering Cancer Center-CUNY 74th Street EIS, New York, NY

AKRF was engaged by Memorial Sloan-Kettering Cancer Center (MSK) and CUNY-Hunter College (CUNY) to prepare an EIS for a proposed joint facility located on a New York City-owned parcel located between East 73rd Street and East 74th Street adjacent to the FDR Drive in Manhattan. The proposed facility was formerly occupied by the Department of Sanitation, and had included over 41 underground storage tanks, will include an ambulatory medical care center for MSK and educational and medical research facilities for CUNY.

Ms. Lapin is leading the hazardous materials work which includes the preparation of the Phase I and II environmental site assessments, remedial action work plans (RAWPs), and construction health and safety plans (CHASPs) for submission to the New York City Office of Environmental Remediation (OER) for the Voluntary Cleanup Program (VCP) and to the New York State Department of Environmental Conservation (NYSDEC) for remediation of a petroleum spill. The RAWPs and CHASPs included provisions for excavation of contaminated soil and rock, removal of tanks and environmental monitoring during the construction activities. AKRF also performed a pre-demolition asbestos survey of the remaining concrete foundation structures and prepared specifications for asbestos abatement, soil management and underground storage tank removal and disposal.

MICHELLE LAPIN, P.E.

SENIOR VICE PRESIDENT

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Brooklyn Bridge Park, Brooklyn, NY

AKRF prepared an Environmental Impact Statement (EIS) and is continuing to provide technical and planning support services for Brooklyn Bridge Park, which revitalizing the 1.3-mile stretch of the East River waterfront between Jay Street on the north and Atlantic Avenue on the south. The new park, allows public access to the water's edge, allowing people to enjoy the spectacular views of the Manhattan skyline and New York Harbor. It also provides an array of passive and active recreational opportunities, including lawns, pavilions, and a marina. As with many waterfront sites around New York City, the lands along the Brooklyn waterfront have a long history of industrial activities. Some of these industries used dangerous chemicals and generated toxic by-products that could have entered the soil and groundwater. In addition, landfilling activities along the shoreline also used ash and other waste materials from industrial processes. Based on site inspections, historical maps, government records, and other sources, AKRF has been investigating the potential for the presence for hazardous materials in the park. This information was compiled into a Phase 1 Environmental Site Assessment report. AKRF has also provided and continues to support to the design team related to designing the project to minimize costs related to remediating hazardous materials where possible. Ms. Lapin is serving as senior manager for the hazardous materials investigations.

East River Science Park, New York, NY

Originally, New York University School of Medicine (NYUSOM) retained the firm to prepare a full Environmental Impact Statement (EIS) for its proposed East River Science Park (ERSP). The proposed complex was to occupy an underutilized portion of the Bellevue Hospital campus between East 30th Street and approximately East 28th Street, immediately south of NYU's campus. As originally contemplated, Phase I was to include 618,000 square feet of development, including a clinical practice and research building, a biotech center, 220 housing units for post-doctorate staff, a child care center, and a conference center. This phase would include reuse of the former Bellevue Psychiatric Building, a historic structure on East 30th Street east of First Avenue. Phase II was to include a second biotech building with a library to serve NYU and Bellevue at the eastern end of the block between 29th and 30th Streets. Phase III was to include a third biotech building and parking. The project's EIS considered a full range of issues, including land use, socioeconomics, shadows, historic resources, open space, traffic and transportation, air quality, noise, and construction. The firm also prepared all of the traffic and transportation studies for the urban design and master planning efforts. Ms. Lapin managed the Phase I Environmental Site Assessment and other hazardous materials-related issues.

Events relating to September 11, 2001 put a hold on the project for a number of years. When the project resurfaced, it had a new developer and a decreased scope. Ms. Lapin updated the hazardous materials issues for the new developer and consulted with them regarding remediation strategies and involvement of regulatory agencies. For the actual remediation/development, the city requested oversight by AKRF to represent its interests (the city is retaining ownership of the land). Ms. Lapin completed directing the remediation oversight on behalf of the City of New York for the remediation of the former psychiatric hospital building, laundry building and parking areas associated with Bellevue Hospital. The new development includes a biotechnology center (Commercial Life Science Research and Office Park) comprising two buildings (combined 550,000 square feet), street level retail, and an elevated plaza.

New York City School Construction Authority (SCA), Environmental Consulting Hazardous Materials Services

The SCA was established by the New York State government to construct school facilities to reduce overcrowding and to provide new schools in growing neighborhoods. Focusing on the environmental consulting services, dating back to the 1980s and the days of the New York City Board of Education, the firm continues to provide broad support to SCA's effort, including environmental assessments in meeting the requirements of the State Environmental Quality Review Act (SEQRA), and site selection and property acquisition support for potential new sites. AKRF is currently serving under three individual on-call contracts for site acquisition and environmental consulting services, hazardous materials consulting services, and architectural and engineering services.



MICHELLE LAPIN, P.E.

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AKRF has undertaken various assignments under two consecutive hazardous materials on-call contract, including environmental assessment, remedial design, and plumbing disinfection consulting tasks. For potential new school sites, assignments include initial due diligence, Phase I environmental site assessments (ESAs) and multi-media subsurface investigation of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school, likely remediation requirements, and associated costs. For sites undergoing design and development, assignments include preparation of remediation plans, design of sub-slab depressurization systems (SSDS) and contract specifications, and construction oversight. The work has also included conducting Phase I ESAs and indoor air quality testing, preparation of specifications, supervision of storage tank removals, and investigation and remediation of spills for existing schools. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours. Ms. Lapin is the QA/QC officer for all of the SCA hazardous materials assignments and the Professional Engineer (P.E.) of record for the various remediation systems, including sub-slab depressurization systems (SSDS).

Hudson River Park, New York, NY

Ms. Lapin is directing AKRF's hazardous materials work during construction of Hudson River Park, a five-mile linear park along Manhattan's West Side. As the Hudson River Park Trust's (HRPT's) environmental consultant, AKRF has overseen preparation and implementation of additional soil and groundwater investigations [working with both the New York State Department of Environmental Conservation (NYSDEC) and the New York City Department of Environmental Protection (NYCDEP)], all health and safety activities, and removal of both known underground storage tanks and those encountered during construction. Previously, the firm performed hazardous materials assessments as part of the Environmental Impact Statement (EIS) process, including extensive database and historical research, and soil and groundwater investigations. Ms. Lapin has been the senior consultant for the soil and groundwater investigations and remediation, and the asbestos investigations and abatement oversight.

Dauids Island Site Investigations, New Rochelle, NY

Ms. Lapin managed the hazardous materials investigation of Davids Island, the largest undeveloped island on the Long Island Sound in Westchester County. The 80-acre island features pre- and post-Civil War military buildings and parade grounds, and is viewed as a major heritage, tourism, and recreational amenity. The island, formerly known as Fort Slocum, was used by the U.S. military, beginning in the 19th century, as an Army base, hospital, and training center. The island was planned for county park purposes. The investigation included a Phase I Environmental Site Assessment, with historical research going back to the 17th century, a Phase II (Subsurface) Investigation, underground storage tank investigations, asbestos surveys, and conditions surveys of all remaining structures. Cost estimates were submitted to Westchester County for soil remediation, asbestos abatement, and building demolition.

Yonkers Waterfront Redevelopment Project, Yonkers, NY

For this redevelopment along Yonkers' Hudson River waterfront, Ms. Lapin headed the remedial investigation and remediation work that included Phase I Environmental Site Assessments of 12 parcels, investigations of underground storage tank removals and associated soil remediation, remedial alternatives reports, and remedial work plans for multiple parcels. Several of the city-owned parcels were remediated under a Voluntary Cleanup Agreement; others were administered with state Brownfields grants. Hazardous waste remediation was completed on both brownfield and voluntary clean-up parcels, which enabled construction of mixed-use retail, residential development, and parking.

Storage Deluxe, Various Locations, NY

Ms. Lapin manages the firm's ongoing work with Storage Deluxe, which includes Phase I Environmental Site Assessments and Phase II Subsurface Investigations, underground storage tank removals and associated remediation, asbestos surveys and abatement oversight, and contaminated soil removal and remediation for sites in Connecticut, the Bronx, Brooklyn, Manhattan, Queens, Westchester County, and Long Island.



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Columbia University Manhattanville Academic Mixed-Use Development, New York, NY

Ms. Lapin served as Hazardous Materials Task Leader on this Environmental Impact Statement (EIS) for approximately 4 million square feet of new academic, research and neighborhood uses to be constructed north of Columbia University's existing Morningside campus. The work included Phase I Environmental Site Assessments for the properties within the site boundaries, and estimates for a Subsurface (Phase II) Investigation of the entire development area. The firm's Hazardous Materials group performed over 30 individual Phase I Environmental Site Assessments for properties within the development area. In addition, a Preliminary Environmental Site Assessment (PESA) was completed in conjunction with the Environmental Impact Statement (EIS). Based on the Phase I studies, AKRF conducted a subsurface (Phase II) investigation in accordance with a New York City Department of Environmental Protection (NYCDEP) approved investigative work plan and health and safety plan. Subsurface activities included the advancement of soil borings, groundwater monitor wells, and the collection of soil and groundwater samples for laboratory analysis. This study was used to estimate costs to remediate contaminated soil and groundwater, and underground storage tanks and hazardous building materials, including lead-based paint and asbestos-containing materials.

DPR Soundview Park Playgrounds and Open Space, Bronx, NY

AKRF is part of a team working on the reconstruction of this 212-acre NYCDPR public park located along the Bronx River in the Bronx, New York. The park was identified as an underutilized park and is being improved in accordance with the goals of PlaNYC. Ms. Lapin is overseeing AKRF's hazardous materials investigations including environmental and remediation-related work. AKRF prepared the Environmental Assessment Statement (EAS) and the project has moved into the design and construction phase. The remediation/construction of multiple phases of the development is currently underway.

Rego Park Home Depot, Queens, NY

Solvent contamination was encountered during retail development of a former industrial property in Rego Park, Queens, New York. The site work included an extensive investigation and a multi-phase remediation performed under the NYSDEC Voluntary Cleanup Program (BCP). Remediation included removal of aboveground and underground storage tanks (ASTs and USTs) and hotspot soil removal. An Air Sparging/Soil Vapor Extraction (AS/SVE) groundwater remediation system designed by AKRF was installed as part of the building construction. Continued remediation work included upgrading and expanding the AS/SVE system after the store was opened. AKRF prepared the Final Engineering Report and obtained closure with a Release and Covenant Not to Sue issued by NYSDEC in 2013. AKRF continues operations, maintenance, and monitoring under the NYSDEC-approved Site Management Plan. Ms. Lapin is the Professional Engineer (P.E.) of record for the remediation design and implementation in accordance with the NYSDEC Brownfield Cleanup Program (BCP).



MARC S. GODICK, LEP

PRINCIPAL-IN-CHARGE

Marc S. Godick, a Senior Vice President of the firm, has over 25 years of experience in the environmental consulting industry. Mr. Godick will serve as Principal-in-Charge for this effort and has broad-based environmental experience includes expertise in brownfield redevelopment, site assessment, remedial investigation, design and implementation of remedial measures, compliance assessment, and litigation support.

Education

M.E., Engineering Science/Environmental Engineering, Pennsylvania State University, 1998

B.S., Chemical Engineering, Carnegie Mellon University, 1989

Licenses/Certifications

Licensed Environmental Professional (License # 396) – State of Connecticut – 2003 - Present

40 Hour HAZWOPER and Annual Refresher Training, 1990 - Present

Supervisors of Hazardous Waste Operations (8 Hour), 1990

Professional Memberships

Chairman, Village of Larchmont/Town of Mamaroneck Coastal Zone Management Commission, 1997 – Present

Member, Westchester County Stormwater Advisory Board, 2011 – Present

Chairman/Member, Westchester County Soil and Water Conservation District, 2005 - 2010

Board of Directors, Sheldrake Environmental Center, Larchmont, New York, 2006 - 2008

Member, NYSDEC Risk-Based Corrective Action (RBCA) Advisory Group for Petroleum-Impacted Sites, 1997

Community Leadership Alliance, Pace University School of Law, 2001

Years of Experience

Year started in company: 2002

Year started in industry: 1990

RELEVANT EXPERIENCE

On-Call Environmental Consulting Services (Various Locations), New York City Mayor's Office of Environmental Remediation (OER) (administered by NYCEDC)

Mr. Godick is managing an on-call contract with the OER for brownfields environmental assessment and remediation. The work has included conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor for various sites funded by EPA grants. The work plans and investigation reports were completed in accordance with OER and EPA requirements. AKRF also developed a remedial plan for a former gas station site in the Bronx and implemented a remedial plan for capping a park site in Staten Island.

Remedial Design, Gowanus Canal First Street Turning Basin, New York City Department of Design and Construction (DDC)

Mr. Godick is managing the remedial design for restoration of the filled-in former First Street Turning Basin in Brooklyn, New York. The remediation is being conducted as part of an Order of Consent between the City of New York and EPA for the Gowanus Canal Superfund Site. The remedial design will include removal of fill and sediment within the fill-in basing in an approximately 475-foot by 50-foot area. The restored basin will provide enhanced waterfront access to the community and a boat launch for canoes and kayaks. Design considerations include geotechnical concerns related to adjacent buildings and new and existing bulkheads; soil and water



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management; landscape design; and access/construction logistics. The design is anticipated to be completed in late 2017.

On-Call Environmental Consulting (Various Locations), New York City School Construction Authority

Mr. Godick is managing an on-call contract with the SCA for environmental assessment, remedial design, and plumbing disinfection. For new school sites, initial due diligence involves conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor to determine the suitability of a site for development as a school and remediation requirements and associated costs. Once design for a school is underway, AKRF would prepare remediation plans and construction specifications and oversee the construction activities. For existing school sites, the work can involve conducting Phase I ESAs and indoor air quality testing, preparation of specifications, supervision of storage tank removals, investigation and remediation of spills, and development of remediation cost estimates. AKRF also oversees plumbing disinfection work, which is required prior to new plumbing being placed into service. The assignments involve reviewing and commenting on disinfection plans, supervision of the disinfection and confirmation testing, and preparation of a report documenting the work was conducted in accordance with the specifications and applicable requirements. Due to the sensitivity of school sites, work under this contract is often conducted on short notice and during non-school hours.

Remediation & Litigation Support, 3200 Jerome Avenue, Bronx, NY (Former PS 151)

Mr. Godick managed the investigation and remediation of a former public school in the Bronx under the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP). The site was contaminated with trichloroethylene (TCE) from historic operations at the property prior to use as a school. The remedial investigation included soil, groundwater, and vapor intrusion assessment both on-site and off-site. The remedial design included excavation of the source area, in-situ chemical oxidation of groundwater, and installation of a sub-slab depressurization system (SSDS) to address potential vapor intrusion. Implementation of the remedy was complete in late 2014. The completed remediation allows for future multi-family residential, educational, childcare, and/or medical uses. Mr. Godick has also been providing litigation support and will serve as a fact witness and potentially an expert witness in connection with a cost recovery claim against the former operator of the site.

Remediation & Litigation Support, Queens West Project, Avalon Bay Communities, Queens, NY

For over 20 years, AKRF has played a key role in advancing the Queens West development, which promises to transform an underused industrial waterfront property into one of the largest and most vibrant mixed-use communities just across the East River from the United Nations. AKRF prepared an Environmental Impact Statement (EIS) that examines issues pertaining to air quality, land use and community character, economic impacts, historic and archaeological resources, and infrastructure. As part of this project, Mr. Godick managed one of the largest remediation projects completed under the New York State Department of Environmental Conservation (NYSDEC) Brownfields Cleanup Program (BCP) that was contaminated by coal tar and petroleum. The remedy included the installation of a hydraulic barrier (sheet pile cut off wall), excavation of contaminated soil under a temporary structure to control odors during remediation, a vapor mitigation system below the buildings, and implementation of institution controls. The investigation, remediation design, and remedy implementation, and final sign-off (issuance of Certificate of Completion) were completed in two years. Total remediation costs were in excess of \$13 million. Following completion of the remediation, Mr. Godick developed a cost allocation model and provided litigation support for a cost recovery action against a former operator of the site, including participation in a deposition as a fact witness prior to settlement between the parties.

Remediation, Former Industrial Laundry/Dry Cleaning Plant, 2350 Fifth Avenue, New York, NY

Mr. Godick managed the assessment, cleanup and post-remedial operations, maintenance and monitoring of the only NYSDEC listed inactive hazardous waste (State Superfund) site in Manhattan, a former laundry/dry cleaning plant in Harlem. Remedial investigation included evaluation of soil, groundwater, soil vapor, indoor air, and building materials. Interim remediation included the removal of contaminated building materials and operation of



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a sub-slab vapor extraction system retrofitted into the existing building. Mr. Godick coordinated with the regulatory agencies, site owner and occupants; and managed the investigation, remedial design, and remedial implementation activities. Phase 1 of the Remedial Action Work Plan consisted of further removal of contaminated building materials. Phase 2 of the remediation included a sub-slab depressurization system (SSDS) retrofitted into the existing building, soil vapor extraction (SVE) system, and chemical oxidation injection. Remedial action work was completed in 2014 and documented in a Final Engineering Report. NYSDEC issued Certificate of Completion in January 2015 and the site has been reclassified to a “Class 4” site (site properly closed – requires continued management). Mr. Godick continues to manage the project, including operations, maintenance and monitoring of the SSDS and SVE system under the NYSDEC-approved Site Management Plan.

606 West 57th Street, New York, NY, TF Cornerstone

AKRF has been retained by TF Cornerstone to provide environmental services for the proposed redevelopment of a portion of the block bounded by Eleventh and Twelfth Avenues and West 56th and 57th Streets. The proposed actions included a zoning map amendment, zoning text amendments, a special permit, and an authorization to facilitate development of approximately 1.2 million square feet of residential and retail space. AKRF prepared an Environmental Impact Statement (EIS) for the New York City Department of City Planning (DCP) to analyze the effects of the proposed actions and development of the proposed building. The EIS addressed the full range of environmental impacts associated with the proposed development.

Mr. Godick was responsible for the elements of the EIS pertaining to hazardous materials, including coordination of a Phase I ESA and summarizing pertinent site information for the hazardous materials and construction chapters. Mr. Godick provided pre-acquisition support to TF Cornerstone, which included development of a remedial cost estimate report to outline remediation cost during site development. Mr. Godick also managed work related to the subsurface investigation, localized remediation (chemical injection and limited excavation beneath the building basement) and regulatory closure of a petroleum spill on a portion of the project site to satisfy NYSDEC requirements. After EIS certification, Mr. Godick coordinated approvals with NYCOER, the regulatory agency overseeing remedial measures related to the redevelopment of the site. The Site has an (E) Designation and is participating in the New York City Voluntary Cleanup Program. Mr. Godick managed the preparation of a Phase II Investigation Work Plan, Remedial Investigation Report, Remedial Action Work Plan, and contractor specifications for soil management and tank and hydraulic lift removal. Mr. Godick is continuing to manage the project during remediation and construction.

NYCDEP Permit Resource Division On-Call Contract, New York, NY

Under subcontract to a national engineering firm, and as part of three successive on-call contracts, AKRF provided support in a wide range of technical areas related to environmental and engineering permits for NYCDEP capital projects. These services fall into two major categories: preparing detailed guidance documents that will be used by project designers and construction managers on future projects, in order to expedite permit approvals and prevent delays; and providing expert review and guidance regarding permits for current projects, in order to ensure completeness of permit applications and effective coordination with regulatory agencies. The technical areas covered by AKRF include: wetlands, groundwater, surface water, and other natural resources; hazardous materials; traffic and transportation; air quality; noise and vibration; historic and archaeological resources; stormwater management; open space and parkland; and a broad range of permits and approvals from the New York City Fire Department (FDNY), the New York City Police Department (NYPD), the New York City Department of Buildings (NYCDOB), and other municipal agencies. AKRF also helped NYCDEP improve the overall process for tracking environmental and engineering permits and approvals, from the planning and design phases of a project to construction and long-term operation. Mr. Godick served as the hazardous materials task leader under this contract.

77 Commercial Street, Brooklyn, NY, Clipper Realty

Mr. Godick managing various environmental consulting services in connection with the proposed affordable housing development at 77 Commercial Street as part of ongoing revitalization of the Greenpoint waterfront. The



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project comprises the redevelopment of an approximately 110,000-squarefoot former industrial parcel into a mixed-use commercial/residential development including public waterfront esplanade, affordable housing, and three interconnected buildings ranging from 2 to 40 stories. The site is being remediated under the New York City Mayor's Office of Environmental Remediation (OER), and is listed with an E-Designation for Hazardous Materials, Air Quality, and Noise. The Remedial Investigation (RI) included 38 soil samples, 6 groundwater samples, and 11 soil vapor samples. Based on the results of the RI, AKRF prepared a Remedial Action Work Plan (RAWP) that included excavation of approximately 90,000 tons of soil, the installation of a vapor barrier beneath the entire building, and design of a sub-slab depressurization system (SSDS) for a portion of the building. Upon approval of the RAWP, the project was enrolled into OER's Voluntary Cleanup Program (VCP) to enable an exemption from hazardous waste disposal taxes, as well as to capitalize on additional community involvement provided by OER. AKRF, OER, and community leaders developed proactive measures to limit the potential disturbances from construction. AKRF conducted extensive waste characterization testing of the soil to pre-classify the material for disposal. The project is expected to break-ground in late 2015/early 2016.

164 Kent Avenue, Brooklyn, NY (AKA Northside Piers and 1 North 4th Place), RD Management, L&M Development, Toll Brothers, and Douglaston Development

The project was a multi-phase development consisting of a large waterfront block in the Williamsburg Rezoning Area. The project site has been developed with a mixed-use residential-commercial high rise towers with an esplanade and a pier along the East River. AKRF provided acquisition and development support, including performing Phase I and II environmental site assessments and development of remedial cost estimates for development, and preparation of Remedial Action Plans (RAPs) and Construction Health and Safety Plan (CHASPs) for approval by DEP and OER. AKRF provided assistance with construction oversight during soil handling activities and managing the Community Air Monitoring Plan (CAMP) activities. To date, closure reports have been prepared and occupancy now achieved for all four buildings under the project.

DEBORAH SHAPIRO, QEP

VICE PRESIDENT

Deborah Shapiro is a Vice President with 17 years of experience in the assessment and remediation of hazardous waste issues. Ms. Shapiro supervises project teams and manages all aspects of assessment and remediation projects. Ms. Shapiro works with developers, non-profit organizations, architects, local community groups, local businesses, and government agencies. Her projects fall under the regulatory oversight of NYSDEC, NYCDEP, and NYCOER including the New York State Brownfield Cleanup Program (BCP), New York City Voluntary Cleanup Program (VCP), NYSDEC petroleum spills program, RCRA/UIC closures, and NYCOER's E-designation program. Ms. Shapiro has also assisted commercial and industrial property owners with maintaining the integrity of their portfolios by providing compliance related cleanup and chemical storage management services.

Ms. Shapiro manages all aspects of redevelopment projects from the initial Phase I ESA, Phase II, and remediation through post-remedial site management. In addition, her experience includes groundwater investigations, monitoring, and sampling programs; Brownfield and hazardous waste site investigations; In-Situ Chemical Oxidation; underground storage tank studies, including soil contamination delineation, classification, removal and disposal; waste characterization sampling; exposure assessments; on-going remedial action (especially AS/SVE), and permitting.

Prior to joining AKRF, Ms. Shapiro was a Senior Project Manager at CA RICH Consultants, Inc. in Plainview, New York. She was responsible for the design, implementation, and management of environmental assessment, investigation and remediation projects on Long Island and across the New York Metropolitan Area. Ms. Shapiro has also been a moderator and panelist at numerous conferences.

BACKGROUND

Education

M.S., Environmental Science, American University, 2001

B.A., Environmental Studies, American University, 1998

Professional Licenses/Certifications

Qualified Environmental Professional

Health and Safety Operations at Hazardous Materials Sites 29 CFR 1910.120

OSHA 10 Hour Occupational Construction Safety and Health

Professional Memberships

Past President, New York City Brownfield Partnership

Board Member, Residents for a More Beautiful Port Washington

Member, Institute of Professional Environmental Practitioners (IPEP)

Awards

Big Apple Brownfield Award recipient as part of the Courtlandt Crescent redevelopment team 2013

Big Apple Brownfield Award recipient as part of the Via Verde redevelopment team 2012

Big Apple Brownfield Award recipient as part of the Cornerstone B1 (LaTerraza) redevelopment team 2011

Years of Experience

Year started in company: 2013

Year started in industry: 1998



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Relevant Experience

Elton Crossing, Bronx, NY

AKRF is currently providing environmental consulting services in connection with the Elton Crossing site in the Bronx, NY. The work initially involved the preparation of a Phase I Environmental Site Assessment and Phase II subsurface investigation including soil and soil vapor testing to determine if the site would be eligible for the New York State Brownfield Cleanup Program (NYSBCP) based on its historic usage. AKRF prepared a NYCBCP Application and the site was accepted in to the NYSBCP. AKRF managed all aspects of the brownfield cleanup including; development of Remedial Investigation (RI) and Supplemental Remedial Investigation (SRI) Work Plans, conducting the RI and SRI and preparing the associated reports, preparation of a Citizen Participation Plan, distribution of public notices, and preparation of a Remedial Action Work Plan (RAWP). AKRF managed all aspects of the remediation, including providing guidance for the closure of two petroleum spills; the registration, removal, and closure of six petroleum storage tanks encountered during excavation; and waste characterization and disposal of soil with contaminants including hazardous lead, petroleum, and pesticides, and design of a Sub-Slab Depressurization System (SSDS). AKRF prepared and submitted a Site Management Plan (SMP) and a Final Engineering Report (FER), which documented compliance with the RAWP. The SMP and FER were approved by NYS in 2016. AKRF is currently providing long-term site management in accordance with the NYSBCP.

On-Call Environmental Consulting Services (Various Locations), New York City Mayor's Office of Environmental Remediation (OER) (administered by NYCEDC)

Ms. Shapiro is managing an on-call contract with the OER for brownfields environmental assessment and remediation. The work has included conducting Phase I environmental site assessments (ESAs) and multi-media sampling of soil, groundwater, and soil vapor for various sites funded by EPA grants. The work plans and investigation reports were completed in accordance with OER and EPA requirements. AKRF also implemented a remedial plan for capping a park site in Staten Island. In addition, Ms. Shapiro is providing support to OER and an affordable housing developer to expedite an application for entry into the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP), as well as preparation and implementation of the remedial investigation and remedial plan.

Atlantic Chestnut, Brooklyn, NY

AKRF was retained by Phipps Houses to provide environmental consulting services in connection with the purchase and development of former burned manufacturing buildings encompassing an entire city block in Brooklyn, New York. As part of due diligence, AKRF prepared a Phase I Environmental Site Assessment (ESA) Report for the property. After acquisition, the property was divided into three separate sites (3264 Fulton Street, 235 Chestnut Street, and 3301 Atlantic Avenue). AKRF prepared a Subsurface (Phase II) Investigation Work Plans and conducted Phase IIs at each of the sites, which included the collection and analysis of soil, soil vapor, and groundwater samples. Based on the results of the Phase IIs, which were documented in Subsurface (Phase II) Reports, New York State Brownfield Cleanup Program (NYSBCP) applications were prepared for each of the sites. After acceptance into the NYSBCP, AKRF prepared Citizen Participation Plans (CPPs) and distributed public notices. AKRF prepared Remedial Investigation (RI) Work Plans (RIWPs) for each of the sites to further investigate contaminated media at the site prior to redevelopment, conducted the RIs, and is in the process of preparing the RI Reports (RIRs).

Second Farms, Bronx, NY

AKRF, Inc. was contracted by the New York City Office of Environmental Remediation (NYCOER) to conduct a subsurface investigation of a 1.12-acre parcel in the Bronx, New York under the United States Environmental Protection Agency (USEPA) Brownfield Assessment Grant program. The investigation included a geophysical survey and utility mark-outs, and the collection and analysis of soil, groundwater, soil vapor, indoor air and ambient air samples.



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Brook 156, Bronx, NY

AKRF was retained by Phipps Houses to provide environmental consulting services in connection with the purchase and development of two lots located at 740 Brook Avenue in the Bronx, NY. AKRF prepared a Phase I Environmental Site Assessment (ESA) of the NYC-owned former gasoline service station and a former railroad. A Tier 1 Vapor Encroachment Screening was also conducted to satisfy HUD's vapor intrusion requirements. AKRF prepared a Remedial Investigation Work Plan (RIWP) and conducted a Remedial Investigation (RI) at the site, which included the collection and analysis of soil, soil vapor, and groundwater. The results of the RI, which were documented in a Remedial Investigation Report (RIR), were used to prepare a New York City Brownfield Cleanup Program (NYCBCP) application. The site was accepted into the New York State Brownfield Cleanup Program (NYSBCP). AKRF prepared a Citizen Participation Plan (CPP), distributed public notices, and is in the process of preparing a Supplemental Remedial Investigation Work Plan (SRIWP) to further investigate soil, soil vapor, and groundwater at the site prior to redevelopment.

Warbrook Portfolio, Manhattan, NY

AKRF provided environmental consulting services to Genesis Y15 Developer LLC and the Abyssinian Development Corporation (ADC) for the proposed rehabilitation of 30 parcels in Central Harlem for low- and moderate-income tenants. The parcels comprise two vacant lots and 28 residential buildings, including several buildings that are vacant or partially vacant. The client is seeking 4% Low-Income Housing Tax Credits issued by the New York City Housing Development Corporation (HDC) through the New York City Department of Housing Preservation & Development (HPD) to rehabilitate the 30 parcels. AKRF prepared a Phase I Environmental Site Assessment for all parcels. The Phase I summarized environmental issues based on a review of available environmental reports, a review of regulatory records, and on-site inspections. Limited Phase II Environmental Site Assessments were conducted at parcels where recognized environmental concerns were identified. Based on evidence of suspect mold associated with the Property parcels, AKRF also prepared a mold specification section for use during renovation of the Property.

Courtlandt Crescent, Bronx, NY

Ms. Shapiro directed all Phases of this NYS Brownfield Cleanup Program project in the Melrose Commons section of the Bronx from the initial Phase I and II through the Certificate of Completion and is currently managing the implementation of the Site Management Plan. A New York State Brownfield Cleanup Program (BCP) Application was submitted simultaneously with the Remedial Investigation Report (RIR) and Remedial Action Work Plan (RAWP), which sped up the timetable so that the remediation could be implemented concurrently with the planned site redevelopment activities. The site comprised an entire city block whose historic usage included a gasoline filling station, auto repair shop, machine shop, auto junkyard, iron works, boiler repair shop, brass fabricator shop, universal machinery manufacturing, waste paper company, cosmetic company, and a saw works. The investigation included soil and soil vapor testing as well as the installation and sampling of groundwater monitoring wells. The remedial activities included the removal of underground storage tanks and hydraulic lifts, soil waste classification testing, the excavation and removal of approximately 23,000 tons of non-hazardous petroleum and metals contaminated soil as well as hazardous soil containing lead, in-situ chemical oxidation, and installation of a composite cover system. In addition, site dewatering activities allowed the elevator pits to be advanced into the groundwater table. A vapor barrier (and water-proofing for the elevator pits) was installed beneath the two new buildings' foundations and a sub-slab depressurization system (SSDS) was incorporated into the buildings' foundations to eliminate the potential exposure pathway for soil vapor into the new affordable housing residential buildings. Ms. Shapiro directed the remedial activities and monitoring under a construction health and safety plan, which included a community air monitoring program. Site management activities include post-remedial groundwater monitoring and sampling, SSDS start-up testing and operations and maintenance, and annual institutional control/engineering control inspections. The project was the recipient of the 2013 Big Apple Brownfield Award.

ExxonMobil, Multiple Locations, NY



DEBORAH SHAPIRO, QEP

VICE PRESIDENT

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Ms. Shapiro has managed the investigation and remediation of numerous ExxonMobil retail service stations in the five boroughs and Long Island. The investigations have included Phase I, II, and III site assessments, regulatory compliance, emergency spill response, UST removals, and soil and groundwater remediation.

ADRIANNA BOSCO

SENIOR PROFESSIONAL

Adrianna Bosco is a Senior Professional in AKRF's Hazardous Materials Department. She has experience in Phase I and Phase II site investigations and remediation/construction monitoring and oversight, as well as project management and reporting. Ms. Bosco is a 2011 graduate of Manhattan College, where she studied Environmental Engineering. She worked as an Environmental Scientist for PS&S Engineering, Inc. prior to joining AKRF.

BACKGROUND

Education

B.S., Environmental Engineering, Manhattan College, Bronx, New York, 2011

Licenses/Certifications

40 Hour OSHA HAZWOPER Certified, September 2011

10 Hour OSHA Construction Program Certified, October 2013

Years of Experience

Year started in company: 2014

Year started in industry: 2011

RELEVANT EXPERIENCE

East Side Coastal Resiliency, Manhattan, NY

DDC has proposed plans to construct a flood protection system for 100+ year storm protection with anticipated sea level rise along the east side of Lower Manhattan. To support the design and construction of the proposed flood protection structures and supporting utility conveyances, subsurface environmental investigations were performed.

A supplemental investigation was performed in 2016 to further evaluate areas identified during the 2015 investigation. Ms. Bosco conducted a portion of the 2016 subsurface investigation of the 2.5 mile study area from Montgomery Street to East 23rd Street. The ESCR subsurface exploration program involved a review of available utility plans and environmental reports involving manufactured gas plant (MGP) and petroleum-related contamination. Responsibilities included groundwater sampling, soil boring and temporary well installation, and compliance with the Supplemental Subsurface Investigation Work Plan.

541 West 37th Street, Manhattan, NY

Ms. Bosco conducted a Phase I Environmental Site Assessment (ESA) and Subsurface (Phase II) Investigation for this vacant property in the Hell's Kitchen section of Manhattan. The investigation has been conducted under OER as the site lots have an E Designation for hazardous materials. Ms. Bosco prepared the Remedial Action Work Plan for the proposed remediation of the site for the anticipated future use as a hotel and residential building.

Elton Crossing, Bronx, NY

This project consists of the remediation of an approximately 0.73-acre site formerly utilized for various industrial and automotive uses under the New York State Department of Environmental Conservation (NYSDEC) Brownfield Cleanup Program (BCP). Ms. Bosco provided remedial oversight during soil excavation, which consisted of confirmatory endpoint sampling, sub-slab depressurization system (SSDS) inspections, vapor barrier installation inspections, and air monitoring for particulates and volatile organic compounds (VOCs).



ADRIANNA BOSCO

SENIOR PROFESSIONAL

| p. 2

145 West Street, Greenpoint, Brooklyn, NY

The investigation and remediation of this site for the proposed redevelopment for a high-rise residential building on the Greenpoint waterfront has been conducted under the NYSDEC BCP, and remediation for redevelopment was also conducted under New York City Office of Environmental Remediation (OER) as the site lots have an E Designation for hazardous materials. For this project, Ms. Bosco conducted a supplemental remedial investigation, including soil and groundwater sampling, and several rounds of waste characterization soil sampling. Ms. Bosco also performed remedial oversight during activities such as soil excavation for off-site disposal, underground storage tank (UST) removal, SSDS piping installation and testing, and routine Community Air Monitoring Program (CAMP) air monitoring. Ms. Bosco also aided in the preparation of the Final Engineering Report (FER) and Site Management Plan (SMP).

Soundview Park, Bronx, NY

This project consists of reconstruction and enhancement of a 205-acre park in the Bronx. The site was historically a landfill and later backfilled with sanitation fill material prior to park construction. Remediation of this site included the excavation and disposal of contaminated soil and placement of clean fill. Ms. Bosco performed environmental monitoring in compliance with the Construction Health and Safety Plan (CHASP) and Remedial Action Plan (RAP) during the excavation and disposal of historic fill and solid waste. Ms. Bosco was also responsible for conducting air quality monitoring for VOCs and particulates during all soil disturbance activities.

Former Laundry/Dry Cleaning Plant, Harlem, New York

This former dry cleaning property, now a privately owned commercial facility, is the only NYSDEC listed hazardous waste site in Manhattan. The final Remedial Action Work Plans (RAWP) for the site were approved in 2012 and 2013. Remedial work includes removal of contaminated building materials, installation of a soil vapor extraction (SVE) system and SSDS, and in-situ soil and groundwater treatment with chemical-oxidation injection. Ms. Bosco performed remedial action oversight, including SSDS piping installation inspections and Health and Safety Plan (HASP) air monitoring for volatiles and particulates.

PS&S Engineering, Inc. (PS&S), Yonkers, NY

Before joining AKRF, Ms. Bosco was an Environmental Scientist I in the Environmental Department at PS&S. She was responsible for conducting site investigations and providing construction oversight for remediation projects in New York and New Jersey. As a staff scientist, she was responsible for the on-site supervision of subcontractors and interacting with project managers and client representatives. Ms. Bosco also prepared technical reports, work plans, field documentation, and Phase I Environmental Site Assessments.



MARK CANDELARIO

JUNIOR GEOLOGIST

Mark Candelario is a Geologist in the AKRF, Inc. Hazardous Materials Department with experience in direct sensing imaging, aquifer profiling, soil and groundwater sampling, and construction monitoring and oversight.

BACKGROUND

Education

B.S., Geology - Environmental Earth Science, State University of New York at Oswego, 2016

Certifications

OSHA 40-hour Health & Safety Training for Hazardous Waste Operations, October 2016

OSHA 8-hour Health & Safety Training for Hazardous Waste Site Personnel Refresher, January 2017

OSHA 10-hour Occupational Construction Safety and Health, September 2017

LPS Loss Prevention System Training Certification, June 2017

JJKeller Crystalline Silica for Construction Certification, October 2016

Years of Experience

Date started at AKRF: September 2017

Prior industry experience:

Cascade Technical Services, LLC – High Resolution Site Characterization Specialist (12 Months)

RELEVANT EXPERIENCE - AKRF

Manhattan West, Hudson Yards, Manhattan, NY – Environmental Consulting Services

Mr. Candelario participated in extensive construction oversight and air monitoring during the excavation work required for the installation of foundation elements at 371 Ninth Avenue in the Hudson Yards neighborhood of New York, New York. The Manhattan West Southeast Tower will be built on an approximately 5,500-square foot portion of land on street grade, and on a platform over a rail yard. The project will involve the installation of the proposed building's foundation support, as well as the closure and relocation of an existing Amtrak signal hut and substation building, and three rail tracks. For this project, Mr. Candelario collected multiple soil/fill, ballast and bedrock samples for off-site disposal. He also oversaw the export of hazardous and nonhazardous soils as an agent for the generator.

Under the Manhattan West Project, removal of the approximately 1,400 cubic yards of soil located above the New York City Department of Transportation (NYCDOT) viaduct to facilitate its repair/replacement was required. Mr. Candelario conducted the soil waste class sampling on West 31st Street to provide analytical data per typical disposal facility guidelines at a frequency of one composite and grab sample per 800 cubic yards.

Confidential Site, Brooklyn, NY – Soil, Sediment and Surface Water Sampling

AKRF was hired by a private client to prepare a Supplemental Remediation Investigation (SRI) Work Plan, for a 75,111-square foot vacant lot in Brooklyn, NY. Investigation of the lot is being conducted under the New York



MARK CANDELARIO

GEOLOGIST

| p. 2

State Brownfield Cleanup Program (BCP). AKRF completed a Phase I Environmental Site Assessment, Phase II Subsurface Investigation, and prepared a Remedial Action Plan (RAP) to address subsurface contamination during site redevelopment. For this project, Mr. Candelario served as an on-site environmental monitor who conducted soil and groundwater sampling, and oversaw excavation and export of soil and groundwater.

Roberto Clemente State Park, Bronx, NY – Environmental Consulting Services

Roberto Clemente State Park is a 25-acre waterfront park located along the Harlem River in the Bronx. For this project, Mr. Candelario oversaw waste manifesting and material screening during excavation. He also managed the disposal of petroleum-contaminated soil and product-stained subsurface concrete at offsite receiving facilities.

Cascade Technical Services, Lynbrook, NY

As a High Resolution Site Characterization (HRSC) Specialist, Mr. Candelario conducted high quality environmental site assessments and characterizations in Michigan, North Carolina, South Carolina, and much of the Northeast. He used direct sensing equipment to detect and map subsurface contamination, track soil and groundwater changes and profile existing remediation systems. As part of his duties, Mr. Candelario provided support to the project managers for preparing final reports and work plans.

L.A.B. Validation Corp., 14 West Point Drive, East Northport, New York 11731

Lori A. Beyer

SUMMARY:

General Manager/Laboratory Director with a solid technical background combined with Management experience in environmental testing industry. Outstanding organizational, leadership, communication and technical skills. Customer focused, quality oriented professional with consistently high marks in customer/employee satisfaction.

EXPERIENCE:

1998-Present L.A.B. Validation Corporation, 14 West Point Drive, East Northport, NY

President

- Perform Data Validation activities relating to laboratory generated Organic and Inorganic Environmental Data.

1998-Present American Analytical Laboratories, LLC. 56 Toledo Street, Farmingdale, NY

Laboratory Director/Technical Director

- Plan, direct and control the operation, development and implementation of programs for the entire laboratory in order to meet AAL's financial and operational performance standards.
- Ensures that all operations are in compliance with AAL's QA manual and other appropriate regulatory requirements.
- Actively maintains a safe and healthy working environment that is demanded by local laws/regulations.
- Monitors and manages group's performance with respect to data quality, on time delivery, safety, analyst development/goal achievement and any other key performance indices.
- Reviews work for accuracy and completeness prior to release of results to customers.

1996-1998 Nytest Environmental, Inc. (NEI) Port Washington, New York

General Manager

- Responsible for controlling the operation of an 18,000 square foot facility to meet NEI's financial and operational performance standards.
- Management of 65 FTEs including Sales and Operations
- Ensure that all operations are in compliance with NEI's QA procedures
- Ensures that productivity indicators, staffing levels and other cost factors are held within established guidelines
- Maintains a quantified model of laboratory's capacity and uses this model as the basis for controlling the flow of work into and through the lab so as to ensure that customer requirements and lab's revenue and contribution targets are achieved.

1994-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York

Technical Project Manager

- Responsible for the coordination and implementation of environmental testing programs requirements between NEI and their customers
- Supervise Customer Service Department
- Assist in the development of major proposals
- Complete management of all Federal and State Contracts and assigned commercial contracts
- Provide technical assistance to the customer, including data validation and interpretation
- Review and implement Project specific QAPP's.

1995-1996 Nytest Environmental, Inc. (NEI) Port Washington, New York

Corporate QA/QC Officer

- Responsible for the implementation of QA practices as required in the NJDEP and EPA Contracts
- Primary contact for NJDEP QA/QC issues including SOP preparation, review and approval
- Responsible for review, verification and adherence to the Contract requirements and NEI QA Plan

1992-1994 Nytest Environmental, Inc. (NEI) Port Washington, New York

Data Review Manager

- Responsible for the accurate compilation, review and delivery of analytical data to the company's customers. Directly and effectively supervised a department of 22 personnel.
- Managed activities of the data processing software including method development, form creation, and production
- Implement new protocol requirements for report and data management formats
- Maintained control of data storage/archival areas as EPA/CLP document control officer

1987-1991 Nytest Environmental, Inc. (NEI) Port Washington, New York

Data Review Specialist

- Responsible for the review of GC, GC/MS, Metals and Wet Chemistry data in accordance with regulatory requirements
- Proficient with USEPA, NYSDEC, NJDEP and NEESA requirements
- Review data generated in accordance with SW846, NYSDEC ASP, EPA/CLP and 40 CFR Methodologies

1986-1987 Nytest Environmental, Inc (NEI) Port Washington, New York

GC/MS VOA Analyst

EDUCATION:

1982-1985 State University of New York at Stony Brook, New York; BS Biology/Biochemistry

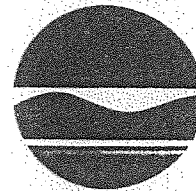
1981-1982 University of Delaware; Biology/Chemistry

5/91 Rutgers University; Mass Spectral Data Interpretation Course, GC/MS Training

8/92 Westchester Community College; Organic Data Validation Course

9/93 Westchester Community College; Inorganic Data Validation Course

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233



Thomas C. Jorling
Commissioner

July 8, 1992

Ms. Elaine Sall
Program Coordinator
Westchester Community College
Valhalla, NY 10595-1698

Dear Elaine,

Thank you for your letter of June 29, 1992. I have reviewed the course outline for organic data validation, qualifications for teachers and qualifications for students. The course that you propose to offer would be deemed equivalent to that which is offered by EPA. The individuals who successfully complete the course and pass the final written exam would be acceptable to perform the task of organic data validation for the Department of Environmental Conservation, Division of Hazardous Waste Remediation.

As we have discussed in our conversation of July 7, 1992, you will forward to me prior to the August course deadline, the differences between the EPA SOW/90 and the NYSDEC ASP 12/91. You stated these differences will be compiled by Mr. John Samulian.

I strongly encourage you to offer an inorganic data validation course. I anticipate the same list of candidates would be interested in an inorganic validation course as well, since most of the data to be validated consists of both organic and inorganic data.

Thank you for your efforts and please contact me if I can be of any further assistance.

Sincerely,

Maureen P. Serafini

Maureen P. Serafini
Environmental Chemist II
Division of Hazardous Waste
Remediation

②



The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

October 2, 1992

Ms. Lori Beyer
3 sparkill Drive
East Northport, NY 11731

Dear Ms. Beyer:

Congratulations upon successful completion of the Organic Data Validation course held August 17 - 21, 1992, through Westchester Community College, Professional Development Center. This course has been deemed by New York State Department of Environmental Conservation as equivalent to EPA's Organic Data Validation Course.

Enclosed is your Certificate. Holders of this Certificate are deemed competent to perform organic data validation for the New York State DEC Division of Hazardous Waste Remediation.

The Professional Development Center at Westchester Community College plans to continue to offer courses and seminars which will be valuable to environmental engineers, chemists and related personnel. Current plans include a TCLP seminar on November 17th and a conference on Environmental Monitoring Regulations on November 18th.

We look forward to seeing you again soon at another environmental program or event. Again, congratulations.

Very truly yours,

Passing Grade is 70%
Your Grade is 99%

Elaine Sall
Program Coordinator

ES/bf



SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595



The Professional
Development Center
AT
WESTCHESTER COMMUNITY COLLEGE

914 285-6619

June 21, 1993

Dear Ms. Beyer:

Enclosed is your graded final examination in the Inorganic Data Validation course you completed this past March. A score of 70% was required in order to receive a certificate of satisfactory completion. Persons holding this certificate are deemed acceptable to perform Inorganic Data Validation for the New York State Department of Environmental Conservation, Division of Hazardous Waste Remediation.

I am also enclosing a course evaluation for you to complete if you have not already done so. The information you provide will greatly aid us in structuring further courses. We wish to make these course offerings as relevant, targeted and comprehensive as possible. Your evaluation is vital to that end.

Congratulations on your achievement. I look forward to seeing you again at another professional conference or course. We will be co-sponsoring an environmental monitoring conference on October 21, 1993 with the New York Water Pollution Control Association, Lower Hudson Chapter, at IBM's Yorktown Heights, NY site. Information regarding this event will be going out in August.

Very truly yours,

Elaine Sall
Program Coordinator

ES/bf

Enclosures



SUNY
WESTCHESTER COMMUNITY COLLEGE
Valhalla, New York 10595

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

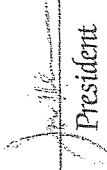
ORGANIC DATA VALIDATION COURSE (35 HOURS)

Dr. John Samuelian

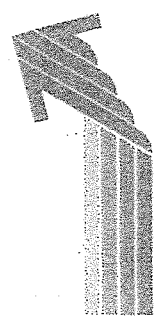
Date AUGUST 1992



Assistant Dean
Professional Development Center



President



The Professional
Development Center

Westchester Community College

Professional Development Center

Awards this Certificate of Achievement To

LORI BEYER

for Successfully Completing

INORGANIC DATA VALIDATION

Instructor: Dale Boshart

Date MARCH 1993



Assistant Dean
Professional Development Center



President



The Professional
Development Center

State University of New York State University at Stony Brook

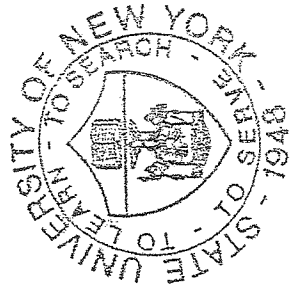
On the Recommendation of the Faculty and by Virtue of the Authority
vested in them the Trustees of the University have conferred on

Lori Ann Jaenber

the Degree of

Bachelor of Science

and have granted this Diploma as evidence thereof
Given at Stony Brook, in the State of New York, in the United States
of America on the twentieth day of December one thousand nine
hundred and eighty-five.



Wm. D. Linde
Chairman of the Board of Trustees

Wm. H. Muller
Chairman of the Council,
State University at Stony Brook

Wm. D. Linde
Chancellor of the State University of New York

John H. Marburger, Jr.
President,
State University at Stony Brook

APPENDIX F
SITE MANAGEMENT FORMS



Groundwater Monitoring Well Sampling Log

Job No: 170058					Client: Wilfrid East Properties LLC, Wilfrid Realty Corp., Wilfrid East LIHTC LLC, Wilfrid Properties LLC, Wilfrid West Properties LLC, Wilfrid LIHTC LLC, and ACMH Wilfrid Housing Development Fund Corporation				Groundwater Monitoring Well ID:
Project Location: 1888 Bathgate Avenue Redevelopment Site, Bronx, NY									
Date:									
PID at surface: ppm									
Total Depth: feet below top of casing					Water Column (WC): feet				
Depth to Water: feet below top of casing					Well Volume*: gallons				*= 0.163 x WC for 2" wells
Depth to Product: feet below top of casing					Volume Purged: gallons				
Depth to top of screen: feet below top of casing					Well Diameter: inches				Target maximum flow rate is 100 ml/min
Depth to bottom of screen: feet below top of casing					Purging Device (pump type): QED MP50 / Bladder Pump				
Approximate Pump Intake: feet below top of casing									
Time	Depth to Water (Ft.)	Purge Rate (ml/min)	Temp (°C)	Conductivity (mS/cm)	DO (mg/L)	pH	ORP (mV)	Turbidity (NTU)	Comments (problems, odor, sheen)
Stabilization Criteria:				+/- 3 mS/cm	+/- 0.3 mg/L	+/- 0.1 pH units	+/- 10 mV	<50 NTU	If water quality parameters do not stabilize and/or turbidity is greater than 50 NTU within two hours, discontinue purging and collect sample.
Notes: Groundwater sample [INSERT SAMPLE ID] was analyzed for CVOCs by EPA Method 8260.									
ppm = parts per million PID = photoionization detector									

APPENDIX G
RESPONSIBILITIES OF THE OWNER AND REMEDIAL
PARTY

Responsibilities

The responsibilities for implementing the Site Management Plan (SMP) for the 1888 Bathgate Avenue Site (the "Site"), number C203088, are divided between the site owner(s) and a Remedial Party, as defined below. The owner is currently listed as:

Wilfred Realty Corp.
54 Center Ct.
Roslyn Heights, NY 11577

Solely for the purposes of this document and based upon the facts related to a particular site and the remedial program being carried out, the term Remedial Party (RP) refers to any of the following: certificate of completion holder, volunteer, applicant, responsible party, and, in the event the New York State Department of Environmental Conservation (NYSDEC) is carrying out remediation or site management, the NYSDEC and/or an agent acting on its behalf. The RP is:

Wilfrid East Properties LLC, Wilfrid Realty Corp.,
Wilfrid East LIHTC LLC, Wilfrid Properties LLC,
Wilfrid West Properties LLC, Wilfrid LIHTC LLC, and
ACMH Wilfrid Housing Development Fund Corporation
48-02 25th Avenue, Suite 400
Astoria, New York 11103

Nothing on this page shall supersede the provisions of an Environmental Easement, Consent Order, Consent Decree, agreement, or other legally binding document that affects rights and obligations relating to the Site.

Site Owner's Responsibilities:

- 1) The owner shall follow the provisions of the SMP as they relate to future construction and excavation at the Site.
- 2) In accordance with a periodic time frame determined by the NYSDEC, the owner shall periodically certify, in writing, that all Institutional Controls set forth in an Environmental Easement remain in place and continue to be complied with. The owner shall provide a written certification to the RP, upon the RP's request, in order to allow the RP to include the certification in the site's Periodic Review Report (PRR) certification to the NYSDEC.
- 3) In the event the Site is delisted, the owner remains bound by the Environmental Easement and shall submit, upon request by the NYSDEC, a written certification that the Environmental Easement is still in place and has been complied with.
- 4) The owner shall grant access to the site to the RP and the NYSDEC and its agents for the purposes of performing activities required under the SMP and assuring compliance with the SMP.
- 5) The owner is responsible for assuring the security of the remedial components located on its property to the best of its ability. In the event that damage to the remedial

components or vandalism is evident, the owner shall notify the site's RP and the NYSDEC in accordance with the timeframes indicated in Section 1.4 - Notifications.

- 6) In the event some action or inaction by the owner adversely impacts the site, the owner must notify the site's RP and the NYSDEC in accordance with the time frame indicated in Section 1.4 - Notifications and coordinate the performance of necessary corrective actions with the RP.
- 7) The owner must notify the RP and the NYSDEC of any change in ownership of the Site property (identifying the tax map numbers in any correspondence) and provide contact information for the new owner of the Site property. 6 NYCRR Part contains notification requirements applicable to any construction or activity changes and changes in ownership. Among the notification requirements is the following: sixty days prior written notification must be made to the NYSDEC. Notification is to be submitted to the NYSDEC Division of Environmental Remediation's Site Control Section. Notification requirements for a change in use are detailed in Section 1.4 of the SMP. A 60-Day Advance Notification Form and Instructions are found at <http://www.dec.ny.gov/chemical/76250.html>.
- 8) In accordance with the tenant notification law, within 15 days of receipt, the owner must supply a copy of any vapor intrusion data, that is produced with respect to structures and that exceeds NYSDOH or OSHA guidelines on the site, whether produced by the NYSDEC, RP, or owner, to the tenants on the property. The owner must otherwise comply with the tenant and occupant notification provisions of Environmental Conservation Law Article 27, Title 24.

Remedial Party Responsibilities

- 1) The RP must follow the SMP provisions regarding any construction and/or excavation it undertakes at the Site.
- 2) The RP shall report to the NYSDEC all activities required for remediation, operation, maintenance, monitoring, and reporting. Such reporting includes, but is not limited to, periodic review reports and certifications, electronic data deliverables, corrective action work plans and reports, and updated SMPs.
- 3) Before accessing the site property to undertake a specific activity, the RP shall provide the owner advance notification that shall include an explanation of the work expected to be completed. The RP shall provide to (i) the owner, upon the owner's request, (ii) the NYSDEC, and (iii) other entities, if required by the SMP, a copy of any data generated during the Site visit and/or any final report produced.
- 4) If the NYSDEC determines that an update of the SMP is necessary, the RP shall update the SMP and obtain final approval from the NYSDEC. Within 5 business days after NYSDEC approval, the RP shall submit a copy of the approved SMP to the owner(s).
- 5) The RP shall notify the NYSDEC and the owner of any changes in RP ownership and/or control and of any changes in the party/entity responsible for the operation, maintenance, and monitoring of and reporting with respect to any remedial system (Engineering Controls). The RP shall provide contact information for the new party/entity. Such activity constitutes a Change of Use pursuant to 375-1.11(d) and

requires 60-days prior notice to the NYSDEC. A 60-Day Advance Notification Form and Instructions are found at <http://www.dec.ny.gov/chemical/76250.html> .

- 6) The RP shall notify the NYSDEC of any damage to or modification of the systems as required under Section 1.4 of the SMP.
- 7) Prior to a change in use that impacts the remedial system or requirements and/or responsibilities for implementing the SMP, the RP shall submit to the NYSDEC for approval an amended SMP.
- 8) Any change in use, change in ownership, change in site classification (*e.g.*, delisting), reduction or expansion of remediation, and other significant changes related to the Site may result in a change in responsibilities and, therefore, necessitate an update to the SMP and/or updated legal documents. The RP shall contact the Department to discuss the need to update such documents.

Change in RP ownership and/or control and/or Site ownership does not affect the RP's obligations with respect to the site unless a legally binding document executed by the NYSDEC releases the RP of its obligations.

Future Site owners and RPs and their successors and assigns are required to carry out the activities set forth above.